LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN VOLUME I - CHAPTERS

Federal Energy Regulatory Commission Project Nos. 935, 2071, and 2111



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LEWIS RIVER HYDROELECTRIC PROJECTS

FEDERAL ENERGY REGULATORY COMMISSION PROJECT NOS. 935, 2071, AND 2111

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

VOLUME I

PACIFICORP ENERGY PORTLAND, OREGON

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ACRONYMS & ABBREVIATIONS

Note: To enhance readability, the use of acronyms and abbreviations has been minimized in this document. However, for longer terms that are frequently used throughout, as well as certain units of measurement, the following acronyms and abbreviations have been used.

cm	centimeter
dbh	diameter at breast height
ha	hectare
HEP	Habitat Evaluation Procedure
HSI	habitat suitability index
kg	kilogram
PUD	Public Utility District
TCC	Terrestrial Coordination Committee
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WHMP	Wildlife Habitat Management Plan

1.0 INTRODUCTION

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

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Appendix 1-1: Settlement Agreement Schedule 10.8: Wildlife Objectives Appendix 1-2: Merwin, Yale, and Swift License Articles 403 and 404

1.1 INTRODUCTION

PacifiCorp has prepared this Wildlife Habitat Management Plan (WHMP) for the Merwin, Yale, and Swift No. 1 Hydroelectric Projects, located in Clark, Cowlitz, and Skamania counties in Washington state. This chapter provides an introduction to the WHMP and includes the following information:

- Purpose and need of the WHMP
- Organization of the WHMP
- Overview of the Lewis River Hydroelectric Projects
- Summary of the relicensing process for the Lewis River Hydroelectric Projects
- Summary of existing wildlife management efforts on Project lands
- Summary of terrestrial resource relicensing studies

<u>1.2 PURPOSE AND NEED OF THE</u> WILDLIFE HABITAT MANAGEMENT PLAN

The purpose of the Lewis River WHMP is to offset habitat impacts and associated wildlife losses resulting from the continued operation of the Lewis River Hydroelectric Projects by protecting, mitigating, and enhancing existing wildlife habitat on the PacifiCorp-owned and/or controlled lands that are associated with the Projects (PacifiCorp et al. 2004). The WHMP will benefit a broad range of wildlife, fish, and native plant species, including, but not limited to, large and small game, amphibians, bats, forest raptors, neotropical migrant birds, and culturally significant native plants.

<u>1.3 ORGANIZATION OF THE</u> WILDLIFE HABITAT MANAGEMENT PLAN

This plan is organized into four types of chapters: general, habitat management, planwide goals, and species association. The general chapters are the *Introduction*, *Management Area*, and *Administration*. This *Introduction* (Chapter 1) provides an overview of the history of the Projects, the relicensing process, and the purpose and need of the WHMP. *Management Area* (Chapter 2) provides an overall description of the Lewis River basin, WHMP lands, proposed land acquisition, and Habitat Evaluation Procedures (HEP) for new lands. *Administration* (Chapter 3) provides the standards for maintaining data, coordinating with the Terrestrial Coordination Committee (TCC), and annual reporting requirements.

There is a corresponding habitat management chapter for each habitat type identified in the overall objectives of the Settlement Agreement Schedule 10.8: Wildlife Objectives (Appendix 1-1). The following is a list of the habitat management chapters:

- Old-growth Habitat Management
- Wetland Habitat Management
- Riparian Habitat Management
- Shrubland Habitat Management
- Farmland/Idle Fields/Meadows Habitat Management

- Orchard Management
- Transmission Line Rights-of-Way Habitat Management
- Unique Area/Habitat Management
- Forestland Habitat Management

The plan-wide goal chapters represent the Settlement Agreement Schedule 10.8: Wildlife Objectives that are not tied to the management of any particular habitat type or associated species, but apply to all WHMP lands (Appendix 1-1). There is a corresponding chapter for each of the following plan-wide goals:

- Invasive Plant Species Management
- Public Access Management
- Raptor Site Management
- Monitoring

Each habitat management and plan-wide goal chapter follows the same organization. Each chapter begins with an introduction to provide a general description of the planwide goal or habitat management type and its benefits to wildlife. This is followed by a description of the goal and objectives and the associated species from the Standards & Guidelines (PacifiCorp and Public Utility District No. 1 of Cowlitz County [Cowlitz PUD] 2006). The third section of the chapter provides habitat type and plan-wide goal descriptions that are specific to WHMP lands including location, amount, and distribution. The fourth section of the chapter provides the methods for conducting initial evaluations and regularly scheduled inspections. The fifth section describes the management actions that may occur to meet the goal and objectives. The last section of the chapter provides a schedule and an estimate of the effort needed to complete the inspections and management actions.

The *Species Association* chapter provides a summary of general life history and habitat information for selected species found within the plan area. It also provides a collection of relevant information from relicensing studies, the HEP data, and implementing the Merwin Wildlife Habitat Management Program.

1.4 OVERVIEW OF THE LEWIS RIVER HYDROELECTRIC PROJECTS

The Lewis River Hydroelectric Projects consist of the Merwin Project (No. 935), Yale Project (No. 2071), Swift No. 2 Project (No. 2213), and Swift No. 1 Project (No. 2111) and associated powerhouses, transmission facilities, recreational facilities, hatcheries, reservoirs, canals, and WHMP lands. PacifiCorp, a subsidiary of MidAmerican Energy Holdings Company, owns the Merwin, Yale, and Swift No. 1 Projects. Cowlitz PUD owns the Swift No. 2 Project.

Merwin Dam is located 21 river miles (34 km) upstream from the confluence of the Lewis and Columbia rivers. Construction of the Merwin Project was started in November 1929, and completed in 1931 with a single unit. Units No. 2 and No. 3 were added in 1949 and 1958, respectively. Merwin powerhouse is a two-story concrete building with provisions in the original plan for expansion to four units. The three turbines are a water wheel reaction type, developing approximately 61,500 horsepower with 180 feet (55 m) of head and 45,000 kilowatts each. The Federal Power Commission issued the first license for the Merwin Project on November 29, 1929, which expired on November 29, 1979. That license was renewed on October 6, 1983, and was originally due to expire on April 30, 2009, but was accelerated by an Order from the Federal Energy Regulatory Commission and expired on April 30, 2006.

Yale Dam is located 14.5 miles (23.3 km) upstream of Merwin Dam. Construction of the Yale Project was started in 1951 and completed in 1953. Yale Dam is a rolled earth-fill embankment type with a crest length of 1,305 feet (398 m) and a height of 323 feet (98 m) above its lowest foundation point. Its thickness at the base is 1,600 feet (488 m), for a total volume of 4,200,807 yd³ (3,212,000 m³). The powerhouse is a two-story concrete structure with two Francis-type generating units with a capacity of 160,000 kilowatts located at the base of the earth embankment. Saddle Dam, a secondary dam, is located northwest of the main dam. Saddle Dam is an earth-fill type, 40 feet (12 m) high with crest length of 1,600 feet (488 m) and a base 200 feet (61 m) thick. The original license for the Yale Project was issued on April 24, 1951, and expired on April 30, 2001; an application to relicense this Project was submitted to the Federal Energy Regulatory Commission in 1999. The Federal Energy Regulatory Commission agreed to defer processing of the Yale Project license application until the applications for the Merwin and Swift No. 1 and Swift No. 2 Projects were filed.

Swift Dam is located approximately 10.5 miles (16.9 km) upstream of Yale Dam. Construction started in 1956 and was completed in 1958. Swift Dam is an earth-fill structure with a crest length of 2,100 feet (640 m) and a height of 512 feet (156 m) above its lowest foundation point. The thickness at base is 1,950 feet (594 m), more than one-third mile. The dam crest is at about elevation 1,012 feet (309 m) mean sea level, with some minor variations across its length. The powerhouse is a three-story steel structure sheathed with aluminum panels. The plant has three Francis-type units with a total capacity of 240,000 kilowatts and is located at the base of the dam. The original licenses for the Swift No. 1 and Swift No. 2 Projects were effective on May 1, 1956, and expired on April 30, 2006.

1.5 OVERVIEW OF THE LEWIS RIVER RELICENSING PROCESS

The Federal Energy Regulatory Commission issued the licenses for the Lewis River Hydroelectric Projects on June 26, 2008. Under Article 403 in the Merwin, Yale, and Swift No. 1 licenses, PacifiCorp is to complete a WHMP for the designated lands. This is to be completed within 6 months from the issuance of the licenses and filed with the Federal Energy Regulatory Commission for approval. Article 404 in these licenses provides measures for protecting wildlife terrestrial resources. The articles for each of the licenses are provided in Appendix 1-2.

The Lewis River Projects used a collaborative process under the Federal Energy Regulatory Commission's Alternative Licensing Procedure to resolve issues related to relicensing. The collaborative process was initiated with public and agency meetings in April 1999. The outcome of this process was the Lewis River Settlement Agreement signed by PacifiCorp, Cowlitz PUD, and 24 other Parties, including five federal agencies, two state agencies, eight county/local agencies, two tribes, two citizens-at-large, and five nongovernmental organizations, on November 30, 2004 (PacifiCorp et al. 2004).

The Settlement Agreement Section 10.8.1 directs PacifiCorp and Cowlitz PUD to consult with the TCC in developing the WHMPs. In preparation of the plans, the TCC developed the Standards & Guidelines document to provide goals and objectives based upon on the broad objectives identified in Settlement Agreement Schedule 10.8 (PacifiCorp and Cowlitz PUD 2006) (Appendix 1-1). The goals are to address the plans' intent for each habitat management area and plan-wide goal. Each goal has objectives that define the management actions, schedule, and/or desired outcomes within a specific time period. Using the same Standards & Guidelines, the two utilities elected to develop separate WHMPs for their respective licenses.

This Lewis River WHMP was prepared in coordination with the TCC, which includes representatives from the Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service, the Cowlitz Indian Tribe, the Yakama Nation, Lewis River Citizens at-Large, and the Rocky Mountain Elk Foundation.

1.6 SUMMARY OF EXISTING WILDLIFE MANAGEMENT EFFORTS

The original Merwin and Yale Project licenses did not include any provisions for wildlife management when they were issued in 1929 and 1951, respectively. The original Swift No. 2 and Swift No. 1 licenses both included articles addressing wildlife. The Licensees complied with the terms of those articles through a series of Memoranda of Agreement with the WDFW in the early 1960s. However, none of the license articles or associated Memoranda of Agreement required implementation of any specific on-the-ground wildlife management or habitat improvement activities at the Swift No. 1 or Swift No. 2 Projects.

As a condition of relicensing the Merwin Project in 1983, PacifiCorp agreed to protect and enhance wildlife habitat on 5,600 acres (2,266 ha) of land around Lake Merwin and in the Saddle Dam Farm near Yale Reservoir. This area is known as the Merwin Wildlife Habitat Management Area and is managed under the Merwin Wildlife Habitat Standard Operating Procedures (PacifiCorp 1998). The management plan for the Merwin Wildlife Habitat Management Area was developed by the WDFW in 1982 and has been implemented by PacifiCorp since 1984. After an initial 5-year development period, PacifiCorp prepared the Standard Operating Procedures to guide annual management activities in the Merwin Wildlife Habitat Management Area. The initial Standard Operating Procedures document was prepared in 1990 and updated in 1998 in cooperation with the WDFW.

Although the Merwin management plan was developed to enhance conditions for wildlife in general, an emphasis of the plan was to develop and maintain a 50:50 cover forage ratio to benefit elk (*Cervus elaphus*). This cover forage ratio and other wildlife habitat enhancements are accomplished primarily through the use of forest management practices. The plan also includes provisions for improving and maintaining existing oldgrowth forest stands, farm fields, orchards, meadows, and a number of created wetlands. This WHMP incorporates lessons learned during the development and implementation of the Merwin management plan and Standard Operating Procedures, as well as relevant literature and other information sources. The Merwin Wildlife Habitat Management Area will continue to be managed under the Standard Operating Procedures for 6 months (until December 26, 2008) after the Federal Energy Regulatory Commission's issuance of the License Orders for the Lewis River Hydroelectric Projects (PacifiCorp 1998).

1.7 SUMMARY OF TERRESTRIAL RESOURCE RELICENSING STUDIES

PacifiCorp and Cowlitz PUD conducted a number of terrestrial resource studies related to the relicensing process for the Lewis River Hydroelectric Projects (PacifiCorp and Cowlitz PUD 2004). Several of these studies were specifically designed to provide data to guide future habitat management activities on Project lands. Terrestrial resource surveys and inventories were conducted in 1996-1998 for the Yale Project; studies for the other three Projects were implemented in 2000-2002. These studies included the following:

- Vegetation Cover Type Mapping (TER 1)
- Habitat Evaluation Procedure (TER 2)
- Analysis Species Assessment (TER 3)
- Botanical Surveys (TER 4)
- Wetland Information Synthesis (TER 5)
- Reservoir Fluctuation Study (TER 6)
- Reservoir and Tributary Stream Study (TER 7)
- Forest Harvest Practices Assessment (TER 8)
- Riparian Habitat Information Synthesis (TER 9)

The "TER" numbers in parentheses are the study numbers assigned during relicensing and are included to facilitate locating the final reports in the License Applications for the Projects. Study objectives, methods, and results are provided in PacifiCorp and Cowlitz PUD (2004).

Studies particularly relevant to the WHMP include the Vegetation Cover Type Mapping, HEP, and the weed inventory, which was part of the Botanical Surveys. The HEP was conducted specifically to provide a baseline assessment of habitat quality on lands on and near the Projects for a select set of evaluation species, and to monitor progress toward achieving the habitat management objectives for the WHMPs, as projected by the HEP (TER 2). The seven evaluation species addressed by the HEP included the following:

- Pond-breeding amphibians (primarily the northern red-legged frog [*Rana aurora aurora*])
- Pileated woodpecker (*Dryocopus pileatus*)
- Black-capped chickadee (*Poecile atricapillus*)
- Yellow warbler (*Dendroica petechia*)
- Savannah sparrow (*Passerculus sanwichensis*)
- Mink (*Mustela vison*)
- Elk

1.8 REFERENCES

- PacifiCorp. 1998. Merwin Wildlife Habitat Management Program, Standard Operating Procedures. PacifiCorp, Portland, Oregon. July 1998.
- PacifiCorp, Cowlitz PUD, National Marine Fisheries Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, Cowlitz Indian Tribe, Confederated Tribes and Bands of the Yakama Nation, Washington Department of Fish and Wildlife, Washington Interagency Committee for Outdoor Recreation, Cowlitz County, Cowlitz-Skamania Fire District No. 7, North Country Emergency Medical Service, City of Woodland, Woodland Chamber of Commerce, Lewis River Community Council, Lewis River Citizens At-Large, American Rivers, Fish First, Rocky Mountain Elk Foundation, Trout Unlimited, and the Native Fish Society. 2004. Settlement Agreement concerning the relicensing of the Lewis River Hydroelectric Projects Federal Energy Regulatory Commission Project Nos. 935, 2071, 2111, and 2213, Cowlitz, Clark, and Skamania Counties, Washington. November 30, 2004.
- PacifiCorp and Cowlitz PUD. 2004. Lewis River Hydroelectric Projects Technical Reports. Technical studies conducted under PacifiCorp and the Public Utility District No. 1 of Cowlitz County's Lewis River Hydroelectric Projects Alternative Licensing Procedure (ALP). Federal Energy Regulatory Commission Project Nos. 935, 2071, 2111, and 2213.
- PacifiCorp and Cowlitz PUD. 2006. Lewis River Wildlife Habitat Management Plan Standards & Guidelines document, version 4/28/06 – 06/14/06. Seattle, Washington.

2.0 MANAGEMENT AREA

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Appendix 2-1: Vicinity Map of the Lewis River Hydroelectric Projects Appendix 2-2: Settlement Agreement Exhibit A Maps Appendix 2-3: Wildlife Habitat Management Plan Lands Management Units Appendix 2-4: Settlement Agreement Section 10

2.1 LEWIS RIVER BASIN

The Lewis River basin is located on the western slopes of the Cascade Mountain Range. Two volcanic peaks, Mount Adams and Mount St. Helens, lie on the northern and eastern extremities of the basin with elevations of 12,280 feet (3,742 m) and 7,382 feet (2,250 m), respectively. Foothills in the central portion of the watershed are generally steep and forested and extend up to approximately 3,000 feet (914 m) above mean sea level. The foothills are largely conifer forests dominated by Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*). Upland deciduous and mixed coniferdeciduous forests also occur in the lower elevations of these foothills. Downstream of Merwin Dam, the Lewis River enters a terrain of rolling hills that eventually transitions to flat floodplain land near the river's confluence with the Columbia River.

The Lewis River basin has a predominantly temperate marine climate typical of the Pacific Northwest. A narrow range of temperatures, dry summers, and mild but rainy winters are typical, with annual precipitation averaging around 90 inches (229 centimeters [cm]). A vicinity map for the Lewis River Hydroelectric Projects is provided in Appendix 2-1.

2.2 LANDS COVERED BY THE WILDLIFE HABITAT MANAGEMENT PLAN

The Lewis River Hydroelectric Projects are located in three counties in southwest Washington: Clark, Cowlitz, and Skamania. More specifically, the Projects are located in the central portion of the basin, and elevations range from about 240 feet (73 m) above mean sea level at Merwin Dam to approximately 2,500 feet (762 m) above mean sea level on lands surrounding the reservoirs. The landscape surrounding the Projects consists primarily of upland conifer, upland deciduous, and mixed conifer-deciduous forests. Wetlands, open areas (e.g., meadows and farmland), and riparian forests are comparatively limited in the Project vicinity. Of the 215 wildlife species associated with low-elevation conifer forests in western Washington, 136 have been documented in the vicinity of the Projects (Johnson and O'Neil 2001 and PacifiCorp and Cowlitz PUD 2004).

As documented in the Standards & Guidelines, PacifiCorp currently owns 10,348 acres (4,188 ha) in the Lewis River basin (PacifiCorp and Cowlitz PUD 2006). The maps in Settlement Agreement Exhibit A are provided in Appendix 2-2 and show the lands owned by PacifiCorp as of June 2005 and indicate the areas that are included or excluded in the WHMP lands. Project facilities, hatcheries, and parts of some recreational developments are excluded from the WHMP lands and represent about 263 acres (106 ha) of PacifiCorp's ownership. Of the 10,085 acres (4,081 ha) currently included in PacifiCorp's WHMP, there are:

- 9,629 acres (3,897 ha) for which wildlife habitat management is the primary priority.
- 159 acres (64 ha) (35 sites) for which wildlife habitat is a secondary priority. Secondary management areas include parts of some recreation developments, lands leased to other entities, and maintenance areas. In general, secondary WHMP lands will be managed for wildlife, provided that there is no conflict with the primary purpose of these areas.
- 23 acres (9 ha) in the Cresap Bay Recreation Area that will be managed for wildlife except during the peak recreation season (Memorial Day to the end of September) when PacifiCorp will manage for both wildlife and recreation. This area will be closed to public vehicle access during the off-season with the intent of minimizing disturbance to wildlife. PacifiCorp may need periodic access to Cresap Bay during the off-season for scheduled maintenance; these activities will be timed to minimize disturbance to wildlife and will be discussed with the TCC on an annual basis, except for emergencies.
- 308 acres (125 ha), including 273 acres (110 ha) in the Cougar/Panamaker Conservation Covenant and 35 acres (14 ha) in the Swift Creek Arm Conservation

Covenant, which are to be maintained in perpetuity for bull trout (*Salvelinus confluentus*). The area of the Cougar/Panamaker Conservation Covenant includes the following: (1) the land within 500 feet (152 m), as measured horizontally, on either side of the high water mark along Cougar Creek, but not extending past the toe slope of the road to the south of Cougar Creek; and (2) the land within 200 feet (60 m) of Panamaker Creek, as measured horizontally on either side of the high water mark, or the property boundary if it is less than 200 feet (61 m) from the creek.

These acres are to be considered the baseline acreages and are expected to change as boundaries are corrected or as additional lands are acquired. These acreages are considered to be the minimum, and any future revisions should increase the overall acreage of the WHMP lands.

2.3 MANAGEMENT UNITS

The Lewis River WHMP lands have been demarcated into 32 Management Units. The purpose of the Management Unit designation is to provide a systematic approach for managing and providing nomenclature to the WHMP lands. The Management Units were delineated using distinct boundaries such as property lines, highways, streams, and/or section lines. In some areas, boundaries were distinguished using physical attributes such as hydrological unit boundaries and/or wildlife use patterns.

Management Units are categorized by the associated reservoir (i.e., Merwin, Yale, and Swift), which is typically the reservoir that is in closest to the unit. Management Units associated with Merwin include the units that were managed during the Merwin Wildlife Habitat Management Program (1983-2008). These include Management Units 1 through 16 and 32, which are the units that are located around the Merwin Hydroelectric Project, the additional acreage along the north shore of Yale Reservoir that is contiguous to the Saddle Dam Farm (Management Unit 10), and Management Unit 32, which is a large isolated block of riparian habitat below Merwin Dam. Management Units associated with Yale Reservoir include Management Units 17 through 23 and include the Cougar/Panamaker Conservation Covenant (Management Unit 20). Swift Reservoir Management Units include units 24 through 31. Management Unit 31 is comprised of 16 isolated parcels along the Swift Reservoir shoreline that vary from 0.1 to 35.2 acres (0.04 to 14.3 ha) and collectively total 122.6 acres (50 ha). Because these areas are so small and isolated, they are managed under a single Management Unit (31); however, for mapping purposes, they are identified into subunits 31-1 through 31-16. Appendix 2-3 provides detailed maps of the Management Units.

2.4 LAND ACQUISITION

The Settlement Agreement Section 10 provides the guidelines and criteria for Pacificorp to acquire Interest in Land to protect or enhance wildlife habitat and to meet the goals and objectives of the WHMP (Appendix 2-4). The term "Interests in Land" is defined in the Settlement Agreement as "acquisition of interests in land to protect wildlife habitat, which may include, without limitation, fee interests and conservation easements." Section 10.1 provides specific guidelines for selecting and funding lands in the Yale Project areas, whereas Section 10.2 is specific to acquiring lands in the vicinity of the Swift Projects, and Section 10.3 provides guidelines for PacifiCorp to acquire or enhance wildlife habitat anywhere in the vicinity of the Projects to meet the objectives of its WHMP. As new lands are acquired, the HEP data will be updated using the methods described in Chapter 16 (*Monitoring*).

2.5 SECONDARY MANAGEMENT AREAS

The secondary management areas are PacifiCorp lands that are within or adjacent to WHMP lands and have a primary purpose other than wildlife habitat, such as recreation. Because these areas have the potential to provide habitat to associated species, they are managed for wildlife to the extent that it does not conflict with the primary purpose. In general, the secondary management areas are associated with recreation, leased lands, and maintenance and operations; as a result, they are generally small in extent and may have both managed and unmanaged landscapes. There are 35 secondary management areas that total 159 acres (64 ha). Each of the areas is identified in Appendices 2-2 and 2-3. The School Lease (3.1 acres [1.25 ha]) identified in Appendix 2-2 has been transferred to the Cowlitz Indian Tribe in 2008 and is no longer part of the WHMP lands.

Management actions that may be implemented to maintain or improve wildlife habitat on secondary management areas may include but are not limited to the following:

- Invasive plant species management
- Seasonal closures
- Apply applicable WHMP buffers
- Identify and mark secondary management areas where needed
- Identify wildlife impacts and potential habitat enhancement opportunities prior to implementing actions that will significantly modify the area (e.g., at Cougar Park)

Activities with the potential to affect secondary management areas will be communicated to a PacifiCorp biologist through the compliance and implementation meetings. These meetings will be attended by a person responsible for WHMP implementation to ensure that any actions that may be conducted within secondary management areas will minimize adverse impacts and identify opportunities for enhancement where feasible.

2.6 REFERENCES

- Johnson, David H., and Thomas A. O'Neil. 2001. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis. 736pp.
- PacifiCorp, Cowlitz PUD, National Marine Fisheries Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, Cowlitz Indian Tribe, Confederated Tribes and Bands of the Yakama Nation, Washington Department of Fish and Wildlife, Washington Interagency Committee for Outdoor Recreation, Cowlitz County, Cowlitz-Skamania Fire District No. 7, North Country Emergency Medical Service, City of Woodland, Woodland Chamber of Commerce, Lewis River Community Council, Lewis River Citizens At-Large, American Rivers, Fish First, Rocky Mountain Elk Foundation, Trout Unlimited, and the Native Fish Society. 2004. Settlement Agreement concerning the relicensing of the Lewis River Hydroelectric Projects Federal Energy Regulatory Commission Project Nos. 935, 2071, 2111, and 2213, Cowlitz, Clark, and Skamania Counties, Washington. November 30, 2004.
- PacifiCorp and Cowlitz PUD. 2004. Lewis River Hydroelectric Projects Technical Reports. Technical studies conducted under PacifiCorp and Public Utility District No. 1 of Cowlitz County's Lewis River Hydroelectric Projects Alternative Licensing Procedure (ALP). Federal Energy Regulatory Commission Project Nos. 935, 2071, 2111, and 2213.
- PacifiCorp and Cowlitz PUD. 2006. Lewis River Wildlife Habitat Management Plan Standards & Guidelines document, version 4/28/06 – 06/14/06. Seattle, Washington.

3.0 ADMINISTRATION

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Appendix 3-1: Settlement Agreement Section 14: Coordination and Decision Making Appendix 3-2: Terrestrial and Aquatic Coordination Committees Final Structure and Ground Rules

3.0 INTRODUCTION

This chapter provides a general description of the TCC responsibilities and coordination, data maintenance, and annual reporting and Annual Plan requirements.

3.1 TERRESTRIAL COORDINATION COMMITTEE

This section summarizes the TCC's responsibilities and the process that will be followed in implementing this WHMP. Additional information is provided in Appendix 3-1 and Appendix 3-2, which are Section 14 of the Settlement Agreement and the TCC Structure and Ground Rules.

3.1.1 Terrestrial Coordination Committee Purpose

As stated in Settlement Agreement Section 14.1, the primary purpose of the TCC is to provide a forum for coordinating between the Licensees and the other Parties on implementation of the protection, mitigation, and enhancement measures for terrestrial resources included in Section 10 of the Settlement Agreement (Appendix 2-4). In addition, the TCC is responsible for the following:

- Overseeing the development by the Licensees of objective-oriented wildlife habitat management plans prior to the issuance of the licenses
- Monitoring implementation of the WHMP
- Overseeing the HEP Study in the 17th year after issuance of the licenses, and modifying the WHMP, if necessary, based on the results of the HEP.
- Overseeing and making decisions regarding the: (1) Yale Fund; (2) the Swift Fund; and (3) the Lewis River Fund
- Overseeing the annual budgets for the WHMP

3.1.2 Terrestrial Coordination Committee Function

As described in Settlement Agreement Section 14.2.3, the functions of the TCC include:

- Coordinating and consulting on development of plans by the Licensees as provided in the Settlement Agreement
- Reviewing information and overseeing, guiding, and making comments and recommendations on implementation and monitoring of the terrestrial protection, mitigation, and enhancement measures, including plans

- Consulting with the Licensees on their respective reports prepared under the Settlement Agreement Section 14.2.6 regarding implementation of the terrestrial protection, mitigation, and enhancement measures
- Making decisions, granting approvals, and undertaking any additional duties and responsibilities expressly given to the TCC with respect to the terrestrial protection, mitigation, and enhancement measures
- Establishing, among other things: (1) procedures and protocols for conducting committee meetings and deliberations to ensure efficient participation and decision-making; (2) rules for quorum and decision-making in the absence of any member; (3) alternative meeting formats as desired, including phone or teleconference; and (4) the methods and procedures for updating committee members on the interim progress of development and implementation of the terrestrial protection, mitigation, and enhancement measures
- Establishing subcommittees, as deemed necessary and appropriate, to carry out specified committee functions and responsibilities, and establishing the size of, membership of, and procedures for any such subcommittees
- Discussing the protocols and the content of public information releases, provided that each Party retains the right to release information to the public at any time without such discussion

3.1.3 Terrestrial Coordination Committee Decision-Making Process and Limitations

Settlement Agreement Section 14.2.4 directs the TCC to make comments, recommendations, and decisions related to implementation of protection, mitigation, and enhancement measures in a timely manner, as provided below.

- Each Party represented on the TCC will have the authority to participate in all committee discussions relating to, and to provide input and advice on, decisions regarding implementation of the terrestrial protection, mitigation, and enhancement measures. Ground rules related to decision-making by both the TCC and Aquatic Coordination Committee have been developed by the two groups and are provided in Appendix 3-2 of this document.
- The TCC will strive to operate by consensus, which is defined in Appendix 3-2. Whether or not the TCC has final authority over decisions on terrestrial protection, mitigation, and enhancement measures, the Licensees and other Parties may proceed with actions necessary to implement the licenses or the Settlement Agreement, even though consensus is not achieved, provided that in such cases the responsible Licensee or Licensees notify the Federal Energy Regulatory Commission of the comments of the TCC members and the areas of

disagreement. If the TCC does not reach consensus, then any member of the TCC may initiate the Alternative Dispute Resolution Procedures as provided in Settlement Agreement Section 15 (PacifiCorp et al. 2004).

- Where one or more Parties have approval authority under the Settlement Agreement, Licensees will notify the Federal Energy Regulatory Commission of any approvals that were not obtained; include the relevant comments of the Parties with approval authority; describe the impact of the lack of approval on the schedule for implementation of protection, mitigation, and enhancement measures; and describe proposed steps to be taken to gain the approval, including dispute resolution.
- In no event will the TCC increase or decrease the monetary, resource, or other commitments made by PacifiCorp under the Settlement Agreement; override any other limitations set forth in the Settlement Agreement; or otherwise require PacifiCorp to modify facilities of the three Projects without PacifiCorp's prior written consent. Consent may be withheld at the discretion of the applicable Licensee.
- At any juncture where discussion or other contact with the TCC is required by the Settlement Agreement, the TCC Coordinator(s) will schedule an opportunity to discuss the relevant issue with the TCC. This event will consist of a conference call, in-person meeting, or other appropriate forum to enable full consideration of the issue.

3.1.4 Terrestrial Coordination Committee Meetings

Settlement Agreement Section 14.2.5 requires that the TCC meet at least annually and provide for additional meetings, if needed. TCC members will have a minimum of 30 days' notice prior to any meeting, unless otherwise agreed to by the members. Meetings will be open to the public who may observe and provide comment at the appropriate time. Non-member participants (i.e., interested parties) cannot participate in the determination of consensus. The TCC may schedule meetings that are not open to non-TCC participants, confidential, or otherwise.

Agendas will be prepared prior to each TCC meeting using the guidance provided in the Ground Rules (Appendix 3-2); similarly, meeting notes will be prepared for review and distribution within 7 days following each TCC meeting. TCC representatives will raise any substantive comments during the review of the notes at the next meeting for discussion and resolution, as necessary (Appendix 3-2).

3.1.5 Compliance with Federal and State Regulations and Other Plans

PacifiCorp and the TCC will be responsible for ensuring that the WHMP and any projects implemented under the WHMP are consistent with, or complementary to Settlement

Agreement Articles, other plans developed under the Settlement Agreement, and all federal and state regulations.

Should an event or circumstance occur that affects terrestrial resources and that is not covered by the WHMP, PacifiCorp will work with the TCC to develop an acceptable solution consistent with the WHMP and Settlement Agreement. That solution will not increase the financial obligation of PacifiCorp, as defined by the Settlement Agreement, unless agreed to by PacifiCorp.

In addition, wildlife management activities under the WHMP will be coordinated with other plans developed under the Settlement Agreement, including the Cougar/Panamaker Creek and Swift Creek Arm areas for bull trout (*Salvelinus confluentus*), aquatic habitat enhancement plans, Historic Properties Management Plan (HPMP) (Thompson and Becker 2004), and Recreation Resource Management Plan (RRMP) (PacifiCorp 2003).

3.2 DATA MAINTENANCE

Section 6 of each of the habitat management and plan-wide goal chapters provides the methods for recording the inspections and management actions. Methods include a summary in the Annual Report, data forms, memos, and individual reports. All reports, inventories, and raw field data from any studies, inventories, and monitoring efforts, including the HEP Study in year 17 of the licenses, will be on file with PacifiCorp and provided to the TCC, as needed, to aid with the decision process.

3.3 ANNUAL REPORT

Settlement Agreement Section 14.2.6 directs PacifiCorp and Cowlitz PUD to prepare and file with the Federal Energy Regulatory Commission detailed Annual Reports on the TCC activities; implementation of the terrestrial protection, mitigation, and enhancement measures occurring during the prior year; and plans for the coming year. The Annual Report will include a detailed budget summary to enable the TCC to evaluate the cost effectiveness of the past year's activities. The Annual Reports are to be prepared in consultation with the TCC members and submitted to the TCC for review each year. Committee members will have a minimum of 30 days to review and provide comment on a draft report before a final report is prepared and filed with the Federal Energy Regulatory Commission. The Licensees are to submit the final report to the Federal Energy Regulatory Commission no later than 30 days after the close of the TCC comment period. To the extent that comments are not incorporated into the final report, an explanation will be provided in writing, and such explanation included in the report.
3.4 ANNUAL PLANS

Implementation of the WHMP will be accomplished by an Annual Plan, which will be developed by PacifiCorp in conjunction with and incorporated into the Annual Report and approved by the rest of the TCC. The Annual Plan will include a detailed budget estimate for activities planned for the upcoming year, WHMP and land acquisition funds, and updated harvest sheet. As provided by Settlement Agreement Section 14.2.6, the Annual Plan will be submitted, and an associated meeting held, prior to implementing any projects for that year. During this time, PacifiCorp should update the Annual Plan to reflect any changes to federal and state-listed species, species of concern, and sensitive species, including plants.

3.5 RESTORATION PLANS

WHMP lands that are identified as being significantly damaged by anthropogenic processes will be reported to the TCC at the next scheduled TCC meeting and documented in the Annual Report. A restoration plan will be completed within 1 year of discovering the site, include the same criteria listed in Section 6.5.3, and will be reviewed and accepted by the TCC prior to implementation. Upon completing the restoration, the TCC will be provided an opportunity to visit the site.

3.6 REFERENCES

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- PacifiCorp, Cowlitz PUD, National Marine Fisheries Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, Cowlitz Indian Tribe, Confederated Tribes and Bands of the Yakama Nation, Washington Department of Fish and Wildlife, Washington Interagency Committee for Outdoor Recreation, Cowlitz County, Cowlitz-Skamania Fire District No. 7, North Country Emergency Medical Service, City of Woodland, Woodland Chamber of Commerce, Lewis River Community Council, Lewis River Citizens At-Large, American Rivers, Fish First, Rocky Mountain Elk Foundation, Trout Unlimited, and the Native Fish Society. 2004. Settlement Agreement concerning the relicensing of the Lewis River Hydroelectric Projects Federal Energy Regulatory Commission Project Nos. 935, 2071, 2111, and 2213, Cowlitz, Clark, and Skamania Counties, Washington. November 30, 2004.
- Thompson, Gail, and Tom Becker. 2004. Historic Properties Management Plan (HPMP), Swift No. 1 Hydroelectric Project (Federal Energy Regulatory Commission Project No. 2111), Yale Hydroelectric Project (No. 2071), and Merwin Hydroelectric Project (No. 935), Clark, Cowlitz, and Skamania Counties, Washington. Prepared for PacifiCorp by Historical Research Associates, Inc. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

4.0 OLD-GROWTH HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

Appendix 4-1: Lewis River Wildlife Habitat Management Plan Old-Growth Stands

Appendix 4-2: Initial Evaluation Procedures and Data Forms

Appendix 4-3: Washington Department of Fish and Wildlife Management Recommendations for Washington's Priority Species Pileated Woodpecker

4.1 INTRODUCTION

This chapter describes the old-growth habitat management goal and objectives, management actions, and schedule on the Lewis River WHMP lands. It compiles information on old-growth habitat from Section 3.1 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.1 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

In the Pacific Northwest, old-growth habitat typically consists of conifer stands that are greater than 200 years of age and are composed primarily of large Douglas-fir (*Pseudotsuga menziesii*) trees (PacifiCorp and Cowlitz PUD 2006). Old-growth habitat characteristics consist of a multi-species and multi-layered canopy, dominated by large overstory trees, high canopy closures, high incidence of forest decadence, numerous larges snags, and heavy accumulations of down wood (Tappeiner et al. 2003).

About one-third of all species found in western forests are closely associated with oldgrowth forest habitat conditions. Some species may be ecologically dependent on oldgrowth habitat characteristics such as the large trees, multi-layered canopy, large snags and logs, and/or deep forest floor litter (McComb et al. 1993). In Washington, a total of 68 wildlife species are closely associated with old-growth forest, including 10 amphibian, 37 bird, and 21 mammal species (Johnson and O'Neil 2001).

4.2 MANAGEMENT GOAL AND OBJECTIVES

The goal and objectives and species association for old-growth habitat management are presented below (PacifiCorp and Cowlitz PUD 2006).

4.2.1 Goal

Promote the development, maintenance, and connectivity of old-growth coniferous forest and/or associated habitat components (e.g., snags, down wood, "wolf trees," multistoried stands) for wildlife species that use old-growth habitat. As defined for the Lewis River cover type mapping (PacifiCorp and Cowlitz PUD 2004a), old-growth includes conifer stands that are greater than or equal to 1.0 acre (0.4 ha) in size with the following characteristics:

- Average conifer diameter at breast height (dbh) greater than or equal to 26 inches (66 cm)
- Multi-layer canopy with small openings
- At least 4 snags/acre (10 snags/ha) greater than or equal to 20 inch (51 cm) dbh and 20.0 feet (6.1 meters [m]) tall.

4.2.2 Objectives

- **Objective a:** Within 5 years of Lewis River WHMP implementation, evaluate <u>existing</u> old-growth stands (i.e., based on maps in PacifiCorp and Cowlitz PUD [2004a]) to determine the number of snags and trees (greater than or equal to 20 inches [51 cm] dbh), and develop a schedule to create snags where needed and appropriate to improve habitat for pileated woodpeckers (*Dryocopus pileatus*). The number and size of snags created will be consistent with the intent of WDFW Priority Habitats and Species guidelines for nesting and roosting (2 snags/10 acre [2 snags/4 ha] greater than or equal to 30 inch [76 cm] dbh; 12 to 18 inch [30 to 45 cm] diameter at the top of the created snag).
- **Objective b:** Protect and maintain *existing* old-growth conifer stands (i.e., based on maps in PacifiCorp and Cowlitz PUD [2004a]) to provide high-quality habitat for pileated woodpeckers, other cavity nesters, and other species over the life of the licenses.
- **Objective c:** Protect and manage *forested buffers* adjacent to streams, wetlands, and reservoir shorelines to promote the development of large trees where appropriate, and to provide connectivity between existing old-growth conifer stands over the life of the licenses.
- **Objective d:** Within 5 years of Lewis River WHMP implementation, identify and evaluate specific *mature* conifer stands or other areas that could improve habitat connectivity between old-growth stands or increase number or size of old-growth patches, and develop a schedule to manage/protect these areas as

appropriate. Complete the identification/evaluation process within 5 years of the acquisition of Interests in Land.

• **Objective e:** Within areas to be thinned to develop old-growth characteristics (see Objectives **c** and **d**), leave large woody debris in sizes that reflect the trees in the stand or import wood from other locations where possible and appropriate.

4.2.3 Species Association

Species association identifies indicator species that require old-growth habitat and/or oldgrowth habitat features as part of their life history (PacifiCorp and Cowlitz PUD 2004b). As a result, it is assumed these species will receive direct benefit from old-growth habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations and be the primary objective for prescribing management actions.

Habitat Evaluation Procedure (HEP) Evaluation Species: Pileated Woodpecker

Pileated Woodpecker (Dryocopus pileatus)

Pileated woodpeckers are closely associated with mature and old-growth forest habitats because of their dependency on large snags and fallen trees (Lewis and Azerrad 2003). Critical components of pileated woodpecker habitat are large snags, large trees, diseased trees, dense forest stands, and high snag densities (Schroeder 1983). The overall pileated woodpecker habitat suitability index (HSI) values for the old-growth vegetation cover type were in the moderate to high range, from the 0.65 to 0.97 (PacifiCorp and Cowlitz PUD 2004b). Merwin has the lowest HSI value, with the limiting factor being the lack of large snags greater than 20 inches (51 cm) dbh (PacifiCorp and Cowlitz PUD 2004b). For more information on pileated woodpeckers, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Analysis Species: Northern flying squirrel (*Glaucomys sabrinus*), marten (*Martes americana*), Larch Mountain salamander (*Plethodon larselli*), northern spotted owl (*Strix occidentalis*), and bald eagle (*Haliaeetus leucocephalus*).

Other Species: None.

4.3 OLD-GROWTH HABITAT MANAGEMENT AREAS

Appendix 4-1 and Table 4.3.1 identify the existing old-growth stands that will be managed under the Lewis River WHMP. The existing old-growth stands are the areas with vegetation cover typed as old-growth during relicensing and are greater than 1.0 acre (0.4 hectare [ha]) in size. The old-growth vegetation cover type is defined as conifer stands with an average tree dbh that is greater than 26 inches (66 cm), a multi-layered canopy with occasional small openings, greater than 4.0 snags/acre (10 snags/ha) that are greater than 20 inch (50 cm) dbh, and greater horizontal and vertical canopy structure than is generally found in mature conifer stands (PacifiCorp and Cowlitz PUD 2004a).

Old-Growth Stand Identification Number	Acres (ha)	Total Acres (ha)
6-1	3.24 (1.31)	
6-2	5.19 (2.1)	Merwin
7-1	47.27 (19.14)	55.7 (22.55)
20-1	6.03 (2.44)	
21-1	2.44 (0.99)	Yale
22-1	6.37 (2.58)	32.96 (13.34)
23-1	18.11 (7.33)	
28-1	1.13 (0.46)	
28-2	2.01 (0.81)	
28-3	33.64 (13.62)	
31-1	6.00 (2.43)	
31-2A	3.21 (1.3)	Swift
31-2B	8.46 (3.4)	70.05 (30.79)
31-3	5.32 (2.15)	
31-4	14.82 (6.0)	
31-5	1.46 (0.59)	
	Total	164.71 (66.68)

 Table 4.3.1 Lewis River Wildlife Habitat Management Plan Old-growth Stands

Under the Merwin Wildlife Habitat Management Program, PacifiCorp managed 17 oldgrowth sites ranging from 8 to 223 acres (3 to 90 ha) in size and totaling 926 acres (375 ha) (PacifiCorp 1998). Most of these acres did not meet old-growth habitat criteria, but were managed as old-growth because they possess some habitat characteristics (e.g., large diameter trees greater than 20 inch [50 cm] dbh) and were thought to have the potential to develop into old-growth habitat with proper management (PacifiCorp 1998). In addition, during development of the Merwin Forest Management Plan, areas that were determined to be unacceptable for ground-disturbing management activities (steep slopes or erosive soils inappropriate for managing elk cover/forage ratios) were sometimes added to the old-growth category if they had predominately larger diameter conifers (PacifiCorp 1998). This included many of the steep slopes along the shorelines that are protected under the shoreline buffer in the new management objectives. Only 56 acres (23 ha) of the Merwin Wildlife Habitat Management Program lands were vegetation cover typed as actual old-growth and will continue to be managed as "existing" oldgrowth stands. The remaining acres were vegetation cover typed as other conifer forest cover types that included mature, upland mixed, and mid-successional forests. Although these acres will not continue to be managed as old-growth habitat, these acres will be protected as 228 acres (92 ha) of mature conifer, 163 acres (66 ha) of riparian buffer, 4 acres (1.6 ha) of wetland buffer, and 154 acres (62 ha) of shoreline buffer. Therefore, the perceived reduction in old-growth habitat acres between past and current plans does not reflect an actual loss in this habitat type.

The HEP will be repeated in year 17, which will require the vegetation cover typing to be repeated. During this time, some of the conifer forest types that have matured into old-growth habitat will be cover typed as old-growth and will be included in old-growth management.

4.4 INSPECTIONS

Each old-growth stand will have an initial evaluation. Following the initial evaluation, the old-growth stands will not be regularly inspected unless dictated by the initial evaluation, other surveys, or management actions. However, the stands will be monitored during annual aerial osprey (*Pandion haliaetus*) and bald eagle nest surveys and during anecdotal or opportunistic ground surveys.

4.4.1 Initial Evaluation

The intention of the vegetation cover type mapping conducted during relicensing was to map the existing old-growth stands on the Lewis River WHMP lands. However, it may be that some of these stands do not meet the old-growth vegetation cover type characteristics and may need to be reclassified or managed to develop old-growth characteristics within the stand (e.g., thinning). Each stand will have an initial evaluation to confirm the accuracy of the vegetation cover typing and what, if any, management actions should be implemented to promote old-growth development.

The initial evaluation will assess each of the old-growth stands shown in Appendix 4-1 and Table 4.3.1 for habitat quality within 5 years of Lewis River WHMP implementation. Old-growth habitat quality will be determined using the criteria described in both the vegetation cover type classification and in the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2004b, 2006) as follows:

- Greater than 70 percent canopy composed of conifer
- Average stand diameter greater than or equal to 26 inch (66 cm) dbh
- Multi-layered canopy with occasional small openings
- Greater horizontal and vertical canopy structure than is generally found in mature stands
- At least 4 snags/acre (10 snags/ha) greater than or equal to 20 inch (50 cm) dbh and 20.0 feet (6.1 m) tall

Both transects and plots will be used in the field to determine the above-listed criteria for each old-growth stand. Prior to beginning the field work, the old-growth stand's boundaries will be determined using global positioning system, aerial photos, topographical maps, and distinct boundaries (e.g., creeks, timber harvest areas, or roads). Boundaries that are difficult to distinguish will be marked with flagging prior to conducting the initial evaluation.

Transects will be conducted to count down wood, snags, and live decay trees. A complete count is the preferred sampling method for snag and live decay trees in stands that are less than 100 acres (40 ha) (Bates et al. 1999). This will require two observers walking transects across the old-growth stand, counting and categorizing each snag and live decay tree that is greater than 10 inches (25 cm) in dbh and 20 feet (6 m) tall and each down log that is at least 7 inches (18 cm) in diameter at the small end and 49 feet (15 m) in length

(Lewis and Azerrad 2003, Schroeder 1983). Transects will begin at the stand boundary and will traverse the stand's slope. The transect width should be 100 feet (30 m) but may vary depending on visibility and ability for the observers to communicate with one another (Bull et al. 1990, Lindquist and Mariani 1991). This will require 3 transects per acre (7.4 per ha) multiplied by 165 acres (67 ha) of old-growth for a total of 495 transects. Estimated time for each transect should vary between 4.5 and 8.0 minutes per transect for areas with medium visibility (50 feet [15 m]), moderate terrain (less than 50 percent slope), and the number of snags varying between 2 and 8 per acre (4.9 and 19.7 per ha) (Bates et al. 1999).

Plots will be placed along the transects and will determine the average stand diameter and canopy cover. The plots on the same transect will be placed approximately 294 feet (90 m) apart. In addition, plots will start at a random distance from the start of the transect to stagger the plots throughout the stand. Each plot will have a 26.3-foot (8.0-m) radius and be (0.05 acre [0.02 ha]) in size. Each living tree within 26.3 feet (8.0 m) of the plot center that is greater than or equal to 20 feet (6 m) in height will be counted and categorized by species and size. To determine the canopy cover, four spherical densiometer readings will be taken from the plot center facing north (360°), east (90°), south (180°), and west (270°). These readings will be averaged to determine the canopy cover for the plot.

A minimum of 0.78 plots per acre (1.92 plots per ha) is required to provide an 80 percent confidence interval within a 5 percent allowable error. However, to achieve an average stand density, there will need to be at least two plots per old-growth stand for a total of 62 plots. Each plot is estimated to take 10 minutes for a total of 10 man hours to collect the data. In addition, observers will provide an overall description of the old-growth stand's canopy cover layers, invasive plant species, disturbance sources, unique habitat features, and wildlife. Appendix 4-2 provides data forms and explanation procedures. Following the completion of the initial evaluation, a report summarizing the old-growth stand descriptions, proposed management actions, and vegetation cover type revisions will be submitted to the TCC.

4.4.2 Aerial Surveys

Old-growth sites will be monitored for large areas of blowdown, mass wasting, disease, or insects concurrently with the aerial osprey and bald eagle nest surveys. This survey includes all of the Lewis River WHMP lands and the shorelines of the North Fork Lewis River from the Interstate 5 bridge upstream to the confluence of Pine Creek and North Fork Lewis River. For more information on these aerial surveys, see Chapter 14 [*Raptor Site Management*], Section 14.4.1).

4.4.3 Ground Surveys

Additional ground surveys of old-growth stands will occur anecdotally or opportunistically with other inspections or management actions (e.g., raptor surveys). Ground surveys will not be documented unless something significant is observed that requires a management action or further monitoring.

4.5 MANAGEMENT ACTIONS

The following management actions outline measures to maintain old-growth habitat in a condition consistent with the management goal and objectives. Management actions include:

- Old-Growth Development
- Connectivity

• Protection

4.5.1 Old-Growth Development

Stands or portions of the stands identified in Table 4.3.1 and Appendix 4-1 may not meet old-growth habitat characteristics; therefore, management actions may be implemented, where feasible, to develop these old-growth characteristics. Old-growth development can be achieved through snag development, thinning, and increasing large woody debris.

The initial evaluations will identify which stands meet the old-growth characteristics and the WDFW Priority Habitats and Species guidelines for nesting and roosting pileated woodpeckers. The Priority Habitats and Species guidelines are as follows: 2 snags/10 acre (2 snags/4 ha) greater than or equal to 30 inch (76 cm) dbh (Appendix 4-3). The TCC will determine a schedule for snag development for old-growth stands that do not meet the WDFW Priority Habitats and Species snag guidelines. The schedule should be based on quantities of hard and soft snags required in each stand and budget considerations.

Snags may be developed by a variety of methods, such as hack-n-squirt (i.e., herbicide applied to a cut [hack] through the tree bark, into the cambium layer) and topping. The method selected depends on species, size, topography, cost, and other management opportunities and should consider the following:

- Topping should remove the crown with a minimum bole diameter of 12 inches (30 cm) at the top of the created snag
- Longevity
- Effectiveness in achieving goal
- Safety the snag should not be developed within reach of roads, trails, or dwellings

In addition to snag development, thinning and large woody debris can enhance oldgrowth habitat characteristics and functionality. Thinning the number of trees can increase the average stand diameter (by removing smaller suppressed trees) and diversifying the canopy layers (by developing openings, where desirable, to promote understory or midstory development).

Additionally, large woody debris can be increased by bringing logs in from other locations if necessary or feasible. Although thinning and increasing large woody debris are expected to be the most common old-growth development management actions, each

stand is unique in habitat conditions; therefore, management opportunities should be determined on a case-by-case basis.

4.5.2 Protection

Each stand listed in Table 4.3.1 and in Appendix 4-1 will be protected to maintain oldgrowth habitat for pileated woodpeckers, cavity nesters, and other old-growth associated species by implementing the following best management practices:

- Avoid conducting management activities within an old-growth stand
- Management activities within an old-growth conifer stand that requires ground disturbance or vegetation removal will be approved by the TCC prior to conducting

4.5.3 Connectivity

Many of the old-growth stands are discrete habitat patches. Connectivity between the oldgrowth forest stands may be achieved with the forested buffers along watercourses, wetlands, and shorelines. Additional old-growth connectivity may be provided with forested areas that are unsuitable for management as early successional habitat because of steep topography or other constraints (e.g., bald eagle nests). Existing mature conifer stands (i.e., mature stands identified in the maps in PacifiCorp and Cowlitz PUD [2004a]) will also be assessed to determine the existing or potential connectivity to old-growth stands within 5 years of Lewis River WHMP implementation. Newly acquired mature conifer stands will be assessed within 5 years of acquiring the land.

Mature stands that are a priority to old-growth connectivity will include stands that are adjacent to and/or connected by forested buffers to old-growth stands. These priority mature stands will be evaluated in the field to determine if any management activities are required to develop old-growth habitat characteristics within the stand (i.e., snag development, thinning, large woody debris development). Evaluations and management recommendations will be documented and discussed with the TCC. Evaluations will follow the same procedures and use the same evaluation forms as used for the old-growth evaluations. The result of these stand evaluations will provide recommended management actions and will identify mature stands that may be developed into old-growth during the life of the licenses.

4.6 SCHEDULE AND EFFORT

The table below provides the schedule, estimated effort (hours), and documentation requirements for each task.

Table 4.6.1 Old-growth Habitat Management Schedule and Estimated Effort						
Procedures	Completion Date	Timing	Effort	Documentation		
Inspections						
Initial Evaluations	Within 5 years of completing the initial evaluation	April 15 to July 15	90-140 hours	Report submitted to the TCC		
Aerial Surveys	Annually	January 1 to December 31	16 hours	Annual Report		
Ground Surveys	Optional ¹	As needed	4 hours/per inspection	Annual Report		
Development						
Snag Development	Optional ¹	September 1 to February 28	4 hours per 20- inch dbh conifer tree	Annual Report		
Thinning	Optional ¹ September 1 to February 28 Unknown		Unknown	Annual Report		
Large Woody Debris Placement	Optional ¹	September 1 to February 28	Unknown	Annual Report		
Connectivity						
Mature Stand Connectivity Evaluation	Within 5 years of completing the initial evaluation	April 15 to July 15	200-225 hours	Report submitted to the TCC		

¹ Optional management actions are actions that are selected to be implemented according to need or opportunity.

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5.0 WETLAND HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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5.1 INTRODUCTION

This chapter describes the wetland habitat management goal and objectives, management actions, and schedule on the Lewis River WHMP lands. It compiles information on wetland habitat from Section 3.2 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.6 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Wetlands occur because conditions of soil and hydrology combine to result in the formation of unique plant communities (PacifiCorp and Cowlitz PUD 2006). Hydrology (the frequency of saturation or inundation) is the single-most important determinant of wetland establishment, processes, and type (Mitch and Gosselink 1986, Cowardin et al. 1979). Wetland soils are hydric, which are soils that are formed under conditions of saturation, flooding, or ponding that occurs long enough during the growing season to develop anaerobic conditions in the upper part of the soil (Soil Conservation Service 1994). Wetland types can range from shallow ponds, to forest or meadow areas with standing surface water during the rainy season, to seeps, or to small, temporal pools (King County 2004, Semlitsch and Brodie 1998, Snodgrass et al. 2000).

Wetlands perform a number of critical environmental functions, such as flood storage and retention, groundwater discharge/recharge, water quality maintenance and protection, and fish and wildlife habitat (National Research Council 2001). Wetlands and the surrounding vegetation provide a complex interface of land and water that meets the life needs of 85 percent of terrestrial wildlife species (Castelle et al. 1992).

5.2 MANAGEMENT GOAL AND OBJECTIVES

The goal and objectives and species association for wetland habitat management are presented below.

5.2.1 Goal

Protect, maintain, and/or enhance wetlands to provide a diversity of habitat types for native amphibians, waterfowl, and other wildlife species.

5.2.2 Objectives

- **Objective a:** Manage water levels in the existing man-made wetlands with water control structures to improve habitat and reproductive success for native amphibians (northern red-legged frogs [*Rana aurora*]) and discourage bullfrog [*Rana catesbeiana*] use. Management will be over the life of the licenses.
- **Objective b**: Identify forested wetlands with less than 20 percent shrub cover and manage to increase overall shrub cover by at least an additional 5 percent (as determined by the line intercept method) without tree harvest by Target Year 17 to benefit the yellow warbler (*Dendroica petechia*) and mink (*Mustela vison*).
- **Objective c:** Within 5 years of WHMP implementation, identify opportunities to enhance select wetlands to benefit nesting waterfowl (diving and dabbling ducks) and bats. Implement enhancement projects over the next 5 years.
- **Objective d:** Within 5 years of WHMP implementation, investigate methods to discourage/reduce bullfrog use of wetlands. Implement appropriate identified measures over the next 5 years.
- **Objective e:** Identify and establish buffers to maintain and protect wetland habitat and functions using the following guidelines as a minimum when planning forest management activities: (1) 150 feet (45 m) as measured from the edge of the hydric vegetation, or height of one site potential tree, whichever is greater, for wetlands greater than or equal to 1.0 acre (0.4 ha); and (2) 100 feet (30 m) as measured from the edge of the hydric vegetation, or the height of one site potential tree, whichever is greater, for wetlands less than 1.0 acre (0.4 ha). Buffer widths are measured horizontally from the edge of the hydric vegetation. Reduced buffer widths and other management activities would only be allowed for the purpose of meeting specific wildlife habitat objectives.
- **Objective f:** Protect great blue heron (*Ardea herodias*) rookeries (colonies) from disturbance and structure removal. Prepare colony-site management plans for any rookeries identified in the future, as described in the Priority Habitat and Species Management Recommendations for great blue herons (Quinn and Milner 1999).

5.2.3 Species Association

Species association identifies indicator species that require wetland habitat and/or wetland habitat features as part of their life history (PacifiCorp and Cowlitz PUD 2004a). As a result, it is assumed these species will receive direct benefit from wetland habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations and be the primary objective for prescribing management actions.

Habitat Evaluation Procedure (HEP) Evaluation Species: Pond-breeding Amphibians (Primarily the Northern Red-legged Frog), Mink, and Yellow Warbler

Mink (Mustela vison)

Mink are closely associated with aquatic habitats because of their dependency on aquatic prey. As a result, mink are generally observed within 656 feet (200 m) of large freshwater streams, rivers, lakes, marshes, and marine shore habitats; the extent and density of mink populations are directly proportional to the distribution and abundance of such habitats (Maser 1998, Verts and Carraway 1998). Surface water must be present for a minimum of 9 months of the year to provide optimum habitat and prey availability for mink (Allen 1986). Extensive woody and persistent herbaceous vegetation provides important cover for foraging and denning mink; however, optimum cover varies between habitat types and is a combination of cover components (i.e., tree and shrub canopy) (Allen 1986).

The overall mink HSI values for wetland vegetation types (palustrine forested, palustrine scrub-shrub, and palustrine emergent) in the study area were in the moderate to high range, from 0.69 to 0.98. The palustrine emergent vegetation cover type had HSI values that range from 0.69 to 0.98, with shrub or tree cover being the limiting factor. The palustrine scrub-shrub vegetation cover type had HSI values that range from 0.81 to 0.96, with tree cover being the limiting factor for habitat quality. The palustrine forested vegetation cover type HSI values that range from 0.81 to 0.94, with the shrub cover being the limiting factor. For more information on mink, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Native Amphibians

The HSI model for native amphibians was specific to pond-breeding amphibians, particularly the northern red-legged frog. Because the model encompasses many species, it is based on evaluating the standing waters that support pond-breeding amphibians and the associated habitat within 656 feet (200 m) of the standing water. HSI values are determined for reproductive habitat and cover. The reproductive habitat values are based on the following habitat elements: depth, persistence, and water velocity (PacifiCorp and Cowlitz PUD 2004a). Cover values are based on the following habitat elements: wetland vegetation, shoreline vegetation, and associated habitats (PacifiCorp and Cowlitz PUD 2004a). For more information on pond-breeding amphibians' optimum habitat, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Most of the wetlands in the Project area provide a low to moderate habitat quality (HSI = 0.00 to 0.55) for native amphibians, with reproduction habitat being the limiting factor (PacifiCorp and Cowlitz PUD 2004a). This is largely because of the substantial amount of areas that are persistent open water for greater than 6 consecutive months (high water permanence). High water permanence favors the non-native bullfrog, which is invasive and predates or outcompetes native amphibians.

Yellow Warbler (Dendroica petechia)

Yellow warbler HSI values are dependent on hydrophytic shrub cover, deciduous shrub cover, and shrub height (PacifiCorp and Cowlitz PUD 2004a). Optimum yellow warbler habitat is 60 to 80 percent shrub crown cover, preferably comprised entirely of hydrophytic species, with an average shrub height of 6.6 feet (2.0 m), and a minimum habitat patch size of 0.37 acres (0.15 ha) (Schroeder 1982). The palustrine scrub-shrub vegetation cover type provides the highest quality yellow warbler habitat, with HSI values that range from 0.63 to 0.95. The palustrine forested vegetation cover type on WHMP lands had moderate HSI values that range from 0.54 to 0.67, with percent deciduous shrub cover being the limiting factor. The palustrine emergent vegetation cover type had low to moderate HSI values ranging from 0.00 to 0.54, with percent deciduous shrub cover being the limited factor. For more information on yellow warblers, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Analysis Species: Beaver (*Castor Canadensis*), great blue heron (*Ardea herodias*) rookeries, and wood duck (*Aix sponsa*). For further information on these species, see Chapter 17 (*Species Associations*).

Other Species: None.

5.3 WETLAND HABITAT MANAGEMENT AREAS

Wetlands on WHMP lands have been identified through a variety of sources. Both of the Vegetation Cover Type and Wetland Information Synthesis relicensing studies identified wetland locations and type for WHMP lands (PacifiCorp and Cowlitz PUD 2004b, PacifiCorp and Cowlitz PUD 2004c). The Yale Reservoir Wetland Inventory and Assessment was a preliminary Yale Dam relicensing study that conducted wetland assessments for all National Wetland Inventory wetlands on PacifiCorp lands surrounding Yale Reservoir, including Frasier Pond, Saddle Dam Farm wetlands, and below Swift Dam (Dueker and Paz 1995). In general, the above-mentioned studies or assessments identified the wetlands in the same location; however, there are discrepancies in size and type.

The Merwin Wildlife Habitat Management Program has managed 16 wetlands to provide a mix of aquatic and riparian vegetation for waterfowl and amphibians (PacifiCorp 1998). This includes eight created wetlands with outflow structures to control water levels; five of these wetlands are along the Frasier Creek in the Saddle Dam Farm area (Cedar Grove, Chestnut, Banker's, Road, and Crossroad ponds), two along the Speelyai transmission line right-of-way (designated as ROW sites) (ROW 8/12 and 9/14 Ponds), and Pumphouse Pond, which is adjacent to and a tributary to Frasier Creek via a water control structure. The ROW 6/12 wetland is two small ponds created by berming a seasonal stream along the Speelyai transmission line. The wetlands associated with the Borrow Area and Upper and Lower Yale ponds developed as water filled sites excavated for borrow materials during the construction of Yale Dam (PacifiCorp and Cowlitz PUD 2004b). Bridge Pond developed as water filled in the site at the toe of slope of Highway 503.

In addition to the 16 wetlands managed under the Merwin Wildlife Habitat Management Program, more than 20 other wetlands associated with Yale and Swift reservoirs were identified during relicensing. The vegetation cover typing conducted during relicensing was used to determine the wetland size and type because it included all WHMP lands (PacifiCorp and Cowlitz PUD 2004c). Wetlands were cover typed as areas that are less than 20 acres (8 ha) in size and have open water, wetland vegetation, hydric soils, or appropriate hydrology. Wetlands were further categorized into palustrine unconsolidated bottom, palustrine emergent, palustrine scrub-shrub, or palustrine forested (PacifiCorp and Cowlitz PUD 2004c). This determined 87 acres (35 ha) of wetland habitat on WHMP lands with 23 acres (9 ha) at Merwin, 36 acres (15 ha) at Yale, and 28 acres (11 ha) at Swift. The wetlands range from 0.05 acres (0.02 ha) to 36.6 acres (14.8 ha) in size and most of the wetlands are less than 10 acres (4 ha) in size (PacifiCorp and Cowlitz PUD 2004b). Table 5.3.1 lists wetland habitat acres by vegetation cover type for the WHMP lands. Although most of the wetlands are upslope from and isolated from the reservoirs, a few of the wetlands (i.e., IP Ponds and Beaver Bay) are hydrologically connected to the reservoir. Appendix 5-1 provides figures identifying all wetlands on WHMP lands and a table describing the size, type, and estimated acres for each of the wetlands.

Wetland Type	Description	Merwin Acres (ha)	Yale Acres (ha)	Swift Acres (ha)	Total Acres (ha)
Palustrine Unconsolidated Bottom	An open water pond with unconsolidated substrate and with less than 30 percent vegetation cover.	10.1 (4.1)	3.2 (1.3)	8.4 (3.4)	21.7 (8.8)
Palustrine Emergent	Emergent herbaceous hydrophytes present throughout most of the growing season ¹	1.6 (0.6)	2.6 (1.1)	5.9 (2.4)	10.1 (4.1)
Palustrine Scrub- Shrub	Dominated with woody shrubs and stunted trees, less than 20 feet (6 m) tall.	5.7 (2.3)	10.1 (4.1)	5.9 (2.4)	21.7 (8.8)
Palustrine Forested	Dominated with woody vegetation greater than 20 feet (6 m) tall.	5.1 (2.1)	19.9 (8.1)	8.0 (3.2)	33.0 (13.4)
	Totals:	22.5 (9.1)	35.8 (14.5)	28.2 (11.4)	86.5 (35.0)

Table 5.3.1 Wildlife Habitat Management Plan Lands' Wetland Acres (ha) by Vegetation Cover Туре

Source: PacifiCorp and Cowlitz PUD 2004c. ¹ Growing season for Cowlitz County is 220 days with a 70 percent chance of these days occurring between April 10 and November 16. (Natural Resources Conservation Service 2007).

5.4 INSPECTIONS

Wetlands will be inspected regularly to ensure that the management goal and objectives are being achieved. Inspections will consist of an initial evaluation, annual, and posttreatment inspections. These inspections are described below.

5.4.1 Initial Evaluation

Initial evaluation of all wetlands on WHMP lands will occur within the first 5 years of receiving the licenses. The primary purpose of the evaluation is to assess the wetlands' habitat potential for the associated species, and to categorize the wetlands as "managed" or "unmanaged." Managed wetlands will be wetlands that are reasonably accessible to conduct inspections and to actively manage to achieve WHMP objectives. Whereas unmanaged wetlands may include, but are not limited to, wetlands that are inaccessible, below the reservoir shoreline (e.g., Speelyai Point Wetland), or where the majority (greater than 50 percent) of the wetland is not on PacifiCorp property (e.g., Beaver Pond Road Wetland) (Appendix 5-1). Although unmanaged wetlands will not be actively managed or annually inspected, all federal and state regulations and WHMP buffers will apply.

Initial evaluations will be conducted between April 10 and June 30 to assess each of the WHMP wetland's habitat condition, hydrology, and to confirm (or determine) the hydrological source(s), vegetation type(s), and size. The initial evaluation will assess and record the following information on the form in Appendix 5-2:

- Approximate wetland size as determined by vegetation and hydrology
- Hydroperiod type
- Hydrological source(s)
- Water depth and area of coverage
- Water velocity
- Wetland vegetation cover type(s)
- Estimate of the snags and down wood within the wetland buffer
- Identify invasive plant species and estimate percent cover within the wetland and wetland buffer
- Vegetation cover types within 656 feet (200 m) of the wetland
- Disturbances within 656 feet (200 m) of the wetland (e.g., roads, mowing, timber harvest areas, development)
- Wildlife observations
- General photographs that present a broad view of the wetland
- Identify the potential drawdown depth of wetlands with water control devices

A final report identifying wetlands as managed or unmanaged, describing habitat potential for associated species, as well as proposed management actions to meet the goal

and objectives will be submitted to the TCC for review 1 year following the completion of the initial evaluation.

5.4.2 Annual Inspections

Annual inspections of managed wetlands will assess habitat condition and ensure that the management goal and objectives are being achieved. Inspections will occur annually between April 10 and June 30 and as needed to monitor the effectiveness of the management activities or to assess habitat conditions (e.g., following a flood event). Unmanaged wetlands will also be inspected during the annual inspection at least every 5 years. The annual inspection will record the following information on the form in Appendix 5-3:

- Water depth and proportional ratio of emergent area to cover of water
- Maintenance condition of water control structures and dikes (i.e., erosion, stoplog condition, or woody debris blocking outflow structures), including the Frasier Creek diversion channel
- Estimated vegetation cover, dominant species, and overall condition of wetland and upland plant species within the wetland and its associated buffer
- The number of snags and down wood within the wetland and wetland buffer
- Identify invasive plant species and estimate percent cover within the wetland and wetland's buffer
- Wildlife observations

5.4.3 Post-Treatment Inspection

Wetlands will be inspected as needed following the implementation of management actions to determine the success of the actions and to adjust actions as needed to meet the management goal and objectives. Observations will be documented using the form provided in Appendix 5-4.

5.5 MANAGEMENT ACTIONS

The following management actions outline measures to maintain wetland habitat in a condition consistent with the management goal and objectives. Management actions include:

- Water Control
- Bullfrog Management
- Yellow Warbler and Mink Habitat Enhancement
- Vegetation Management
- Great Blue Heron Colony Management
- Waterfowl and Bat Habitat Enhancement

5.5.1 Water Control

Many of the Merwin Wildlife Habitat Management Program wetlands have water control structures or dikes to retain and/or control water levels. Dikes, levees, berms, and embankments (all of which will be referred to as dikes) have been constructed to retain water on nine of the wetlands. Eight of the wetlands have constructed outflow structures, such as diversion control gates or standpipes and Gabion dams, with stoplogs to adjust or maintain water levels. Wetlands with water control structures are identified in the Appendix 5-1 table.

Water Diversion and Outflow Structures

The only water diversion on WHMP lands is the Frasier Creek diversion structure and control gate. The diversion may divert all, part, or none of the flow into the diversion channel to Cedar Grove Pond (Appendix 5-1). The overflow from Cedar Grove Pond continues into a diversion channel that flows to Chestnut Pond and finally back into Frasier Creek just upstream of Banker's Pond. The diversion gate will be monitored during the annual inspection and as needed during periods of drought or heavy precipitation. Complete or partial drawdown may be necessary to facilitate maintenance on the wetlands, but this is expected to be a low frequency of occurrence and will likely be scheduled during the annually scheduled drawdown (See Section 5.5.5). Other than during the drawdowns, the Frasier Creek diversion gate will be maintained in a position that provides adequate flow to both the Frasier Creek diversion channel and Frasier Creek.

Outflow structures are located at nine ponds: Banker's, Cedar Grove, Chestnut, Road, Crossroads, Frasier, ROW 8/12, ROW 9/14, and Pumphouse (Appendix 5-1). Three of these wetlands were constructed with beaver-proof outflow structures: Cedar Grove, ROW 8/12, and Pumphouse Pond. Stoplogs within the outflow structures control water levels in these ponds and may be adjusted as needed to achieve management objectives. To prevent damage or debris from collecting during high winter flows, one or two stoplogs may be removed between October 15 and 30 and replaced between February 15 and 28. Ponds that have the potential to be impacted by high winter flows include Banker's, Cedar Grove, Chestnut, Crossroad, Frasier, Road, ROW 8/12, and ROW 9/14.

Stoplogs will deteriorate over time and need to be replaced. Most of the wetlands' stoplogs were replaced in 2005 and 2006.

Dike Maintenance

Dikes have been constructed to provide catch-basins that increase the water storage capacity and duration for the ponds. There are nine ponds that have water levels maintained with dikes: Banker's, Cedar Grove, Chestnut, Crossroad, Road, Pumphouse, ROW 6/12, ROW 8/12, and ROW 9/14 (Appendix 5-1). The following is a list of potential maintenance actions:

- Evaluate dikes for animal burrows, uprooted trees, and erosion during the annual inspections and following major weather events to determine the dike's integrity.
- Revegetate dikes with grasses, sedges, forbs, or shrubs, in consideration of native vegetation and adjoining habitats to stabilize soils following ground-disturbing activities.
- Remove or control trees with roots that can damage or weaken dikes. It is preferable to remove these trees when they are seedlings.

5.5.2 Vegetation Management

Vegetation within and adjacent to the wetland plays an important role in preserving the wetland's function and in protecting the wetland from disturbances, as well as providing habitat for wetland-associated species, such as pond-breeding native amphibians, wood ducks (*Aix sponsa*), mink, yellow warblers, and beavers (*Castor Canadensis*). Promote and maintain submergent and emergent vegetation within these wetland zones at an open water to cover (subemergent/emergent vegetation) ratio of 25:75 (\pm 10 percent). Some of the wetlands may not be able to achieve this ratio because of their depth, size, utility/infrastructure management constraints, hydroperiod, etc. Annual inspections will record percent cover for vegetation types, and other relevant information and provide recommendations for management for each wetland. The annual inspection forms will be submitted to the TCC for review in the Annual Report.

The shoreline vegetation should be enhanced and protected to promote overhanging vegetation on undercut banks and the overall diversity and cover along the wetland banks. Designated buffers have been established to protect and promote surrounding vegetation on the shoreline. The buffers are as follows and will be measured horizontally from the edge of hydric vegetation line, which is defined as the line where more than 50 percent of the dominant species are classified as obligate, facultative wet, or facultative (U.S. Army Corp of Engineers 1987):

- Buffers for wetlands less than 1.0 acre (0.4 ha) in size will be 100 feet (30 m) or one site potential tree, whichever is greater
- Buffers for wetlands greater than or equal to 1.0 acre (0.4 ha) will be 150 feet (45 m) or one site potential tree, whichever is greater

Management activities will protect and enhance the vegetation by conducting the following:

- Forest management activities are prohibited within the wetland buffer without prior TCC approval and must address specific wildlife management objectives.
- Control invasive plant species. Invasive plant species that can dominate vegetation and become monocultures (e.g., Himalayan blackberry [*Rubus aremeniacus*] and reed canarygrass [*Phalaris arundinacea*]) have little value to wildlife and should be discouraged and controlled. Preferred control methods are dependent on site conditions and plant species and may include but are not limited to raising or lowering the water levels, mechanical, burning, and chemical means. Chapter 13 (*Invasive Plant Species Management*) provides best management practices for controlling invasive plant species in wetlands.
- Revegetate (i.e., reseed and replant) areas that have ground disturbance within the next growing season to prevent the introduction of invasive plant species. Seed and plant selections should be made in consideration of the sensitive nature of wetland habitats, and use native species when available.
- Promote and protect the diversity of the surrounding vegetation. If necessary, plant native wetland dependant or associated shrubs and trees to promote diversity and prevent invasive plant species.

5.5.3 Yellow Warbler and Mink Habitat Enhancement

Palustrine forested wetlands may provide suitable habitat for minks and yellow warblers if adequate shrub cover exists. Wetland Habitat Objective B is to increase shrub cover in palustrine forested wetlands that are less than 20 percent shrub cover. The HEP Team calculated that a 5 percent increase in shrub cover will increase the suitability index for both species by 0.08 (Lewis River HEP Team 2002). Table 5.5.1 shows the number of shrubs to be planted, which was determined by using the relicensing HEP data as a baseline and the HEP Team's model calculations.

The yellow warbler's habitat requirements are more specific than the mink; therefore, it is assumed that management actions that improve yellow warbler habitat will also benefit mink habitat cover. Mink and yellow warbler habitat will be increased in palustrine forested areas using the following management actions:

- Determine the percent shrub cover of all palustrine forested areas (habitat patch) that are greater than or equal to 0.37 acres (0.15 ha) in size (yellow warbler's minimum habitat patch size is 0.37 acres [0.15 ha]) (Schroeder 1982). Percent shrub cover will be determined by ocular assessment during the initial evaluation.
- Determine the feasibility of successfully planting shrubs in palustrine forested habitat patches that are less than 20 percent shrub cover and greater than 0.37 acres (0.15 ha) in size. Hydrophytic shrubs are preferable, but shrubs species planted will be dependent on site conditions, such as canopy cover, dominant overstory, hydrology, and herbivory. A list of shrubs is provided in Chapter 7 (*Shrubland Habitat Management*), Appendix 7-3.

• Enhance existing shrubs by reducing tree canopy. This may include topping or pruning tree crowns. Although no tree harvest may occur in wetlands or in the wetland buffers, trees may be felled if needed. All tree tops or fallen trees will remain in the wetland and the wetland buffers, unless they are inconsistent with wetland objectives.

HED	HEP Segment				
Plot Data	Merwin	Yale	Swift & Swift Bypass ¹	Total	
Number of Palustrine Forested HEP Plots	3	6	4	13	
Sampled	-	Ű	•		
Number of Palustrine Forested HEP Plots	1	2	2	5	
Sampled with < 20 Percent Shrub Cover	1				
Percent of Palustrine Forested HEP Plots	33%	33%	50%	38%	
Sampled with < 20 Percent Shrub Cover					
Total Number of Palustrine Forested Acres on	6.2	10.0	86	347	
WHMP Lands	0.5	19.9	8.0	54.7	
Estimated Palustrine Forested Acres on					
WHMP lands that are < 20 Percent Shrub	2.1	6.6	4.3	13.0	
Cover					
5 Percent of Palustrine Forested Acres on	0.1	0.2	0.2	0.6	
WHMP Lands that will be Planted with Shrubs	0.1	0.5	0.2	0.0	
Total Number of Shrubs to be Planted ²	175 to 484	525 to 1452	349 to 968	1,049 to 2,904	

 Table 5.5.1 Habitat Evaluation Procedure Team Acreage Calculations for each Habitat Evaluation

 Procedure Segment

¹ Swift and Swift Bypass were evaluated as separate HEP segments, but are managed as the Swift area in the WHMP.

 2 Number of shrubs is based on shrubs being planted on a 3- to 5-foot spacing. Planting space is dependent on species and site conditions.

5.5.4 Waterfowl and Bat Habitat Enhancement

Wetlands provide important habitat for waterfowl and bats. The Yuma bat (*Myotis yumanensis*) and the little brown myotis (*Myotis lucifugus*) are closely associated with wetlands and forage over areas with shallow open water and ample room to maneuver. Adjacent snags, cavities, and rock crevices provide important roosts for bats and should be protected and promoted. Diving and dabbling ducks prefer shallow open waters, adequate cover for nesting and rearing young, and a clear flight path to and from the water. In addition, partially submerged down logs and islands provide secure areas that are important for loafing waterfowl. Waterfowl and bat habitat will be enhanced through the following management actions:

- Evaluate waterfowl and bat habitat quality during the initial evaluations (Section 5.4.1).
- Enhance palustrine unconsolidated bottom wetlands or wetlands that were identified as important habitat for waterfowl and bats within 5 years of completing the initial evaluation.
- Promote and protect down logs, particularly logs that are partially submerged in the wetland.

- Develop snags or artificial structures around the wetland edge to increase down wood, create roosts for bats, and nesting cavities for ducks.
- Control aquatic vegetation to increase open water areas by manipulating water levels or removing plants by mechanical, cutting, burning, or chemical means. Methods used will be dependent on site conditions and plant species, but should occur at a time that avoids impacting pond breeding amphibians and other wildlife. Chapter 13 (*Invasive Plant Species Management*) provides the best management practices for controlling invasive plant species in wetland areas.
- Promote overhanging vegetation to create diversity and to promote habitat for nesting ducks.

5.5.5 Bullfrog Management

Bullfrogs are not native to the Pacific Northwest. Because the bullfrog is much larger than our native species, it outcompetes many of the native amphibians in the warmer water wetlands (Corkran and Thoms 1996). In addition, bullfrogs predate on amphibians, turtle hatchlings, ducklings, and other birds (Corkran and Thoms 1996). To control, reduce, and prevent bullfrog populations, the following management actions will be implemented:

- Determine methods to discourage or reduce bullfrog use in wetlands that have a permanent water source in a normal water year. Methods identified will be implemented within 5 years of completing the initial evaluation.
- Draw down wetlands that have water control structures annually by removing as many stoplogs as possible between August 15 and September 15. The stoplogs will be replaced in the outflow structures between October 15 and 31 to restore water levels for wintering ducks.

5.5.6 Great Blue Heron Colony Management

Although great blue herons are often seen foraging in the wetlands, there are no known existing great blue heron colonies (rookeries) on WHMP lands. Colonies may be identified in the future through anecdotal observations or the Washington Department of Natural Resources heritage database. If a colony is discovered, a site-specific colony management plan will be submitted to the TCC for review within 6 months of discovering the colony. The objective of the colony site management plan is to protect the site from disturbance and structure removal. Appendix 5-5 provides the WDFW Priority Habitat and Species recommendations for the great blue heron (Quinn and Milner 1999). A site management plan will include, but not be limited to, the following information:

- Identify the colony's size, location, relative isolation, and degree of habituation to disturbance
- Topographic or vegetative features surrounding the colony that might ameliorate the effect of human disturbance
- Foraging habitat availability and proximity to the colony site

- Proximity to forest lands that could be used as an alternative colony site
- Land-use patterns and potential for long-term availability of nesting and foraging habitat
5.6 SCHEDULE AND EFFORT

The table below provides the schedule, estimated effort (hours), and documentation requirements for each task.

Table 5.6.1 Wetland Habitat Management Schedule and Estimated Effort							
Procedures	Completion Date	Timing	Effort	Documentation			
Inspections							
Initial Evaluation	Within 5 years of implementation	April 10 to June 30	180 hours	Data Forms, Photos, and Maps			
Initial Evaluation Final Report	Within 1 year of completing the initial evaluation	January 1 to December 31	80 hours	Report submitted to the TCC			
Annual Inspection	Annually	April 10 to June 30	80 hours	Data Form			
Annual Inspection with Unmanaged Wetlands	Every 5 years	April 10 to June 30	140 hours	Data Form			
Post-Treatment Inspections	Optional ¹	January 1 and December 31	4 hours per inspection	Data Form			
Water Control	i	i	i	ł			
Diversion Draw Down	Optional ¹	January 1 to December 31	3 hours per diversion	Annual Report			
Remove 1 to 2 Stoplogs for High Winter Flows	Annually	October 15 to October 31	16 hours	Annual Report			
Replace 1 to 2 Stoplogs for High Winter Flows	Annually	February 15 to 28	16 hours	Annual Report			
Dike Maintenance	Optional ¹	January 1 to December 31	Unknown	Annual Report			
Vegetation Managem	ent		•				
Surrounding Wetland Vegetation	Optional ¹	January 1 to December 31	4 hours per site	Annual Report			
Yellow Warbler and	Mink Habitat Enhanc	ement	•				
Tree Topping or Pruning to Enhance Existing Shrubs	Target Year 17	January 1 to December 31	3 hours per tree	Annual Report			
Shrub Planting	Target Year 17	February 1 to March 15	1 hour per shrub and \$50 per shrub	Annual Report			
Waterfowl and Bat H	Waterfowl and Bat Habitat Enhancement						
Loafing Log	Within 5 years of completing the initial evaluation	January 1 to December 31	2 men x 1 hour per 1-20 in dbh Douglas-fir tree 1 hour for reporting	Annual Report			
Snag Creation	Within 5 years of completing the initial evaluation	January 1 to December 31	2 men x 1.5 hour per 1 20-in dbh Douglas-fir tree 1 hour for reporting	Annual Report			
Aquatic Vegetation Control	Optional ¹	July 16 to November 30	Unknown	Annual Report			

Table 5.6.1 Wetland Habitat Management Schedule and Estimated Effort (continued)						
Procedures	Completion Date Timing Effort Documentation					
Bullfrog Managemen	t					
Implement Methods Identified in the Initial Evaluation	Within 5 years of completing the initial evaluation	January 1 to December 31	Unknown	Annual Report		
Remove Stoplogs	Annually	August 15 to September 30	16 hours	Annual Report		
Replace Stoplogs	Annually	October 15 to October 30	16 hours	Annual Report		
Great Blue Heron Co	lony Management					
Review WDNR Heritage Database	Annually	December 1 to December 31	2 hours	Annual Report		
Great Blue Heron Colony Site Management Report	Optional ¹	Within 6 months of discovery	15 hours	Report submitted to the TCC		

WDNR = Washington Department of Natural Resources; dbh = diameter at breast height.¹ Optional management actions are actions that are chosen to be implemented according to need or opportunity.

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6.0 RIPARIAN HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

Appendix 6-1: Lewis River Wildlife Habitat Management Plan Riparian Areas Locations and Type
Appendix 6-2: Tree Transect Data Form, Snag and Live Decay Tree Transect Data Form, and Riparian Mixed Forest Stand Snag Inventory

6.1 INTRODUCTION

This chapter describes the riparian habitat management goal and objectives, management actions, and schedule on the Lewis River WHMP lands. It compiles information on riparian habitat from Section 3.3 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), and Schedule 10.8 Section 2.12 of the Settlement Agreement (PacifiCorp et al. 2004). The Merwin Wildlife Habitat Management Program (PacifiCorp 1998) had no specific goals or objectives attributed to managing riparian habitat; however, PacifiCorp implemented buffers or enhancements consistent with best management practices and Washington State Forest Practices Rules where applicable. In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Riparian habitats provide a number of important ecosystem functions, including stream bank stabilization, stream temperature control, flood control, and wildlife habitat (PacifiCorp and Cowlitz PUD 2006). Riparian habitat encompasses the areas that are influenced by high-water events, such as the floodplains, channel migration zones, wetlands, and upland plant communities, that directly influence streams. Specifically, the riparian habitat begins at the ordinary high-water mark of a stream or river and includes the portion of adjacent lands that influence the aquatic habitat by providing shade, nutrients, woody materials, insects, or habitat for riparian-associated species.

Riparian habitats are important for fish and wildlife because of the diverse mix of physical, structural, and biotic characteristics. As a result, riparian areas provide some of the most diverse, dynamic, and complex terrestrial habitat in the Pacific Northwest. Riparian habitats are used for essential life activities by approximately 85 percent of Washington's terrestrial vertebrate species, and the density of wildlife in riparian areas is comparatively high (Knutson and Naef 1997). For perspective, these areas only represent 1 to 2 percent of the landscape in Oregon and Washington, but 319 of the 593 species that occur in these two states have been recorded using riparian habitat (Kauffman et al. 2001).

Although the reservoir shorelines are not riparian habitat by definition, they are included in the Riparian Habitat Management area, and Objective b is specific to protecting the shorelines. Reservoir shorelines are similar to riparian habitat and natural lake shorelines in that they influence the aquatic habitat by providing shade, nutrients, woody materials, insects, and habitat for riparian-associated species. Because reservoir water levels fluctuate more than natural lakes (both in magnitude and frequency), the reservoir shoreline habitat is not typically influenced by the aquatic habitat and consists mostly of upland plant communities (PacifiCorp and Cowlitz PUD 2004a).

6.2 MANAGEMENT GOAL AND OBJECTIVES

The goal and objectives and species association for riparian habitat management are presented below (PacifiCorp and Cowlitz PUD 2006).

6.2.1 Goal

Protect, maintain, and/or enhance riparian areas to include a diversity of native plant species and vegetation structures to benefit wildlife species that use riparian habitats.

6.2.2 Objectives

- **Objective a:** Identify and establish buffers to protect, maintain, and enhance riparian habitat structure and functions, using the following guidelines as a minimum when planning forest management activities:
 - (1) 300 feet (90 m) or the height of two site potential trees, whichever is greater, for perennial fish-bearing streams that potentially support bull trout (*Salvelinus confluentus*) or anadromous fish
 - (2) 300 feet (90 m) for perennial fish-bearing streams that support residential fish species only
 - (3) 150 feet (45 m) for perennial nonfish-bearing streams
 - (4) 100 feet (30 m) for intermittent streams

Buffer widths are measured horizontally from the ordinary high-water mark or the outer margin of the channel migration zone and are applied to both sides of the stream. Buffers will be larger for streams showing evidence of mass wasting or erosion.

Water Type	Buffer Widths
Type 1 and 2 streams; or Shorelines of the State, Shorelines of Statewide	250 feet (75 m)
Significance	
Type 3 streams; or other perennial or fish-bearing streams 5-20 feet (1.5-	200 feet (61 m)
6.1 m) wide	
Type 3 streams; or other perennial or fish-bearing streams <5.0 feet (1.5 m)	150 feet (46 m)
wide	
Type 4 and 5 streams; or intermittent streams and washes with low mass	150 feet (46 m)
wasting potential ¹	
Type 4 and 5 streams; or intermittent streams and washes with high mass	225 feet (68 m)
wasting potential ¹	

Table 6.2.1 Recommended Riparian Buffers for Streams with Mass Wasting

Source: Knutson and Naef 1997

¹ Mass wasting is a general term for a variety of processes by which large masses of rock or earth material are moved down slope by gravity, either slowly or quickly.

Reduced buffer widths and other management activities would only be allowed for the purpose of meeting specific wildlife habitat objectives.

- **Objective b:** Maintain a 200-foot (60-m) buffer around the reservoir to protect shoreline riparian habitat as a minimum when planning forest management activities. Reduced buffer widths would only be allowed for the purpose of meeting specific wildlife habitat objectives.
- **Objective c:** Within 5 years of WHMP implementation, evaluate the number of live conifers and snags greater than or equal to 20 inch (50 cm) dbh in riparian mixed forest stands.
 - If there are less than or equal to 20 live conifer trees per acre (49 trees per ha) that are greater than or equal to 20 inches (50 cm) dbh, then protect the large conifers
 - If there are greater than 20 live trees per acre (49 trees per ha) that are greater than or equal to 20 inches (50 cm) dbh then determine if creation of additional large snags is needed to increase snag numbers (at least 1 per 6 acres [1 per 2.4 ha] greater than or equal to 20 inches [50 cm] dbh) and snag average dbh (greater than or equal to 25 inches [63 cm] dbh) for pileated woodpecker (*Dryocopus pileatus*). Develop a schedule to create additional snags, if needed.
- **Objective d:** Protect existing large snags in riparian habitats.
- **Objective e:** As part of implementation of the WHMP, identify riparian sites damaged by anthropogenic processes and prepare restoration plans within 5 years of identification, if feasible. Restoration plans should incorporate measures to meet applicable objectives for invasive species and public access management.

6.2.3 Species Association

Species association identifies indicator species that require riparian habitat and/or riparian habitat features as part of their life history (PacifiCorp and Cowlitz PUD 2004b). As a result, it is assumed these species will receive direct benefit from riparian habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations and be the primary objective for prescribing management actions.

Habitat Evaluation Procedure (HEP) Evaluation Species: Black-capped Chickadee, Mink, Pileated Woodpecker, and Yellow Warbler

Black-capped Chickadee (Poecile atricapilla)

In Washington, black-capped chickadees' preferred habitat is deciduous forests, and chickadee abundance in deciduous forests is related to canopy volume (Marshall et al. 2003, Schroeder 1983a). Black-capped chickadees nest in cavities of dead or hollow trees. The nest trees are a minimum of 4 inches (10 cm) dbh, the tree diameter at the nest site ranges from 3.9 to 5.9 inches (10.0 to 15.0 cm), and the total tree height ranges from

1.0 to 40.0 feet (0.3 to 12.2 m) (Schroeder 1983a). In Oregon and Washington, winter roost cavities are excavated in snags (Schroeder 1983a). Black-capped chickadees nest in cavities and are only able to excavate a cavity in soft or rotten wood (Schroeder 1983a).

The overall black-capped chickadee HSI values for the riparian vegetation types, which include riparian deciduous forest and riparian mixed forest, were in the moderate to high range (from 0.58 to 0.90), except for riparian deciduous forest at Swift, which was only 0.19 (PacifiCorp and Cowlitz PUD 2004b). The limiting factor in riparian deciduous and riparian mixed forest vegetation cover types at Merwin and Yale is tree cover (optimum is 50 to 75 percent canopy closure), whereas at Swift it is both the tree cover and snag density. There was not enough young riparian mixed forest vegetation cover type to accurately sample; therefore, there are no HSI values for Merwin, Yale, and Swift (PacifiCorp and Cowlitz PUD 2004b). For more information on black-capped chickadees, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Mink (Mustela vison)

Mink are closely associated with aquatic habitats because of their dependency on aquatic prey. As a result, mink are generally observed within 656 feet (200 m) of large freshwater streams, rivers, lakes, marshes, and marine shore habitats, and the extent and density of mink populations are directly proportional to the distribution and abundance of such habitats (Maser 1998, Verts and Carraway 1998). Surface water must be present for a minimum of 9 months of the year to provide optimum habitat and prey availability for mink (Allen 1986). Extensive woody and persistent herbaceous vegetation provides important cover for foraging and denning mink; however, optimum cover varies between habitat types and is a combination of cover components (i.e., tree and shrub canopy) (Allen 1986).

Although mink were designated as a HEP evaluation species for riparian habitat, the mink HSI values were not determined at streams during the HEP Study. As a result, there are no baseline mink HSI values for the riparian vegetation cover types: riparian deciduous, riparian mixed, riparian deciduous shrubland, riparian grassland, and young riparian mixed.

Mink baseline information for riparian vegetation cover types will be determined by applying the mink HSI model to perennial fish-bearing streams on Lewis River WHMP lands (Allen 1986). The HSI values will only be assessed at perennial fish-bearing streams that extend greater than 328 feet (100 m) onto WHMP lands. The streams will be assessed using the assumptions, equations, and suitability index values that apply to riverine cover type in the mink HSI model (i.e., percent of year with surface water present, percent shoreline cover within 3 feet [1 m] of the water's edge, and percent canopy cover of trees and shrubs within 328 feet [100 m] of the stream's edge) (Allen 1986). The mink HSI model will be applied at the same time the newly acquired lands HSI values are accessed (PacifiCorp et al. 2004).

Pileated Woodpecker (Dryocopus pileatus)

Pileated woodpeckers may be found in several seral stages of both deciduous and coniferous forests (Csuti et al. 1997). Because of their dependency on large snags and fallen trees, pileated woodpeckers are more closely associated with mature and old-growth forest habitats (Lewis and Azerrad 2003). Critical components of pileated woodpecker habitat are large snags and trees, diseased trees, dense forest stands, and high snag densities (Schroeder 1983b). Nest and roost trees are usually the larger and taller snags or live decay trees (i.e., greater than or equal to 90 feet [27 m] and 30 inches [76 cm] dbh). A variety of forest seral stages can be used as foraging habitat if an adequate amount of large trees and snags (greater than 20 inches [51 cm] dbh) are present and capable of supporting an abundant amount of insect prey associated with the dead wood (Lewis and Azerrad 2003).

The overall pileated woodpecker HSI values for riparian vegetation cover types were in the low to moderate range (0.26 to 0.37) for riparian deciduous forests and moderate to high (0.46 to 0.74) for riparian mixed forests (PacifiCorp and Cowlitz PUD 2004b). The limiting factor for riparian deciduous and riparian mixed forest vegetation cover types at Merwin and Yale is the lack of large trees and snags. Under the Merwin Wildlife Habitat Management Program, numerous snags greater than or equal to 20 inches [51 cm] dbh were created. However, most of these snags were not developed in the riparian forested areas but in adjacent upland forests, shrublands, or timber harvest areas. For more information on pileated woodpeckers, HSI values, and the HSI model, see Chapter 17 (*Species Associations*).

Yellow Warbler (Dendroica petechia)

Optimum yellow warbler habitat is 60 to 80 percent shrub crown cover, comprised entirely of hydrophytic species, with an average shrub height of 6.6 feet (2.0 m), and a minimum habitat patch size of 0.37 acres (0.15 ha) (Schroeder 1982). The overall HSI values for the riparian vegetation cover types (riparian shrub, riparian deciduous, riparian mixed forest) were all in the moderate to high range (0.45 to 0.96). Percent of hydrophytic shrub cover is the limiting factor for riparian forested areas, and percent of deciduous shrubs is the limiting factor for riparian shrub areas. For more information on yellow warblers, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Analysis Species: Cascade torrent salamander (*Rhyacotriton cascadae*), and papillose tail-dropper (*Prophysaon dubium*).

Other Species: None.

6.3 RIPARIAN HABITAT MANAGEMENT AREAS

As described in Section 6.1, riparian habitats are the areas adjacent to the stream or river that contains elements of both the aquatic and terrestrial ecosystems which mutually influence each other (PacifiCorp and Cowlitz PUD 2004c). The size of riparian habitat varies greatly and is largely dependent on the stream size, gradient, channel dynamics, hydrology, topography, and geomorphology (Knutson and Naef 1997). As a result, riparian habitat areas are not easily distinguished and are best determined per site and from the ground. The riparian areas have been identified on the WHMP lands by applying riparian buffers and using vegetation cover typing.

The vegetation cover type study differentiated vegetation into the following riparian cover types: riparian deciduous forest, riparian deciduous shrubland, riparian mixed forest, young riparian mixed forest, and riparian grassland. These were essentially all of the upland vegetation cover types, except conifer, that are within the riparian zone (i.e., that is within 300 feet [91 m] of a stream) (PacifiCorp and Cowlitz PUD 2004b, August 4, 1999, meeting notes). Because the vegetation cover type did not include the conifer, wetland, or disturbed cover types within the riparian zones, it is not a true representative of the total riparian habitat acres on WHMP lands. The following table lists the amount of acres that were vegetation cover typed as a riparian habitat; Appendix 6-1 provides the locations.

Vegetation Cover Type	Merwin Acres (ha)	Yale Acres (ha)	Swift Acres (ha)	Total Acres (ha)
Riparian Deciduous Forest	67.3 (27.2)	41.8 (16.9)	77.1 (31.2)	186.2 (75.4)
Riparian Deciduous Shrubland	2.5 (1.0)	0.0 (0.0)	4.6 (1.9)	7.1 (2.9)
Riparian Grassland	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Riparian Mixed Forests	101.3 (41.0)	83.1 (33.6)	13.7 (5.5)	198.1 (80.2)
Young Riparian Mixed Forest	0.0 (0.0)	0.0 (0.0)	3.5 (1.4)	3.5 (1.4)
Total	171.1 (69.3)	124.9 (50.6)	98.9 (40.0)	394.9 (159.9)

 Table 6.3.1 Riparian Vegetation Cover Type Acres on Wildlife Habitat Management Plan Lands

To protect riparian habitat function from adjacent upland activities, the Standards & Guidelines establish riparian buffers using standardized widths based upon the water type (PacifiCorp and Cowlitz PUD 2006). The stream locations and water types on WHMP lands are identified using the Washington Department of Natural Resources geographic information system hydrography data layer, and it is updated annually. However, over the past few years, PacifiCorp has submitted several Water Type Modification forms to the Washington Department of Natural Resources, requesting corrections in both water type and location to the hydrography data layer; however, because of backlogs at the Washington Department of Natural Resources, the requested corrections have not been

included in the hydrography layer to date. As a result, PacifiCorp's stream data layer may not be accurate and will require field verification prior to establishing buffers. The following table estimates the amount of WHMP lands that are within the riparian buffer by water type; the maps in Appendix 6-1 provide stream locations and water type.

Water Type	Washington Department of Natural Resources Water Type	Buffer	Merwin acres (ha)	Yale acres (ha)	Swift acres (ha)	Total acres (ha)
Shoreline	S	200 feet (60 m)	791 (320)	411 (166)	139 (56)	1341 (543)
Perennial fish-bearing streams that potentially support bull trout (<i>Salvelinus confluentus</i>) or anadromous fish	F	The greater of 300 feet (90 m) or 2 site potential trees ¹	230 (93)	258 ² (104)	97 (39)	585 (237)
Perennial fish-bearing streams that support residential fish species only	F	300 feet (90 m)	226 (93)	294 (119)	91 (37)	611 (247)
Perennial nonfish- bearing steams	Np	150 feet (45 m)	346 (140)	41 (17)	98 (40)	485 (196)
Intermittent streams	Ns	100 feet (30 m)	371 (150)	228 (92)	94 (38)	693 (281)
		Total	1,964 (795)	1,232 (499)	519 (210)	3,715 (1,504)

 Table 6.3.2 Total Wildlife Habitat Management Plan Lands' Riparian Buffer Acres by Water Type

¹Unless determined on site, the upper limit of 2 site potential trees is assumed to be 400 feet (121 m). ²Total includes Cougar Creek Conservation Covenant acres.

The riparian buffers provide a more accurate description of riparian habitat on WHMP lands. Therefore, for management purposes, riparian habitat refers to the WHMP lands that are within the riparian buffers described in Table 6.3.2.

6.4 INSPECTIONS

Overall, riparian areas will not be inspected on a regular basis, except for riparian mixed forests, which will be evaluated to determine the number of live conifers and snags. Riparian areas will instead be evaluated on an as-needed basis or opportunistically with other management activities or inspections. As a result, there will not be a standardized method or form for recording the information. However, the following information should be observed when evaluating a riparian area:

- Date
- Wildlife observation
- Vegetation cover type
- Water flowing in channel
- Number of large snags (i.e., greater than 20 inches [51 cm] dbh)
- Damage to the riparian habitat and potential causes

If management activities are recommended following an evaluation, then a memo will be prepared to document the observations and recommended management. The memo will be summarized in the Annual Report.

6.4.1 Riparian Mixed Forest Stand Evaluation

Pileated woodpecker habitat will be enhanced in riparian mixed forest stands on WHMP lands by evaluating the number of large live conifers and snags. If the evaluations determine the stands have less than or equal to 20 live large conifer trees per acre (49 trees per ha), then the large trees will be protected. However, if a stands meets the following criteria, then snags may be developed:

- Greater than or equal to 20 live conifer trees per acre (49 trees per ha) greater than or equal to 20 inches (50 cm) dbh
- Greater than or equal to 1 snag per 6 acres (1 snag per 2.4 ha) greater than or equal to 20 inches (50 cm) dbh
- Snags average dbh is greater than or equal to 25 inches (63 cm)

There are 34 riparian mixed forest stands on WHMP lands that total 198 acres (80 ha), ranging from 0.55 to 38.3 acres (0.22 to 15.5 ha) in size. Only the riparian areas that are greater than 1.0 acre (0.4 ha) will be inventoried. This will eliminate 12 of the riparian mixed forest stands and reduce the total acreage to 189 acre (76 ha). Appendix 6-1 shows the riparian mixed forest stands on WHMP lands.

Aerial photo (color infrared) and natural color aerial photography interpretation can be used to determine the approximate number of conifer trees per acre in the riparian mixed forest stands. Each riparian mixed forest stand will be delineated on the aerial photo, and the number of conifer trees will be estimated within the stand to determine if the stand initially meets 20 or more conifer trees per acre (49 trees per ha). Stands that appear to have less than 20 conifer trees per acre (49 trees per ha) will not be field verified, and the large trees will not be developed into snags. In addition, riparian mixed forest stands that are entirely within a secondary or seasonal management area cannot have snags developed because of the public safety risk; therefore, these stands will not be field verified.

Stands that are estimated to have more than 20 live conifer trees per acre (49 trees per ha) will be inventoried using transects to estimate the number of live conifers and snags and live decay trees that are greater than or equal to 20 feet (6 m) in height. Prior to beginning the field work the riparian mixed forest stand boundaries will be identified using global positioning system, aerial photos, topographical maps, and distinct boundaries (e.g., timber harvest areas or roads). Boundaries that are difficult to distinguish in the field will be marked with flagging prior to conducting transects.

Because most stands are linear and narrow, only one or two persons will be required to complete the transects. The two observers will walk parallel to each other through the stand, counting and categorizing each snag and live decay tree that is greater than 20 feet (6 m) tall and each live conifer tree that is greater than or equal to 20 inches (51 cm) dbh on the Tree Transect Data form provided in Appendix 6-2. The transects will parallel the stream approximately 50 feet (15 m) upslope from the ordinary high-water mark. The transect width should not exceed 100 feet (30 m), but may vary depending on visibility, stand width, and the observers' ability to communicate with one another (Bull et al. 1990, Lindquist and Mariani 1991).

The total number of transects is dependent on the size and shape of a stand, but may require up to 3 transects per acre (7.4 per ha). Some riparian mixed stands are so narrow that a single transect adjacent to the stream will accomplish the evaluation. The estimated time for each transect will vary depending on the size of the stand, visibility, and terrain. However, if a stand is determined to meet the above-listed criteria before all of the transects are completed, then no further transects will be needed. A general inspection of the stand will occur at the time of the evaluation to determine the best methods or areas for trees to be developed into snags. The total estimated time to complete the evaluation is 160-200 hours, including time for stand delineation, transects, travel, and documentation.

6.5 MANAGEMENT ACTIONS

The following management actions outline measures to maintain riparian habitat in a condition consistent with the management goal and objectives. Management actions include the following:

• Establish Buffers

• Snag Management

• Restoration

6.5.1 Establish Buffers

Riparian area buffers will be established to protect, maintain, and enhance riparian habitat structure and functions when implementing forest management activities. Table 6.5.1 should be used as a guideline for minimum buffer widths, and the maps in Appendix identify the streams by water type. The buffer guideline widths may vary depending on the water type, condition of the riparian habitat, and activity. For example, buffers may be increased on streams with evidence of mass wasting or erosion, but may be reduced if the activity is for the purpose of meeting specific wildlife habitat objectives. Any reduction to the buffer widths listed in Table 6.5.1 will be approved by the TCC prior to implementing the activity.

Water Type	Minimum Buffer	Mass Wasting Buffer
Shoreline	200 feet (60 m)	$250 \text{ feet } (76 \text{ m})^1$
Perennial fish-bearing streams that potentially support bull trout or anadromous fish	The greater of 300 feet (90 m) or two site potential trees	Greater than 300 feet (90 m) or two site potential trees
Perennial fish-bearing streams that support residential fish species only	300 feet (90 m)	Greater than 300 feet (90 m)
Perennial nonfish-bearing streams	150 feet (45 m)	Greater than 150 feet (45 m)
Intermittent streams	100 feet (30 m)	225 feet $(69 \text{ m})^1$

Table 6.5.1 Buffer Guidelines by Water Type

¹ Source: Table 6.2.1.

Prior to conducting a ground-disturbing activity near a stream, the buffer distance will be measured on the ground and will be marked according to the activity and the site. The boundaries will be marked with flagging, carsonite post, paint, or stakes. Buffer widths will be measured at a horizontal distance from the ordinary high-water mark or the outer margin of the channel migration zone when present. These terms are based on the definitions provided in the forest practice rules Washington Administrative Code 222-16-010 general definitions:

• **Channel migration zone** is the area where the active channel of a stream is prone to move, resulting in a potential near-term loss (i.e., the time that is required to grow a mature forests) of riparian function and associated habitat adjacent to the stream, except as modified by a permanent levee or dike. The Forest Practices

Board Manual (Section 2) provides a standard method for identifying channel migration zones (Washington Department of Natural Resources 2004).

- Horizontal distance is the distance between two points measured at a zero percent slope.
- **Ordinary high-water mark** is the mark on the shores of all waters, which can be found by examining the beds and banks and ascertaining where the presence and action of waters are so common and usual during an ordinary year that it marks the soil characteristics to be distinct from the upland vegetation.

Establishing the buffers may identify errors in the Washington Department of Natural Resources geographic information system hydrography data layer. If necessary, a Water Type Modification form will be filed with the Washington Department of Natural Resources to correct the hydrography data layer. These Water Type Modification forms will be provided in the Annual Report as new information is obtained.

6.5.2 Snag Management

Snags will be protected, and in some cases created, in riparian habitats to promote pileated woodpecker habitat structure and quality. Existing large snags (i.e., snags greater than or equal to 20 inches [51 cm] dbh) will be protected. The TCC will approve the removal of large snags within riparian areas, unless a snag is an imminent threat to public safety or a transmission line, in which case the TCC will be notified of the snag removal and it will be reported in the Annual Report for that year.

Pileated woodpecker habitat will be enhanced by developing snags in riparian mixed forest stands on WHMP lands that lack large snags and have a sufficient number of large live conifers. The Riparian Mixed Forest Stand Evaluations described in Section 6.4.1 will determine which of the stands snags will be developed. Within 1 year of completing the Riparian Mixed Forest Stand Evaluations, a schedule to develop snags in the qualifying stands will be completed. Trees may be developed into snags by using the appropriate method which may include, but are not limited to, topping, hack-n-squirt (i.e., herbicide applied to a cut [hack] through the tree bark into the cambium layer), etc.

6.5.3 Restoration

The damaged riparian areas will be reported to the TCC following the discovery of the area at the next scheduled TCC meeting, documented in that year's Annual Report, and a restoration plan for the area will be completed within 5 years. Anthropogenic processes that can damage a riparian area include, but are not limited to, improperly sized culverts, road erosion, vegetation removal, and off-road vehicle trespass. Riparian areas will be examined opportunistically in association with other management activities or inspections, or an as-needed basis.

The damaged riparian areas will be documented in the Annual Report of the year the area was identified, and a restoration plan for the area will be completed within 5 years following the documentation. Restoration plans will vary from site to site, and restoration methods will depend on the extent and source of the damage. Restoration plans will be reviewed and accepted by the TCC prior to implementation and should include the following:

- Riparian area description
- Anthropogenic process
- Restoration methods
- Timeline
- Potential regulatory compliance (i.e., permitting)
- Incorporate measures to meet Invasive Plant Species and Public Access Management goals and objectives

Upon completing the restoration, the TCC will be provided an opportunity to visit the site.

6.6 SCHEDULE AND EFFORT

The table below lists the schedule, estimated effort (hours), and documentation requirements for each task.

Table 6.6.1 Riparian Habitat Management Schedule and Estimated Effort							
Procedures	Completion Date	Timing	Effort	Documentation			
Inspections							
Riparian Mixed Forest Stand Evaluations	Within 5 years of receiving the licenses	January 1 to December 31	200 hours	Data forms and report			
Other Inspections	Optional ¹	January 1 to December 31	4 hours per site	Annual Report			
Establish Buffers							
Establish Buffers	Optional ¹	January 1 to December 31	1 hour per 100 feet (30 m) of stream	Annual Report			
Water Type Modification form	Optional ¹	January 1 to December 31	4 hours per form	Data Form and Annual Report			
Snag Management							
Snag Development Schedule	Within 1 year of completing the Riparian Mixed Forest Stand	January 1 to December 31	50 hours	Report submitted to the TCC			
Snag Removal	Optional ¹	January 1 to December 31	3 hours per 20 inches (50 cm) dbh Douglas-fir	Annual Report			
Restoration							
Riparian Area Damage Identification	Optional ¹	January 1 to December 31	1 hour per area	Report to TCC at next scheduled meeting and Annual Report			
Riparian Area Restoration	Within 5 years of identifying a damaged riparian area	January 1 to December 31	Unknown	Memo submitted to the TCC			

¹ Optional management actions are actions that are chosen to be implemented according to need or opportunity.

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7.0 SHRUBLAND HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

Appendix 7-1: Lewis River Wildlife Habitat Management Plan Shrubland Habitat Area Figures

Appendix 7-2: Shrubland Inspection Form

Appendix 7-3: Wildlife Value for Lewis River Shrub Species

Appendix 7-4: Post-Treatment Shrubland Inspection Form

7.1 INTRODUCTION

This chapter describes the shrubland habitat management goal and objectives, management actions, and schedule on Lewis River Wildlife Habitat Management Area lands. It compiles information on shrubland habitat from Section 3.4 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.3 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Shrubland habitats are either permanent habitats that are stable over time, or a midsuccessional habitat that exist as a site transitions from grass/forb to pole/sapling (Johnson and O'Neil 2001). Permanent shrubland habitat sites tend to be associated with hydric or xeric conditions, or areas with shallow soils (Thompson and DeGraaf 2001). Mid-successional shrublands are, however, typically associated with a disturbance event, such as fire or logging. Permanent shrublands are not common in western Washington, particularly in the lower elevations. Most of the WHMP land shrublands are midsuccessional shrublands that are the result of past disturbances in areas where conditions limit tree regeneration, thus favoring dense shrub communities.

Shrubland habitat benefits wildlife by providing food sources and complex structure, which is desirable hiding and nesting cover for several species. Many shrubs contain a higher percentage of crude protein during the fall and winter months than grasses and forbs do, making them an important source of winter forage for big game (McWilliams 2000). The fruit, buds, catkins, and nuts produced by shrub species are an important food source to many small mammals and birds. In addition, shrubland habitat that occurs near or within forested habitat creates a unique habitat type that increases diversity in forested landscapes.

7.2 MANAGEMENT GOAL AND OBJECTIVES

The goal and objectives and species association for shrubland habitat management are presented below.

7.2.1 Goal

Perpetuate and enhance designated shrub stands and patches to provide habitat for wildlife that use these areas.

7.2.2 Objectives

- **Objective a**: Within 5 years of WHMP implementation, evaluate all cover typed shrub stands to determine tree composition and size classes, as well as shrub size and structural characteristics. Where appropriate, manage to prevent conversion to forest and maintain/improve a mixture of shrub ages and sizes; re-evaluate stands every 15 years.
- **Objective b**: Within 5 years of WHMP implementation, evaluate the designated shrublands identified in the Merwin Wildlife Habitat Management Program Standard Operating Procedures (PacifiCorp 1998) and determine if and how these areas should continue to be managed as shrublands in the future. Within 8 years, revise management actions where necessary.
- **Objective c**: To benefit raptors, maintain existing snags and large perch trees, while minimizing excessive shading in shrublands over the license periods. When possible, maintain existing large red-cedar (*Thuja plicata*) trees.

7.2.3 Species Association

Species association identifies indicator species that require shrubland habitat and/or shrubland habitat features (PacifiCorp and Cowlitz PUD 2004). As a result, it is assumed these species will receive direct benefits from shrubland habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations during inspections.

Habitat Evaluation Procedure (HEP) Species: Elk and Yellow Warbler

Roosevelt Elk (Cervus elaphus)

Elk were identified as a HEP evaluation species for shrublands. The WHMP lands have an overall low to moderate baseline HSI value for elk (median 0.43, average 0.50), with forage being the limiting factor (PacifiCorp and Cowlitz PUD 2004). Shrublands primarily provide cover habitat for elk and are evaluated as a cover habitat type in the elk HEP model. However, shrubland habitat management will also benefit elk by providing some forage. For more information on elk, HSI values for habitat variables, and the WDFW elk model, see Chapter 17 (*Species Associations*).

Yellow Warbler (Dendroica petechia)

Optimum yellow warbler habitat is 60 to 80 percent shrub crown cover, comprised entirely of hydrophytic species, with an average shrub height of 6.6 feet (2.0 m) and a minimum habitat patch size of 0.37 acres (0.15 ha) (Schroeder 1982). The WHMP shrubland habitat provides moderate HSI values, which is dependent on hydrophytic shrub cover, deciduous shrub cover, and shrub height (PacifiCorp and Cowlitz PUD 2004). Although the percent of deciduous cover should increase under the WHMP, the percent of hydrophytic shrub cover may be the limiting factor for improving shrubland HSI values. For more information on yellow warblers, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Analysis Species: None.

Other Species: Black-tailed deer (*Odocoileus hemionus*), migratory birds, and raptors. For further information on black-tailed deer, see Chapter 17 (*Species Associations*).

7.3 SHRUBLAND HABITAT MANAGEMENT AREAS

Currently, PacifiCorp has 33 shrublands that are managed under the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). The shrubland habitat areas range from 0.4 to 37.0 acres (0.2 to 15 ha) and total 211 acres (85 ha). The Merwin Wildlife Habitat Management Program management objectives required leaving 3 to 5 trees per acre (7.4 to 12.4 per ha) to provide perch sites for raptors (PacifiCorp 1998). As a result, many of the existing shrublands' tree canopy cover exceeded 10 percent and therefore were not cover typed as shrubland vegetation. This resulted in a discrepancy between the acres and the locations of shrublands identified in the vegetation cover type mapping and the designated Merwin Wildlife Habitat Management Program shrublands. Management objectives a and b in the Standards & Guidelines were developed to resolve this discrepancy (PacifiCorp and Cowlitz PUD 2006). Shrubland locations are shown on the maps in Appendix 7-1.

During the cover type studies associated with relicensing, the shrubland vegetation cover type was defined as areas with less than 10 percent forest canopy cover and greater than 50 percent shrub species coverage. This resulted in mapping about 75 acres (31 ha) of shrubland habitat on WHMP lands including: 17 acres (7 ha) at Merwin, 58 acres (24 ha) at Yale, and 2 acres (<1 ha) at Swift No. 1. Most of the shrubland vegetation cover type areas were mapped in areas associated with disturbance that are located within or along old fields, transmission lines, forested areas, or dry, rocky sites.

7.4 INSPECTIONS

Shrublands will be inspected regularly to ensure that the management goal and objectives are being achieved. Inspections consist of initial, post-treatment, and periodic inspections, as described below.

7.4.1 Initial Inspections

The initial shrubland inspection will assess the structural conditions and habitat elements for associated species (yellow warbler, elk, black-tailed deer, migratory birds, and raptors) to determine if the shrubland will continue to be managed under the Lewis River WHMP. Each shrubland will be inspected using the form provided in Appendix 7-2. The initial inspection will also determine future management needs for each shrubland. Criteria for determining if the identified shrublands areas will be managed as shrublands include the following:

- Shrub cover will be greater than 50 percent of the total cover.
- Tree canopy cover will not inhibit shrub cover.
- Tall shrubs (shrubs taller than 6.6 feet [2.0 m] in height and less than 20 feet [6 m]) will be greater than 50 percent of the total shrub cover.
- Shrubland habitat width will average greater than 200 feet (61 m) to provide adequate hiding cover for elk. If less than 200 feet (61 m), then shrubland density must be adequate to conceal 90 percent of an adult elk.
- Shrubland habitat will be greater than or equal to 1.0 acre (0.4 ha).
- Shrub species will support associated species foraging and nesting needs (e.g., hydrophytic shrub species or preferred big game forage species) (Appendix 7-3).
- Mark shrubland boundaries with flagging.
- Shrubland boundaries will be traversed to determine acreage.

The inspections will be completed within 4 years of WHMP implementation and will be conducted when the shrubs and trees are leafed out (April 15 to October 31). A final report identifying shrublands to be managed under the WHMP, as well as proposed management actions will be submitted to the TCC for review 1 year following the completion of the initial evaluation. A schedule for inspecting shrubland habitat to no more than every 15 years (see Section 7.4.3) will be included in this report. Shrublands may be inspected more frequently than every 15 years if the shrubland has a greater potential for disturbance and/or conifer encroachment. This should be determined in the initial inspections and included in the final report.

7.4.2 Post-Treatment Inspection

Shrublands will be evaluated 2 to 3 years following the implementation of management actions to record general observations on resprouting, browsing, and seedling germination. The objective is to adjust management actions to existing and new management areas to comply with the management goal and objectives. The shrubland inspections will occur during the summer (June 1 to August 31) to ensure that all

vegetation has leafed out. Observations will be documented using the form provided in Appendix 7-4.

7.4.3 Periodic Inspections

Following the initial inspections, shrublands will be inspected on a rotating schedule of no more than every 15 years, and less if determined necessary during the initial inspection, to assess the habitat condition and management needs. A schedule for inspections will not be developed until the completion of the initial inspection, which determines the actual shrubland habitat acreage (see Section 7.4.1). The inspection will occur when the shrubs and trees have leafed out (April 15 to October 31). Each shrubland inspection will be documented using the form provided in Appendix 7-2. The following actions will be conducted at these inspections:

- Conduct a walk-through visit to determine baseline conditions and assess management needs.
- Mark treatment areas, such as pruned areas or competing vegetation control areas, with flagging that differs from the shrubland boundary flagging.
- Mark shrub stems that are to be cut within the pruned area with tree paint; unmarked stems will not be cut.
- Mark trees to be killed with tree paint. Kill trees by either falling, topping, herbicide treatment, or other methods. All unmarked trees will be retained as leave trees. Dead trees will be left as snags or large woody debris, except when safety concerns exist or the TCC decides differently.

7.5 MANAGEMENT ACTIONS

The following management actions include measures to maintain shrubland habitat areas in a condition consistent with the management goal and objectives. Management actions include:

- Shade Control
- Vegetation Control
- Revised Management Actions
- Heavy Pruning
- Maintain or Create Hiding Cover

7.5.1 Shade Control

Shade control kills or reduces overstory tree species, such as red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*), and conifers, to increase sunlight and stimulate basal sprouting in shrubs. Generally, overstory tree species will be managed at preferably less than 10 percent of the total cover (Johnson and O'Neil 2001). However, tree species that are relatively uncommon on WHMP lands and have excellent wildlife value should be retained, regardless of the percent cover of overstory trees. The following actions should be applied.

- Girdle all young trees less than 10 inches [25 cm] dbh height when encountered, except for preferred species such as cascara (*Frangula purshiana*), bitter cherry (*Prunus emarginata*), willow (*Salix* spp.), or Pacific dogwood (*Cornus nuttallii*).
- Retain black cottonwood (*Populus balisamifera*) and large western red cedars (*Thuja plicata*) as leave trees where possible.
- Kill large (greater than 21 inch [53 cm] dbh) conifers by topping, falling, or herbicide injection. Large tops (greater than 12 inch [30 cm] dbh) from a topped conifer will be left on the ground as large woody debris. Slash will be preferably piled within the shrubland, but if needed slash can be removed. Topping or falling trees in dense overstory will be done outside of the growing season (November 1 to March 1) to protect the shrub foliage from sudden increases in sunlight (causing scalding).
- Mark trees to be killed with tree paint. All unmarked trees will be retained as leave trees.
- Avoid removing canopy trees in wet areas, especially sites with southern aspects that may be susceptible to drying out.
- Thin dense clusters of trees to maximize sunlight penetration. Remove trees, preferably on the outer edges of the cluster and on the southern or eastern edge.
- Avoid removing canopy trees that may adversely affect hydrophytic shrub species.
- Avoid killing large conifers that are in proximity (200 feet [61 m]) of the shoreline and that may provide perch or roost sites for ospreys (*Pandion haliaetus*) and eagles (e.g., *Halieaeetus leucocephalus*).

7.5.2 Heavy Pruning

This practice applies primarily to shrubland areas dominated by decadent and/or impenetrable masses of vine maple (*Acer circinatum*) or hazel (*Corylus cornuta*). The homogeneous patches of vine maple and hazel should be treated to increase structural diversity, produce growth, and open up the ground layer to allow other desirable species to colonize. Creating a mosaic of clearings will increase sunlight penetration to the ground layer, stimulating basal sprouting and increasing big game forage. The following actions should be conducted:

- Pruning will occur during dormancy and at the end of the growing season (September 1 to December 31).
- Break up homogeneous stands of vine maple and hazel with a mosaic of clearings, where possible.
- Space clearings approximately 20 feet (6 m) in radius and at least 80 feet (24 m) apart depending on the density and height of shrubland plants.
- Prevent invasive plant species from establishing by placing the edge of pruned areas at least 100 feet (30 m) from the edge of roads, recent timber harvest areas (past 10 years), meadows, transmission line rights-of-way, and agriculture and recreation areas.
- Prune stems from a shrub clump within 1 to 2 feet (30 to 60 cm) from the base. Preferably prune the mature stems that are greater than 1 inch (2.5 cm) caliper. Tree paint will mark shrub stems for pruning.
- Mark clearing perimeters with flagging. Pile brush in as few piles as possible, outside the cleared area. Orient the branches toward the cleared area rather than lengthwise along the edges of the clearing to maximize access to the clearing. Avoid piling brush on big game trails.
- Avoid creating openings where salal (*Gaultheria shallon*) is the major ground cover to prevent salal from outcompeting sprouting shrubs.
- Avoid using heavy pruning methods on fruit-bearing shrubs that add to structural diversity and may not survive heavy pruning. These species are identified in Appendix 7-3 as having bird or mammal wildlife value.

7.5.3 Vegetation Control

Invasive plant species growing adjacent to desirable shrubs, such as huckleberry (*Vaccinium* sp.) and elderberry (*Sambucus* sp.), may shade, crowd, or outcompete the desired species. Vegetation control may need to be implemented to increase the desired shrub species productivity. Clearing the competing vegetation around selected shrubs and trees will increase sunlight exposure and increase fruit production. The following actions should be conducted:

- Mark a 10-foot (3-m) perimeter around the preferred shrub species with flagging.
- Clear competing brush, such as nonpalatable shrubs and dense salal, in a 10-foot (3-m) radius around preferred shrub species to promote an open growth form.

Brush may be removed by cutting the base or by herbicide application. Avoid cutting or spraying preferred shrub species (Appendix 7-3).

• Control vegetation in small patches with herbicides. Because most herbicides will affect broadleaf species, this option should only be used when necessary. To minimize the impact on the shrub species, use only backpack sprayers and spot spray target species. Apply herbicides on calm days to prevent drift from killing nontarget species. Apply all necessary best management practices listed in Chapter 13 (*Invasive Plant Species Management*).

7.5.4 Maintain or Create Hiding Cover

Maintain or create hiding cover along the shrubland edge to screen the center of the shrubland from disturbance. Elk use in shrublands can be directly proportional to the amount of human disturbance (i.e., open roads) and available hiding cover. The following actions should be applied to maintain or create hiding cover and minimize disturbance:

- Maintain hiding cover when shrublands are within 200 feet (61 m) of roads, recreation areas, right-of-way, or recent timber harvest areas (past 10 years).
- Avoid conducting heavy pruning within 100 feet (30 m) of roads, clearcuts, rightof-way or other open areas that could be a potential source for disturbance.
- Maintain or enhance the structural diversity along forested edges by preserving the taller shrubs and selected tree species dispersed along edges.
- Mark the shrubland boundary with flagging to preserve the shrubland before conducting timber harvest activities.

7.5.5 Revised Management Actions

Within 8 years of WHMP implementation, a comprehensive review of shrubland management actions will be conducted to determine the effectiveness of each action. A report summarizing findings and the supporting conclusions and proposed revisions to management actions will be submitted to the TCC for review within 8 years of WHMP implementation.

7.6 SCHEDULE AND EFFORT

The table below lists the schedule, estimated effort (hours), and documentation requirements for each task.

Table 7.6.1 Shrubland Habitat Management Schedule and Estimated Effort						
Procedures	Completion Date	Timing	Effort	Documentation		
Inspections						
Initial Inspection	Within 4 years of WHMP implementation	April 15 to October 31	80 hours	Data Forms, Photos, Maps, and Report		
Initial Evaluation Final Report	Within 1 year of completing the initial evaluation	January 1 to December 31	30 hours	Report submitted to the TCC		
Post-treatment Inspection	Optional ¹	June 1 to August 31	15 hours	Data Form		
Periodic Inspection	Following the completion of the Initial Inspection Report	April 15 to October 31	50 hours	Data Form		
Shade Control		1				
Topping a Tree and Hand Piling Debris	Optional ¹	November 1 to March 1	2 men x 1.5 hour per 1 20-in dbh Douglas- fir tree 1 hour for reporting	Annual Report		
Falling a Tree and Hand Piling Debris	Optional ¹	November 1 to March 1	2 men x 1 hour per 1- 20 in dbh Douglas-fir tree 1 hour for reporting	Annual Report		
Herbicide injection	Optional ¹	Dependent upon species, method, and herbicide	1 man x 0.5 hour per 1 tree 1 hour for reporting	Annual Report		
Other Managemen	ıt					
Heavy Pruning	Optional ¹	September 1 to December 31	3 men x 1.5 hour per 1 pruning circle 1 hour for reporting	Annual Report		
Vegetation Control - Clear Competing Brush	Optional ¹	January 1 to December 31	1 man x 0.75 hour per 1 10-foot radius area 1 hour for reporting	Annual Report		
Revised Management Action	Within 8 years of WHMP implementation	January 1 to December 31	100 hours	Report submitted to the TCC		

¹ Optional management actions are actions that are selected to be implemented according to need or opportunity.
7.7 REFERENCES

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8.0 FARMLAND, IDLE FIELDS, AND MEADOWS HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

Appendix 8-1: Lewis River Wildlife Habitat Management Plan Lands Farmlands, Idle Fields, and Meadow Locations

Appendix 8-2: Inspection Forms

Appendix 8-3: Daubenmire Method

Appendix 8-4: Pasture Growth Calendar for the Western Washington Cascade Foothills and Grass Structures Definitions, Function, and Mechanisms for Growth

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8.1 INTRODUCTION

This chapter describes the farmland, idle field, and meadow habitat goal and objectives, management actions, and schedule. It compiles information on farmland, idle fields, and meadow management from Section 3.5 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.4 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions for achieving the goal and objectives.

Agricultural lands, such as meadows, idle fields, and farmlands, benefit wildlife by providing food sources, permanent cover, corridors for movement and breeding habitat. Most of the wildlife species that use agricultural lands are either seasonal migrants or permanent residents that use the habitat in conjunction with other adjacent habitats. Feeding is the most common wildlife activity to occur on agricultural lands. The linear and narrow nature of most agricultural lands creates a large amount of edge habitat, which typically has a high amount of species diversity. Agricultural lands can contribute to population declines for breeding species because of the land's attractiveness to predators and brood parasites (e.g., brown head cowbird [*Molothrus aters*]), management practices, and propensity for invasive and exotic species (Johnson and O'Neil 2001).

Despite the ecological limitations, there are substantial opportunities for enhancing wildlife habitat and species diversity on agricultural lands. In particular old fields and field edges can provide forage for deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*) and grassland bird habitat. Wide shelterbelts and hedgerows that include seed- and fruit-producing plants and a mixture of canopy layers can provide nesting and foraging habitat for a variety of game bird and passerine species. Crop mix, planting configuration, tillage practices, harvest timing, and the timing and use of herbicides and pesticides can be manipulated to improve wildlife habitat (Johnson and O'Neil 2001).

8.2 MANAGEMENT GOAL AND OBJECTIVES

The goal, objectives, and species association for farmland, idle field, and meadow habitat management are presented below.

8.2.1 Goal

Perpetuate and enhance farmlands, old fields, and meadows to benefit elk and other species that use open habitats.

8.2.2 Objectives

- **Objective a**: Intensively manage select meadows, farm fields at Saddle Dam Farm, and other designated lands to provide quality forage for wintering elk (November 1-April 30) over the life of the licenses.
- **Objective b**: Manage and develop hedgerows or shrub patches in and between farm fields and meadows to break up line-of-sight distances and provide screening/hiding cover for elk and multi-layered habitat structure for birds for the license periods. Evaluate alternative techniques.
- **Objective c:** Manage select meadows and old fields over the license periods to prevent shrub/tree encroachment, and maintain a diverse composition and structure of desirable grasses and forbs for birds (e.g., savannah sparrows [*Passerculus sandwichensis*]) and mammals.
- **Objective d**: Maintain fruit or soft mast bearing species in shrub patches or hedgerows over the life of the licenses.

8.2.3 Species Association

Species association identifies indicator species that use open habitats, such as farmlands, idle fields, and meadows (PacifiCorp and Cowlitz PUD 2004a). As a result, it is assumed that these species will receive direct benefits from farmland, idle field, and meadow habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife detections by sight, sound, smell, etc. during inspections (Section 8.4).

Habitat Evaluation Procedure (HEP) Species: Elk and Savannah Sparrow

Roosevelt Elk (Cervus elaphus)

Elk were identified as a HEP evaluation species for farmland, idle field, and meadow areas. The WHMP lands have an overall low to moderate baseline HSI value for elk (median 0.43, average 0.50), with forage being the limiting factor (PacifiCorp and Cowlitz PUD 2004a). This emphasizes the importance of providing quality big game forage in the farmland, idle field, and meadow areas. For more information on elk, HSI

values for evaluation areas, and the WDFW elk model, see Chapter 17 (Species Associations).

Savannah Sparrow (Passerculus sandwichensis)

Farmland, idle field, and meadow areas provide low to moderate quality savannah sparrow habitat (HSI values: Merwin 0.35 and Yale 0.52) (PacifiCorp and Cowlitz PUD 2004a). Savannah sparrow habitat quality and HSI values for farmland, idle field, and meadow areas may be limited by grasses that are too tall (exceeding 17 inches [43 cm]) during the early breeding season and by habitat fragments that may be too small to provide adequate nesting habitat (PacifiCorp and Cowlitz PUD 2004a). For more information on savannah sparrows, HSI values for habitat variables, and the HEP model, see Chapter 17 (*Species Associations*).

Analysis Species: None identified.

Other Species: Black-tailed deer.

8.3 FARM, IDLE FIELDS, AND MEADOWS MANAGEMENT AREAS

Under the Merwin Wildlife Habitat Management Program, meadows, farmlands, and idle fields were managed to optimize benefits for wildlife (primarily elk) during the elk use period. Areas can be either actively managed or passively managed. Actively managed areas are managed to produce highly nutritional grasses and forbs for big game with regular mowing and fertilizing and would include the farmland and some of the meadow areas (e.g., Speelyai). Passively managed areas are managed to reduce shrub encroachment and maintain grasses by conducting invasive plant species control and mowing as needed (e.g., idle fields and inaccessible meadows). The Merwin Wildlife Habitat Management Program meadows, farmlands, and idle field locations are shown in Appendix 8-1, and the acreages are listed below in Table 8.3.1.

Other WHMP lands that will be managed as meadows, farmlands, or idle fields were vegetation cover typed during relicensing as either agricultural or dry meadow/grassland. The only WHMP lands that were vegetation cover typed as agricultural were the existing orchards and the Saddle Dam farm fields (PacifiCorp and Cowlitz PUD 2006). Orchards will be managed separately from farmland and are addressed in Chapter 9. WHMP lands that are modified to provide permanent forage areas (e.g., Timber Harvest Areas) that are greater than 1.0 acre (0.4 ha) will be classified as meadows and managed under this section. These lands are identified as unnamed in Table 8.3.1 and locations are shown in Appendix 8-1.

Management	Туре	Name	Acres	Hectares
Unit	Meadow	Lower McKee	0.8	0.3
3	Meadow	Upper Mckee	1.2	0.5
6	Meadow	Speelvai	0.9	0.4
8	Meadow	Unnamed	3.4	1.4
	Farmland	Field 1	2.6	1.1
	Farmland	Field 2	8.4	3.4
	Farmland	Field 3	8.9	3.6
10	Farmland	Field 4	5.3	2.1
10	Farmland	Field 5	3.6	1.5
	Idle Field	Idle Field 1 / 5	1.5	0.6
	Idle Field	Idle Field 3 / 4	5.9	2.4
	Idle Field	Unnamed	0.5	0.2
	Meadow	Bridge	1.3	0.5
12	Meadow	Lower Hanley-Curry	6.9	2.8
	Meadow	Upper Hanley-Curry	7.8	3.2
15	Meadow	Unnamed	0.5	0.2
17	Meadow	Unnamed	4.8	1.9
18	Meadow	Unnamed	3.9	1.6
25	Meadow	Unnamed	2.2	0.9
23	Meadow	Unnamed	2.7	1.1
	Meadow	Unnamed	0.4	0.2
26	Meadow	Unnamed	1.5	0.6
	Meadow	Unnamed	2.1	0.9
		Total Meadow Acres	40.4	16.4
		Total Farmland Acres	28.8	11.7
		7.9	3.2	
		Total Acres	77.1	31.2

Table 8.3.1 Meadows, Farmland, and Idle Fields on Existing Wildlife Habitat Management Plan Lands

8.4 INSPECTIONS

Farmland, idle fields, and meadows will be initially inspected to document the site's baseline information and determine the feasibility of intensively (actively) managing the area. The annual inspections will document the forage condition, hedgerow's effectiveness in providing food and screening cover, wildlife use, and prescribe specific management actions. Bi-annual inspections (spring and fall) will be conducted to ensure the management goal and objectives area being achieved. Optional inspections may be conducted throughout the year to evaluate, recommend, and coordinate management actions for a site.

8.4.1 Initial Inspections

Initial inspections will confirm that areas that are vegetation cover typed as dry meadow/grassland or agricultural qualify as farmland, idle field, or meadow habitat and to determine the applicability of managing the area (Appendix 8-1). The inspections will be completed within 4 years of WHMP implementation and will be conducted during the growing season (between April 15 and September 30). The inspections will be recorded on the Initial Inspection Form in Appendix 8-2 and assess the following:

- Confirm that the area meets either the dry meadow/grassland or agricultural criteria. The criterion for dry meadow/grassland sites is less than 10 percent forested canopy and consisting of greater than 50 percent grass species. Agricultural sites are characterized by human disturbance, development, or modification and are annually seeded or planted with row crops and harvested for commercial agricultural use (PacifiCorp and Cowlitz PUD 2004b).
- Evaluate the potential big game and savannah sparrow use, as well as other wildlife observations.
- Estimate the grass, forb, and shrub composition by ocular assessment.
- Estimate the size of the area.
- Describe current access to the area and access restrictions or limitations; determine if further management is required.
- Evaluate potential disturbance and line-of-sight to the disturbance.
- Assess invasive plant species presence and potential.

The inspections will be summarized in a final report that will be submitted to the TCC for review one year following the completion of the initial evaluation. The report will identify which areas are proposed to be managed as farmland, idle field, or meadow habitat under the Lewis River WHMP. The report will identify which farmland, idle fields, and meadows may be actively managed (i.e., intensive and annual management) and which areas may be passively managed (i.e., managed as needed and where feasible), as well as proposed management practices for each area. The TCC will collaboratively determine which areas will be actively and passively managed.

8.4.2 Annual Inspections

The farmland, idle fields, and meadows that are actively managed will be inspected in the spring and fall of each year to document compliance with the Lewis River WHMP. Spring inspections will occur during the growing season between April 15 and May 31 and prior to mowing to assess the forage condition, invasive plant species, potential disturbance and access control, and wildlife use. An estimated percent cover for species that are greater than or equal to 10 percent of the cover will be recorded. The fall inspection will occur at the end of the growing season and before the first frost, if possible. Idle fields and managed meadows inspections will be recorded on the Meadow/Idle Fields Annual Inspection Forms (Appendix 8-2). Meadows and idle fields that are passively managed will be inspected every 5 years during the spring inspection or as needed.

The annual inspections for the farmland, idle fields, and meadows will include the following:

- Describe forage quality by estimating the forage height, density, and color for the meadows and idle fields
- Identify invasive plant species, percent cover, and recommend control measures
- Inspect screening (topographical and/or vegetation) to determine year-round effectiveness for big game hiding cover
- Identify wildlife use and recommend practices to maintain wildlife habitat diversity and enhance associated species habitat
- Identify any access or potential disturbances to the area
- Assess the hedgerows and other vegetation for density and actual screening capabilities, as well as seasonal fruit or mast production

The annual farmland inspections are more specific and document the percent cover of invasive species, desirable forage grasses, legumes, bare ground and moss, the hedgerow's species composition, vigor, and effectiveness in providing food and screening cover, wildlife use, and prescribe specific management actions. Farmland forage quality is more thoroughly evaluated than in the meadows and idle fields. The inspection will be recorded on the Farmland Forage Inspection Forms (Appendix 8-2). The percent canopy coverage of legumes, grasses, and bare ground for each field are determined using an 8×20 inch (20×50 cm) Daubenmire frame and modified coverage classes (U.S. Forest Service and Bureau of Land Management 1996 [Appendix 8-3]).

8.5 MANAGEMENT ACTIONS

The following management actions include measures to assess and maintain farmland, idle fields, and meadows in a condition consistent with the management goal and objectives. Management actions include the following:

- Mowing or Hay Harvest
- Soil Testing
- Fertilizing and Liming
- Forage Restoration
- Access Control and Disturbance Reduction

8.5.1 Mowing or Hay Harvest

Mowing and/or haying fields and meadows can improve and prolong the forage quality throughout the growing season. Forage quality is at its highest when the plant is rapidly growing and then significantly declines after the plant matures and begins seed production (Moore 1995, Hart et al. 2000). Mowing or harvesting pastures prior to the plants reaching seed maturity, mid-May to mid-June, prolongs and improves the forage quality (Moore 1995). Mowing or harvesting the pastures following the completion of the reproductive phase and late summer semi-dormancy removes the dead tillers that may be shading out the new tillers and accelerates the fall nutrient recycling and regrowth (Moore 1995, PacifiCorp 1998). Appendix 8-4 outlines pasture growth throughout the year and provides literature on the structure, function, and growth mechanisms of grass.

Saddle Dam Farmland has immense and year-round elk use; therefore the farmland's highest and best use is to provide high-quality elk forage. The farmland may be either mowed or harvested depending on the conditions of the field and the growing season. Mowing should occur before the grasses exceed 24 inches (61 cm) in height to reduce the thatch that is left on the field. Excess thatch that may impede secondary growth should be removed to avoid hindering regrowth of desired forage species. The spring mowing should occur before the grasses produce their inflorescences (May 15 and June 15). To stimulate regrowth in the grasses and to reduce thatch and noxious weeds the mower should be set at a stubble height of 6 inches (15 cm) during the spring mowing (Fransen and Hackett 2001). The fall mowing will occur following or during the summer semi-dormancy, which is typically August 1 to August 31, but should be conducted after August 15 if possible to protect ground-nesting birds. The mower should be set at a stubble height that is no lower than 3 inches (8 cm).

Actively managed meadows will be mowed annually between August 15 and August 31, when possible, to promote fall regrowth and to improve winter big game forage. Passively managed meadows will be mowed as needed to maintain forage quality and diversity and to prevent shrub encroachment. The mower should be set at a stubble height of 3 inches (8 cm), where possible. Often the meadows have uneven ground, so the stubble height can be increased to avoid having the mower blade come in contact with soil. Shrub islands and irregular edges of the meadows increase the diversity and should be protected during mowing. Shrub islands comprised of Himalayan blackberry (*Rubus*

armeniacus) or evergreen blackberry (*Rubus laciniatus*) may be mowed to be removed or to remove overhanging canes and rejuvenate browse.

Idle fields provide important bedding areas and cover for elk. However, it may be necessary to mow these areas to promote big game forage and to control woody vegetation or invasive plant species. Idle fields should not be mowed earlier than August 15, if possible, and mowing should coincide with the Saddle Dam Farmland mowing. No more than one idle field surrounding the Saddle Dam farmland should be mowed per growing season.

Best Management Practices

The following best management practices apply to all mowing or hay harvesting:

- Hay will be baled and removed from the fields within 14 days of cutting.
- The fields will be fertilized between hay harvests if multiple hay harvests occur within the same growing season.
- No mowing should occur within 50 feet (15 m) of streams, reservoir, wetlands, or diversion channels (Appendix 8-1).
- Fire conditions should be assessed prior to conducting any fall mowing.
- PacifiCorp could conduct mowing after August 15 or as close to as possible to protect ground-nesting birds and their nests.

8.5.2 Soil Testing

Meadows that are actively managed and farmland fields will be soil tested every other year to ensure that adequate soil nutrients are available to plants without creating excessive or unbalanced reserves. Idle fields and meadows that are not actively managed will only be soil tested if the areas are to be fertilized, and sampling will occur in August prior to fertilizing. All soil tests will be collected between August 1 and August 31. Soil samples will consist of a broad number of samples that is representative of both the size and variation of the site. Each sample will be collected using a soil auger and collected between 6 and 9 inches (15 and 23 cm) from the surface (Appendix 8-5).

Soil samples should be tested for pH, nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S), and boron (B). In addition, the Shoemaker, MacLean, and Pratt (SMP) lime requirement test should be conducted to determine the amount of lime required if liming is determined necessary (Marx et al. 1996). There is no standard for the sulfur test $(SO_4^{2-}S)$ west of the cascades; however, this nutrient level is consistently tested just to monitor the response to fertilization. Other nutrients and soil tests may be conducted as needed. Because soil test results can change between testing labs, it is preferable to use the same laboratory each year. Currently, and for several years, PacifiCorp has used Agri-Check, Inc., in Umatilla Oregon. A soil test request form is provided in Appendix 8-5. The following table lists the preferred nutrient levels for western Washington.

pH and Nutrients	Range	
рН	\geq 5.4 (grasses) and \geq 5.8 for legumes	
N	10 to 30 ppm NO ₃	
Р	15 to 30 ppm	
K	125 to 200 ppm	
Ca	5 to 10 meq/100 g	
Mg	0.8 to 1.5 meq/100 g	
В	0.7 to 2.0 ppm	

 Table 8.5.1 Soil Nutrient and pH Standards for West of the Cascades

ppm = parts per million; meq/100 g = millequivalents per 100 grams; NO_3 = Nitrate. Sources: Hart et al. 2000, Hart et al. 2007, Marx et al. 1996, and PacifiCorp 1998.

8.5.3 Fertilizing and Liming

Fertilizing and top-dressing lime supplies soils with essential nutrients and maintains proper soil pH to increase both the forage yield and quality. In western Washington, there is typically a shortage of forage in the late fall and early spring, whereas excess forage exists in the late spring (Hart et al. 2000). To compensate for this forage shortage, the fields and meadows can be fertilized twice a year in the late winter/early spring and in the fall.

Fall fertilizing should occur annually in the farmland fields and in the actively managed meadows. The optimum time for fall fertilization is after the plants have ended their summer semi-dormancy, the rains have initiated the fall regrowth period and before the first frost, which is typically between September 1 and October 15 (Appendix 8-4) (Hart et al. 2000).

Spring fertilization will be determined on as-needed basis. The WHMP farm fields and meadows do not typically require spring fertilizing because they are not heavily grazed by livestock and the fields are typically mowed, instead of harvested, returning the plant material nutrients to the soil. Spring fertilization will be determined on an as-needed basis. Spring fertilization should occur as close to the T-Sum 200 date as possible which is usually between February 1 and March 15 (The T-Sum 200 is a method to calculate the best time to apply nitrogen fertilizers to pastures for early feeding). The table in Appendix 8-4 provides instructions on determining the T-Sum 200 date.

Idle fields and meadows that are not actively managed will be fertilized as needed. Fertilization should occur in the fall and the areas should be mowed prior to fertilizing.

Fertilizer application rates should be based on soil tests results, the amount of forage needed, and estimated fall regrowth. The following table lists fertilization rates for soil test results and recommended timing.

Soil Nutriont	Soil Tost Dosults	Fertilization Rate ¹		
Son Nutrient	Soli Test Results	Fall	Spring	
Nitrogen (N)	< 30 ppm	40-60 lbs/acre	50-60 lbs/acre	
	<20 ppm	60-100 lbs/acre	60-100 lbs/acre	
Phosphorus (P)	20-30 ppm	0-60 lbs/acre	0-60 lbs/acre	
	>30 ppm	0 lbs/acre	0 lbs/acre	
	0-125 ppm	100-150 lbs/acre	100-150 lbs/acre	
Potassium (K)	125-200 ppm	70-100 lbs/acre	70-100 lbs/acre	
	>200 ppm	0 lbs/acre	0 lbs/acre	
Sulfur (S)	None	Not recommended	20-30 lbs/acre	
Boron (B)	< 0.7 ppm	Not recommended 2-3 lbs/acre		

Table 8.5.2 Fertilization Rates and Timing

Source: Hart et al. 2000.

¹ Convert rates from fertilizer grade (10-20-5 NPK = 10%, 20%, and 5% N-P-K) to actual fertilizer material using the following formula: ((lbs. of nutrient recommended / % of nutrient in fertilizer material) x 100). An example is 40 lbs of N with a grade of 10-2-5 would be (40/10) x100 = 400 lb of N should be applied; ppm = parts per million; lbs = pounds.

Lime Application

Soils west of the Cascades are naturally acidic and applying lime can increase the pH and supply calcium or magnesium (Hart 1998, Hart et al. 2000). Liming needs are determined from the soil pH or calcium and the amount of lime required to raise soil pH is determined by the Shoemaker, MacLean, and Pratt buffer test (Hart et al. 2000). For grass pastures, a lime application is recommended for pastures with a pH of less than 5.8 or the Calcium soil test is below 5 meq/100 g (Table 8.5.1) (Hart et al. 2000). Legumes, except subclover (*Trifolium subterraneum*), are more responsive to lime than grasses; therefore a lime application is recommended for pastures with a pH less than 5.8 (Table 8.5.1) (Hart et al. 2000). The table below shows the amount of lime required to raise the soil pH in the top 6 inches (15 cm) of the soil to a desired amount. Lime should be applied between March 1 and November 1, provided that the field is dry during the time of application (Cheney et al. 2002).

SMP	Tons/acre of 100-scor	re lime needed raise th	e top 6 inches of soil to	the following pH
Buffer	5.3	5.6	6.0	6.4
5.0	4.2	5.4	7.3	9.4
5.1	3.9	5.0	6.9	8.9
5.2	3.6	4.7	6.4	8.3
5.3	3.2	4.3	6.0	7.8
5.4	2.9	3.9	5.5	7.3
5.5	2.6	3.6	5.1	6.8
5.6	2.3	3.2	4.6	6.3
5.7	2.0	2.8	4.2	5.8
5.8	1.7	2.5	3.7	5.3
5.9	1.4	2.1	3.3	4.7
6.0	1.0	1.7	2.9	4.2

Table 8.5.3 Shoemaker, MacLean, and Pratt (SMP) Buffer Test Lime Requirement

Source: Hart 1998

Idle fields and meadows that are not actively managed will be limed as needed and where accessible. Fertilization should occur in the fall and the areas should be mowed prior to liming.

Best Management Practices

The following best management practices apply to fertilizer and lime applications:

- Fertilizing and liming applications will not occur within 50 feet (15 m) of streams, reservoir, wetlands, or diversion channels (Appendix 8-1).
- Fertilizing and lime applications will only occur when the farmland field and meadows are dry.

8.5.4 Forage Restoration

Forage quality and production may decrease over time. This will vary from site to site because of the succession of the field, changes in soils, disturbance, management practices, or invasive plant species. Restoring a forage area requires a dedicated effort and can require a substantial amount of funding and resources. Therefore, it may be more cost-effective to do two fields in the same growing season or to do a portion of a single field.

Farmland fields are the only areas that have the forage quality quantified; therefore, farmland fields will be considered for forage restoration when the fields do not meet one of the following criteria for two or more consecutive growing seasons:

- Minimum 60 percent cover of desirable grasses
- Minimum 5 percent cover of legumes
- Maximum 15 percent cover of moss/bare ground

Meadows and idle fields will be considered for forage restoration when the area is less then 75 percent grass cover or is comprised of 40 percent or greater unwanted grass species (e.g., reed canarygrass [*Phalaris arundinacea*]).

Soil Testing

Areas should be soil tested in August prior to being tilled to determine the rate of lime and fertilizer required for the next spring. If soils were not tested during the previous August, then the soils will be sampled and analyzed the following February (Section 8.5.2). Appendix 8-5 provides instruction for soil sampling and a lab test request form.

Lime Application

Lime will be applied during the fall between September 1 to October 31 and prior to planting in the spring. Lime rates will be determined using soil test results and preferred

pH levels for desired forage species (Table 8.5.1). If no soil test is available, then apply 2 tons of lime per acre (4.48 metric tones/acre) (Fransen and Chaney 2002). If soil moisture prevents the application of lime in the fall, then lime will be applied no sooner than 5 days following the application of herbicide.

Herbicide Application Treatment

A broad-spectrum nonresidual herbicide (e.g., Glyphosate) will be applied to the area to remove the existing forage stand in the early spring when the grasses have reached at least 4 to 6 inches (10 to 15 cm) in height. This is generally between March 1 and April 15. A second herbicide application can be applied if invasive plant species are severe and it will not delay seeding. If possible allow the seeds in the tilled soil to germinate following the primary tillage and then reapply the herbicide (Fransen and Chaney 2002). Perennial weeds that will not be killed by broad-spectrum herbicides should be treated in the growing season prior to restoring the field

Cultivation

Primary tillage loosens the soil and mixes fertilizer and plant material into the soil resulting in rough texture soil. Primary tillage will be conducted no earlier than 5 days following the herbicide application, and it is preferred to delay the tillage until the sod changes color to orange or brown (Fransen and Chaney 2002). Secondary tillage will be conducted, as necessary, to attain a smooth and fine seedbed. If necessary, the soil will be cultipacked or rolled to prepare a firm seedbed. Cultivation will occur between March 6 and April 30.

Fertilization

Fertilizer will be applied following cultivation and will occur between March 6 and April 30. For areas that will be dominated with grasses (i.e., meadow and idle fields), the fertilizer rate should be as indicated by the soil test (Table 8.5.2) and should approximate the following rate: 3N:1P:2K:1S rate with no more than 75 units of nitrogen (Fransen and Chaney 2000). Adequate levels of potassium are essential for grass-legume field growth. Therefore forage areas that maintain a grass and legume cover (i.e., farmland fields) should be fertilized at a rate that is similar to the above-mentioned rate, except for potassium, which should be applied at the rate indicated by the soil test and as listed in Table 8.5.2 (Hart el al. 2000). Do not apply boron to new seedlings.

Planting

Areas should be seeded as early as possible following fertilization and no later than May 1 (Fransen and Chaney 2002). Areas will be seeded with a grass-legume seed mix that is comprised roughly of 65 percent grasses and 35 percent legumes (Oregon Department of Fish and Wildlife 2002). Appendix 8-6 lists forage values for several grasses and legumes and provides a spreadsheet for determining the seeding rate. Perennial ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) are preferred species for the seed mix

because of their long growing season and ability to withstand close grazing (Natural Resources Conservation Service 2002, Hannaway et al. 1999). Other species selected to be used in the seed mix will be selected using the following criteria:

- Select cultivars with the highest resistance to disease (e.g., rust-resistant orchardgrass [*Dactylis glomerata*]), defoliation by pests, and frost damage to maximize forage quality
- Select long-lived cultivars that are tolerant of big game grazing and trampling
- Species and cultivars selected for planting should provide high quality forage that is high in palatability and nutritive value and available during the peak big game use periods (PacifiCorp 1998)
- The preferred grass-legume mix for the farmland fields is as follows (PacifiCorp 1998):
 - 50 percent perennial ryegrass
 - 30 percent orchardgrass
 - 10 percent white clover
 - 5 percent big trefoil (*Lotus perdunculatus*) or birdsfoot trefoil (*Lotus carnculatus*)
 - 5 percent red clover (*Trifolium pretense*)

Invasive Plant Species Control

Invasive plant species control methods may include mowing, hand-pulling, alternative, or chemical methods. The method and timing to use will be determined by the effectiveness on the target specie(s), impact on forage quality, and potential impact on wildlife. Invasive plant species control on newly established grass-legume fields should be limited to mowing or spot spraying, when possible. The fields should be mowed to a height that is above the tops of legumes but prior to the weed seed maturing. This may require the field to be mowed multiple times in a growing season and begin early in the season. Postemergent herbicides may be used in fields with high weed seed (e.g., wild mustard [*Brassica* spp.], Canada thistle [*Cirsium arvense*]) in the soil.

Top Seeding Legumes and Perennial Ryegrass

The species composition of grasses and legumes in the stand will vary over time based on the species planted, site conditions, management practices, and grazing. Top seeding may be an effective option in restoring forage quality when the grasses or legumes have significantly declined.

Legumes may be topseeded in forage areas where the legume canopy coverage is less than 5 percent for two consecutive growing seasons, but the grass component is healthy and soil fertility is high. Seeds may be broadcast or drilled using a no-till or in-sod seeder and, if necessary, strips or blocks may be seeded to increase the legume component. To control competing grasses a light disking and/or herbicide treatment can follow in the spring.

Perennial ryegrass has a short to moderate longevity; therefore, as a field matures, the grasses with longer longevity (e.g., orchard grass) will begin to outcompete the perennial ryegrass. Forage areas where the perennial ryegrass component is estimated to be less than 10 percent cover and the legume component is healthy and soil fertility is high, may be topseeded with perennial ryegrass. A portion of or the entire area may be topseeded to increase the perennial ryegrass component. The seed may be broadcast or drilled using a no-till or in-sod seeder following light disking in the spring.

Best Management Practices

The following best management practices apply to fertilizer and lime applications:

- Herbicide, fertilizer, and lime applications will not occur within 50 feet (15 m) of streams, reservoirs, wetlands, or diversion channels (Appendix 8-1)
- Herbicide, fertilizer, and lime applications will only occur when the farmland field and meadows are dry

8.5.5 Access Control and Disturbance Reduction

To reduce disturbance to elk, deer, and other wildlife, access roads to farmland fields, idle fields, and meadows will be closed to public motorized vehicle access and visual screens will be developed and/or maintained to break the line-of-sight and to provide security cover for big game. Line-of-sight within farmlands, idle fields, and meadows will be reduced with visual screens to no more than 600 feet (183 m) from cover, where feasible and necessary (Woodland Fish and Wildlife Project 1992). Meadows, idle fields, and farmland that cross public roads (roads that are open to the public at any time) will have visual screens established where slope, soils, and topography allow.

The Saddle Dam Farm and other sensitive forage areas that fall under the farmlands, idle fields, and meadow management will continue to have no public vehicle access from late fall to early spring. During these periods of critical use for forage species (December 1 to May 1), PacifiCorp and their consultants will give consideration to minimizing vehicular access and disturbance. Steps to improve/maintain forage opportunities while reducing off-season disturbance will aid in the utilization of these habitats by elk and other forage species.

Effective visual screen may be topographical, vegetation, or both. Conifers provide the most effective visual screens in the winter, but dense stands of deciduous species can provide adequate screening during the winter too. Existing visual screens will be maintained with supplemental watering, fertilizing, and pruning, as needed. New or replacement plantings will be conducted to maintain a continuous vegetation screen with Gaps will be filled as they occur to provide the intended screening. Species should be planted between February 1 and March 31. All newly planted shrubs and trees should be

in animal exclosures (e.g., wood posts and top-rails) with trunk protectors and weed block fabric. Protective devices will be removed after plants have attained the size necessary to withstand animal damage.

Hedgerow and visual screen methods will vary from site to site. Review alternative and new techniques prior to planting a new vegetation screen or hedgerow. It is preferred that a hedgerow would be able to provide equal big game cover and a wildlife food source. Pruning of the upper canopy sections of the conifers to promote a low bushy growth may be enacted to accelerate screening effects, but pruning in the lower sections should not take place. Placement of shrub species within these screens will also enhance the screening capabilities in these areas, and will provide supplemental forage opportunities for elk. Appendix 7-3 of Chapter 7 (*Shrubland Habitat*) lists the potential wildlife value for native shrub species.

8.6 SCHEDULE AND ESTIMATED EFFORT

The schedule and estimated effort for conducting meadow, farmland, and idle field inspections and management actions are listed below.

Table 8.6.1 Farmland, Idle Fields, and Meadow Habitat Management Schedule and Estimated Effort				
Management Actions	Completion Date	Timing	Estimated Effort	Documentation
Inspections				
Initial Inspections	Within 4 years of WHMP Implementation	April 15 to September 30	60 hours	Data Forms
Initial Inspections Final Report	Within 1 year of completing initial inspections	January 1 to December 31	60 hours	Report
Annual Spring Inspection	Annually	April 15 to May 31	40 hours	Data Forms
5-year Passively Managed Area Inspections	Every 5 years	April 15 to May 31	80 hours	Data Forms
Annual Fall Inspection	Annually	October 1 to October 15	40 hours	Data Forms
Mowing	-	-		-
Spring Mowing/ Hay Harvest	Annually	May 15 to June 15	2 hours per acre	Annual Report
Fall Mowing/ Hay Harvest	Annually	August 15 to August 31	2 hours per acre	Annual Report
Soil Testing				
Soil Testing	Annually	August 1 to August 31	2 hours per site	Annual Report
Fertilization and Lime				
Fall Fertilization	Annually	September 1 to October 15	2 hours per acre	Annual Report
Spring Fertilization	Optional ¹	February 1 to March 15	2 hours per acre	Annual Report
Lime Application	Optional	March 1 to November 30	2 hours per acre	Annual Report
Field Restoration				
Soil Testing	Optional ¹	In the season prior to the fields being tilled either August 1 to August 31 or February 1 to February 28	2 hours per site	Annual Report
Lime Application	Optional ¹	September 1 to October 31	2 hours per acre	Annual Report
Herbicide Application Treatment	Optional ¹	March 1 to April 15	2 hours per acre	Annual Report
Cultivation	Optional ¹	March 6 to April 30	4 hours per acre	Annual Report

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Table 8.6.1 Farmland, Idle Fields, and Meadow Habitat Management Schedule and Estimated Effort				
Management Actions	Completion Date	Timing	Estimated Effort	Documentation
Fertilization	Optional ¹	March 6 to April 30	2 hours per acre	Annual Report
Seeding/Planting	Optional ¹	March 6 to May 1	4 hours per acre	Annual Report
Invasive Plant Control	Optional ¹	January 1 to December 31	2 hours per acre	Annual Report
Top Seeding	Optional ¹	April 1 to May 15	4 hours per acre	Annual Report
Access/Disturbance Redu	iction			
Fertilizing Vegetation Screen	Optional ¹	September 1 to October 15	2 hours per screen	Annual Report
Planting	Optional ¹	February 1 to March 31	4 hours per planting	Annual Report
Supplemental Watering	Optional ¹	July 15 to October 15	1 hour per exclosure	Annual Report
Animal Damage Control	Optional ¹	January 1 to December 31	1 hour per exclosure	Annual Report

¹Optional management actions are actions that are chosen to be implemented according to need or opportunity.

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PacifiCorp Lewis River Hydroelectric Projects Federal Energy Regulatory Commission Project Nos. 935, 2071, and 2111

9.0 ORCHARD MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

Appendix 9-1 Orchard Locations on Lewis River Wildlife Habitat Management Plan Lands

Appendix 9-2 Orchard Inspection Form

9.1 INTRODUCTION

This chapter describes the orchard habitat management goal and objectives, management actions, and schedule. It compiles information on orchard management from Section 3.6 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.7 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Orchards are a type of agricultural habitat that consists of cultivated fruit- or nut-bearing trees. An orchard's primary benefit to wildlife is to provide a food source. Apples left on the ground can persist into the winter, providing a food source for bear (*Ursus americanus*), deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*). Blossoms provide an excellent nectar source for bees, butterflies, hummingbirds, and other pollinating species. In addition to fruit and nuts, the open grassy habitat and tree structure provide nesting habitat for birds, big game forage, and fawning/calving habitat.

9.2 MANAGEMENT GOAL AND OBJECTIVES

The goal, objectives, and species association for orchard management are presented below.

9.2.1 Goal

Maintain existing orchard habitat and expand, where appropriate, to provide healthy fruit trees to benefit wildlife and to provide forage for elk.

9.2.2 Objectives

- **Objective a**: Replace dead fruit trees, as needed, and maintain existing orchards over the license periods.
- **Objective b**: Within 5 years of WHMP implementation, evaluate existing orchards and determine the feasibility and desirability of expanding the number of trees. Where feasible, plant new trees in year 6 of the WHMP.
- **Objective c**: Maintain elk forage in orchards, including mowing (at selected orchards) in the understory outside the nesting season.

9.2.3 Species Associations

Species association identifies indicator species that require orchard habitat and/or orchard habitat features (PacifiCorp and Cowlitz PUD 2004). As a result, it is assumed that these species will receive direct benefits from orchard habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations during inspections (Section 9.4).

Habitat Evaluation Procedure (HEP) Species: Elk

Elk were the only species identified as a HEP evaluation species for orchards. The WHMP lands have an overall low to moderate baseline HSI value for elk (median 0.43, average 0.50), with forage being the limiting factor (PacifiCorp and Cowlitz PUD 2004). This emphasizes the importance of forage production in the orchards for maintaining elk habitat quality. For more information on elk, HSI values for habitat variables, and the WDFW elk model, see Chapter 17 (*Species Associations*).

Analysis Species: None identified.

Other Species: Black bears, black-tailed deer, and migratory and upland birds. For further information on black bear and black-tailed deer, see Chapter 17 (*Species Associations*).

9.3 ORCHARD MANAGEMENT AREAS

All orchard management areas are located around the Merwin Hydroelectric Project and were previously managed as part of the Merwin Wildlife Habitat Management Program. Most of the Lewis River orchard trees are fruit-bearing trees and vary in age from seedling to mature trees. Several of the orchards are original homestead orchards. Some small orchard sites have been established along the transmission line rights-of-way. The orchards primarily consist of apple and crabapple trees, with lesser amounts of pear and plum trees; a few of the orchards have walnut and chestnut trees. None of the orchards are managed as a commercial operation, and each of the orchards contains less than or equal to 100 trees.

There are eight old homestead orchards encompassing 227 trees and 13 transmission line right-of-way orchards encompassing 90 trees (Appendix 9-1). Homestead orchards range in size from 4 to 100 trees. They consist of 183 full-size trees (mostly apple) approximately 70 years old, and 44 apple or crabapple saplings planted between 1996 and 2005. Right-of-way orchards range from 3 to 10 trees and consist of both dwarf and semidwarf apple trees planted from 1983 to 1985, and crabapple trees planted in 1992 and 1998. Orchard locations and number of trees per orchard are provided in Table 9.3.1.

Orchards are named according to their location. In the case of right-of-way orchards, names are identified by the right-of-way structure (pole number/line mile). Two right-of-way orchards (designated as ROW 5/11-611 and 6/17 - 1/18) are located off of WHMP lands. These orchards will continue to be managed under the Lewis River WHMP.

During relicensing, the orchard vegetation cover type was defined as agricultural lands composed of cultivated fruit trees. This resulted in mapping about 4.9 acres (2.0 ha) of orchard on WHMP lands. This did not include orchards that are less than the 1.0-acre (0.4-ha) minimum mapping unit. Orchard size is determined by the number of trees, not the actual area.

Name	Road	Number of Trees
Homestead		
Speelyai Bay	655	44
Saddle Dam # 1	1000	6
Saddle Dam # 3	1000	15
Saddle Dam Road	900	13
Yale Dam	1140	11
Hanley-Curry	1230	23
Buncombe Hollow	1555	101
	Subtotal	213
ROW (transmission line structures are iden	ntified by: pole nu	umber/line mile)
1/11 - 2/11	650	7
4/11 - 5/11	650	8
5/11 - 6/11 ¹	590	3
5/12 - 6/12	601	4
7/12 - 8/12	600	4
8/12 - 1/13	600	2
4/13 - 5/13	610	4
3/14 - 4/14	420	4
9/14 - 1/15	410	4
1/15 - 2/15	410	6
1/17 - 2/17	230	11
5/17 - 6/17	230	8
6/17 - 1/18 ¹	220	8
2/18 - 3/18	210	6
2/19 - 3/19	120	8
	Subtotal	87
	Total	300

Table 9.3.1	Orchard Names	Access Road	and Number of Trees
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¹ Orchard is located off of WHMP lands. ROW = right-of-way.

9.4 INSPECTIONS

Orchards will be inspected regularly to insure that the management goal and objectives are being achieved. Inspection findings will be recorded on Orchard Inspection Forms (Appendix 9-2) and reported in the Annual Report for the current operating year. Proposed management actions will be recommended in the Annual Plan for the following year. The following is a description of these inspections.

9.4.1 Schedule

Annual inspections are based on the pruning schedule for the orchards. Inspections will occur in the winter prior to pruning and summer prior to and following pruning. For example, an orchard that is scheduled to be pruned in the winter of 2008 will be inspected in the summer of 2007, winter of 2008 prior to pruning, and in the summer of 2008 following pruning to evaluate the response to pruning.

- Winter inspection (January 1 to February 15) will occur when the trees are dormant and trees can be closely inspected for pruning requirements and winter damage, as well as winter habitat conditions for big game. Winter inspections will occur prior to pruning to set pruning prescriptions and direct the pruning contractor.
- Summer inspection (July 1 to September 15) will occur during the growing season when the trees' vigor, fruit production, and competing vegetation can be assessed. Summer inspections will assess the current conditions of the trees prior to and following a scheduled pruning to identify response and follow-up practices.
- During the first 5 years of implementation (estimated to be in 2013), the summer inspections will also evaluate the potential for expanding the number of trees in each orchard. The results of this evaluation will be recorded in the Annual Report. Planting recommendations for orchards will be proposed to the TCC in Annual Plans. New trees will be scheduled for planting in the spring of the 6th year of implementation (estimated 2014).
- Optional inspections (January 1 to December 31) may occur throughout the year, as needed (e.g., following severe storms and high winds), to coordinate and assess practices, or to do follow-up inspections on management practices. Optional inspections will include newly planted trees that occasionally require watering because of heat stress between July 1 and 31 during their first and second years.

9.4.2 Procedures

General inspection procedures to assess the orchard's condition and recommend management actions are as follows:

- Inspect for pruning needs such as crowns with severely unbalanced tops, branches susceptible to snow or wind breakage, closed centers, dead limbs, and excessive water shoots.
- Evaluate trees for animal damage from heavy browsing, girdling, etc.

- Inspect exclosures for damage and repairs.
- Inspect access to orchards for effectiveness and schedule maintenance needs.
- Record observations of elk, deer, bears, migratory birds, upland game birds, and other wildlife or evidence of use (pellets, scat, track, nests, etc.).

Summer inspections include the following additional procedures:

- Assess individual tree vigor by recording leaf color (Munsell Color Services 1977), recording fruit production, estimating terminal growth, and examine for occurrence of pests and disease.
- Determine fertilizer needs based on the overall condition of the orchard or if tree vigor appears to be fading.
- Identify dead or dying trees for replacement.
- Assess occurrence and abundance of invasive plant species including noxious weeds and climbing vegetation, such as Himalayan blackberry (*Rubus armeniacus*), wild cucumber (*Marah oreganos*), or species that decrease big game forage, such as bracken fern (*Pteridium aquilinum*).
- Evaluate the adverse effects of shade trees and crown competition.
- During the first 5 years of implementation, evaluate the possibility of expanding the number of trees.

9.5 MANAGEMENT ACTIONS

The following management actions include measures to assess and maintain orchard areas in a condition consistent with the management goal and objectives. Management actions include the following:

- Pruning
- Fertilization
- Plantings
- Supplemental Watering
- Vegetation Control
- Pest Control
- Animal Damage Control
- Forage Enhancement

9.5.1 Pruning

Pruning is beneficial to orchard trees by reducing the overall size of the tree; it improves structural strength, induces branching in young trees, increases production, and improves fruit quality (Stebbins 1997). The objective of pruning is to maintain an open growth form with a balanced top. Specific recommendations for pruning include the following:

- Prune young trees very lightly.
- Prune mature trees more heavily, especially if growth or fruit production have been low.
- Do not prune more than 30 percent of the tree.
- Prune the top portion of the tree more heavily than the bottom portion.
- Thin out shoots in mature trees toward the end of well-pruned branches to increase fruit size and quality on the remaining shoots.
- Remove any dead or diseased wood.
- Retain fruitwood if possible.
- Remove water shoots.
- Remove any touching limbs.
- Cut whole limbs out of the top, making cuts flush with the bark of lower limbs. Do not leave stubs in the top of the tree.
- Remove the limbs that are parallel and the upper limbs that are shading the lower limbs.

Trees respond differently to pruning depending on the time of year they are pruned. Dormant pruning is an invigorating process. During the fall, energy is stored primarily in the trunk and root system to support the top portion of the tree. However, care should be taken if a large portion of the tree is removed while the tree is dormant (winter), as the tree will respond by producing excessive vegetative vigor (several water shoots). This uses much of the tree's energy and reduces fruit growth and development (Parker 2006).

Most of the orchards will be pruned during the dormant season, following the fall or early winter freeze but prior to the full bloom of spring (Stebbins 1997). Therefore, orchard pruning may occur between January 1 and March 31. However, to ensure that the

orchards are inspected prior to pruning, the dormant pruning time will be February 1 to March 31.

In the past, the orchards have been pruned in the dormant season. However, summer pruning may be more beneficial to a particular tree than dormant pruning, or it may be more cost effective to conduct summer pruning because of coinciding management activities. Summer pruning eliminates the energy or food-producing portion of the tree, resulting in reduced tree growth. Pruning can begin as soon as the buds start to grow, but it is generally started after vegetative growth is several inches long. For most purposes, summer pruning should be limited to removing the upright and vigorous current season's growth; only thinning cuts should be used (Parker 2006). Summer pruning may occur between May 1 and July 31. Because summer pruning occurs during the breeding season for most birds, each tree should be inspected for occupied nests prior to pruning. Trees with an occupied nest will not be pruned.

Pruning slash will be piled within and around the perimeter of the orchard to provide cover for songbirds and small mammals. Slash will be piled in areas that do not obstruct mowers and are preferably away from areas with Himalayan blackberry or other vinegrowing vegetation. Piling pruning slash is the preferred method; however, if pruning slash is excessive, it may be necessary to chip and spread the chips into the orchard area.

Pruning will be conducted by a qualified contractor, PacifiCorp employee, or volunteer. However, the orchard pruning provides PacifiCorp an opportunity for community youth outreach by using vocational training programs. If this program, or programs similar to it, is used, it will be supervised by a qualified PacifiCorp employee.

The objective is to maintain, not optimize, fruit production; therefore, the trees will be pruned on a rotating 4-year schedule to control shoots, stimulate vigor, and improve bud and fruit production. The schedule for pruning orchards is presented in Table 9.5.1.

9.5.2 Vegetation Control

Plant species identified during the inspections that are competing with orchard trees for moisture, nutrients, and sunlight will be controlled. These activities should coordinate with a scheduled pruning but may occur as needed throughout the year. Trees shading the orchard will be pruned, removed, or created as snags. To protect orchard trees, snags will be topped at a height less than the distance to the closest orchard tree.

Himalayan blackberry and wild cucumber are sources of competing vegetation. Both of these species can climb on orchard trees and if left alone can cause limb breakage or take over the canopy. These species should be controlled, or preferably removed, when they are compromising the health of the orchard trees. These species may require follow-up herbicide treatments to ensure effective control.

Pruning Interval Years ¹	Orchard	Total Number of Trees to Prune
1 and 4	Buncombe Hollow ²	50
1	Saddle Dam #1	6
1	Saddle Dam #3	15
1	Saddle Dam Road	12
2	Yale Dam	4
2	ROW 5/12 - 6/12	4
2	ROW 7/12 - 8/12	4
2	ROW 8/12 -1/13	2
2	ROW 4/13 - 5/13	4
2	ROW 3/14 – 4/14	4
2	ROW 9/14 - 1/15	3
2	ROW 1/15 – 2/15	5
2	ROW 1/17 – 2/17	10
2	ROW 5/17 - 6/17	8
2	ROW 6/17 – 1/18	4
2	ROW 2/18 - 3/18	7
3	Hanley-Curry	23
3	Speelyai Bay	42
3	ROW 1/11 – 2/11	7
3	ROW 4/11 - 5/11	4
3	ROW 5/11 - 6/11	4
3	ROW 2/19 – 3/19	8

 Table 9.5.1 Orchard Pruning Schedule

¹ Year 1 is the first year the license is issued. Orchards will be pruned on a rotating 4-year schedule. For example, Saddle Dam #1 will be pruned in 2009, 2013, and 2017, etc.

² Buncombe Hollow Orchard will be pruned over 2 years, with half of the trees pruned each year. ROW = right-of-way.

Hanley-Curry, Buncombe Hollow, and Speelyai Bay orchards will be mowed each summer to promote forage and control competing vegetation. Mowing will coincide with meadow mowing practices (see Chapter 8 [*Farmland/Idle Field/Meadow Habitat Management*]) and will occur between August 16 and August 31. Saddle Dam #1 and Saddle Dam #3 orchards are not typically mowed because they are heavily used by bedding elk in the summer months when the Saddle Dam fields are mowed. However, mowing may be necessary in these orchards to control competing vegetation and will be conducted as needed between August 16 and August 31. Other orchard management areas cannot be mowed because of their size, topography, and accessibility.

9.5.3 Fertilization

Fertilization may be needed if the overall orchard or a group of trees appear to be in poor condition or tree vigor is fading. Fertilizer needs for other sites will be determined during the summer inspection. Speelyai Bay and Hanley-Curry are fertilized annually in early fall in conjunction with meadow management practices (see Chapter 8 [*Farmland/Idle Field/Meadow Management*]). Soil testing will be used to determine fertilizer rates. To optimize the trees' nutrient uptake, the orchards should be fertilized in the spring between April 1 and May 31. Fertilizer will be applied preferably outside of the tree's dripline and not within 6 inches (15 cm) of the tree's trunk.

Newly planted trees may require fertilizer within 1 to 2 years of being planting. Delaying fertilizer application for at least 1 year will reduce root burn, avoid wasting nutrients, and avoid creating a chemical barrier to root growth.

9.5.4 Pest Control

Pest control is not anticipated; however, pesticides may be necessary in cases of significant insect infestation or disease outbreak. Pesticides will be used only after other measures (e.g., mechanical removal, biological control) are evaluated and the TCC and specialists have been consulted.

9.5.5 Plantings

Trees will be planted as needed to replace dead fruit trees and to expand orchard tree numbers where feasible. Tree planting locations, numbers, and species will be determined by a qualified PacifiCorp employee or contractor and will be planted by a contractor. Semidwarf root stock is preferred for fruit trees. Standard size rootstock is acceptable, except in the right-of-way orchards (because of tree height concerns). Dwarf root stock trees should not be used because big game browsing can be significant on the trees.

Apple trees are the preferred tree to plant because they tend to be hardier than other fruit trees, and the fruit can persist on the ground through the winter. However, other fruit trees, such as pear, plum, crabapple, and cherry, may also be considered to diversify the larger orchards. Preferred apple tree varieties include Spartan, Northern Spy, Jonagold, Maelrose, Siberian, and Renetka. Native fruit-bearing tree and shrub species may be planted in the orchards, especially in areas that will not be regularly inspected or maintained. Chapter 7 (*Shrubland Habitat Management*), Appendix 7-3 provides a list of desirable native shrub and tree species.

Trees will be planted in the spring (February 1 to March 31). Newly planted trees will be protected by exclosures to prevent big game browse, and weed blocking fabric will be used to control competing vegetation around the base of the tree (see Section 9.5.6). Newly established orchard trees will be inspected for heat stress between July 1 September 15 during their first and second years, and will be watered as necessary (see Sections 9.4.1).

9.5.6 Animal Damage Control

Exclosures will be used to protect young trees from big game browsing and antler rubbing. Exclosures will be constructed at the time of planting. The type of exclosure used will be determined by the site conditions and known big game use in the area. Trunk protectors of split 4-inch (10-cm) diameter drain line will be used to prevent girdling from small mammals.
9.5.7 Supplemental Watering

Fruit trees will normally be watered at the time of planting. For the first 2 years after planting, new orchard trees will be watered during periods of heat stress. Supplemental watering will be conducted by a contractor using a tank truck/trailer or smaller containers, if necessary.

9.5.8 Forage Enhancement

Big game forage management is limited at most of the orchards because of their size, topography, and accessibility. However, some of the larger orchards that are accessible, such as Hanley-Curry, Buncombe Hollow, and Speelyai Bay orchards, can be managed to enhance big game forage. Big game forage enhancement management activities include annual mowing as described in Section 9.5.2 (*Vegetation Control*), soil testing, fall fertilization, and grass/legume seeding. Soil testing and fall fertilization will occur as needed, and the timing will coincide with the Farmland/Idle Field/Meadow Management activities (see Chapter 8). Grass seeding selection will be dependent on the orchard conditions and big game forage needs. The timing for grass seeding will occur either in the spring or fall during optimum weather.

9.6 SCHEDULE AND ESTIMATED EFFORT

The schedule and effort for conducting orchard management procedures is presented below.

Table 9.6.1 Orchard Management Schedule and Estimated Effort						
Procedures	Completion Date Timing Effort/Cost			Documentation		
Inspection						
Winter	Annually	January 1 to February 15	16 hours	Data Form		
Summer	Annually	July 1 to August 31	16 hours	Data Form		
Optional	Optional ¹	January 1 to December 31	8 hours	Data Form		
5-year Inspection	Within 5 years of WHMP implementation	July 1 to August 31	40 hours	Annual Report		
Pruning						
Dormant	Optional ¹	February 15 to March 31	\$3000	Memo on file		
Summer	Optional ¹	May 1 to July 31	Unknown	Memo on file		
Vegetation Control						
Shade Tree Control	Optional ¹	August 16 to December 31	\$0 to \$500	Memo on file		
Invasive Plant Species Control	Optional ¹	January 1 to December 31	2 hours per acre	Memo on file		
Mowing	Annual	August 16 to August 31 \$2000		Memo on file		
New Plantings						
Replacement Plantings	Optional ¹	February 1 to March 31	2 hours/per planting	Memo on file		
New Plantings Inspection	Optional ¹	July 1 to September 15	4 hours/per planting	Memo on file		
Orchard Expansion Plantings	2016	February 1 to March 31	4 hours/per planting	Memo on file		
Big Game Forage						
Soil Testing	Optional ¹	August 1 to August 31	2 hours per site	Annual Report		
Fertilizing	Optional ¹ (per soil test results)	September 1 to October 15	2 hours per acre	Annual Report		
Grass Seeding	Optional ¹	April 1 to May 15 or September 15 to October 31	2 hours per acre	Annual Report		
Other Management						
Orchard Tree Fertilizing	Optional ¹	April 1 to May 31	\$0 to \$1000	Memo on file		
Pest Control	Optional ¹	January 1 to December 31	Unknown	Memo on file		
Animal Damage Control	Optional ¹	January 1 to December 31	\$500 per exclosure	Memo on file		
Supplemental Watering	Optional ¹	July 15 – September 30	\$500	Memo on file		

¹ Optional management actions are actions that are selected to be implemented according to need or opportunity.

9.7 REFERENCES

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9.8 GLOSSARY

Fruitwood: The shoots that will produce fruit during a subsequent season.

Shoot: The length of branch growth in one season. The bud scale scars (ring of small ridges on a branch) mark the start of a season's growth.

Suckers (root suckers): Shoots that are growing from the rootstock.

Thinning cut: A pruning method that reduces the canopy density but retains the height of the tree.

Water Shoots (water sprouts): A sprig or shoot from the root or stock of a tree.

10.0 TRANSMISSION LINE RIGHTS-OF-WAY HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

- Appendix 10-1: Lewis River Wildlife Habitat Management Plan Lands Transmission Line Locations
- Appendix 10-2: Transmission Line Right-of-Way Initial Evaluation Form
- Appendix 10-3: Transmission Line Right-of-Way Annual Inspection Form
- Appendix 10-4: Merwin Wildlife Habitat Management Program Transmission Line Right-of-Way Monitoring Plot & Plot Station Locations
- Appendix 10-5: Transmission Line Right-of-Way Post-Treatment Inspection Form

10.1 INTRODUCTION

This chapter describes the transmission line right-of-way habitat management goal and objectives, management actions, and schedule. It compiles information on transmission line right-of-way management from Section 3.7 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.5 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Vegetation associated with the right-of-way areas is managed to provide safe and reliable transmission of electricity. This includes removing trees and tall shrubs that pose a risk to the transmission line, and promoting low-growing vegetation and early-successional habitat. Rights-of-way are narrow, linear corridors that provide edge habitat within a forest landscaped (King and Byers 2002). This benefits species that prefer open areas for feeding and forested habitats for cover; in addition, big game and predators use the narrow linear openings as travel corridors (PacifiCorp and Cowlitz PUD 2006).

10.2 MANAGEMENT GOAL AND OBJECTIVES

The goal, objectives, and species association for right-of-way habitat management are presented below.

10.2.1 Goal

While allowing for the safe and reliable transmission of electricity, promote the establishment and maintenance of desirable vegetation on utility-owned lands in transmission line rights-of-way to provide habitat for wintering deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*) and a diverse mix of shrub and other early-successional habitats.

10.2.2 Objectives

- **Objective a:** Manage and develop patches of desirable shrubs in the transmission line rights-of-way and along their edges to break up line-of-sight distances and provide screening/hiding cover for elk and multi-layered habitat structure for birds for the license periods. Evaluate alternative techniques to provide security cover and reduce line-of-sight, where needed.
- **Objective b:** Continue to manage existing deer and elk foraging areas, where appropriate on right-of-way in the Merwin Wildlife Habitat Management Area. Identify and manage other suitable areas within PacifiCorp's transmission line rights-of-way to provide "enhanced forage" for elk and deer. Enhanced forage is defined as a mix of grasses and forbs that are considered forage species by elk and deer that may be mowed, fertilized, and/or seeded. Suitable areas should be identified within 5 years of WHMP implementation, with management activities to follow.
- **Objective c**: Identify and provide screening cover for deer and elk, where needed, along public roads that cross transmission line rights-of-way.
- **Objective d**: Schedule mowing in transmission line rights-of-way between August 15 and September 15 to minimize impacts on ground-nesting birds, and complete prior to fall rains.

10.2.3 Species Association

Species association identifies indicator species that require right-of-way habitat and/or right-of-way habitat features (PacifiCorp and Cowlitz PUD 2004). As a result, it is assumed that these species will receive direct benefits from right-of-way habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations during inspections (see Section 10.4).

Habitat Evaluation Procedure (HEP) Species: Elk and Savannah Sparrow

Roosevelt Elk (Cervus elaphus)

Elk were identified as a HEP evaluation species for right-of-way areas. The WHMP lands have an overall low to moderate baseline HSI value for elk (median 0.43, average 0.50), with forage being the limiting factor (PacifiCorp and Cowlitz PUD 2004). This emphasizes the importance of providing quality big game forage in the right-of-way areas. For more information on elk, HSI values for habitat variables, and the WDFW elk model, see Chapter 17 (*Species Associations*).

Savannah Sparrow (Passerculus sandwichensis)

Although right-of-way areas provide moderate quality savannah sparrow habitat (HSI values: Merwin 0.47, Yale 0.46, Swift is 0.51), no savannah sparrows were documented on the right-of-way areas during the relicensing studies (PacifiCorp and Cowlitz PUD 2004). Savannah sparrow habitat quality and HSI values for right-of-way areas may be limited by grasses that are too tall (exceeding 17 inches [43 cm]) during the early breeding season and by habitat fragments that may be too small to provide adequate nesting habitat (PacifiCorp and Cowlitz PUD 2004). For more information on savannah sparrows, HSI values for habitat variables, and the HEP model, see Chapter 17 (*Species Associations*).

Analysis Species: None identified.

Other Species: None identified.

10.3 RIGHT-OF-WAY MANAGEMENT AREAS

Rights-of-way encompass a substantial amount of acreage in the Lewis River drainage, with approximately 207 acres (84 ha) on WHMP lands (Appendix 10-1). As a result, it was identified as an important habitat to manage on WHMP lands. Only the rights-of-way on PacifiCorp lands downstream of Swift No. 1 that are on WHMP lands will be managed according to the goal and objectives. These includes portions of the Battleground Line (115 kilovolts), Kalama Line (115 kilovolts), Merwin-Yale (Lake Line) (115 kilovolts), Swift No. 2 Bonneville Power Administration TAP (Speelyai Line) (230 kilovolts), and Swift 1-Swift 2 (Cougar Line) (230 kilovolts) transmission lines.

During the relicensing process, the right-of-way vegetation cover type was defined as the area within the cleared transmission line right-of-way corridor (PacifiCorp and Cowlitz PUD 2004). Although other vegetation cover types (e.g., orchards, wetlands, and riparian areas) exist within the right-of-way, they are categorized as right-of-way for purposes of the WHMP. Specific management of these vegetation cover types may be found in the respective WHMP chapters.

10.4 INSPECTIONS

Right-of-way areas will be inspected regularly to ensure that the management goal and objectives are being achieved. Inspections will consist of initial, annual, and post-treatment inspections, as well as photo documentation. Inspection findings will be recorded on the forms in Appendices 10-2, 10-3, and 10-5 and in the Annual Report for the current operating year. Proposed management actions will be recommended in the Annual Plan for the following year. The following is a description of these inspections.

10.4.1 Initial Evaluation

The initial evaluation will assess general habitat conditions and the need for visual screens; identify and map desirable shrub patches, invasive plant species populations, existing and potential forage areas, and aquatic areas; and will determine and prioritize management actions. The inspections will occur within 5 years of WHMP implementation and will occur in the fall (September 1 to October 15). Each right-of-way span will be evaluated based on the following criteria and documented using the form provided in Appendix 10-2:

- Dominant trees, shrubs, and herbaceous species
- Presence of invasive plant species
- Aquatic areas
- Forage area potential
- Soil depth
- Slope
- Aspect
- Potential disturbances (e.g., public roads)
- Visual screen (topographical or vegetation)
- Line-of-sight
- Direct and indirect wildlife observations (pellets, scat, tracks, nests, dens), particularly savannah sparrows and big game
- Photo document right-of-way spans. Identify and remark the original Merwin Wildlife Habitat Management Area right-of-way photo documentation points. Identify and mark photo documentation points on additional Lewis River WHMP right-of-way areas.

A final report identifying existing and new forage areas, as well as shrub patches and other habitat enhancements areas, will be submitted to the TCC for review. The final report may require modifying the *Management Actions* and *Schedule* sections of this chapter. The TCC will review these modifications prior to revising the Lewis River WHMP. These revisions will be entered into the Lewis River WHMP within 5 years of implementation.

10.4.2 Annual Inspections

The rights-of-way will be inspected every year in the fall (September 1 to October 15) to determine the habitat condition, management needs, and Lewis River WHMP compliance. Each right-of-way span will be evaluated and will be based on the following criteria using the form provided in Appendix 10-3:

- Evaluate shrub patches
- Presence of invasive plant species
- Existing aquatic areas
- Evaluate potential forage areas (i.e., soil sampling, topography, access, existing vegetation)
- Access potential disturbance
- Effectiveness of the visual screens
- Direct and indirect wildlife observations (pellets, scat, tracks, nests, dens), particularly Savannah sparrows and big game

Following the inspection, a summary report will be prepared to document program compliance and identify management actions.

10.4.3 Photo Documentation

To assess trends in vegetation on the right-of-way and the overall effectiveness of management actions, right-of-way areas will be photo documented during the initial evaluations and every 5 years thereafter. Right-of-way areas managed under the Merwin Wildlife Habitat Management Program have permanent photo points that have been photographed over the years. These points will be located and remarked during the initial evaluations (Appendix 10-4). Right-of-way areas to be managed under the Lewis River WHMP, but that were not managed under the Merwin Wildlife Habitat Management Program, will have photo documentation points established and photographed during the initial evaluations. In addition to photo documentation points, shrub patches, visual screens, and forage areas will be photographed as needed to document compliance with the Lewis River WHMP. A summary report will be prepared following the completion of the 5-year photo documentation to document trends in vegetation and overall effectiveness of past management actions.

Photo documentation should be consistent with prior Merwin Wildlife Habitat Management Program right-of-way photo documentation (Pacific Power & Light Company 1988). It will occur between September 1 and October 15. Photographs taken with a film camera will use 200 International Organization of Standardization film and a 50 millimeter camera lens. Photographs taken with a digital camera will be set at 200 International Organization, and the optical zoom will be set to a value as equivalent as possible to a 50 millimeter film camera lens length. Photo documentation methods may change as technology changes.

10.4.4 Post-Treatment Inspection

Rights-of-way will be inspected within 2 months following hazard tree or invasive plant species control to ensure that shrub patches, forage areas, aquatic areas, and visual screens are not negatively affected. If these areas are affected by management actions or transmission line maintenance activities, they will be restored to the best condition possible. Post-treatment inspections will be documented using the form provided in Appendix 10-5.

10.5 MANAGEMENT ACTIONS

The following management actions include measures to assess and maintain right-of-way areas in a condition consistent with the management goal and objectives. Management actions include the following:

- Shrub Management
- Invasive Plant Species Control
- Vegetation Management
- Forage Enhancement
- Aquatic Management
- Access/Disturbance Reduction

10.5.1 Shrub Management

Shrubs and low-growing tree species provide forage and cover for wildlife but rarely present a hazard to transmission line clearance. To promote shrubs and increase habitat diversity, the Wire - Border Zone technique will be implemented where feasible. The goal of this technique is to increase wildlife habitat diversity by promoting low-lying vegetation in the wire zones and a tall shrub cover type in the border zones (Yahner et al. 2004, PacifiCorp 2005). The wire zone is the right-of-way portion directly below and 10 feet (3 m) beyond the wires. The remaining portion of the right-of-way is the border zone (PacifiCorp 2005).

The wire zone will be managed for a shrub-forb-grass cover type consisting of a dense population of plants with a mature height of less than 3 feet (1 m). Shrubs that provide a visual screen for deer and elk and are within the wire zone should be protected and maintained at a height of less than 15 feet (5 m), as long as the shrub does not pose a hazard to the transmission line (PacifiCorp 2005). Shrubs adjacent to the transmission line towers pose the least risk to the transmission system and should be protected as long they do not interfere with transmission tower maintenance.

The border zone will be managed to promote a shrub cover type consisting of plants with a mature height of less than 15 feet (4.5 m) and that do not pose a risk to the transmission system (PacifiCorp 2005). A list of desirable shrub species is available in Chapter 7 (*Shrubland Habitat Management*), Appendix 7-3.

10.5.2 Invasive Plant Species Control

Due to the early successional habitat and maintenance activities, right-of-way areas are prone to invasive plant species infestations. Invasive plant species will be assessed each year during the annual inspection (see Section 10.4.2). In addition, the goal and objectives in Chapter 13 (*Invasive Plant Species Management*) require all Class A and B-designated noxious weeds and other invasive plant species be identified and prioritized for eradication and/or control treatments.

To prevent the establishment of invasive plant species, best management practices will be implemented prior to conducting soil-disturbing activities. Best management practices for soil-disturbing activities are described in Chapter 13 (Invasive Plant Species Management).

Large blocks of shrubs that reduce habitat diversity or impede wildlife movement, such as Himalayan blackberry (*Rubus armeniacus*) and Scots broom (*Cytisus scoparius*), may be treated as needed. Treatment methods will be based on a case-by-case basis and will use the best management practices as specified in Chapter 13 (*Invasive Plant Species Management*). Areas where treatment effectiveness is limited by topographical or other constraints may not be able to be treated and will be closely monitored. In some cases, solid masses of shrubs, particularly Himalayan blackberry, may be maintained to control public access.

10.5.3 Vegetation Management

Trees and tall shrubs that pose a potential risk to transmission lines are either removed or reduced in height. PacifiCorp's Vegetation Management Services or designated contractors conduct this work in compliance with the North American Electricity Reliability Council (NERC) and American National Standards Institute (ANSI) vegetation management standards (PacifiCorp 2005). Trees and tall shrubs become a hazard when they violate the minimum clearance threshold of 15 feet (4.5 m) for 230 kilovolt and 10 feet (3 m) for 115 kilovolt transmission lines (PacifiCorp 2005). Hazard trees will be controlled by either chemical or manual/mechanical methods. Where possible, western red cedar (*Thuja plicata*) will be retained and the hazard will be reduced with side trimming or topping. Hazard trees within the border zones may be created into snags if they do not represent a safety concern or down wood to enhance wildlife habitat. Desirable shrub species should be preferably managed by manual or mechanical methods. If a desirable shrub or visual screen needs to be removed during hazard tree control or because it is a hazard itself, it will be replaced in proximity to the site.

10.5.4 Aquatic Management

Aquatic areas (e.g., riparian and wetland areas) will be identified during the initial evaluation and categorized according to the buffer requirements for streams (*Riparian Habitat Management*, Chapter 6) and wetlands (*Wetland Habitat Management*, Chapter 5). Table 10.5.1 provides buffer requirements for the aquatic areas. Aquatic areas along the right-of-way may be managed to:

- Maintain shade along the water course
- Prevent erosion
- Release shrub species in the understory
- Maintain wildlife corridors
- Reduce line-of-sight (<1,200 feet [365 m]) along the right-of-way

Area	Classification	Buffer
Wetland	>1 acre	150 feet (45 m) or one site- potential tree height, whichever is greater
Wetland	< 1acre	100 feet (30 m) or one site- potential tree height, whichever is greater
Riparian	Perennial fish-bearing stream that supports anadromous fish or bull trout	300 feet (90 m) or two site- potential tree heights, whichever is greater
Riparian	Perennial fish-bearing stream that support residential fish species only	300 feet (90 m)
Riparian	Perennial nonfish-bearing streams	150 feet (45 m)
Riparian	Intermittent streams	100 feet (30 m)

Riparian management signs will be posted and maintained at aquatic areas that are readily accessible to motorized vehicles. The purpose of these signs is to alert management personnel and contractors that they are in proximity to an aquatic area. These areas will be identified during the initial evaluation.

Hazard tree removal may need to occur within an aquatic area buffer. Under Washington Administrative Code 222-110-160, PacifiCorp may obtain a Hydraulic Project Approval permit to fall trees into or across stream channels. Slash will be reduced so as to not impede travel by big game along riparian corridors.

Ground-disturbing activities and erosion control practices within the riparian and wetland buffers will be reviewed with the TCC prior to conducting the activity, unless it is an emergency situation. Ground-disturbing activities will avoid aquatic area buffers, where feasible. If ground-disturbing activities must occur within the buffer, erosion control practices (e.g., silt fences and straw bales) will be in place to prevent soil erosion into the stream. The area will be revegetated within the growing season.

Invasive plant species control occurring within the buffers will adhere to the best management practices as specified in Chapter 13 (*Invasive Plant Species Management*).

10.5.5 Forage Enhancement

Forage areas will be designated along the right-of-way as areas that are managed to enhance forage for deer and elk. Three designated forage areas along the Speelyai Line were managed under the Merwin Wildlife Habitat Management Program (Table 10.5.2) and will continue to be managed as forage areas in the Lewis River WHMP. Additional areas will be determined during the initial evaluation.

0	U U		/ 0
Name	Span(s)	Acres (ha)	Prescription
Speelyai Bay	1/11 -3/11	4.0 (1.6)	Mow annually and fertilize as needed
Woodland Park West	8/14 -1/15	2.0 (0.8)	Mow annually and fertilize as needed
Wilkinson	5/15 -7/15	2.0 (0.8)	Mow annually and fertilize as needed

Table 10.5.2	Right_of_Way	Forage Areas	Locations	Size and	Management
1 abic 10.3.2	, Kight-01- way	rurage Areas,	Locations,	Size, and	Management

Right-of-way forage areas are intensively managed to produce high-quality forage. Management includes soil testing, fertilization, and annual mowing.

- Forage sites will be mowed annually between August 15 and September 15. The fire hazard will be assessed prior to mowing, and mowing will be delayed if necessary.
- A mowing height of 4 to 6 inches (10 to 15 cm) will be used, and desirable shrubs within and adjacent to forage sites will be retained, if possible.
- Soils will be sampled every other year between August 1 and August 31. Soil samples will include 10 samples per site augured 6 to 9 inches (15 to 23 cm) (Oregon State University Extension Service 2000).
- Forage sites will be fertilized as determined by the soil test results.

10.5.6 Access/Disturbance Reduction

To reduce disturbance to elk, deer, and other wildlife, right-of-way access roads on PacifiCorp property will be closed to public motorized vehicle access. Right-of-way access roads that are currently open to the public will be evaluated during the initial evaluation to determine the appropriate action for closing the road (e.g. gate or abandonment). These actions will be implemented within 5 years of Lewis River WHMP implementation. All right-of-way gates will be inspected during the annual inspections, but will be managed as described in Chapter 15 (*Public Access Management*). Right-of-way gates will be constructed of steel, instead of cable. Access restriction signs will be posted at gates, where feasible. Motorized vehicle trespass around gates will be controlled with boulders or other barriers, where feasible.

Visual screens will be developed and/or maintained to break the line-of-sight along the right-of-way and to provide security cover for big game at public road crossings. Line-of-sight along the right-of-way will be reduced with visual screens to less than 1,200 feet (366 m), where feasible (Woodland Fish and Wildlife Project 1992). Right-of-way areas that cross public roads will have visual screens evaluated and established where slope, soils, and topography allow. For the purposes of the right-of-way, a public road is any road that is open to the public. Eighteen public road crossings have initially been identified, six of which were established under the previous Merwin Wildlife Habitat Management Program.

Effective visual screens may be topographical, vegetation, or both. Conifers provide the most effective visual screens in the winter, but dense stands of deciduous species can provide adequate screening during the winter. Where site conditions are harsh (e.g., rock, xeric, steep road shoulder, southern aspect), effective screening may take many years to

establish or may not be feasible. Big game browse and antler rub can cause plant mortality, thus reducing the effectiveness of a visual screen. Therefore, to prevent big game damage, animal exclosures will be constructed and plants replaced as needed. Vegetative visual screen will include species that are selected and planted to minimize potential hazard to transmission lines. Vegetation in a visual screen that presents a hazard to the transmission line will be controlled by pruning and/or tree growth regulator. Techniques used to reduce line-of-sight and provide security cover on the right-of-way will be reviewed with the TCC prior to implementing.

10.6 SCHEDULE AND ESTIMATED EFFORT

The schedule and estimated effort for conducting right-of-way inspections and management actions are listed below.

Table 10.6.1 Right-of-Way Habitat Management Schedule and Estimated Effort							
Management Actions	Completion Date	Timing	Estimated Effort	Documentation			
Inspections							
Initial Evaluations with Photo Documentation	Within 5 years of WHMP implementation	September 1 to October 15	130 hours	Data Forms, Photos, Maps, and Summary Report			
Initial Evaluation Final Report	Within 1 year of completing initial evaluation	January 1 to December 31	40 hours	Report			
Revise Transmission Line Rights-of-Way Habitat Management Chapter	Within 5 years of WHMP implementation	January 1 to December 31	20 hours	Revised Lewis River WHMP			
Annual Inspection	Annually	September 1 to October 15	50 hours	Data Form and Memo on File			
Annual Inspection with Photo Documentation	Every 5 years beginning with initial evaluation year	September 1 to October 15	100 hours	Data forms, Photos, and Summary Report			
Post Hazard Tree and Invasive Plant Species Management Inspection	Within 2 months of management action being completed	January 1 to December 31	2 hours per site	Data Form			
Shrub Management							
Shrub Management	Optional ¹	January 1 to December 31	4 hours	Annual Report			
Plantings	Optional ¹	February 1 to March 31	4 hours per planting	Annual Report			
Invasive Plant Species Cont	rol						
Invasive Plant Species Control	Optional ¹	January 1 to December 31	Unknown	Annual Report			
Aquatic Area Management							
Aquatic Area Management	Optional ¹	January 1 to December 31	Unknown	Annual Report			
Big Game Forage Enhancen	nent						
Soil Testing	Every 2 years	August 1 to August 31	2 hours per site	Annual Report			
Annual Mowing	Annually	September 1 to October 15	2 hours per acre	Annual Report			
Fertilizing	Optional ¹ (per soil test results)	September 1 to October 15	2 hours per acre	Annual Report			
Access/Disturbance Reducti	ons		•				
Access/Disturbance Reduction	Optional ¹	January 1 to December 31	2 hours per site	Annual Report			
Closing Open Roads	Within 5 years of WHMP implementation	January 1 to December 31	4 hours per site	Annual Report			

¹ Optional management actions are actions that are chosen to be implemented according to need or opportunity.

10.7 REFERENCES

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11.0 UNIQUE AREA/HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

- Appendix 11-1: Lewis River Wildlife Habitat Management Plan Unique Area/Habitat Locations and Type [Confidential]
- Appendix 11-2: Ethnobotanically Significant Plants for the Lewis River Wildlife Habitat Management Plan Lands
- Appendix 11-3: Oak Stand Inspection Form

<u>11.1 INTRODUCTION</u>

This chapter describes the unique area/habitat management goal and objectives, management actions, and schedule on the Lewis River WHMP lands. It compiles information on unique areas/habitats from Section 3.8 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.10 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Unique areas are generally associated with a geological event, a specific landscape feature, or soil type. As a result, they are localized in extent and usually support a different assemblage of species compared to adjacent habitats. Unique areas/habitats often provide a greater species diversity than adjacent habitats. These areas may support species that are completely dependent on the habitat, such as Larch Mountain salamanders (*Plethodon larselli*), or species that are only seasonally dependent, such as the Pacific western big-eared bat (*Coryhorhinus townsendii townsendii*). Cliffs, caves, talus slopes, and oak (*Quercus* sp.) stands were identified as the unique areas/habitats because they are generally small and limited in extent along the Lewis River but provide habitat for a number of sensitive wildlife species.

11.2 MANAGEMENT GOAL AND OBJECTIVES

The goal, objectives, and species association for unique area/habitat management are presented below (PacifiCorp and Cowlitz PUD 2006).

11.2.1 Goal

Protect unique habitats, including, but not limited to, oak stands, cliffs, talus/lava flows, and caves, as well as areas of culturally sensitive plant species identified as important to the Tribes.

11.2.2 Objectives

- **Objective a**: Protect and maintain existing oak stands and prevent encroachment of conifers and invasive plant species over the life of the licenses.
- **Objective b**: Coordinate with cooperating agencies and other Parties to protect caves in or near the WHMP lands over the life of the licenses.
- **Objective c:** Maintain a record of sensitive sites and unique habitats, as they are identified, through implementation of the WHMP.
- **Objective d:** Identify and implement appropriate measures to protect and maintain important areas of ethnobotanically significant plants, as identified by the Tribes, over the life of the licenses.

11.2.3 Species Association

Species association identifies indicator species that require unique area/habitat features as part of their life history (PacifiCorp and Cowlitz PUD 2006). As a result, it is assumed that these species will receive direct benefit from unique area/habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations and be the primary objective for prescribing management actions.

Habitat Evaluation Procedure Evaluation (HEP) Species: None identified.

Analysis Species: Pacific western big-eared bat, Larch Mountain salamander, and Van Dyke's salamander (*Plethodon vandykei*).

Other Species: Other species associated with unique areas (i.e., migratory birds).

11.3 UNIQUE AREA/HABITAT MANAGEMENT AREAS

Unique habitats in the Lewis River basin include oak stands, cliffs, talus, lava flows, and caves. The Lewis River has been heavily influenced by glaciation, volcanic activities, and stream processes (PacifiCorp and Cowlitz PUD 2006). These have created a number of unique landscape features (e.g., rock outcrops, lava flows, talus slopes, lava tubes, or caves) and their associated vegetation (e.g., oak stands and lodgepole pine [*Pinus contorta*]). Unique areas/habitats on the WHMP lands are described below, and Appendix 11-1 includes a figure showing the location of each of the unique areas/habitats. Because some of the unique areas/habitats may be as small as a single point, there is no minimum mapping unit.

11.3.1 Oak Stands

Oak stands are typical in the Puget Trough, Willamette Valley, and Columbia River Gorge (Franklin and Dyrness 1988). Lands surrounding Merwin Reservoir are near the eastern extent of the range of the Oregon white oak's (*Quercus garryana*) on the west side of the Cascades. As a result, only a few stands exist, and these are on rocky outcrops covered with thin soils. During the relicensing studies, the oak stands vegetation cover type was defined as an area that is greater than 10 percent forested canopy cover, greater than 70 percent of the canopy cover is composed of deciduous trees, and it is an upland site dominated by oak trees (PacifiCorp and Cowlitz PUD 2004a). Oak stands were the only type of unique habitat that was managed under the Merwin Wildlife Habitat Management Program. Twelve oak stands were identified in the Merwin Wildlife Habitat Management Program Standard Operating Procedures (PacifiCorp 1998). Table 11.3.1 lists each of the oak stand sites on the Lewis River WHMP lands.

Management Unit	Oak Stand Name	Acres (ha)	Number of Trees
1	1-12	0.45 (0.18)	40
5	5-1	1.23 (0.5)	Unknown
5	5-2	1.08 (0.44)	Unknown
6	6-22a	0.54 (0.22)	15
6	6-22b	0.44 (0.18)	15
6	6-23	0.83 (0.34)	50
6	6-26a	0.7 (0.28)	11
6	6-26b	0.2 (0.08)	8
6	6-45a	0.49 (0.2)	20
6	6-45b	0.47 (0.19)	40
6	6-45c	0.7 (0.28)	15
6	6-45d	1.14 (0.46)	4
6	6-45	0.47 (0.19)	20
6	6-52	0.37 (0.15)	1
6	6-58	0.2 (0.08)	40
	Total	$9.31(3.79)^1$	264^2

Table 11.3.1 Oak Stands on the Lewis River Wildlife Habitat Management Plan Lands

¹ This total is based on current geographic information system data and is slightly less than what was reported in PacifiCorp and Cowlitz PUD (2006). This is because of the fine-tuning of the data and not the loss of an oak stand.

² Tree number totals are from the Merwin Wildlife Habitat Management Program Standard Operating Procedures (PacifiCorp 1998). Oak stands 5-1 and 5-2 were not identified in the Merwin Wildlife Habitat Management Program Standard Operating Procedures, so the total does not include the tree counts for these stands.

<u>11.3.2 Lava Flows and Talus Slopes</u>

Large talus slopes and lava flows are the most common of the unique habitats found on the WHMP lands and are similar in that they consist of an accumulation of broken rock. These areas can provide excellent habitat for Larch Mountain and Van Dyke's salamanders, if there is adequate ground cover, canopy cover, and interstitial space between the rocks and the soil. Riprap located at the face of Yale Dam and on portions of Swift Dam provides moss-covered rock habitat that is similar to a talus slope. The only population of Larch Mountain salamanders that is known to exist on the Lewis River WHMP lands is on the face of Yale Dam (Appendix 11-1) (PacifiCorp and Cowlitz PUD 2004b).

Talus is comprised of rock that has accumulated at the base of a steep slope. During the relicensing studies, the rock talus vegetation cover type was defined as areas with less than 10 percent forest canopy cover, ground area comprised of greater than 70 percent exposed rock, and ground area consisting of rock rubble (PacifiCorp and Cowlitz PUD 2004a). Only one rock talus area has been identified on the Lewis River WHMP lands. It is 0.36 acres (0.15 ha) in area and is located on south side of Merwin Reservoir in Management Unit 13 (Appendix 11-1).

Lava flows are comprised of streaming molten rock; as a result, they are linear in shape and are generally gently sloped. The only lava flow areas known to exist on Lewis River WHMP lands are in Units 21 and 24 adjacent to the Swift bypass reach and the western portion of Unit 26 (Appendix 11-1). It is characterized by large, moss-covered rocks and is one of the few places in the valley that supports lodgepole pine. This area is intermixed with Douglas-fir (Pseudotsuga menziesii) and a diverse shrub layer of manzanita (Arctostaphylos columbiana), kinikinik (Arctostaphylos uva-ursi), oceanspray (Holodiscus discolor), and ceanothus (Ceanothus sanguineus) (PacifiCorp and Cowlitz PUD 2004c). The lava flows were identified during the relicensing vegetation cover type study as lodgepole pine. The lodgepole pine vegetation cover type was defined as greater than 70 percent canopy cover comprised of lodgepole pine (PacifiCorp and Cowlitz PUD 2004a). There is a total of 73.0 acres (29.6 ha) of lodgepole pine habitat in the WHMP lands, with approximately 62.7 acres (25.4 ha) in Unit 21, 7.1 acres (2.9 ha) in Unit 24, and 3.2 acres (1.3 ha) in Unit 26.

11.3.3 Rock Outcrops

Rock outcrops are large areas of exposed rock that form steep slopes or cliffs that are easily distinguishable from adjacent habitats on aerial photographs. The WDFW defines cliffs that are greater than 24.9 feet (7.6 m) high and occurring below 5,000 feet (1,524 m) in elevation as a priority habitat (WDFW 2008). During the relicensing process, the vegetation cover type study defined rock outcrops as areas that are less than 10 percent forested canopy coverage and ground area that consists of solid rock cliffs and slopes (PacifiCorp and Cowlitz PUD 2004a). The Standards & Guidelines report identified 4.6 acres (1.9 ha) of exposed rock, whereas the vegetation cover type mapping developed

during relicensing identified 29.9 acres (12.1 ha) of exposed rock on the Lewis River Project study area's Merwin, Yale, and Swift No. 1 segments (PacifiCorp and Cowlitz PUD 2006, PacifiCorp and Cowlitz PUD 2004a). However, subsequent refinement of the data to improve accuracy on the WHMP lands and to include rock outcrops that were not previously identified has resulted in a total of 13.25 acres (5.36 ha) of mapped rock outcrop areas. Appendix 11-1 and the following table identifies all of the known rock outcrops on the WHMP lands.

Unit	Acres (ha)
5-1	0.4 (0.16)
5-2	0.28 (0.11)
5-3	1.7 (0.69)
5-4	0.12 (0.05)
5-5	0.29 (0.12)
6-1	0.4 (0.16)
6-2	0.47 (0.19)
7-1	1.74 (0.7)
13-1	1.34 (0.54)
13-2	0.33 (0.13)
20-1	1.48 (0.6)
20-2	0.54 (0.22)
20-3	0.42 (0.17)
20-4	0.15 (0.06)
21-1	0.68 (0.28)
28-1	2.27 (0.92)
28-2	0.64 (0.26)
Total	13.25 (5.36)

Table 11.3.2 Rock Outcrops on the Lewis River Wildlife Habitat Management Plan Lands

11.3.4 Caves or Lava Tubes

The WDFW describes a cave or lava tube as a naturally occurring cavity or system of interconnected passages (including associated dendritic tubes, cracks, and fissures) that are large enough to contain a human (WDFW 2008). There are currently no records of caves or lava tubes on the Lewis River WHMP lands. However, Washington Heritage Records do have records of caves occupied by bats adjacent to the WHMP lands. Appendix 11-1 identifies the maternal bat colonies that are on or within 0.25 miles (0.4 km) of WHMP lands.

<u>11.3.5 Ethnobotanically Significant Plants</u>

Ethnobotanically significant plants are plants that were traditionally gathered by the Cowlitz Tribe and/or Yakama Nation throughout the Lewis River basin (PacifiCorp Cowlitz PUD 2004c). Appendix 11-2 provides a list of these species and whether or not they are known to exist on WHMP lands. Because most of these species are common and widespread, there is no specific database to track the individual plant locations. However, the information will be recorded by area and will include areas dominated by the ethnobotanically significant plants that are uncommon on WHMP lands, such as a huckleberry (*Vaccinium ovatum*) patch. Currently, the lodgepole pine areas in Units 21, 24, and 26 and the oak stands identified in Table 11.3.1 are the only ethnobotanically significant plant areas known to exist on WHMP lands (Appendix 11-1).

11.3.6 Ethnoecologically Significant Areas

Ethnoecologically significant areas are areas where plants or other raw material resources were traditionally gathered by the Cowlitz Tribe and/or the Yakama Nation throughout the Lewis River basin. Areas where plants common on the WHMP lands achieve an unusual density or unusual quality may also reach ethnobotanically significant status. PacifiCorp may also be alerted to an ethnobotanically significant area through formal notification by a designated Tribal representative. Determination that an area is ethnobotanically significant will be made by consulting with the Cowlitz Tribe and/or the Yakama Nation. If the proposed area is determined to be significant, it will be mapped and recorded in the Unique Areas database (Section 11.5.3). Certain ethnobotanically significant areas (such as oak stands) may be simultaneously classified as unique areas because of habitat value, and as ethnobotanically significant areas.

Ethnoecologically significant resources are not limited to plant materials, but also include certain kinds of crypto-crystalline silicate (CCS) rocks such as jasper, flint, chert, and chalcedony. These materials may occasionally be found exposed in rocky outcrops, but are more commonly found as abraded cobbles in riverbeds. No such areas are currently known or expected to be discovered within WHMP lands. Nonetheless, any area identified by the Cowlitz Tribe or Yakama Nation containing ethnoecologically significant raw material resources at an uncommon density or unusual quality may be classified as a unique area. Determination that an area is ethnoecologically significant will be made by the Cowlitz Tribe and/or the Yakama Nation. If the area is determined to be significant, it will be mapped and recorded in the Unique Areas database (Section 11.5.3).

11.4 INSPECTIONS

Of the unique areas/habitat, only the oak stands will require regular inspections. The other unique areas/habitats do not require regular inspections; therefore, these areas will be inspected on an as-needed basis or opportunistically with other management activities or inspections. The following sections describe the methods for conducting the inspections.

11.4.1 Oak Stands

Oak stands will be inspected every 3 years between September 15 and October 15. The objective of these inspections is to document the number of trees, tree health, and determine if management actions need to be applied to protect and maintain the oak stand. Appendix 11-3 includes the inspection form; the schedule for the inspections will be as follows:

- Year 1 (2009): Oak Stands 1-12, 5-1, 5-2, 6-45, 6-52
- Year 2: Oak Stands 6-45a, 6-45b, 6-45c, 6-45d, 6-58
- Year 3: Oak Stands 6-22a, 6-22b, 6-23, 6-26a, 6-26b

Additional inspections may occur as needed to determine the success of management actions and can occur throughout the year.

11.4.2 Other Unique Areas/Habitats

Other unique areas/habitats include the rock talus, lava flow, rock outcrops, caves, and lava tubes. If these areas are inspected or additional areas are discovered, then the following information should be recorded:

- Date
- Wildlife observation
- Estimated size of unique habitat
- Adjacent vegetation cover type(s)
- Ground cover
- Estimated depth and size of entrance of cave or lava tube
- Estimated size of rock
- Cracks or fissures present
- Slope percent and azimuth
- Invasive plant species
- Cliff height

If management activities are recommended following an evaluation, then a memo will be prepared to document the observations and recommended management. The memo will be summarized in the Annual Report.

11.5 MANAGEMENT ACTIONS

The following management actions include measures to maintain unique areas/habitats in a condition consistent with the management goal and objectives. Management actions include the following:

- Oak Stand Management
- Cave Management
- Unique Area Record Management
- Ethnoecologically Significant Area Management

<u>11.5.1 Oak Stand Management</u>

Oak stand management includes controlling competing vegetation by removing encroaching conifers and invasive plant species. Other actions that may benefit individual oak stands, consistent with other oak restoration strategies, and that are viable on WHMP lands include thinning oak stands and planting oak seedlings (Vesley and Tucker 2004, Campbell 2003, Larsen and Morgan 1998). These actions will be determined on a case-by-case basis and be approved by the TCC prior to implementing.

Oregon white oaks will not tolerate shading and will not persist when they are overcrowded and shaded by other trees. West of the Cascades, conifer encroachment is primarily from Douglas-firs that can grow three to five times faster than Oregon white oaks (Campbell 2003). As a result, to maintain healthy oak stands, conifers need to be removed or controlled. Preferred methods for conifer control include falling or topping competing trees. Topping conifer trees to remove the crown and create a snag would be the preferred method. If the snag would create a hazard to an adjacent oak or to public safety, then the tree should be fallen away from the oak site.

Invasive plant species can prevent oak seedling recruitment and outcompete the native plant species. The most common invasive plant species in the oak stands is Scots broom (*Cytisus scoparius*) and is the only invasive plant species that has required control in an oak stand thus far. However, other noxious weeds (e.g., Queen Anne's lace [*Daucus carota*]) and native invasive plant species (e.g., salal [*Gaultheria shallon*]) have been observed and have the potential to require control in the future. Preferred control methods are dependent on the oak stand and plant species and may include, but are not limited to, mechanical and chemical methods. The method used should be selected for its effectiveness and ability to protect oak trees and associated native vegetation, where possible. Chapter 13 (*Invasive Plant Species Management*) provides a description of the methods and best management practices to be applied.

11.5.2 Cave Management

A definition for caves is provided in Section 11.3.4, and the known locations of caves or lava tubes on or within 0.25 miles (0.4 km) of the WHMP lands have been identified in Appendix 11-1. Caves that have been identified as being important habitat will be protected to maintain the microclimate at the cave entrance, the physical integrity of the

cave passages, and to minimize human disturbance to bat hibernaculas and maternity colonies (Washington Department of Natural Resources 1997). All ground-disturbing activities that occur within 0.25 miles (0.4 km) of a cave entrance will be evaluated for potential impact on the cave. If an activity has the potential to impact a cave, then a management strategy will be developed that may include, but not be limited to, cave entrance and passage buffers and/or seasonal restrictions. The cave management strategy will be determined on a case-by-case basis and will be dependent on known species occupancy, activity, and habitat surrounding the cave.

11.5.3 Unique Area Record Management

A "Unique Area" database will be developed that will include all unique areas and sensitive sites. The database will be updated as needed to include new information. The unique areas will include the unique habitats identified in the goal (i.e., oak stands, cliffs, talus/lava flow, and caves). Section 11.3 provides a description of these areas, and Appendix 11-1 provides the location of the existing areas on or near the WHMP lands. This database may also include sensitive sites, which are sites that not identified as a unique habitat or other WHMP habitat (e.g., wetlands), is locally uncommon, and is potentially impacted by disturbance.

11.5.4 Ethnoecologically Significant Area Management

Most of the ethnobotanically significant plants are locally common and are widely distributed on the Lewis River WHMP lands. Areas that are determined to be ethnobotanically or ethnoecologically significant will be recorded in the Unique Areas database. A management strategy will be developed with the TCC to protect and maintain the area. Management strategies will be developed on a case-by-case basis and will be dependent on location, species, and potential disturbances.

<u>11.6 SCHEDULE AND EFFORT</u>

The table below lists the schedule, estimated effort (in hours), and documentation requirements for each task.

Table 11.6.1 Unique Area/Habitat Management Schedule and Estimated Effort				
Procedures	Completion Date ¹	Timing	Effort	Documentation
Inspections				
Annual Oak Stand	Annual	September 15 and October 15	16 hours	Data Forms
Additional Oak Stands	Optional ¹	January 1 to December 31	4 hours per area	Annual Report
Other Unique Areas	Optional ¹	January 1 to December 31	4 hours per area	Annual Report
Oak Stand Managem	ient			
Topping a Competing Tree and Hand Piling Debris	Optional ¹	January 1 to December 31	2 men x 1.5 hour per 1 20-inch dbh Douglas-fir tree; 1 hour for reporting	Annual Report
Falling a Competing Tree and Hand Piling Debris	Optional ¹	January 1 to December 31	2 men x 1 hour per 1-20-inch dbh Douglas-fir tree; 1 hour for reporting	Annual Report
Invasive Plant Species Control	Optional ¹	January 1 to December 31	0.5 hours per area	Annual Report
Cave Management				
Develop Management Strategy	Optional ¹	January 1 to December 31	10 hours	Memo submitted to the TCC
Unique Area Record	Management			
Create Unique Area Database	Within 1 year of WHMP Implementation	January 1 to December 31	8 hours	Annual Report
Update Unique Area Database	Optional	January 1 to December 31	2 hours	Annual Report
Ethnoecologically Sig	gnificant Area Manag	ement		
Develop Management Strategy	Optional ¹	January 1 to December 31	10 hours	Memo submitted to the TCC

¹ Optional management actions are actions that are chosen to be implemented according to need or opportunity.

dbh = diameter at breast height.

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12.0 FORESTLAND HABITAT MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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12.1 INTRODUCTION

This chapter describes the forestland management goal and objectives, planning criteria, management area descriptions, proposed actions, and schedule and estimated effort. It compiles information on forestland management from Section 3.9 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.9 of the Settlement Agreement (PacifiCorp et al. 2004), Lewis River relicensing documents, the USFWS Biological Opinion (USFWS 2006), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Forestland is a general term for upland areas dominated by trees; it encompasses all forest types, structures, and age classes. For the Lewis River Wildlife Habitat Management Plan, forestlands are defined as areas that are periodically subject to timber harvest for purposes of perpetuating enhanced forage for deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*), as well as other species that benefit from a variety of successional stages. Forestlands are often distinguished by whether or not they are unmanaged or managed. Unmanaged forestlands are not harvested periodically, and changes are the result of natural succession and environmental processes; managed forestlands are periodically affected by some type of harvest.

Managed forestlands, as defined for the Wildlife Habitat Management Plan, exclude oldgrowth conifer stands; forest stands within the Cougar/Panamaker Creek and Swift Creek Arm Conservation Covenant areas; designated forested buffers for wetlands, streams, and reservoir shorelines; and special habitat categories including shrublands, orchards, and oaks (*Quercus* sp.). Some mature conifer stands may be categorized as forestland if not identified for development under Old-growth Objective d (see Chapter 4) or Raptor Management Objective h (see Chapter 14). Finally, some riparian buffers may be managed for specific wildlife habitat needs using forestry but are not included as part of the harvest schedule.

This Wildlife Habitat Management Plan provides the initial process for identifying areas that will be proposed for forest harvest activities, such as thinning or clear cutting. In addition, it prioritizes areas for management into three phases over the 50-year license period and provides management criteria for maintaining existing Timber Harvest Areas and the standard forest management practices that will guide all planning to provide cover and forage over an approximate rotation of 60 to 70 years. Specific site management plans will be prepared on an annual basis that identify where and what type of management is proposed to achieve the management objectives. These site management plans will identify proposed harvest boundaries, roads, and purpose of the specific management such that the TCC can approve the actions.

The *Forestland Habitat Management* chapter is a management plan to establish the criteria under which forestry practices should be conducted; in addition, it provides best management practices for existing forestland management practices. For previous Timber

Harvest Areas, there are reforestation inspections and best management practices for managing the vegetation, whereas the forestland areas yet to be managed need harvest schedules to be developed, which requires further resource planning.

12.2 MANAGEMENT GOAL AND OBJECTIVES

The goal, objectives, and species association for forestland management are presented below (PacifiCorp and Cowlitz PUD 2006).

12.2.1 Goal

Promote forestland species composition and structures that benefit wildlife and provide an appropriate mosaic of big game hiding cover and forage.

12.2.2 Objectives

- **Objective a**: At the Management Unit level, provide a range of alternatives for developing and maintaining a mix of forage and hiding cover for elk, considering activities on adjacent lands, over the life of the licenses. Revise Management Unit Plans for Wildlife Habitat Management Plan lands associated with the Merwin Project and create new plans for Wildlife Habitat Management Plan lands at the Yale and Swift No. 1 Projects.
- **Objective b**: Over the life of the licenses, maintain or create at least eight snags (>= 20 inches [50 cm] dbh), green retention trees (>= 15 inches [38 cm] dbh), or wildlife reserve trees (>=15 inches [38 cm] dbh) per acre (19.8 per ha) if available within the harvest area. Retain larger trees and snags representative of the harvest area. A different number of snags, retention, or reserve trees would be allowed only to meet specific wildlife objectives. To the extent possible, retain or create 4 logs/acre (9.9/ha) (>= 24 inches [60 cm] diameter and 50 feet [15 m] long).
- **Objective c**: At the Management Unit level, promote forest habitat diversity for wildlife by increasing or maintaining minor native tree species (e.g., cottonwood [*Populus* sp.], big-leaf maple [*Acer macrophyllum*], western red-cedar [*Thuja plicata*]) composition where appropriate site conditions exist over the life of the licenses.

12.2.3 Species Association

Species association identifies indicator species that require forestland habitat features as part of their life history (PacifiCorp and Cowlitz PUD 2006). As a result, it is assumed that these species will receive direct benefit from forestland habitat management and may be an indicator of habitat quality. These species will be the focus of wildlife observations and be the primary objective for prescribing management actions.

Habitat Evaluation Procedure (HEP) Species: Black-capped chickadee, savannah sparrow, pileated woodpecker, and elk

Black-Capped Chickadee (Poecile atricapilla)

In Washington, preferred habitat for the black-capped chickadee is deciduous forests, and chickadee abundance in deciduous forests is related to canopy volume (Marshall et al. 2003, Schroeder 1983). Black-capped chickadees nest in cavities of dead or hollow trees and are only able to excavate a cavity in soft or rotten wood (Schroeder 1983). Preferred nest tree diameter at nest height ranges from 3.9 to 5.9 inches (10 to 15 cm), and tree height ranges from 1 to 40 feet (0.3 to 12.2 m) (Schroeder 1983). In Oregon and Washington, winter roost cavities are excavated in snags (Schroeder 1983).

Nearly all conifer forest cover types in the Lewis River study area provide relatively high-quality habitat (HSI value = 0.60-0.94), except for unthinned and thinned pole stands that had HSI values of 0.0 to 1.00, depending on location. Mixed and deciduous forest types provide at least moderate habitat quality (HSI value = 0.27-0.89). Tree cover—either too high or too low—is often the most limiting factor for habitat quality, although low snag density also plays a role in some forest types (PacifiCorp and Cowlitz PUD 2004). The limiting factor is tree cover (optimum is 50 to 75 percent canopy closure). For more information on black-capped chickadees, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Savannah Sparrow (Passerculus sandwichensis)

Few cover types in the Wildlife Habitat Management Plan area include the open grass and forb-dominated habitats required by the savannah sparrow. The new clearcuts and meadows generally provide moderate habitat (HSI value = 0.33-0.52) for the savannah sparrow. In some cover types, grass and forb cover and height are too great to provide optimal habitat; the opposite is the case in other vegetation types.

Pileated Woodpecker (Dryocopus pileatus)

As might be expected for a species that nests and forages in large trees and snags, mature and old-growth conifer forests provide high-quality habitat (HSI values = 0.65-0.97) for the pileated woodpecker. Riparian mixed, upland mixed, and midsuccessional conifer stands generally provide moderate habitat quality (HSI value = 0.34-0.66), but some Lewis River Project segments had HSI values as low as 0.19 and as high as 0.94, indicating a great deal of variability. Habitat quality is typically limited by the number or average dbh of large snags (> 20 inches [51 cm]). Deciduous forests, forested wetlands, and young conifer stands all provide low habitat quality (PacifiCorp and Cowlitz PUD 2004). For more information on pileated woodpeckers, HSI values for habitat variables, and the HSI model, see Chapter 17 (*Species Associations*).

Roosevelt Elk (Cervus elaphus)

The Wildlife Habitat Management Plan lands have an overall low to moderate baseline HSI value for elk (median 0.43, average 0.50), with forage being the limiting factor (PacifiCorp and Cowlitz PUD 2004). Managed forestlands can provide cover habitat for elk or as improved forage and are evaluated in the elk HEP model. Forage habitat – in most cases – was below a threshold of 25 percent for each of the evaluation units (different from the Management Units). For more information on elk, HSI values for habitat variables, and the WDFW elk model, see Chapter 17 (*Species Associations*).

The WDFW elk model was used to calculate habitat quality on PacifiCorp lands surrounding the three reservoirs and was based on the acreage of cover types, evidence of enhanced forage conditions (grass-legume planting, fertilizing and forest management activities implemented to provide understory development of shrubs), road density, and visual security along roads.

Analysis Species: Northern flying squirrel (*Glaucomys sabrinus*), northern spotted owl (*Strix occidentalis*).

See Section 12.5.1 for further information on silvicultural treatments for spotted owl and flying squirrel habitat.

Other Species: Black-tailed deer.

12.3 FORESTLAND MANAGEMENT AREAS

The Wildlife Habitat Management Plan land are divided into 32 Management Units delineated by ownership and natural boundaries, ranging in size from approximately 33 to 831 acres (13 to 340 ha). Each Management Unit contains areas reserved for nonforest management (e.g., shrublands, old-growth, wetlands, oaks, orchards, right-of-way, or agriculture). In addition, buffers for streams and wetlands either have no forest management or a modified forest management (variable thinning), depending on overall site objectives. Past forest management may have Timber Harvest Area boundaries that overlap newly prescribed buffers, and these areas will also receive a modified forestry approach depending on intended management objectives in the buffers. The remainder is intended for forestland management (commercial thinning, uneven or even-aged management) to achieve wildlife habitat management objectives.

Because of topography, buffers, ownership boundaries, and associated access restrictions, some areas of upland forest do not appear feasible for forest management and are designated as "deferred" from conventional forestry. These deferred areas are designated in the forestland Management Unit maps (Appendix 12-1) and will be further refined with field checking as necessary; these deferred areas can be included as buffers, developed for snags, or receive a less conventional approach that does not remove trees from the stands. The final management of these areas will be determined with the TCC at a future time.

The remaining upland forest areas consist of previously managed areas (within the previous 35 years) and un-managed areas that have been initially subdivided into areas of priority or a phased management approach. Three phases are proposed in approximately 16-year periods over the 50-year license period. The first phase would cover the period 2009 through 2024. Forest practices in the first phase would prioritize management based on priority wildlife habitat needs (e.g., improving cover:forage ratios) and targeting vegetation types where forest management would do the most good for the specific objective desired. Each Management Unit has been summarized in terms of vegetation cover types, buffers, and proposed harvest acres in Appendix 12-2 (Management Unit Summaries).

Forest harvests are designed to meet specific size and distribution criteria that would provide a mosaic of cover and forage over the license planning period. Scheduling forest management on a Management Unit basis is intended to meet the overall distribution and diversity of age class objectives for wildlife across the Wildlife Habitat Management Plan area. The schedule of forest management will be developed using planning criteria established using best management practices and reviewed with the TCC so that the long-term distribution of forage and cover can be looked at for any future year of planning.

12.4 INSPECTIONS

12.4.1 Reforestation Inspections

Evaluating the growth of each Timber Harvest Area is necessary to ensure the development of a healthy plantation and identify necessary work associated with interplanting, invasive plant control, tree spacing, forage condition, browse damage to seedlings, trespass issues, and overall seedling development. Two survey inspections are conducted, one in the spring and then again in the fall.

The spring Timber Harvest Area inspection task evaluates winter damage as well as the effect of the previous year's invasive plant species treatments or precommercial thinning treatments. Each harvest unit should be evaluated by June 1st of each year, when shrubs and deciduous trees have reached full leaf development. This is the best time to determine further needs for competition reduction for the benefit of the seedlings and forage. The primary target species that compete with conifer seedlings and can make Timber Harvest Areas inaccessible to big game species are red alder (*Alnus rubra*), scotch broom (*Cytisus scoparius*), salmonberry (*Rubus spectabilis*), Himalayan blackberry (*Rubus armeniacus*) and wild cucumber (*Marah oreganus*).

The second survey inspection of each Timber Harvest Area should be performed in November to identify plantation issues to be managed during the following growing season. The Timber Harvest Area survey results are reported on a spreadsheet (Appendix 12-3). The monitoring report will be used to budget and schedule treatments for the coming year. In general, the Timber Harvest Area should be inspected on a twice annual basis for the first 15 years. After that time, the inspections can occur every 3 years or more, depending on the invasive species concern.

The results of these inspections will ensure that wildlife habitat management objectives are maintained through the initial 15 years of tree establishment. After the first 15 years, Timber Harvest Areas begin to lose a majority of the grass and forbs in the understory, and shrubs become more prominent. Maintaining the herbaceous vegetation in the understory for at least 15–17 years is a function of tree spacing and invasive plant control. At this age, the conifers are of sufficient height that they begin to shade out understory grasses and forbs, and the stands are more effectively hiding cover than optimum forage. Some shrubs should be in the stand at this age and should be noted on inspections.

12.5 MANAGEMENT ACTIONS

The following management actions outline measures to establish and manage harvest practices, maintain existing Timber Harvest Area's and includes best management practices (best management practices) for achieving the Forestland Habitat Management goal. Forestland habitat management is also influenced or guided by objectives identified in other Wildlife Habitat Management Plan chapters. Management actions include the following:

- Best Management Practices
- Harvest Scheduling
- Harvest Area Traverse
- TCC On-Site Meeting
- Regeneration Practices

- Forestland Harvest Planning
- First Precut Survey
- Second Precut Survey
- Timber Harvest Area Inspection

12.5.1 Forestland Best Management Practices

The following management criteria describe the practices and processes used to guide harvest and postharvest activities. Procedures described in the Chapter 14, *Raptor Management* (i.e., Limited Operating Periods, buffering nest sites) are in addition to the practices described here. The WDFW provided a handout at the TCC meeting on May 30, 2006, recommending considerations for tree harvest activities (Appendix 12-4). Those recommendations complement the best management practices.

The following general assumptions were used during relicensing to assess timber management effects on the HEP species:

- Protection and/or selective harvest would be used in riparian buffers and riparian mixed forest vegetation types to increase the number of large trees and create snags, if necessary, to meet optimal numbers. Selective harvest would have the objective to increase the mean number of large trees relative to current conditions as well as develop or retain a diversity of understory and overstory vegetation.
- Upland deciduous stands would be converted to conifer stands or upland mixed stands. Upland deciduous stands are harvested and converted to conifer in all Management Units while retaining deciduous forest components in the buffers or deferred forest areas. Once these stands have been cut, they are planted with conifer seedlings, enter the conifer succession model, and can be thinned once they reach the pole stage. Where sites are more suited to alder as a preferred management outcome (mesic sites), alder may be planted or naturally developed.
- Elk forage and snags would be protected or enhanced in midsuccessional, pole conifer, upland mixed, seedling-sapling, and new seedling-sapling stands through timber harvests. In general, stands can be thinned once as pole and once as midsuccessional; upland mixed stands can be thinned once as well.

Timber Harvest Options

Several methods of timber harvest are used within the Lewis River watershed. These are defined as clearcutting, shelter-wood cutting, selective cutting, and commercial thinning. The specific silvicultural method chosen will be designed to manage the composition, structure, and distribution of vegetative species within the stand to meet habitat and species objectives. The management intent and silvicultural plan will be presented in the Annual Plan and refined by the expectations of the TCC.

The selection of specific silvicultural treatments to manage forest vegetation is dependent on desired site and landscape-level wildlife habitat objectives. Silvicultural treatments will be selected by evaluating the ecological and physical characteristics that influence the site. The ecological characteristics are a function of existing stand conditions (cover:forage ratios, overstory age and species classes, management species requirements and restrictions). The physical properties constrain how management activities can be conducted on the ground (slope, aspect, accessibility, soils, etc.).

- **Clear cutting** is the removal of an entire stand of trees at one time. This practice is also referred to as even-age management because once new trees have been established, they grow under full sunlight into a stand of trees that are all about the same age.
- **Shelter-wood cutting** leaves approximately 20 to 40 trees per acre (49 to 99 per ha) when cutting the rest of the stand. This cutting style is used to reforest harsh or steeply sloped sites, or when managing for more shade-tolerant tree species. The original shelter-wood trees can be removed or retained over the future entries.
- Selective cutting includes many different styles of forest harvest. The reasons for selective cutting can include harsh site conditions; salvage logging of dead or diseased trees, and aesthetic or wildlife habitat considerations. Seed tree or patch cuts are considered types of selective cuts.
- **Commercial thinning** is another type of selective harvest that is an intermediate step in managing a stand. Commercial thinning is usually conducted for better tree spacing. The spacing can modify the overstory to meet understory objectives (enhance shrubs or grasses) and enhance growth in the overstory.

Forest management is the primary tool for managing habitat characteristics for the enhancement of wildlife cover and forage. Cover and forage are the habitat components typically used to describe deer and elk habitat at a Management Unit scale. Cover:forage ratios should be examined to provide a mix of vegetation cover types throughout the Management Unit to minimize energy demands for animals seeking food and shelter. Timber Harvest Areas that are replanted with tree seedlings provide short-term (approximately 15 years) enhanced grass/legume/forbs forage and gradually grow toward a more shrub-based understory of a conifer stand (or hardwood depending on site characteristics). Because forage is a critical need for deer and elk on WHMP lands,

providing a portion of the available forage at a Management Unit level should include some areas of permanent forage (see the *Forage Seeding* section, below). Forage areas for deer and elk can include predominantly shrub sites or more open grass or meadow sites. The biologists should examine the entire Management Unit and identify the forage components most necessary to meet the desired objectives. In establishing Timber Harvest Areas and in managing for cover:forage ratios, it may be desirable to develop permanent forage areas through forest canopy removal and only reseeding with a desired grass/legume forage mix. PacifiCorp should identify some options for permanent forage for the TCC to review in the Annual Plan and then further discuss as part of the On-Site Meeting.

Timber Harvest Area Scheduling and Planning

Forest practices will be scheduled to accomplish the following:

- Minimize disturbance to big game or raptors during critical periods.
- Disperse timber harvest area development to achieve a year-round balance of forage and cover for big game; the timing of harvest for contiguous areas in a Management Unit is determined based on the allocation of cover:forage habitat within a management area and the desire to provide the greatest distribution of cover and forage areas.
- Distribute harvest units throughout the Management Unit in time to avoid having more than 25 percent of the clearcut acres within 10 years of age.
- Locate harvest units to create forage blocks within large, uncut forested areas.
- Schedule timber harvest areas to be dispersed over the Management Unit over the entire rotation period (rotation is a minimum of 60 years of age for conifer).
- Maintain a minimum of 8–10 years between adjacent harvest areas, and provide approximately 200 feet (61 m) of cover between harvests less than 8–10 years old.

Timber Harvest Area Design

- Design harvest units to be no greater than 30 acres (12 ha) in size.
- Design harvest units to conform to topographic features on the landscape where possible.
- Create harvest units where all portions are within 600 feet (183 m) of cover (hiding or thermal).
- Larger timber harvest areas (greater than 10 acres [4.0 ha]) should retain patches of residual vegetation where possible within the Timber Harvest Area boundaries to provide additional security cover and in-stand diversity.
- Leave buffer strips to screen natural openings.
- Provide travel corridors of hiding cover between natural openings and nearby cover.
- Consider development of permanent forage areas as part of larger Timber Harvest Areas or as separate forage areas through the removal of overstory trees and seeding the area to preferred forage without replanting trees. The permanent

forage areas should be developed in consideration of managing for a minimum of 5 percent of a Management Unit's manageable acres.

Retention Trees

- Cedar and cottonwood will be retained outside of all previous (2008) Timber Harvest Areas. The intent is to retain large cedar (> 20 inches [51 cm] dbh); however, cedar that have been planted between 1986 and 2008 in Timber Harvest Areas may be thinned or managed to meet other objectives.
- Clump and group snags (and/or green retention trees) where appropriate.
- Emphasize retention of hollow trees and western red cedar snags.
- Retain all snags greater than 20 inches (51 cm) dbh to the greatest extent practical and considering forest practice regulations for safety. This will require buffering some snags. The intent is not to replace natural snags with artificially developed snags.
- If specific snags cannot be retained for safety reasons, pursue topping them to an acceptable height rather than removing them. Buffer with green retention trees if possible.
- To the extent possible, retain decaying live and defective trees including those showing signs of decay such as top rot, broken tops, fungal conks, dead branch stubs, or other defects.
- Leave a mix of hard and soft snags.

Scarification and Debris Management

- For clearcut harvest areas, the ground will be scarified using a low ground compaction tractor where possible (slope constraints) equipped with a brush blade to remove unwanted vegetation and to prepare the site for grass seeding and tree seedling planting.
- Slash depths greater than 1 foot (0.3 m) will be reduced by piling and selective burning.
- Pile debris away from residual trees and boundaries.
- Approximately 80–90 percent of the debris piles will be burned, retaining some smaller piles where appropriate to serve as visual barriers or protective cover for small mammals and birds.
- Retain large woody debris in Timber Harvest Areas exceeding 24 inches (60 cm) in diameter; to the extent possible (availability and economically feasible), import large woody debris to create 4 logs/acre (9.9/ha).
- Evaluate the potential for broadcast burning following clearcut timber harvests where feasible, economic, and presenting a minimum risk of escape.

Forage Seeding, Tree Seedling Planting:

• Seed forage that is palatable and nutritious to elk at a rate of 20 lbs per acre (22.4 kilograms [kg]/ha). A recommended mix is specified in Table 12.5.2 (later in this chapter) but can be adjusted through consultation with the TCC for specific areas.

- Provide optimum conditions for the healthy growth of seedlings by reducing competition for moisture and sunlight without compromising quality forage production at the early stages of development.
- On favorable tree-growing sites where little or no mortality is anticipated, trees will be planted at a spacing of 12 by 12 feet (3.7 by 3.7 m) for 302 seedlings per acre. Planting density will vary depending on the seedling species and the characteristics of the planting site.
- Provide a minimum of 5 percent of each Management Unit as permanent forage. This includes natural meadows, managed transmission or distribution line rightsof-way, or other vegetation cover types that preclude timber harvest and provide suitable palatable and nutritious forage (e.g., shrublands managed to include enhanced browse production). Where permanent forage is lacking, develop sites (including timber removal) up to 1.5 acres (0.6 ha) and distribute within the Management Units. The 5 percent target is determined from the amount of manageable habitat in a Management Unit (manageable habitat excludes stream, wetland, and shoreline buffers; deferred habitat that is determined to be inaccessible to access). Once permanent forage areas are established as a result of clearing forest vegetation, the sites greater than 1 acre (0.4 ha) should be managed under the goal and objectives established for field and meadow habitat management (see Chapter 8, *Farmland, Idle Fields, and Meadows Habitat Management*).

Competing Vegetation and Seedling Damage

The first year or two of seedling establishment requires reducing moisture competition around seedlings. To ensure the health and survival of seedlings and saplings until they reach a height where they are considered free to grow, an application of pre-emergent herbicide will be used. The application is conducted using a backpack sprayer and applied in an 18-inch (45.7-cm) radius around the tree seedling.

Browse damage by big game or damage by meadow voles (*Microtus pennsylvanicus*) to planted seedlings can lead to injury or mortality of the seedlings. To ensure plant survival in the first few years, seedling protection should be used where necessary. Seedling protection includes using plastic mesh cylinders (trade name Vexar®) around the seedling, staking the cylinders to prevent them from being easily pulled by animals, spraying with an effective nontoxic taste deterrent (Plantskydd ®) and occasionally using garlic tubes (Plant Pro-Tec®) to provide additional olfactory deterrent.

Control of invasive plants is especially necessary in Timber Harvest Areas where the soil disturbance is easily occupied by Himalayan blackberry and scotch broom. See Chapter 13 (*Invasive Species Management*) for further information.

Pre-commercial Thinning and Pruning

• Precommercial thin Timber Harvest Areas before canopy closure eliminates forage species.

- When young trees are approximately 10-13 feet (3-3.9 m) in height, they should be thinned to maintain forage in the understory. Thinning should be conducted using a hack-n-squirt method (herbicides applied to a cut [hack] through the tree bark into the cambium layer). This method of thinning trees, while they are still standing, reduces slash accumulation.
- Fall trees < 3 inches (7.6 cm), and lop and scatter the resulting slash to reduce slash/fuel height.
- When saplings reach a height of 20 to 24 feet (6.1 to 7.3 m), lower branches of the trees should be pruned to a height of 5 to 6 feet (1.5 to 1.8 m).

Commercial Thinning

Commercial thinning can be an effective tool to enhance cover:forage ratios (effectively enhancing understory development) when crown canopies are thinned to less than 70 percent (preferably 50 - 60 percent), depending on existing tree species, age structure, and tree crown forms.

- Alternate blocks thinned to less than 50 percent crown cover to those with greater amounts.
- Thin overstory tree crowns to the degree to permit the most rapid growth and structure development of understory vegetation.

Forest Roads – General Maintenance Practices

• Cut-and-Fill Areas

- a. Remove small debris slumps from the ditches and roadway where necessary. Remove overhanging material from the cut slopes.
- b. Material from small debris slumps or other sources requiring removal shall not be deposited in streams or at locations where it would erode into streams or watercourses.
- c. Undesirable slide materials and debris shall not be mixed into the surface material of the road bed.
- d. Seed all newly exposed cut-and-fill slopes with grass/legume seed mix as necessary to establish vegetation cover. Erosion matting will be used where necessary to protect vulnerable slopes until vegetation becomes established.

• Surface

- a. Grade and shape the road surface, turnouts, and shoulders to the original crown, in slope, or out-slope as needed to provide suitable travel surface and surface water runoff in an even, unconcentrated manner. Grading may be substituted with a lift of surface rock.
- b. Grading will not undercut the back-slope of the bottom of the ditchline.
- c. Desirable surface material will not be graded off the roadway.
- d. Replace surface material lost or worn away.

e. Remove outside berms where present to prevent water being channeled on the roadway.

• Drainage: Ditched Roads

- a. Keep ditches and drainage channels at outlets and inlets of culverts clear of obstructions and functioning as intended.
- b. Inspect and clean culverts annually, with additional inspections occurring every 48 hours during storms and periods of high runoff. This must be done even during periods of inactivity.
- c. Add rock energy dissipater aprons at the outlet of each culvert equaling at least two times the culvert diameter where necessary.
- d. Maintain headwalls to the road shoulder level with material that will resist erosion.
- e. Keep all silt-bearing surface runoff from entering live streams. This will be achieved by adding cross drains to disconnect ditch water from any stream water. In some instances, ditch filters or silt ponds may be installed. These structures shall be inspected and cleaned annually or more frequently as needed.
- f. If an existing cross drain is in good shape and is functionally adequate but it is not 18 inches (46 cm) in diameter, it will remain until it is worn out. When the cross drain is replaced, it will be upgraded to the 18-inch (46-cm) diameter standard.

• Drainage: Out-sloped Roads

- a. Maintain out-slope to a 3 percent grade.
- b. Install drivable dips into subgrade where necessary.
- c. Install water bars as necessary when the road is not in use.

• Crossdrain Installation

- a. All new installations on road grades in excess of 3 percent will be skewed at least 30 degrees from perpendicular to the road centerline.
- b. Cross drains will be installed at a slope steeper than the incoming ditch, but not less than 3 percent nor more than 10 percent.
- c. Construct rock headwalls to the road shoulder level with materiel that will resist erosion.
- d. A rock outfall or a metal flume will be installed on all fill slopes to the toe of the fill. Where there is no fill slope, a rock apron at least two times the diameter of the culvert will be installed.

• Seeps and Springs

- a. All seasonal and year-round springs entering the road ditchline will be cross drained through the roadbed within 50 feet (15 m) of its entry into the ditchline.
- b. Locate new roads away from seeps and springs where feasible.

• Nonfish-Bearing Stream Crossings

- a. All stream crossings will be sized to accommodate the 100-year flood. Riprap will be installed on the inlet of the pipe to resist scour and erosion.
- b. All existing stream crossings will be inspected for scour, delivery, outfall, and flow adequacy. If the structure is functional and in good shape with no evidence of delivery, it will be maintained until replaced. Maintenance will include the installation of riprap at the inlet. Replacement will upgrade that structure to the size needed for a 100-year flood.
- c. Follow Hydraulic Project Approval requirements.

• Fish-bearing Stream Crossings

- a. Stream crossings will be designed and installed to ensure fish passage. All installations will include riprap at the inlet and armoring of the fill slope.
- b. Follow Hydraulic Project Approval requirements.

Silvicultural Considerations for the Northern Spotted Owl (Strix occidentalis)

The northern spotted owl is an analysis species for forestland habitat management. Best management practices for spotted owls will be developed on a case-by-case basis and incorporate literature review and input from the TCC. Spotted owl density is thought to be positively correlated with mature and old-growth forest patch (stand) size (Lehmkuhl and Raphael 1993). Home ranges for this species may be related to prey abundance and can be extremely variable. Owls in mesic westside Washington forests rely on the northern flying squirrel as their primary prey source. Management of spotted owl habitat in Washington should follow similar guidelines as the management of habitat for northern flying squirrels. Secure denning locations, adequate forage material, and a closed canopy are all important to the survival of the northern flying squirrel and therefore also the northern spotted owl. Large-diameter snags are a significant indicator of good spotted owl habitat (Mills et al. 1993). Therefore, management for the northern spotted owl in the Lewis River basin should emphasize the retention and development of blocks of mature and old-growth timber. Clearcuts should not be replaced by extensive commercial thinning, as some owls do not seem to select against fragmentation within their home range (Meyer et al. 1998). Where possible, stands adjacent to existing mature and oldgrowth areas should be managed for early development of key old-growth forest characteristics. In addition, the retention of the oldest existing trees within a stand is critical.

In general, the goal of silvicultural treatments to conserve the northern spotted owl should be to provide a closely spaced reserve of old forest for this species. However, dispersing spotted owls have been shown to range up to 69 miles (111 km), enabling them to move across fragmented landscapes (Forsman et al. 2002). Forestland management objectives that are directed toward enhancing late successional old-growth characteristics will be closely coordinated with the TCC. To achieve some of the Wildlife Habitat Management Plan goals and objectives, active forestland management will occur in suitable spotted owl roosting and foraging habitat or in dispersal habitat (considered unsuitable) and may include the creation of snags, commercial thinning, and small clearcuts. Commercial thinning operations will be designed to accelerate late successional forest habitat characteristics, which may degrade the stands in the short term, but are expected to improve the functionality of those stands for spotted owls and other late successional associated species over the long term (USFWS 2006). The intent for lands within the Siouxon Spotted Owl Special Emphasis Area is to provide a greater level of protection for the spotted owl than would be provided under the Washington Forest Practices Act, and timber management will be conducted specifically for improving habitat for this species.

Silvicultural Considerations for the Northern Flying Squirrel (*Glaucomys sabrinus*)

The northern flying squirrel is an analysis species for forestland habitat management. Northern flying squirrels require a forest mosaic with adequate denning and feeding areas. Flying squirrels are hypothesized to be limited by the presence of secure den locations and adequate forage material (Carey et al. 1997). Den sites include tree cavities formed by wood rot, frost cracking, and woodpeckers, and witches brooms formed by mistletoe infection. These habitat features are more commonly found in mature and old-growth stands. Feeding areas may be in either young or old forests that contain fungi (mushrooms and truffles), berries, and tree lichens (Alaska Department of Fish and Game 1994). Retention and creation of snags that could support cavities for den sites could prove successful in improving habitat for the northern flying squirrel. Residual conifer trees and conifer snags are likely candidates for early successional cavity production.

Silvicultural Considerations for the Columbian Black-tailed Deer (*Odocoileus hemionus columbianus*)

The black-tailed deer is identified as an "other" species for forestland habitat management. Important characteristics of deer habitat are similar to that for elk, but because of the smaller home range of deer (up to 1 square mile [259 ha]), it is important to maintain resources of food, security cover, and thermal cover in close proximity. One of the most important considerations for managing deer habitat is a well-distributed mix of quality forage and cover. Additionally, riparian areas should be protected to provide travel corridors. Black-tailed deer habitat has been reduced in western Washington because of human encroachment, a reduction in timber harvest, and the natural progression of aging timber stands (succession) (WDFW 2008).

Best management practices as described in Section 12.5.1 identify the criteria for distributing cover and forage on a Management Unit scale and for the design of Timber Harvest Areas. Black-tailed deer are often associated with early successional vegetation but are an herbivore that browse a variety of woody plants, graze on grasses and forbs,

and can be found in all terrestrial habitats. In general, the amount of forage in a deer's home range should be between 40 and 60 percent (Washington State University Cooperative Extension et al. 1998). Deer forage (grass and legumes) is most abundant the first 10-15 years following logging, and forage can be enhanced by seeding preferred food plants following timber harvest. Preferred native shrubs include salmonberry, trailing blackberry (*Rubus ursinus*), and vine maple (*Acer circinatum*) and are common within WHMP lands on the Lewis River. Some of the preferred forbs, grasses, and legumes that may do well in Timber Harvest Areas include white clover (*Trifolium repens*), fireweed (*Chamerion angustifolium*), and yarrow (*Achillea millefolium*). Depending on availability and cost, these may be introduced in forage seed mixes.

12.5.2 Forestland Harvest Planning

Harvest planning is primarily determined through examining cover:forage ratios in each Management Unit and intended stand conditions for spotted owl nesting, roosting, and foraging depending on the Management Unit's relationship to spotted owl management circles and the Siouxon Spotted Owl Special Emphasis Area. Planning on an individual Management Unit basis is expected to provide diversity across the Wildlife Habitat Management Plan land ownership. Proposed cover:forage ratios are projected based on evaluating vegetation maps and aerial photographs but will require ground verification and depend on the ability to manage habitat that can be limited by access. Projected manageable habitat is based on geographic information systems maps depicting buffers, slope characteristics, and vegetation types. No projection has been determined for open road buffers because this will be determined on a case-by-case basis. Manageable acres are likely to be less than projected because of other factors (e.g., seeps, raptor nest buffers, etc.) that can only be determined through site-specific surveys. Harvest scheduling is also influenced by the budgets necessary to perform the necessary practices to meet the intended wildlife objectives.

During the first 5 years of implementing the Wildlife Habitat Management Plan, several vegetation cover types will be surveyed to determine the final management prescriptions for those areas (e.g., shrublands). In addition, inventories will be conducted for mature and old-growth forest vegetation cover types, which will refine boundaries and determine strategies for management. Until the inventories are completed and final vegetation cover typing is established, forestland harvest scheduling will focus on the following:

- Maintaining existing Timber Harvest Areas through precommercial and commercial thinning necessary to develop or enhance cover:forage ratios or other forest stand attributes (e.g., mature forest characteristics).
- Establishing improved forage areas through permanent meadow enhancements or development (additional permanent forage can be established through nonforestry practices, such as forage enhancements on transmission line rights-of-way).
- Establishing even-aged management (clearcuts) or commercial thinning in Management Units lacking any enhanced forage.
- Developing tree stand structural components for older age forest requirements through commercial thinning or individual tree management selection criteria.

Annual Plans presented to the TCC will propose 2 years of forest harvest management alternatives. Harvest unit boundaries and roads will be presented on maps such that the specific areas are identified and intended management prescriptions are described. The 2-year schedule will allow for scheduling the necessary raptor surveys in the vicinity of proposed management actions.

Initial planning for forest management for this plan included a review of the geographic information system data for each of the 32 Management Units, with the intent to determine what the overall direction should be for implementing the goal and objectives. For units that are not currently associated with spotted owl management circles or the Spotted Owl Special Emphasis Area, the emphasis will be to develop the cover:forage components for elk and/or deer while also maintaining structural components for species requiring snags, large woody debris, and other structures associated with diverse forests. Existing vegetation cover types along with overlays of stream and wetland buffers, raptor nesting sites, and cover: forage ratios were examined on the geographic information system containing the metrics established during relicensing studies, the Merwin Wildlife Habitat Management Program, and objectives established for buffers. These data provide the basis for determining alternative management strategies both within and between each Management Unit (Appendix 12-1 - Forestland Management Unit Maps). Management Units that contain spotted owl management circles or are associated with the Spotted Owl Special Emphasis Area will be managed to promote those forest characteristics that optimize nesting, roosting, and foraging characteristics where appropriate.

Upland forestland areas consist of previously managed areas (within the past 35 years) and un-managed areas that have been initially subdivided into areas of priority or a phased management approach. There are three phases in approximately 16-year periods over the 50-year license period. Forest harvests are designed to meet specific size and distribution criteria that would provide a mosaic of cover and forage over the license planning period. Scheduling forest management on a Management Unit basis is intended to meet overall distribution and diversity of age class objectives for wildlife across the Wildlife Habitat Management Plan lands. The schedule for forest management will be developed using the planning criteria established in the Wildlife Habitat Management Plan and reviewed with the TCC so that the long-term distribution of forage and cover can be developed and maintained along with managing for late successional habitat characteristics. A summary of each Management Unit is provided below that includes the existing cover: forage ratios, proposed management (indicating cover: forage ratios or late successional habitat), existing permanent forage components, and a summary of proposed planning. A summary of the vegetation cover types and related information for individual Management Units is included in Appendix 12-2.

Management Unit 1

Area:	131.2 acres (53.1 ha)
Existing Cover:Forage Ratio:	52:48
Proposed Management:	50:50 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	5.5 acres (2.2 ha) of right-of-way

This unit is not associated with a spotted owl management circle or within the 2-mile Spotted Owl Special Emphasis Area buffer. It is recommended that management continue to follow a cover:forage ratio of approximately 50:50, as previously managed under the Merwin Wildlife Habitat Management Program. There are approximately 83 manageable acres (33.6 ha) after buffers and deferred management areas are subtracted. Permanent forage is provided on approximately 5.5 acres (2.2 ha). Managing a minimum of 5 percent of the manageable acres as improved forage would require a total of approximately 4.1 acres (1.7 ha) and is currently being achieved on the right-of-way. The balance of maintaining the cover:forage ratio can be achieved through maintaining the existing Timber Harvest Areas on a 60- to70-year rotation and using precommercial and commercial thinning to maximize understory shrub and forage diversity. During the first phase of management (2009-2024), commercial thinning should be conducted in Timber Harvest Area 840107 in approximately 10 more years.

Management Unit 2

Area:	258.3 acres (104.5 ha)
Existing Cover:Forage Ratio:	67:33
Proposed Management:	60:40 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	17.3 acres (7.0 ha) of right-of-way

This unit is not associated with a spotted owl management circle or within the 2-mile Spotted Owl Special Emphasis Area buffer. It is recommended that management follow a cover:forage ratio of approximately 60:40 to promote big game habitat. There are approximately 89.5 acres (36.2 ha) of manageable habitat after buffers and deferred management areas are subtracted, or only 35 percent of the Management Unit because of the narrow, linear ownership in this unit. There is approximately 125 acres (50.6 ha) of mature habitat within the Management Unit (currently deferred), which limits where forest management practices can improve forage distribution. In the first phase of management, it is recommended that additional forest management be scheduled to provide forage on the western one-third of the Management Unit This can consist of approximately 35 acres (14.2 ha) of commercial thinning and some additional harvest of stands north of the right-of-way. Permanent forage is provided on approximately 17 acres (6.9 ha) of right-of-way. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 4.5 acres (1.8 ha) and is currently being achieved on the right-of-way.

Management Unit 3

Area:	297.9 acres (120.6 ha)
Existing Cover:Forage Ratio:	54:46
Proposed Management:	50:50 cover: forage ratio (+/- 5%) for elk
Permanent Forage:	30.6 acres (12.4 ha) of right-of-way, shrubland, and
-	meadows

This unit is not associated with a spotted owl management circle or within the 2-mile Spotted Owl Special Emphasis Area buffer. It is recommended that management continue to follow approximately a 50:50 cover:forage ratio to enhance big game habitat. There are approximately 108 acres (43.7 ha) of manageable habitat after buffers and deferred management areas are subtracted, or only 36 percent of the Management Unit. Permanent forage is provided on approximately 30.6 acres (14.6 ha) of right-of-way. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 5.4 acres (2.2 ha) and is currently being achieved on the right-of-way.

Management Unit 4

Area:	351.8 acres (142.4 ha)
Existing Cover:Forage Ratio:	50:50
Proposed Management:	Spotted Owl Management Circle
	60:40 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	15.7 acres (6.4 ha) of right-of-way; (shrubland to be
	determined)

This unit is associated with a spotted owl management circle that incorporates approximately 159.3 acres (64.5 ha). The Management Unit also has an active bald eagle (Haliaeetus leucocephalus) nest site and receives a high amount of elk use. Management under the previous Merwin Wildlife Habitat Management Program has significantly enhanced elk forage in this unit while retaining habitat that subsequently became occupied by the bald eagle nest site and at least one pair of nesting osprey (Pandion haliaetus). It is recommended that management adjust the cover:forage ratio to a minimum 40 percent forage to retain quality big game habitat (primarily on the west side of the Management Unit) while maintaining at least 50 percent submature habitat or better in the area of the spotted owl management circle per objective h of the raptor management objectives (see Chapter 14). There are approximately 164.3 acres (66.5 ha) of manageable habitat after buffers and deferred management areas are subtracted, or only 47 percent of the Management Unit. Permanent forage is provided on approximately 15.7 acres (6.4 ha) of right-of-way (fertilized and/or mowed), but a large area of shrubland (from the Merwin Wildlife Habitat Management Program) still needs to be evaluated to determine its final management prescription and area. To manage a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 8.2 acres (3.3 ha) and is currently being achieved on the right-of-way. During the first phase of management, the prescription is to manage the upland deciduous cover types within the spotted owl management circle toward establishing conifer. Additional precommercial thinning and commercial thinning would continue on previous Timber Harvest Areas. At present, the Management Unit is receiving high elk use.

Management Unit 5

Area:	359.3 acres (145.4 ha)
Existing Cover:Forage Ratio:	56:44
Proposed Management:	Spotted Owl Management Circle
	60:40 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	2.6 acres (1.1 ha) of oak stands (shrubland to be
	determined)

This unit is associated with a spotted owl management circle that incorporates approximately 163.9 acres (66.3 ha). Management under the previous Merwin Wildlife Habitat Management Program has significantly enhanced elk forage in this unit, which is receiving high grazing use. Because of the spotted owl management circle, it is recommended that management adjust the cover: forage ratio to a minimum of 40 percent forage to retain quality big game habitat (primarily on the east side of the Management Unit) while maintaining at least 50 percent submature habitat or better in the area of the spotted owl management circle per objective h of the raptor management objectives (see Chapter 14). There are approximately 198.5 acres (80.3 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 55 percent of the Management Unit. Permanent forage is provided on approximately 2.6 acres (1.1 ha) of oak stands, but several large areas of shrubland (from the Merwin Wildlife Habitat Management Program) still need to be evaluated to determine the final management prescription. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 9.9 acres (4.0 ha) and is currently not being achieved. Pending trade of a large portion of this unit, only maintenance activities of existing Timber Harvest Areas is planned, although a preliminary phased approach has been identified if ownership of the unit continues. During the first phase of management, the prescription is to manage the existing Timber Harvest Areas within the spotted owl management circle toward establishing conifer and retaining forage through precommercial and commercial thinning. Increasing the permanent forage would be deferred until final disposition of the unit is determined. At present, the Management Unit is receiving high elk use.

Management Unit 6

Area:	831.3 acres (336.4 ha)
Existing Cover:Forage Ratio:	57:43
Proposed Management:	Spotted Owl Management Circle
	50:50 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	31.9 acres (12.9 ha) of right-of-way, oak, shrubland,
	orchards, and meadow (shrubland to be determined)

This unit is associated with a spotted owl management circle that incorporates approximately 73.1 acres (29.6 ha). Management under the previous Merwin Wildlife Habitat Management Program has significantly enhanced elk forage in this unit, and it is receiving moderate to high use. The spotted owl management circle occupies a small amount (9 percent) of the overall Management Unit in the northwest portion of the unit. It is recommended that management maintain the cover:forage ratio at 50:50 to retain quality big game habitat while maintaining at least 50 percent submature habitat or better in the area of the spotted owl management circle per objective h of the raptor management objectives (see Chapter 14). There are approximately 416.2 acres (168.4 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 50 percent of the Management Unit. Permanent forage is provided on approximately 31.9 acres (12.9 ha) and includes quality fertilized right-of-way, orchards, and meadows. Several large areas of shrubland (from the Merwin Wildlife Habitat Management Program) still need to be evaluated to determine the final management prescription. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 20.8 acres (8.4 ha) and is currently being achieved. During the first phase of management, the prescription is to manage the existing Timber Harvest Areas through precommercial and commercial thinning. Within the spotted owl management circle, evaluations will be conducted to assess any site-specific needs toward managing the existing structure of the conifer stands. Currently, greater than 50 percent of the 73.1 acres (29.6 ha) meets the minimum 50 percent submature habitat component necessary for spotted owl management circles.

Management Unit 7

Area:	522.9 acres (211.6 ha)
Existing Cover:Forage Ratio:	60:40
Proposed Management:	50:50 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	4.3 acres (1.7 ha) of right-of-way

This unit is not associated with a spotted owl management circle or within the 2-mile Spotted Owl Special Emphasis Area buffer. It is recommended that the unit continue to be managed toward a 50:50 cover:forage ratio to enhance big game habitat. There are approximately 257.7 acres (104.3 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 49 percent of the Management Unit. Permanent forage is provided on approximately 4.3 acres (1.7 ha) of right-of-way. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total

of approximately 12.9 acres (5.2 ha) and is currently not being achieved. At present, the Management Unit is receiving high elk use. Access to a large portion of the northern half of the unit is limited and may prevent achieving the proposed cover:forage ratio. The first phase of management will continue to manage existing Timber Harvest Areas through precommercial and commercial thinning. Recent (2005) forestland management in this unit is providing significant forage.

Management Unit 8

Area:	281.1 acres (113.8 ha)
Existing Cover:Forage Ratio:	57:43
Proposed Management:	55:45 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	3.4 acres (1.4 ha) of meadow (some additional
-	winter forage in Cresap Park)

This unit is not associated with a spotted owl management circle or within the 2-mile Spotted Owl Special Emphasis Area buffer. The recommended cover:forage ratio is proposed as 55:45 for big game habitat because of the large stream buffers that limit management opportunities in this unit. There are approximately 66.9 acres (27.1 ha) of manageable habitat after buffers and deferred management areas are subtracted, or only 24 percent of the Management Unit. Permanent forage is provided on approximately 3.4 acres (1.4 ha) of meadow, but additional winter forage is available in the Cresap Bay Campground during winter months. This foraging habitat is limited, but the grass parking area and play area were specifically designed to provide the added winter forage. Fall fertilization of this forage area after seasonal park closing provides a small amount of enhanced winter forage. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 3.3 acres (1.3 ha) and is currently being achieved. At present, the Management Unit is receiving moderate elk use in the winter months. Additional commercial thinning or small clearcuts are proposed for evaluation in the first phase.

Management Unit 9

Area:	349.4 acres (141.4 ha)
Existing Cover:Forage Ratio:	51:49
Proposed Management:	50:50 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	14.3 acres (5.8 ha) of right-of-way and orchard

This unit is not associated with a spotted owl management circle or within the 2-mile Spotted Owl Special Emphasis Area buffer. It is recommended that management maintain the cover:forage ratio of 50:50 for big game habitat. There are approximately 173.8 acres (70.3 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 50 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 8.7 acres (3.5 ha) and is currently being achieved. The first phase of management will continue to manage existing Timber Harvest Areas through pre-commercial and

commercial thinning and identify additional harvest management in upland deciduous stands.

Management Unit 10

Area:	349.4 acres (141.4 ha)
Existing Cover:Forage Ratio:	29:71
Proposed Management:	30:70 cover: forage ratio (+/- 5%) for elk
Permanent Forage:	40.5 acres (16.4 ha) of farm, orchard, meadow, and
-	shrubland

This unit is not associated with a spotted owl management circle or within the 2-mile Spotted Owl Special Emphasis Area buffer. Management Unit 10 contains Saddle Dam Farm with its agricultural lands managed for elk forage. It is recommended that management emphasize the importance of forage in this Management Unit and maintain a ratio of approximately 30:70 for big game habitat. There are approximately 44.9 acres (18.2 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 13 percent of the Management Unit. Adequate permanent forage is being maintained within the Saddle Dam Farm. The first phase of management will identify opportunities to manage habitat north of the Saddle Dam Farm.

Management Unit 11

Area:	390.9 acres (158.2 ha)
Existing Cover:Forage Ratio:	41:59
Proposed Management Emphasis:	Spotted Owl Special Emphasis Area and Spotted
	Owl Management Circle
	60:40 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	0.4 acres (0.2 ha) of orchard

This unit is entirely within the 2-mile Siouxon Spotted Owl Special Emphasis Area buffer and within a spotted owl management circle. Management will emphasize providing/developing at least 50 percent of the Management Unit as high-quality nesting spotted owl habitat per objective i of the raptor habitat management objectives (see Chapter 14). It is recommended that management also emphasize the importance of forage in this Management Unit and develop a ratio of approximately 60:40 for big game habitat. There are approximately 204.1 acres (82.6 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 52 percent of the Management Unit. Phase 1 includes management of existing upland deciduous stands to develop the conifer necessary for spotted owl habitat as well as enhancing elk forage for the short term. The existing cover: forage ratio appears to indicate an excessive amount of forage, but this is largely attributed to unmanaged deciduous stands that do not provide adequate forage or overstory thermal cover. Permanent forage for elk is limited. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 10.2 acres (4.1 ha) and is currently not being met. The first phase of management will identify opportunities to manage the existing deciduous habitat while additional precommercial and commercial thinning would continue on previous Timber Harvest Areas. Some of the thinning will be conducted to enhance or accelerate development of conifer structural characteristics for spotted owls.

Management Unit 12

Area:	419.4 acres (169.7 ha)
Existing Cover:Forage Ratio:	61:39
Proposed Management:	Spotted Owl Special Emphasis Area buffer
	60:40 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	29.0 acres (11.7 ha) of right-of-way, meadow,
	orchard, and shrublands

This unit includes a portion of the 2-mile buffer for the Siouxon Spotted Owl Special Emphasis Area of approximately 41.3 acres (16.7 ha). This habitat is located in the eastern portion of the unit, dominated by upland mixed conifer and midsuccessional conifer, which can be managed for providing/developing high-quality nesting spotted owl habitat without limiting management of big game cover and forage habitat. Management under the previous Merwin Wildlife Habitat Management Program has significantly enhanced elk forage in this unit, and there are large meadows that will be further assessed for enhancing potential shrub cover. While most of the manageable acres in this unit have received forest management to improve cover and forage over the past 20 years, large stands of forested habitat (78 acres [31.6 ha]) are deferred, limiting future management to those already in development. It is recommended that management adjust the cover: forage ratio from 50:50 to 60:40. This Management Unit has more deer use than elk, and forage enhancement should focus on retaining a greater browse component where possible. There are approximately 159.6 acres (64.6 ha) of manageable habitat after buffers and deferred management areas are subtracted, or only 38 percent of the Management Unit. Permanent forage is provided on approximately 29 acres (11.7 ha) of right-of-way, meadow (fertilized and mowed), and orchards. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 8 acres (3.2 ha) and is currently being achieved. During the first phase of management, the prescription is to manage existing Timber Harvest Areas through precommercial thinning and commercial thinning.

Management Unit 13

Area:	204.7 acres (82.8 ha)
Existing Cover:Forage Ratio:	95:05 (unmanaged)
Proposed Management:	Limited management due to slope, access, streams
	85:15 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	None

This unit is not associated with spotted owl management areas and has limited access for management. Recommendations are for assessing access through neighboring Washington Department of Natural Resources property to manage a limited amount of upland mixed and midsuccessional habitat on the western-most end of the Management Unit. If access is feasible, there are only 18.5 acres (7.5 ha) potentially manageable to develop a limited amount of forage for big game. Managing to achieve a cover:forage ratio of approximately 85:15 or deferring access altogether may be the best option. There are approximately 18.5 manageable acres (7.5 ha) after buffers and deferred management areas are subtracted. There are no improved permanent forage areas. Because of this unit's proximity to the shoreline and existing osprey nest sites (i.e., two occupied territories), the recommendation for this area is primarily for enhancing as raptor nesting and perching opportunities, which can be achieved with snag development.

Management Unit 14

Area:	119.3 acres (48.3 ha)
Existing Cover:Forage Ratio:	64:36 (unmanaged)
Proposed Management:	Limited management due to slope, access, streams.
	Limited potential for elk; emphasize raptor perching
	and nesting
Permanent Forage:	None

This unit is not associated with spotted owl management areas and has limited access for management. Recommendations are for assessing access through neighboring Washington Department of Natural Resources property to manage a limited amount of young upland mixed and young upland deciduous habitat. If access is feasible, there are only 18.6 acres (7.5 ha) potentially manageable to develop a limited amount of improved forage for big game. Managing to achieve a cover:forage ratio of approximately 60:40 or deferring access altogether may be the best option. There are no improved permanent forage areas. Because of this unit's proximity to the shoreline and existing osprey nest site (one occupied territory), the recommendation for this area is primarily for enhancing as raptor nesting and perching opportunities, which can be achieved with snag development.

Management Unit 15

Area:	529.3 acres (214.2 ha)
Existing Cover:Forage Ratio:	70:30
Proposed Management:	70:30 cover:forage ratio (+/- 5%) for elk
Permanent Forage:	2.5 acres (1 ha) of orchard and meadow

This unit is not associated with spotted owl management areas but does contain the Merwin bald eagle roost. It is recommended that management for the cover:forage ratio be changed from 50:50 to 70:30 for big game habitat. There are approximately 202.1 acres (81.8 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 38 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 10.1 acres (4.1 ha) and is currently not being achieved. The first phase of management will continue to manage existing Timber Harvest Areas through precommercial and

commercial thinning, identify additional harvest management in upland deciduous stands, and establish additional permanent forage areas.

Management Unit 16

Area:	387.8 acres (156.9 ha)
Existing Cover:Forage Ratio:	54:46
Proposed Management:	70:30 cover:forage ratio (+/- 5%) for big game
Permanent Forage:	14.6 acres (5.9 ha) of right-of-way

This unit is not associated with spotted owl management areas but is within the buffer of a bald eagle roost boundary and an unoccupied eagle nest site. It is recommended that management for the cover:forage ratio be changed from 50:50 to 70:30 in recognition of the raptor habitat use in the area and the minimal amount of elk use but considerable deer use. There are approximately 123.3 acres (49.9 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 32 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 6.2 acres (2.5 ha) and is currently being achieved. The first phase of management will continue to manage existing Timber Harvest Areas through precommercial and commercial thinning and identify additional harvest management in upland deciduous and upland mixed stands.

Management Unit 17

Area:	472.0 acres (191 ha)
Existing Cover:Forage Ratio:	37:63
Proposed Management:	50:50 cover: forage ratio (+/- 5%) for big game
Permanent Forage:	61.9 acres (25 ha) of shrubland, meadow, and right-
	of-way

This unit is not associated with spotted owl management areas, nor does it have any osprey nesting use. The high forage component is all related to unimproved forage habitat, primarily consisting of a large shrubland vegetation type and upland deciduous forest. The only previous forest management that has occurred in this unit was conducted on the western portion, which was purchased during relicensing. PacifiCorp has conducted precommercial thinning in those stands, but because the previous owners applied no forage seeding, only a limited amount of forage is available to big game. It is recommended that the cover:forage ratio be established at 50:50, with the objective to manage the upland deciduous stands and conduct some commercial thinning to improve forage in the early part of the first phase of management. There are approximately 254.3 acres (102.9 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 54 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 12.7 acres (5.1 ha) and is currently being achieved (primarily because of the shrubland).

Management Unit 18

Area:	424.4 acres (171.7 ha)
Existing Cover:Forage Ratio:	31:69
Proposed Management:	50:50 cover: forage ratio (+/- 5%) for big game
	Spotted Owl Management Circle (<1%)
Permanent Forage:	33.1 acres (13.4 ha) of right-of-way and meadow

This unit is associated with a spotted owl management circle that incorporates approximately 2.1 acres (0.8 ha) of largely unsuitable habitat (upland deciduous and mixed forest). The high forage component is mostly related to unimproved forage habitat, primarily consisting of upland deciduous and mixed forest vegetation types. No previous forest management has been conducted in this unit. It is recommended that the cover:forage ratio be established at 50:50, with the objective to manage the upland deciduous stands and mixed stands to improve forage in the first phase of management. There are approximately 242.5 acres (98.1 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 57 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 12.1 acres (4.9 ha) and is currently being achieved (primarily because of the transmission right-of-way).

Management Unit 19

Area:	163 acres (66 ha)
Existing Cover:Forage Ratio:	39:61
Proposed Management:	Spotted Owl Management Circle
	60:40 cover:forage ratio (+/- 5%) for big game
Permanent Forage:	3.5 acres (1.4 ha) of right-of-way

This unit is associated with a spotted owl management circle that incorporates approximately 128.3 acres (51.9 ha). This Management Unit is adjacent to the town of Cougar, but there has been considerable elk use in prior years. The high forage component is mostly related to unimproved forage habitat, primarily consisting of upland deciduous and mixed forest vegetation types. Previous forest management in this unit consisted of 29.7 acres (12 ha) of clearcut that is now 22 years old. Forage availability is diminishing as the stands begin to close. It is recommended that the cover:forage ratio be established at 60:40, with the objective to manage the upland deciduous and mixed stands on the east side of the unit away from the residences to improve forage while retaining and promoting larger conifer within the spotted owl habitat on the west. There are approximately 97.7 acres (39.5 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 60 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 4.9 acres (2 ha) and is currently not being achieved. Additional permanent forage can be established in the first phase while logging.

Management Unit 20

Area:	940 acres (380.8 ha)
Existing Cover:Forage Ratio:	37:63
Proposed Management:	Spotted Owl Management Circle
	60:40 cover:forage ratio (+/- 5%) for big game
Permanent Forage:	15.1 acres (6.1 ha) of right-of-way and shrublands

This unit is associated with two spotted owl management circles southwest and northeast of the Management Unit that incorporate approximately 31.2 acres (12.6 ha). The high forage component is mostly related to young mixed vegetation types as the result of timber management conducted prior to the 1990s by previous landowners. The Cougar Creek Conservation Covenant is approximately 151.3 acres (61.2 ha) that forms 500 and 200 foot (152.4 and 61.0 m) buffers around Cougar and Panamaker Creeks, respectively, in the center of the unit. Forage availability is diminishing as the stands begin to close. PacifiCorp conducted extensive precommercial thinning from 2006 – 2008 in these older units to enhance the understory forage. It is recommended that the cover: forage ratio be established at 60:40, with the objective to manage the upland deciduous and mixed stands on the east side of the unit to improve big game forage while retaining and promoting larger conifer within the spotted owl habitat management circles. There are 136 acres (55 ha) designated as deferred management because of the steep rocky slopes on the east of Panamaker Creek and inaccessible habitat because of the conservation buffers protecting Cougar Creek. There are approximately 325.8 acres (131.8 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 35 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 16.3 acres (6.6 ha) and is currently not being achieved. Additional permanent forage would be established in the first phase of logging.

Management Unit 21

Area: Existing Cover:Forage Ratio:	430.3 acres (174.1 ha) 21:79
Proposed Management:	Spotted Owl Management Circle; Spotted Owl Special Emphasis Area; secondary wildlife habitat
Permanent Forage:	20.5 acres (8.3 ha) of right-of-way

This unit is associated with spotted owl management circles southeast and east of the Management Unit, as well as portions of the unit that are within the Spotted Owl Special Emphasis Area. The Management Unit also includes the Cougar and Beaver Bay recreation areas, which are mostly secondary wildlife habitat management areas (72.9 acres [29.5 ha]). Forestland management will be limited to improving habitat related to the spotted owl based on what is feasible because of the limited access on the east end of the unit. The high forage component is mostly related to upland deciduous vegetation types and lodgepole pine (*Pinus contorta*) habitat. The pine stands grow on lava flows

and are unlikely to develop 70 percent crown closure. It is recommended that a cover:forage ratio not be established for this unit, although elk and deer forage within the parks as well as the rest of the unit. Management to improve spotted owl habitat characteristics may provide short-term forage benefits for big game. There are approximately 59.5 acres (24.1 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 14 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 3 acres (1.2 ha) and is currently being achieved.

Management Unit 22

Area:	518.5 acres (209.8 ha)
Existing Cover:Forage Ratio:	33:67
Proposed Management:	Spotted Owl Special Emphasis Area
Permanent Forage:	0.0 acres

This unit is entirely within the Siouxon Spotted Owl Special Emphasis Area. Forestland management will be limited to improving spotted owl habitat based on what is feasible given the limited access. The high forage component is mostly related to upland deciduous vegetation types. It is recommended that a cover:forage ratio not be established for this unit. Management to improve spotted owl habitat characteristics may provide forage benefits to big game. There are approximately 149.7 acres (60.6 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 29 percent of the Management Unit. The first phase of management proposes to examine approximately 100.0 acres (40.5 ha) of upland deciduous and upland mixed forest for improving spotted owl habitat. No permanent forage areas are proposed within this Management Unit.

Management Unit 23

Area:	175.6 acres (71.1 ha)
Existing Cover:Forage Ratio:	37:63
Proposed Management:	Spotted Owl Special Emphasis Area buffer
	70:30 cover:forage ratio (+/- 5%) for big game
Permanent Forage:	0.0 acres

This unit is entirely within the 2-mile (3.2-km) buffer of the Siouxon Spotted Owl Special Emphasis Area. In addition, there is an active bald eagle territory within the unit. Forestland management will manage to provide/develop high-quality nesting spotted owl habitat on at least 50 percent of the unit. Old-growth and mature forest cover types currently represent approximately 65 acres (26.3 ha), or 37 percent of the unit. The high forage component is mostly related to upland deciduous vegetation types and upland mixed cover types. It is recommended that a 70:30 cover:forage ratio be established for this unit to provide some limited big game forage. Management to improve spotted owl habitat characteristics may provide forage benefits to big game. There are approximately 62.5 acres (25.3 ha) of manageable habitat after buffers and deferred management areas

are subtracted, or 36 percent of the Management Unit. The second phase of management proposes to examine approximately 35 acres (14.2 ha) of upland deciduous and upland mixed forest for improving spotted owl habitat. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 3.1 acres (1.3 ha) and is currently not being achieved. Permanent forage areas would be developed as part of the first entry of forest management in this unit without compromising spotted owl habitat.

Management Unit 24

Area:	85.3 acres (34.5 ha)
Existing Cover:Forage Ratio:	N/A
Proposed Management:	Spotted Owl Special Emphasis Area buffer
	Swift Canal bald eagle roost buffer
Permanent Forage:	0.0 acres

This unit is comprised of five polygons of ownership that lie in and along the old Lewis River channel (bypass reach), south of the Swift No. 2 canal. The area is entirely within the 2-mile (3.2-km) buffer of the Siouxon Spotted Owl Special Emphasis Area and within the half-mile (0.8-km) buffer for the Swift Canal bald eagle winter roost. There are no forest management plans for this Management Unit.

Management Unit 25

Area:	143.9 acres (58.2 ha)
Existing Cover:Forage Ratio:	0:100
Proposed Management:	Spotted Owl Special Emphasis Area buffer
	15:85 cover:forage ratio (+/- 5%) for big game
Permanent Forage:	18.3 acres (7.4 ha) of right-of-way and meadow

This unit is entirely within the 2-mile (3.2-km) buffer of the Siouxon Spotted Owl Special Emphasis Area. Forestland management is guided by objective i of the raptor site management plan (see Chapter 14) to provide/develop high-quality nesting spotted owl habitat on at least 50 percent of the land. The existing vegetation cover types in this unit are entirely deciduous hardwoods, except for 4.5 acres (1.8 ha) of upland mixed forest. To meet spotted owl objectives for this unit, it would require converting approximately 72 acres (29.1 ha) of deciduous forest cover types to mature conifer. There are approximately 24.9 acres (10.1 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 17 percent of the Management Unit. It is therefore not possible to meet the requirement of providing 50 percent high-quality nesting habitat for spotted owls in this unit. Because Management Unit 25 is an artificial boundary, it is recommended that meeting the requirements of this objective could be met by applying the objective across both Management Units 25 and 26 combined. Both units are entirely within the 2-mile (3.2-km) buffer of the Siouxon Spotted Owl Special Emphasis Area and together provide 641 acres (259.4 ha) of land with 327.5 acres (132.5 ha) of manageable habitat and the ability to provide 50 percent of their combined acres for high-quality

nesting spotted owl habitat. Combining the units for the purposes of this objective would require managing 320.5 acres (130 ha) to provide high-quality nesting habitat. This option, however, would not provide long-term forage for elk in Management Unit 26. Additional options would be to manage for more than 50 percent of other Wildlife Habitat Management Plan lands in the 2-mile (3.2-km) Spotted Owl Special Emphasis Area buffer to meet the 72-acre (29-ha) deficit in Management Unit 25. The options and a final decision will be discussed within the TCC when annual planning is scheduled for Management Unit 25.

Managing a minimum of 5 percent of the manageable acres in Management Unit 25 as permanent forage would require a total of approximately 1.2 acres (0.5 ha) and is currently being achieved. For elk and deer, the high forage component indicated by the ratio to cover is directly related to the upland deciduous vegetation and upland mixed cover types not providing thermal cover. There are 4.9 acres (2 ha) of improved forage resulting from meadows, and the rest of the permanent forage is within the right-of-way.

Management Unit 26

Area:	497.1 acres (201.2 ha)
Existing Cover:Forage Ratio:	30:70
Proposed Management:	Spotted Owl Special Emphasis Area buffer
	70:30 cover:forage ratio (+/- 5%) for big game
Existing Permanent Forage:	5 acres (2 ha) of meadow

This unit is entirely within the 2-mile (3.2-km) buffer of the Siouxon Spotted Owl Special Emphasis Area. Forestland management is guided by objective i of the raptor site management plan (see Chapter 14) to provide/develop high-quality nesting spotted owl habitat on at least 50 percent of the land. There are approximately 302.6 acres (122.5 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 61 percent of the Management Unit. See the management discussion for Management Unit 25 regarding options for meeting spotted owl habitat objectives in this unit. If Management Unit 26 is managed independently to meet spotted owl objectives, 248.5 acres (100.6 ha) will need to be managed to meet high-quality nesting spotted owl habitat. The midsuccessional conifer cover type (109 acres [44.1 ha]) provides the bulk of the habitat that can be managed in the shortest term to develop high-quality nesting habitat. The remainder would come from existing pole conifer (thinned) stands (53 acres [21.5 ha]) and developing upland deciduous stands into mature/old-growth conifer (65 acres [26.3 ha]). This, along with the existing mature habitat, would meet the 248.5 acres (100.6 ha) of spotted owl nesting habitat.

In 2008, forest management in this unit converted approximately 30 acres (12.1 ha) of upland deciduous stands to much-needed short-term forage for elk and begins the necessary conversion of upland deciduous stands to conifer for future mature/old-growth conifer habitat. The silvicultural prescription of the areas harvested in 2008 will include a mix of western hemlock (*Tsuga heterophylla*), western red cedar, and Douglas-fir

(*Pseudotsuga menziesii*) to complement the already mixed residual conifers retained in the Timber Harvest Area following alder harvest.

Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 15.1 acres (6.1 ha) and is currently not being achieved. In 2008, 1 acre (0.4 ha) of Timber Harvest Area 082605 was developed as meadow (i.e., not planted with conifer seedlings), and an additional 1.5 acres (0.6 ha) of old meadow was rehabilitated to provide additional permanent improved forage. The remainder of the foraging habitat would come through short-term conversions of upland deciduous to conifer and some from rotational forest management on about 70 acres (28.3 ha) (with the sites to be determined). With each entry, additional permanent forage habitat can be developed.

Management Unit 27

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This unit is not associated with a spotted owl management circle or within the 2-mile (3.2-km) Spotted Owl Special Emphasis Area buffer. Previous forest management in this unit has resulted in about 47 percent of the area being a pole vegetation cover type. It is recommended that management initially begin to commercially thin these pole stands to develop forage to enhance big game habitat. There are approximately 135.2 acres (54.7 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 53 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 6.8 acres (2.8 ha) and is currently not being achieved.

Present access is a moderately used public access road through PacifiCorp lands that serves private industrial forest logging interests and private homes. The relationship of this open road and the Forest Service 90 road that bisects the unit limits the security of elk habitat and management potential. Further site reconnaissance will be required to determine best management practices. The first phase of management proposes to manage the pole stands. A recommended cover:forage ratio is undetermined until the unit is further surveyed.

Management Unit 28

Area:	153.8 acres (62.2 ha)
Existing Cover:Forage ratio:	93:07
Proposed Management:	50:50 cover:forage ratio (+/- 5%) for big game
Existing Permanent Forage:	0.5 acres (0.2 ha) shrubland habitat

This unit is not associated with a spotted owl management circle or within the 2-mile (3.2-km) Spotted Owl Special Emphasis Area buffer. The recommended management is to develop a 50:50 cover:forage ratio to enhance big game habitat. There are approximately 65.7 acres (26.6 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 43 percent of the Management Unit. Permanent forage is limited to 0.5 acres (0.2 ha) of shrubland. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 3.3 acres (1.3 ha) and is currently not being achieved. At present, the Management Unit is receiving at least moderate elk use based on pellet counts, although forage in the understory is scarce. The first phase of management proposes to commercially thin or develop shelterwood style harvests in the predominately midsuccessional forest cover type to enhance understory development while retaining overstory structure. Approximately 15 acres (6.1 ha) of this Management Unit is in the jurisdiction of the Cowlitz Indian Tribe and although the land is considered part of the Wildlife Habitat Management Plan lands, the tribe will be consulted regarding any proposed management.

Management Unit 29

Area:	50 acres (20.2 ha)
Existing Cover:Forage Ratio:	18:82
Proposed Management:	50:50 cover:forage ratio (+/- 5%) for big game
Existing Permanent Forage:	0.0 acres

This unit is within the 2-mile (3.2-km) Spotted Owl Special Emphasis Area buffer. The recommended management is to develop a 50:50 cover:forage ratio to enhance big game habitat. There are approximately 31.4 acres (12.7 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 34 percent of the Management Unit. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 1.6 acres (0.6 ha) and is currently not being achieved. Access to the Management Unit needs to be assessed through adjacent properties to determine if forest management is practical. The second phase was chosen to conduct management to allow time to assess management alternatives.
Management Unit 30

Area:	91.2 acres (36.9 ha)
Existing Cover:Forage Ratio:	10:90
Proposed Management:	Spotted Owl Management Circle, Spotted Owl
	Special Emphasis Area
Existing Permanent Forage:	0.0 acres

This unit is entirely within the 2-mile (3.2-km) Siouxon Spotted Owl Special Emphasis Area buffer and within a spotted owl management circle. Management will emphasize providing/developing at least 50 percent of the Management Unit as high-quality nesting spotted owl habitat per objective i of the raptor habitat management objectives (see Chapter 14). Vegetation cover type maps indicate that the unit is composed of mature and upland mixed vegetation types and therefore suitable habitat. The upland mixed cover type is 82 percent of the vegetation cover type and can be highly variable as suitable spotted owl habitat. Phase one management proposes identifying approximately 21.7 acres (8.8 ha) of upland mixed habitat for enhancing high-quality nesting habitat. The area is accessible only from adjacent state or private lands, which will determine final management ability. There are approximately 21.7 acres (8.8 ha) of manageable habitat after buffers and deferred management areas are subtracted, or 24 percent of the Management Unit.

The existing cover:forage ratio appears to indicate an excessive amount of forage, but this is largely because of the unmanaged upland mixed stands that may not provide adequate forage or overstory thermal cover. Permanent forage is limited for elk. Managing a minimum of 5 percent of the manageable acres as permanent forage would require a total of approximately 1.1 acres (0.4 ha) and is currently not being met. The first phase of management will identify opportunities to manage the existing upland mixed habitat to provide enhanced forage for elk while retaining conifer for late successional habitat development.

Management Unit 31

Area:	134.1 acres (54.3 ha)
Existing Cover:Forage Ratio:	N/A
Proposed Management:	Shoreline buffer

Management Unit 31 is comprised of 16 small polygons of PacifiCorp ownership along the shoreline of Swift Reservoir. All of the polygons are individually numbered from 31-1 through 31-16 to allow specific site references and monitoring, but none of the polygons of ownership are planned for forestland management.

Management Unit 32

Area:	27.6 acres (11.2 ha)
Existing Cover:Forage Ratio:	N/A
Proposed Management:	Riparian and shoreline management

This unit is composed entirely of a riparian corridor and the tailrace of Merwin Dam. No forestland management is proposed for this unit.

12.5.3 Harvest Scheduling

Harvest scheduling is specific to forest practices that initiate a timber management activity, such as commercial thinning or clearcutting. For precommercial thinning, this is determined based on annual monitoring of the Timber Harvest Areas and based on assessing the understory forage component, as addressed in Section 12.5.9 (*Regeneration Practices*).

Scheduling a forest harvest practice will begin 2–3 years prior to filing a Forest Practice Application by identifying areas from the Forestry Planning Maps and reviewing relevant information related to the Management Unit's cover:forage ratio for elk, late successional forest habitat development for spotted owl habitat, general forest health (disease, fire, or wind damage) and TCC input. The geographic information system database will be consulted to identify specific vegetation cover types, buffers, and any constraints related to a management activity. In addition the geographic information system will be used to:

- Identify areas from first, second, or third phases of management as appropriate
- Select priority areas based on cover:forage ratios and late successional forest habitat needs
- Check the database for updated information based on streams, raptors, vegetation cover types, and roads
- Prepare base maps for field use

A maximum of 65 acres (26.3 ha) of mid-successional and upland mixed habitat was used in the Lewis River Biological Opinion (USFWS 2006) to establish the potential effect on spotted owls. This will be the maximum harvest (clearcut) per year for the 50-year licenses. The number of acres was established based on the average number of acres harvested under implementation of the Merwin Wildlife Habitat Management Program.

12.5.4 First Precut Survey

The first precut survey is intended to provide a field review of the proposed area of management. Before flagging boundaries or roads, a general walk-through by a biologist and forester will be conducted to familiarize them with the area before making any final plans. The general appropriateness of the management action based on wildlife habitat needs and forestry considerations is assessed. Aerial photographs and inventory maps

should be used and any notes should be identified in field notebooks or on the maps. Specific objectives include the following:

- Determine whether or not the area qualifies as northern spotted owl habitat (change maps as necessary).
- Verify cover:forage ratio (ocular assessment change maps as necessary).
- Verify vegetation cover type mapping (change maps as necessary).
- Identify what the proposed harvest type should be (clearcut, shelterwood, seed-tree harvest) to achieve desired wildlife habitat objectives.
- What the proposed harvest method should be (tractor logging or cable methods).
- Special use areas or considerations (raptor nests, snags, seeps, trespass).
- Access needs and stream crossing considerations (culverts, bridges, temporary crossings).
- Determine buffers for streams, wetlands, shorelines, roads, and raptor nests.
- Determine regeneration considerations based on soils and existing tree growth.
- Schedule protocol raptor surveys for the year preceding and the year of the planned timber harvest activity.

The result of the first precut survey is to flag roads, boundaries, and special use areas so that the area can be traversed for mapping. The survey is recommended to occur from September through December at least 2 years prior to actual management. Boundary flagging should follow the recommendations in Table 12.5.1.

Designation	Meaning	
Orange paint	Retain tree/snag. DO NOT CUT. Trees marked	
	with "S" are designated for developing as a snag	
Blue flagging	Road center-line	
Pink flagging or "Harvest Area Boundary" flagging	Harvest Area Boundary or property line	
Blue paint	Tree selected for harvest/selective harvest	
Yellow flagging – Special Management Area	Identifies retention areas within the proposed	
	management areas (shrub islands etc.)	

 Table 12.5.1 Tree and Timber Harvest Area Marking Codes

12.5.5 Harvest Area Traverse and Geographic Information System Update

The proposed harvest area will be traversed along the flagged boundaries to determine the actual acreage and location, and digitized into the geographic information system database. Based on the mapping results (acres, etc.), the PacifiCorp biologist may need to adjust boundaries as necessary to meet cover:forage objectives. Any additional information from the first precut survey (identification of previously unmapped unique areas or other important features) that may need to be updated into the geographic information system database should be completed.

Following timber harvest, the Timber Harvest Areas are assigned specific identification numbers. The number indicates the year the stand was harvested, followed by the Management Unit number (1 through 32) and then a unique polygon number (e.g.,

920238 indicates that the area is located in Management Unit 2, was harvested in 1992, and the polygon that represents the harvest is number 38).

12.5.6 Second Precut Survey

Once the final proposed boundary has been determined, a second precut survey will be conducted by a PacifiCorp biologist. A Wildlife/Forestry Evaluation Form (Appendix 12-5) will be completed during this survey. Survey sheets will be used to describe existing conditions, identify special wildlife habitat (snags, cottonwoods, cedar, and shrub retention), riparian buffers, vegetation cover type verification, spotted owl habitat verification, and describe the proposed forestland management practices.

During the second precut survey, all trees to be retained should be marked according to the tree marking codes (Table 12.5.1). Additional marking may include selected shrubs or retention of special habitat islands (e.g., rock outcrops) within the Timber Harvest Area. A final harvest area map will be prepared that delineates the boundaries, roads, and any additional habitat information to present to the TCC as part of the Annual Plan or at other regularly scheduled TCC meetings.

12.5.7 Terrestrial Coordination Committee On-site Meeting

Following the Annual Report meeting with the TCC, a field meeting will be scheduled for agency review and comment on any proposed forestland habitat work anticipated for the current or future year actions. The field review should include a discussion of the goals and objectives of the proposed action, results of any field surveys, and recommendations for management.

Following the field review by the TCC, PacifiCorp will prepare final contract specifications for administration of the logging that identifies resource expectations and compliance requirements.

12.5.8 Timber Harvest Area Inspections

During logging operations, weekly inspections will be conducted by a PacifiCorp biologist and/or forester to ensure compliance with the best management practices and contract conditions. PacifiCorp uses a contract forester to supervise the logging and is responsible for ensuring that the objectives of this plan are consistent with the State Forest Practices Act and industry standards, as applicable.

12.5.9 Regeneration Practices

General

The objectives of reforestation must comply with the State Forest Practices required under Washington Administrative Code 22-34-010 and conform with the forestland

habitat goal and objectives. Regeneration objectives include development and maintenance of cover (both for hiding and thermal) and forage (grass/legume component and shrubs) while promoting forest habitat diversity. Regeneration practices, including planting a mix of tree species along with the retention of some trees and shrubs throughout the Timber Harvest Area, will provide structural diversity throughout the Management Unit; diverse structural components and species in the understory and overstory are intended.

Site Preparation for Regeneration

For clearcuts, site preparation for regeneration includes tractor scarification or using a shovel loader to pile the residual slash resulting from the logging. The objective of site preparation is to provide a seed bed for grass/legume planting, reduce competition for tree seedling establishment, and minimize dead organic material within the plantation that may impede movement of big game species. The slash should be piled as free of dirt as possible using a brush blade on a low ground compaction tractor, or piled with the shovel loader and piled away from leave trees to allow for burning after the piles have dried. Approximately 10 percent of the smaller slash piles are intended for retention to provide habitat for small birds and mammals. Within commercial thinning operations, slash should be minimized by hauling unmerchantable material to a landing or lopping and scattering slash such that accumulations do not exceed 6 inches (15 cm) over more than 50 percent of the area.

Forage Seeding

Following site preparation and just prior to fall rains (prior to October 1), the grasslegume forage mix should be applied at a rate of 20 lbs/acre (22.4 kg/ha) on freshly scarified soil. All disturbed areas will be seeded to provide improved forage production and reduce the establishment of invasive species. Two seed mixes have been developed, depending on shade conditions (clearcut mix vs. commercial thin mix; Table 12.5.2).

Common name (Varieties)	Lbs (% by wt.)
Clearcut Mix	
Perennial Ryegrass (Tetra Perennial)	7 (35%)
Annual Ryegrass	1 (5%)
Orchard grass (Pomar, Penniate, Latar, Able)	2 (10%)
Subclover (Mt. Baker Tallarook)	5 (25%)
White Clover (new Zealand)	1 (5%)
Birdsfoot trefoil (cascade, Leo) or Big Trefoil (Marshfield)	4 (20%)
TOTAL	20 lbs/acre
Commercial Thin Mix	
Fescue (Johnstone)	17 (85%)
Big Trefoil (Marshfield) or Birdsfoot trefoil (Cascade, Leo)	2 (10%)
Annual Ryegrass	1 (5%)
ΤΟΤΑΙ.	20 lbs/acre

Table 12.5.2 Recommended Grass-Legume Seed Mix for Timber Harvest Areas

Composition of seed mix may vary based on availability or based on substitutions determined by the TCC. Seed should be stored in a cool dark location to extend life of inoculants (DORMAL). Seed should be applied on freshly scarified soil in fall. Lbs = pounds

Planting and Maintenance

Timber harvest areas will be replanted with conifer species (Douglas-fir, ponderosa pine [*Pinus ponderosa*], western red cedar, and western hemlock) where appropriate or with hardwoods (alder and cottonwood) in more mesic sites. The exact percentage of each species will be determined on a case-by-case basis depending on site conditions and overall management intent. Site conditions may favor one tree species over another, and management intent could include favoring specific reforestation for developing northern spotted owl habitat, big game habitat, or general diversity.

Providing optimum conditions for the healthy growth of seedlings is achieved by reducing competition for moisture and sunlight without compromising quality forage production at the early stages of development. Maintaining adequate spacing of tree saplings promotes understory development and diversity, hiding cover, and can diversify the overstory structure, depending on specific site objectives.

Tree Seedlings

Conifer species used for regeneration include primarily Plug-1 Douglas-fir for average sites and Styro-15 Douglas-fir for dry south slopes and/or rocky sites. Western red cedar, western hemlock, and ponderosa pine are used on appropriate micro sites. Species other than Douglas-fir (ponderosa pine, western red cedar, and hemlock) are used in root rot sites, where more shade-tolerant species are required and to provide both species and structural diversity.

Planting

Planting density will vary depending on the species of seedling and the characteristics of the planting site. To meet a minimum stocking objective of approximately 302 well-spaced seedlings per acre (746 per ha) in 5 years after planting, a higher number of seedlings may need to be planted. Some mortality must be anticipated for all species, even on favorable planting sites. On very favorable sites where little or no mortality is anticipated, Douglas-fir is planted at a spacing of 12 by 12 feet (3.6 by 3.6 m) for 302 seedlings per acre (746 per ha). On average sites for Douglas-fir where some mortality is anticipated or where other species are desired, seedlings are planted at a spacing of 11 by 11 feet (3.4 by 3.4 m) for 360 trees per acre (890 per ha). On severe sites where significant mortality is anticipated, seedlings are planted at a spacing of 10 by 10 feet (3 by 3 m for 435 trees per acre (1,075 per ha).

Invasive Plant Control

Preventing invasive species from becoming well established in Timber Harvest Areas requires extensive treatment through the plantation's first 10 years and can still be required through the next 5-10 years. At the first year of a newly established Timber Harvest Area, OUST® (pre-emergent herbicide) will be applied in an 18-inch (46-cm)

radius around the individual seedlings to prevent moisture stress to the tree. This sometimes requires application during the first 2 years after establishment to ensure the seedling has adequate root growth. During the second year of Timber Harvest Area seedling growth, alder and Himalayan blackberry will often become established. Where these species interfere with development of establishing conifer tree cover (thermal and hiding) or reduce forage, they should be controlled as necessary to meet the specific wildlife habitat objectives established for the Timber Harvest Area. On mesic sites, salmonberry and wild cucumber can also become established and may require immediate treatment before they overtop young tree seedlings. Where appropriate, any herbicide application to improve tree seedling growth should also include recognition of specific species of shrubs that should be retained when not interfering with overall management objectives for establishing thermal cover. Specific procedures for applying herbicides are within the contract specifications and are not presented here but are available upon request.

Precommercial Thinning

The objective of precommercial thinning is to provide optimum spacing of seedlings to minimize competition with forage species while ensuring adequate spacing to accomplish cover objectives. Prune trees to increase forage development in the understory. Maintain hiding cover (< 200-foot [61-m] sight distance) while still encouraging understory development. Care should be taken to identify and avoid shrub species that have been designated for protection. Hardwood tree species that are to remain in the plantation include cottonwood and dogwood (Cornus stolonifera). Trees and shrubs that provide forage but are competing for sunlight with desired conifer seedlings can be pruned to promote resprouting and reduce competition. This is only done where these trees and shrubs are within 5 feet (1.5 m) of the lateral branches of the seedlings. The trees include wild cherry (Prunus emarginata) and cascara (Frangula pursiana), and the shrubs include elderberry (Sambucus racemosa), beaked hazel (Corylus cornuta), ocean spray (Holodiscus discolor), and trailing blackberry (Rubus ursinus). Target species for herbicide application will typically include scotch broom, Himalayan blackberry, red alder, big leaf maple, and nonindigenous species such as holly (Ilex aquifolium) and empress trees (Paulownia tomentosa).

The objective of precommercial thinning is to maintain a forage component in the understory on approximately 50 percent of the area for the first 15 years while additionally developing the proper spacing, growth form, and vigor of the saplings. The removal of saplings from the plantation is either by chainsaw cutting of trees 5 to 7 feet (1.5 to 2.1 m) tall or by herbicide application (hack and squirt) for larger trees. The first precommercial thinning is conducted at an early age of the plantation (usually <10 years) so as not to impact wildlife travel through the area. When the average trees in the plantation are 5 to 7 feet (1.5 to 2.1 m) tall, the spacing objective is approximately 14 by 14 feet (4.2 by 4.2 m) or 222 trees per acre (549 per ha). This is an important procedure where natural reproduction has increased tree density or where planting site requirements called for high-density spacing. When chainsaws are used, the sapling is cut within 4

inches (10 cm) of the ground and the limbs are lopped off and scattered to accelerate decomposition.

When saplings reach a height of 20 to 24 feet (6 to 7.3 m), the lower branches of the trees should be pruned to a height of 5 to 6 feet (1.5 to 1.8 m). This practice will allow additional sunlight to reach the forest floor, encouraging the growth of grass, forbs, and shrubs. Pruning should be performed with the intent of not opening up long visual corridors (to ensure that hiding cover is maintained). Some of the dominant leave trees should not be pruned for the purpose of visual screening within the understory.

The spacing objective when the plantation trees average 20 to 24 feet (6 to 7.3 m) in height is approximately 15 by 15 feet (4.5 by 4.5 m) or 194 trees per acre (479 per ha). This is a critical age for evaluating leave trees in the stand since dominance and growth characteristics have become apparent. During a precommercial thinning at this time, leave trees should be well-spaced dominant and codominant trees.

At this age, the saplings are of sufficient size that cutting them down will create an impediment to wildlife. Removing saplings from the stand without adverse impacts on wildlife is best achieved by herbicide application. The hack-and-squirt method is used where one hatchet mark is made every 3 inches (7.62 cm) in circumference at waist height. Enough herbicide should be applied to saturate the hatchet mark without the herbicide running out onto the bole of the tree. Evidence of the effectiveness of this herbicide may take from 1 to 6 months.

12.6 SCHEDULE AND ESTIMATED EFFORT

The table below lists the schedule, estimated effort (hours and cost), and documentation requirements for each task.

Procedures	Completion Date	Timing	Effort/Cost (\$)	Documentation
Inspections				
Spring Timber Harvest Area Survey	June	May-June	40 hours	Annual Report
Fall Timber Harvest Area Survey	November	Field work: Nov 1 to November 30 Analysis: Dec 1 to December 31	Est. 3 hours per Timber Harvest Area + 20 hours total for analysis (avg. 140 hours)	Data Forms and Analysis
Management Actions		1		
Harvest Planning	Optional ¹	January 1 to December 31	40 hours/yr	Annual Report
Harvest Scheduling	December	January 1 to December 31	8 hrs/yr	Wildlife Habitat Management Plan
First Precut Survey	December	January 1 to December 31	1.0 hr/acre (0.4 ha)	Data Forms
Timber Harvest Area Traverse and GIS Update	January	January 1 to December 31	24 hrs / yr	Geographic Information System Maps
Second Precut Survey	March	January 1 to December 31	2.5 hrs/acre (0.4 ha)	Data Forms
TCC On-Site Meeting	April	April to May	16 hours	To Be Determined
Timber Harvest Area Logging Inspections	September	July 1 to September 30	60 hrs/yr	N/A
Snag Development	Optional ¹	July 15 to December 30	\$75-125/tree	Annual Report
Regeneration		1		
Site Preparation	October	July 1 to September 30	12 hrs/10 acres (4 ha)(contract) Inspection (10 hrs/yr)	N/A
Purchase Forage Mix	August	August	\$1,200/yr; depending on acres (30 acres [12 ha] est.)	Requisition
Forage Seeding	September	September 15 to September 30	Contract (3 days/yr)	Annual Report
Invasive Species; OUST	May	April 1 to May 15	\$45/acre (0.4 ha)	Annual Report
Invasive Species. (e.g., blackberry, etc.)	November	April 1 to November 15	\$75,000.00 - \$100,000.00 yr	Annual Report
Precommercial thinning	December	January 1 to December 31	\$40,000.00/yr	Annual Report

 Table 12.6.1 Forestland Management Schedule and Estimated Effort

¹Optional management actions are actions that are chosen to be implemented according to need or opportunity. GIS = geographic information system.

12.7 TIMBER HARVEST EXPENSE ALLOCATION

WHMP funding, as described in the Settlement Agreement 10.8.2.1, will not include expenses that occur as a result of timber harvest activities that are considered to be standard forestry practices. However, the WHMP requires several forestland management actions that are above and beyond standard forestry practices; as such, the expenses associated with these management actions will be included in the WHMP funding. Table 12.7.1 lists all of the anticipated timber harvest practices (standard forestry practices and forestland management actions) and the expense allocation between PacifiCorp and WHMP funding. Estimated cost and effort are site specific and determined following harvest planning; therefore, they are not included in the table.

Practice	PacifiCorp	WHMP
Spring Timber Harvest Area Survey		X
Fall Timber Harvest Area Survey		X
Harvest Planning		X
Harvest Scheduling		X
First Precut Surveys		X
Property Survey	X	
Timber Harvest Area Traverse		X
Geographic Information System Update	Х	
Second Precut Survey		X
TCC On-Site Meeting		X
Logging Costs (fall, buck, load, haul)	X	
Logging Costs (above and beyond standard forest practices)		X (not to exceed 10% of logging costs)
Timber Harvest Area Inspection		X
Site Preparation for Regenerating (scarification and debris management)		X
Purchase Forage Seed Mix		X
Forage Seeding		X
Permanent Forage Area Development (stump removal, cultivation, etc.)		X

Table 12.7.1 Timber Harvest Expense Allocation between PacifiCorp and WHMP

Practice	PacifiCorp	WHMP
Snag Development		X
Road Construction and Maintenance (Road Maintenance and Abandonment Program activities included)	X	
Access Control (gate purchase and placement)	X	
Invasive Plant Control (grasses and other competing vegetation)		X
Tree Seedlings	X (Douglas-fir)	X (seedlings other than Douglas-fir and planting above and beyond standard forest practices)
Planting	X	
Pre-commercial Thinning		X

 Table 12.7.1 Timber Harvest Expense Allocation between PacifiCorp and WHMP

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Nation, Washington Department of Fish and Wildlife, Washington Interagency Committee for Outdoor Recreation, Cowlitz County, Cowlitz- Skamania Fire District No. 7, North Country Emergency Medical Service, City of Woodland, Woodland Chamber of Commerce, Lewis River Community Council, Lewis River Citizens At-Large, American Rivers, Fish First, Rocky Mountain Elk Foundation, Trout Unlimited, and the Native Fish Society. 2004. Settlement Agreement Concerning the Relicensing of the Lewis River Hydroelectric Projects, Federal Energy Regulatory Commission Project Nos. 935, 2071, 2111, and 2213, Cowlitz, Clark, and Skamania Counties, Washington. November 30, 2004.

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13.0 INVASIVE PLANT SPECIES MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

Appendix 13-1: Washington State and Country Noxious Weed Control Board Noxious Weed Lists and Other Invasive Plant Species on Lewis River Wildlife Habitat Management Plan Lands

Appendix 13-2: Ground Disturbance Form

Appendix 13-3: Invasive Plant Species Monitoring Form

13.1 INTRODUCTION

This chapter describes the invasive plant species goal and objectives, management actions, and schedule on the Lewis River WHMP lands. It compiles information on invasive plant species management from Section 4.1 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006) and Schedule 10.8 Section 2.11 of the Settlement Agreement (PacifiCorp et al. 2004). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives. Finally, experience gained from implementing invasive plant species management on the Merwin Wildlife Habitat Management Program lands was used to refine management practices (PacifiCorp 1998).

Invasive plant species are plants that are so reproductively successful and aggressive they can dominate an area, interfering with the natural function and diversity of the system (Twin Groves 1998). Invasive plant species may include both native and non-native species and can reduce crop yields, decrease wildlife habitat value, clog waterways, and harm wildlife and domestic animals (Noxious Weed Control Board 2005). As a result, the Settlement Agreement and TCC have identified invasive plant species management as important for maintaining quality wildlife habitat.

The Washington State Noxious Weed Control Board defines noxious weeds as nonnative plants introduced into Washington through human actions and that are highly destructive, competitive, or difficult to control because of their aggressive growth and lack of natural enemies (Noxious Weed Control Board 2005). The Noxious Weed Control Board maintains a list of plant species or cultivars that are designated as noxious weeds and categorizes the noxious weeds into classes according to the seriousness of the threat they pose to the state or region of the state (Appendix 13-1). The classes are as follows (Noxious Weed Control Board 2006):

- Class A: are non-native species with a limited distribution in the state.
- **Class B**: are non-native species whose distribution is limited to portions of the state. In regions where they are already abundant, control is decided at the local level.
- **Class B designate**: are Class B noxious weeds that are designated for control in regions where they are not yet widespread.
- **Class C:** are non-native species that are considered widespread or of special interest to the agricultural industry.

According to the Revised Code of Washington 17.10.140, land owners are required to eradicate all Class A weeds and control and prevent Class B weeds designated for control in that region, and Class B and C weeds listed on the county weed list as mandated for control within and from the owner's property.

13.2 MANAGEMENT GOAL AND OBJECTIVES

The goal and objectives and species association for invasive plant species management are presented below.

13.2.1 Goal

Work to prevent the establishment and spread of weeds currently listed by the Washington State Noxious Weed Control Board and Clark, Cowlitz, and Skamania County weed control boards, and other undesirable or invasive plant species identified by the TCC.

13.2.2 Objectives

- **Objective a:** Identify infestations of weeds and other undesirable or invasive plant species as part of implementation of Annual Plans. Priority infestations for treatment will be mapped and included in the Annual Report.
- **Objective b**: Identify and implement best management practices over the life of the licenses to discourage and control the establishment of weeds and other undesirable or invasive plant species in areas disturbed by Project operations and maintenance, wildlife habitat management, and recreation-related activities.
- **Objective c**: Control known infestations of Class A and B designate weeds and other undesirable or invasive plants, as part of implementing Annual Plans for habitat management activities.
- **Objective d**: Monitor the effectiveness of control measures and best management practices over the life of the licenses.
- **Objective e**: Coordinate with public and private land managers to control priority infestations of invasive non-native plant species on their lands within the Project boundary and on adjacent lands.
- **Objective f:** Coordinate with the county weed control boards to meet state and local noxious weed objectives and requirements on WHMP lands.

13.2.3 Species Association

There are no species associations that were identified for invasive plant species management.

13.3 INVASIVE PLANT SPECIES MANAGEMENT AREA

Surveys for invasive plant species on WHMP lands were conducted during relicensing in 2000 and 2001 (PacifiCorp and Cowlitz PUD 2004). Currently, there are no known Class A species on the Lewis River WHMP lands and only one known infestation of a Class B designated weed (policeman's helmet [*Impatiens glandulifera*]), which was treated in 2006. Several Class B and Class C species exist on WHMP lands, particularly in disturbed areas. In addition, there are several invasive plant species on the WHMP lands that are not designated as noxious weeds but are extremely invasive, detrimental to habitat quality, and require control treatments. Appendix 13-1 provides a list of the state and county classified weeds, as well as nonclassified invasive plant species that have been treated on the WHMP lands. Because invasive plant species can occur on any of the WHMP lands, there are no designated management areas; however, the majority of control treatments for invasive plant species occur within timber harvest areas. In addition, transmission line rights-of-way, roads, and other disturbed habitat areas are also treated as necessary.

13.4 MANAGEMENT ACTIONS

The following management actions include measures to manage invasive plant species in a condition consistent with the management goal and objectives, specifically to control infestations. Management actions include the following:

• Prevention

• Detection

• Treatment

13.4.1 Prevention

Prevention procedures will be applied to all ground-disturbing activities that are 1,000 square feet (93 m^2) or greater in size and will include evaluations, monitoring, and best management practices. The evaluations and monitoring will not apply to timber harvest areas, which are inspected annually in November to evaluate the overall stand condition and competing vegetation (see Chapter 12, *Forest Management*).

Pre-Ground Disturbance Evaluation

Before ground-disturbing activities occur, the project area, access route, and staging areas will be inventoried for existing invasive plant species infestations; the risk of existing invasive plant species spreading or new invasive plant species establishing will be assessed; and prevention practices will be identified. It is preferred that the areas be inspected during the growing season (i.e., between May 1 and August 30) (Cheney et al. 2002). Emergency situations may require inspections to occur at any time of the year and possibly after the ground-disturbing activity has occurred. Pre-ground disturbance evaluations will be recorded on the Ground Disturbance Form provided in Appendix 13-2.

Post-Ground Disturbance Monitoring

Following ground disturbance, a project area will be monitored annually for up to 3 years to insure that invasive plant species populations are under control and not expected to spread. The inspections will occur during the growing season (May 1 and August 30) to identify annual weeds. Post-ground disturbance evaluations will be recorded on the same Ground Disturbance Form (Appendix 13-2) as the pre-ground disturbance evaluations.

Best Management Practices

Best management practices were developed to prevent the spread and establishment of invasive plant species in ground disturbance areas. These best management practices were developed through literature review and experience gained through implementation of the Merwin Wildlife Habitat Management Program. Although these best management practices are applicable to most projects, each project is unique and may require fine-tuning. Applicable best management practices will be described in the pre-ground disturbance evaluation and recorded on the Ground Disturbance Form (Appendix 13-2).

The following is a list of general best management practices that could be applied to most projects (U.S. Forest Service 2001).

- Before ground-disturbing activities occur, evaluate the project site and staging areas to inventory invasive plant species populations, assess risk of invasive plant species establishment and spread, and identify best management practices.
- Where feasible, control infestations of existing priority invasive plant species in the project area, access route, and staging areas prior to conducting the ground-disturbing activity.
- Locate and use weed-free project staging areas, where possible.
- Keep soil disturbance to a minimum to prevent weed germination and establishment.
- Revegetate disturbed soil in a manner that optimizes plant establishment for that specific site.
- Use certified weed-free or weed-seed-free hay or straw as necessary and when reasonably available or use a commercial biodegradable matting when mulch is necessary on reseeded, disturbed sites.
- Avoid or minimize traveling through areas infested with invasive plant species, or restrict traveling to periods when spreading seeds or propagules are least likely.

13.4.2 Detection

Although the entire WHMP lands will not be surveyed for invasive plant species annually, there will be many opportunities for incidental surveys during regularly scheduled inspections (e.g., ground disturbance surveys, aerial surveys, and road, forestry, and transmission line inspections). Only significant invasive plant species infestations will be mapped and recorded on the Invasive Plant Species Monitoring Form provided in Appendix 13-3. Each identified invasive plant species infestation will be assigned a priority using the following criteria (U.S. Forest Service 2005):

- **Priority 1** All Class A, Class B designated weeds, aggressive new species with the potential to cause significant ecological impact, and invasive plant species in areas scheduled for a ground-disturbing activity within the year.
- **Priority 2** Class B, C, or nonlisted invasive plant species with high potential to spread (e.g., in open roads, parking lots, trailheads, campgrounds, borrow areas) or will negatively impact an area of special concern (e.g., fish-bearing streams, unique areas, or designated big game forage areas).
- **Priority 3** Control of existing large infestations (greater than 0.25 acres [0.1 ha) of Class A and Class B designated noxious weeds.
- **Priority 4** Containment of existing large infestations (greater than 0.25 acres [0.1 ha]) of Class B, C, or other unlisted invasive plant species.

• **Priority 5** - Suppression of existing large infestations – when eradication/control or containment is very difficult and the invasive plant species population is relatively contained.

All Invasive Plant Species Monitoring Forms will be submitted in the Annual Report and prioritized for treatment in the following year's Annual Plan. Priority 1 species and areas identified in the report will be treated in the same operating year if possible. The Noxious Weed Control Board and county weed control board lists will be updated annually in the Annual Plan.

13.4.3 Treatments

Invasive plant species populations may be treated manually, mechanically, biologically, culturally, with prescribed burns, and chemically. These methods may be used singularly or in combination to effectively manage populations of invasive plant species. The following is a description of the control methods (U.S. Forest Service 2005).

- **Manual or Mechanical** Manual and mechanical treatments physically remove and destroy, disrupt the growth of, or interfere with the reproduction of invasive plants. These treatments can be accomplished by hand, hand tool (manual), or power tools (mechanical); and include pulling, grubbing, digging, hoeing, tilling, cutting, mowing, and mulching of the target plants.
- **Cultural** Cultural methods are generally targeted toward enhancing desirable vegetation to minimize invasion. Common cultural treatments include planting or seeding desirable species to shade or outcompete invasive plants, applying fertilizer to desirable vegetation, and controlled grazing.
- **Biological Control** Biological controls are the deliberate use of natural enemies (parasites, predators, or pathogens) to reduce weed densities. Biological control may be used if appropriate when invasive plant populations have become so large that eradication or control is no longer deemed possible.
- **Prescribed Fire** Prescribed fire can reduce the abundance of some species by preventing flower or seed set, destroying seeds, stimulating germination (for future seedling treatments), depleting carbohydrate reserves, or killing perennating tissue (such as rhizomes, bulbs, or buds). In addition, fire can be used to facilitate revegetation, increase herbicide efficacy, and remove litter to assist in emergence of desirable species.
- **Chemical** Herbicide treatment consists of applying chemicals, usually of a manufactured or synthetic origin, to a plant or to soil. The herbicide interferes with plant metabolic processes, stopping growth and usually killing the plant.

Determining the best method or combination of methods to use is dependent on the invasive plant species population, topography, adjacent vegetation, and impacts on

sensitive environmental resources. Therefore, each method should be considered for effectiveness, cost, and practicality. In practice, PacifiCorp has not used prescribed fire because of its inherent risks and permitting difficulties but maintains the option where it may be preferred. All treatment methods will be recorded on the Invasive Plant Species Monitoring Form (Appendix 13-3).

Best Management Practices

Best management practices are developed to reduce the impact and improve the effectiveness of implementing control treatments. Although these best management practices are applicable to most invasive plant species populations, each invasive plant species population is unique and may require additional best management practices to be developed. All best management practices will be recorded on the Invasive Plant Species Monitoring Form (Appendix 13-3). The following is a list of general best management practices that can be applied to most invasive plant species treatments:

- Avoid creating soil conditions that promote weed germination and establishment.
- Coordinate project activities with any nearby herbicide application to maximize the cost effectiveness of weed treatments.
- Coordinate with public and private land managers to control priority invasive plant species infestations on their lands (i.e., all WHMP lands and adjacent private land).
- Use herbicides in accordance with label instructions, permits, and other applicable state requirements.
- Control measures for the application of pesticides to waters of the state must adhere to conditions stated in the Certificates for Section 401 Federal Water Pollution Control Act for Merwin, Yale, and Swift Hydroelectric Projects, Section 4.7, Pesticide Application (Washington Department of Ecology 2006a, 2006b, and 2006c).
- Invasive plant species control methods occurring below the ordinary high water mark should be conducted when the streams are at their lowest flow (August 1 through October 15).
- Herbicide applications should only treat the minimum area necessary to meet the site objectives.
- Herbicide application will occur when wind velocity is less than 5 miles per hour (8 km per hour). Winds above 5 miles per hour (8 km per hour) may cause drift; therefore, all spraying must cease when spray patterns cannot be kept on target. The applicator may need to begin application early in the morning to cover as much area as possible before the wind velocity rises.
- Most herbicide applications should be discontinued if rainfall is threatening, or the treatment postponed until favorable conditions are present. However, some herbicides, such as pre-emergents, should be applied just prior to rainfall. In all cases, follow herbicide instructions on the label.
- Aquatic-labeled herbicides or herbicides with lower risk to aquatic organisms would be applied using spot or hand/selective methods within 15 feet (4.6 m) of wet roadside ditches (U.S. Forest Service 2006).

- Wetland, lakes, and ponds should be treated when soils are driest. If herbicide treatments are necessary for emergent target plants when soils are wet, use aquatic-labeled herbicides. Use hand or selective treatment methods where effective and practical (U.S. Forest Service 2006).
- Control large infestations by controlling the boundaries first.
- Monitor control treatments for effectiveness for up to 2 years following completion of the project. Provide for follow-up treatments based on inspection results.

Monitoring

To determine the effectiveness of invasive plant species treatments and evaluate impacts on nontarget species, infestations of invasive plant species will be monitored following treatment. The infestation will be monitored annually for 2 years following treatment or until the infestations is controlled. Monitoring should occur during the growing season (May 1 to August 30) (Cheney et al. 2002) or during other regularly scheduled assessments. The evaluations will be recorded on the Invasive Plant Species Monitoring Form provided in Appendix 13-3.

13.5 SCHEDULE AND ESTIMATED EFFORT

The table below lists the schedule, estimated effort (in hours), and documentation requirements for each management action.

Table 13.5.1 Invasive Plant Species Management Schedule and Estimated Effort				
Procedures	Completion Date	Timing	Effort	Documentation
Pre-Ground Disturbance Evaluation	Optional ¹	May 1 to August 30	1.0 hour per site	Ground Disturbance Form
Post-Ground Disturbance Evaluation	Optional ¹	May 1 to August 30	1.0 hour per site	Ground Disturbance Form
Detection	Optional ¹	January 1 to December 31	0.5 hours per site	Invasive Plant Species Monitoring Form
Update State and County Noxious Weed Lists	Annual	January 1 to March 31	2 hours	Annual Report
Control Treatments	Optional ¹	January 1 to December 31	To be determined per invasive plant species population	Invasive Plant Species Monitoring Form
Control Treatments within the Ordinary High Water Mark	Optional ¹	August 1 to October 15	To be determined per invasive plant species population	Invasive Plant Species Monitoring Form
Monitoring	Optional ¹	May 1 to November 30	0.5 hours per site	Invasive Plant Species Monitoring Form or Timber Harvest Area Survey Form

¹ Optional management actions are actions that are selected to be implemented according to need or opportunity.

13.6 REFERENCES

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14.0 RAPTOR SITE MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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APPENDICES (Bound Separately as Volumes II, III, and IV)

- Appendix 14-1: Limiting Operating Periods and Habitat and Disturbance Thresholds for Potentially Breeding Raptors on Wildlife Habitat Management Plan Lands
- Appendix 14-2: Northern Goshawk Survey Protocol
- Appendix 14-3: Northern Spotted Owl Survey Protocol
- Appendix 14-4: Peregrine Falcon Survey Protocol
- Appendix 14-5: Osprey and Bald Eagle Nest Occupancy and Bald Eagle Nest Productivity Aerial Survey Form (*Confidential*)
- Appendix 14-6: Bald Eagle Communal Roost Locations (Confidential)
- Appendix 14-7: Guidelines for Hazard and Danger Trees
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- Appendix 14-10: National Bald Eagle Management Guidelines

14.1 INTRODUCTION

This chapter describes the raptor management goal and objectives, management actions, conservation measures for federally listed raptors, and schedule and estimated effort. It compiles information on raptor management from Section 4.2 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006), Schedule 10.8 Section 2.8 of the Settlement Agreement (PacifiCorp et al. 2004), and the implementation of the Merwin Wildlife Habitat Management Program (PacifiCorp 1998). In addition, a literature review was conducted to identify and develop management actions and procedures for implementing the goal and objectives.

Raptors, or birds of prey, include eagles, accipiters, ospreys, vultures, hawks, falcons, and owls. Currently, several populations of raptor species are at risk or are state or federally listed as threatened or endangered. In addition, eagles have special protection under the Bald and Golden Eagle Protection Act (16 United States Code § 668), and all raptors and their nests are protected under the Migratory Bird Treaty Act. Because raptors are top predators, they are key species for assessing changes in habitat and their prey species populations, as well as chemical contaminations (e.g., mercury, lead). The Settlement Agreement identified raptor management as important to maintaining and enhancing quality wildlife habitat on WHMP lands.

14.2 MANAGEMENT GOAL AND OBJECTIVES

The goal and objectives and species association for raptor management are presented below.

14.2.1 Goal

Provide and protect habitat for, and minimize or avoid disturbance to, raptors, including bald eagles (*Haliaeetus leucocephalus*), buteos, ospreys (*Pandion haliaetus*), accipiters, and owls.

14.2.2 Objectives

- **Objective a**: Use protocol surveys in areas scheduled for road construction, heavy maintenance, or forestland management activities to identify specific raptors and their active and inactive nest sites and roost sites (including bald eagle winter roosts in suitable habitat), if possible, and implement appropriate measures to protect these sites.
- **Objective b**: Develop a management plan for nesting bald eagles, considering sitespecific requirements, within 3 years of WHMP implementation, and revise upon discovery of a new active nest site.
- **Objective c**: Opportunistically identify areas that could be enhanced to provide future nesting, perching, or roosting habitat for raptors. Develop a schedule to implement enhancement measures, if needed.
- **Objective d**: Conduct two annual aerial surveys of WHMP lands to determine bald eagle nest site occupancy and productivity and osprey nest site occupancy.
- **Objective e**: Continue to manage PacifiCorp electrical, distribution, and transmission facilities according to PacifiCorp guidelines, which are based on industry standards for avian protection on power lines (Avian Power Line Interaction Committee 1994, 1996; Avian Power Line Interaction Committee and USFWS 2005). Update PacifiCorp guidelines over the license period, if needed, to reflect changes in industry standards.
- **Objective f**: If identified, manage avian interaction problems with Cowlitz PUD electrical and transmission facilities, as described in Settlement Agreement Exhibit B, consistent with the Avian Power Line Interaction Committee guidelines (1994 and 1996; Avian Power Line Interaction Committee and USFWS 2005).
- **Objective g**: In accordance with USFWS Limits of Operating Periods (Harke 2003; see Table 14.4.1, presented later in the chapter), limit WHMP activities that may generate noise-related disturbance near spotted owl (*Strix occidentalis*) nest sites.

- **Objective h**: Unless separated by a reservoir from the nest site center, manage WHMP lands greater than 2 miles (3.2 km) from the Siouxon Spotted Owl Special Emphasis Area and within Spotted Owl Management Circles (Status 1-3) (Appendix 14-9) to maintain at least 50 percent submature habitat or better, as defined by Washington Administrative Code 222-16-085 (1) (a) within the Licensees' ownership in each management circle. In addition, all conifer trees greater than 21 inches (53 cm) dbh within Spotted Owl Management Circles will be retained unless otherwise determined by the TCC.
- **Objective i**: Unless separated by a reservoir from the Siouxon Spotted Owl Special Emphasis Area, over the life of the licenses, manage at least 50 percent of WHMP lands within a 2-mile (3.2-km) buffer outside of the Siouxon Spotted Owl Special Emphasis Area to provide/develop high-quality nesting spotted owl habitat, as defined by Washington Administrative Code 222-16-085 (1) (a) (Appendix 14-9).
- **Objective j**: Manage WHMP lands within the Siouxon Spotted Owl Special Emphasis Area under Forest Practices, especially Washington Administrative Code 222-16-080 and 222-10-041 (Appendix 14-9).
- **Objective k**: Manage standing live and dead trees along designated trails through WHMP lands to maintain safety based on U.S. Forest Service Long-Range Planning for Developed Sites in the Pacific Northwest: The Context of Hazard Tree Management (Harvey and Hessburg 1992) and Field Guide for Danger Tree Identification and Response (Toupin and Barger 2005) (Appendix 14-7). Leave all trees and snags cut for safety reasons as down wood in the forest adjacent to the trail. Leave any large down wood cleared from the trail in the adjacent forest stand.

14.2.3 Species Association

Raptor management includes all raptors with the potential to nest in the vicinity of WHMP lands. Because raptors use various vegetation cover types, there are no specific species associations for raptor management. Appendix 14-1 provides information on habitat and nest chronology for raptors with the potential to nest in the vicinity of WHMP lands. In addition, northern spotted owls and bald eagles are Old-Growth Habitat analysis species; Chapter 17 (*Species Associations*) 7 provides further information on these two species.

14.3 RAPTOR MANAGEMENT AREA

Since 1981, PacifiCorp has conducted surveys for nesting raptors on WHMP lands. This includes conducting aerial surveys for nesting bald eagles and ospreys on the WHMP lands (and immediate vicinity), along the Lewis River shorelines, downstream to Woodland, and conducting broadcast surveys for accipiters and nest searches in timber harvest areas prior to conducting timber harvest activities. The following table lists raptor species that potentially breed in the vicinity of WHMP lands and their state and federal listing status.

Common Name	Species Name	Federal Status ¹	State Status ¹
American kestrel	Falco sparverius	None	None
Bald eagle	Haliaeetus leucocephalus	Delisted ²	Threatened
Barn owl	Tyto alba	None	None
Barred owl	Strix varia	None	None
Cooper's hawk	Accipiter cooperii	None	None
Golden eagle	Aquila chrysaetos	None	Candidate
Great horned owl	Bubo virginianus	None	None
Merlin	Falco columbarius	None	Monitor
Northern goshawk	Accipiter gentilis	Species of Concern	Candidate
Northern harrier	Cicus cyaneus	None	None
Northern pygmy owl	Glaucidium gnoma	None	None
Northern saw-whet owl	Aegolius acadicus	None	None
Northern spotted owl	Strix occidentalis	Listed Threatened	Endangered
Osprey	Pandion haliaetus	None	Monitor
Peregrine falcon	Falco peregrinus	Species of Concern	Sensitive
Red-tailed hawk	Buteo jamaicensis	None	None
Sharp-shinned hawk	Accipiter striatus	None	None
Turkey Vulture	Cathartes aura	None	Monitor
Western screech-owl	Otus kennicotti	None	None

Table 14.3.1 Potentially Breeding Raptor Species in the Vicinity of Wildlife Habitat Management Plan Lands

¹ Source: Washington Natural Heritage Program 2006.

² Source: USFWS 2007.

14.4 MANAGEMENT ACTIONS

The following management actions include measures to manage raptor species in a condition consistent with the management goal and objectives. In addition, Section 14.5 provides additional conservation measures for protecting federally and state-listed raptor species. Management actions include the following:

- Monitoring
 Habitat Enhancement
- Best Management Practices

14.4.1 Monitoring

Both inactive and active raptor nest and roost sites will be monitored through annual aerial surveys, protocol surveys, and anecdotal observations. Nest and roost locations and occupancy will be recorded and maintained in a database.

- All known raptor nest sites will be assumed to be occupied during the species' breeding season, unless sufficient surveys have determined the site unoccupied.
- All known bald eagle winter roost sites will be assumed to be occupied during the winter, unless sufficient surveys have determined the site unoccupied.
- Raptor nests will be determined to be occupied if one of the following is observed during that species breeding season:
 - Eggs, evidence or signs of nest site occupancy (e.g., eggshell fragments, molted feathers close together, etc.), or young
 - On two separate occasions in the same breeding season, a pair of adult birds are present at the nest
 - An adult is observed vocalizing or otherwise defending an area near the nest
 - A female is in an incubating posture
- Habitat for species that have protocol surveys (northern spotted owls, northern goshawks [*Accipiter gentilis*], and peregrine falcons [*Falco peregrinus*]) will be determined to be occupied or unoccupied based on the protocol criteria (Appendices 14-2, 14-3, and 14-4).
- Raptor nest sites, except for northern spotted owls, that are unoccupied for 5 consecutive years, per Stofel (2006) will be archived in the PacifiCorp's raptor geographic information system database.

Protocol Surveys

Protocol surveys will be conducted prior to implementing activities that would remove or modify nesting habitat, have the potential to disturb breeding raptors (e.g., road construction, heavy maintenance activities, and forestland management), and will be conducted during the breeding season. Currently, the northern spotted owl, northern goshawk, and peregrine falcon are the only breeding raptors that have protocol survey methods. Survey protocols are available in Appendix 14-2, 14-3, and 14-4.

Aerial Surveys for Bald Eagle and Osprey Nests

Aerial surveys will be conducted twice annually to document osprey and bald eagle nest occupancy and bald eagle nest productivity. The aerial surveys will include all WHMP lands and the shorelines of the North Fork Lewis River from the Interstate 5 bridge upstream to the confluence of Pine Creek and North Fork Lewis River. The first aerial survey will document bald eagle nest occupancy and will be conducted between April 7 and April 25. The second aerial survey will document bald eagle nest productivity and osprey occupancy and will be conducted between June 10 and June 25. Specific survey procedures include the following:

- Surveys should occur between 0800 and 1400 hours (depending on local visibility conditions). The helicopter should be flown at a speed of 40 to 80 knots (46 to 92 miles [74 to 148 km per hour]) at an altitude of approximately 164 feet (50 m) above ground or treetop level, depending on the topography.
- There will be at least two observers in the helicopter during the survey.
- Data will be recorded on the standardized data forms provided in Appendix 14-5.
- A summary of the data and maps of nest site locations will be provided to the WDFW and to the TCC in the Annual Report. Sensitive data will be considered confidential and proprietary and not for public viewing.

Bald Eagle Roost Monitoring

Bald eagle communal winter roosts are best defined as three or more eagles perching for two or more consecutive nights for more than 1 year (Anderson et al. 1985, Stofel 2006, Watson and Rodrick 2001). Communal roosts can be larger "traditional" roosts used regularly on multiple days or consecutive years by numerous eagles, or smaller more transitory roosts used by a few eagles near temporary or less-visited foraging areas (Jackman and Jenkins 2004). Although roost tree species vary geographically, they are typically larger in diameter, taller, and more decadent than random trees (Watson and Rodrick 2001). Communal roost stands are typically uneven-aged with a multilayered canopy, often on the leeward-facing side of a hill or valley (Watson and Rodrick 2001). Roost stands average 22 acres (8.9 ha) in size and are within 0.7 miles (1.1 km) of foraging areas (Watson and Rodrick 2001).

Between 1984 and 1986, PacifiCorp studied the wintering ecology of bald eagles on the North Fork Lewis River to characterize the abundance and distribution of wintering bald eagles and to identify and monitor communal roost sites on or adjacent to PacifiCorp lands (Anderson et al. 1985, Anderson and Ichisaka 1986). From these studies, 12 communal roosts were identified in the vicinity of WHMP lands (Anderson et al. 1985, USFWS 2006). All of the roost sites are in conifer stands on the south side of the reservoirs (Anderson and Ichisaka 1986). Appendix 14-6 identifies the communal roosts that are within 0.5 miles (0.8 km) of WHMP lands.
Communal Roost Monitoring

Activities that occur within 0.25 miles (0.4 km) of a known communal roost during the key wintering period (between November 15 and March 31) have the potential to disturb roosting eagles. Because roost occupancy can be transitory, roosts can be monitored to determine if the roost is occupied at the time the activity occurs. If monitoring determines that the roost area is occupied, then the activity will be postponed until the roost is no longer occupied. Monitoring will use the following procedures:

- Communal roosts will be monitored each morning that the potentially disturbing activity is scheduled to occur.
- Weather conditions should allow the observer a constant line-of-sight to the communal roost for the entire survey.
- There should be a sufficient number of observers to monitor the entire roost simultaneously.
- The surveys will begin 30 minutes before and end 2 hours after official sunrise (Jackman and Jenkins 2004).
- Observers will record the date, observers' names, observers' locations, official sunrise time, start and end time, time of observations, weather, and the number, age class, and general behavior (including direction of approach or departure) of eagles.

Monitoring Suitable Habitat for Potential Communal Roosts

If an activity is scheduled to occur during the key wintering period, has the potential to disturb roosting eagles, and is within 0.25 miles (0.4 km) of suitable roosting habitat but is not a known communal roost, then the area will be surveyed to determine if the habitat is occupied by roosting eagles. Suitable roosting habitat will be defined as old-growth or mature forested habitat that is greater then 20 acres (8 ha) and within 0.7 miles (1.1 km) of the shoreline (Watson and Rodrick 2001). Survey methods will be based on the methods described in Jackman and Jenkins (2004) using the following procedures:

- Surveys will be conducted for 2 consecutive years.
- At least three surveys per year, with one survey occurring in each month of December, January, and February and conducted at least 2 weeks apart.
- Surveys will occur in the afternoon to early evening at least 3 hours before official sunset to dusk.
- Weather conditions should allow the observer a constant line-of-sight to the suitable roost habitat for the entire survey.
- There should be a sufficient number of observers to monitor the entire suitable roost habitat simultaneously.
- Observers will record the date, observers' names, observers' location, official sunset time, start and end time, time of observations, weather, and the number, age class, and general behavior of eagles.
- If eagles are observed roosting at the site, the area will be revisited 30 minutes before the following sunrise for 2 hours to make an additional count of eagles leaving the roost.

• Communal roost locations will be delineated and mapped to include all physical features surrounding roost trees that are important to the suitability of the roost for eagle use. These features include flight corridors, sources of disturbance, trees in which eagles spend the night, trees used for perching during arrival or departure (i.e., staging trees), and other trees or physical features, such as hills, ridges, or cliffs that provide wind protection (Washington Administrative Code 232-12-292 [3.1]) (Appendix 14-9).

Anecdotal Observations

Raptor nests may be located through anecdotal observations while conducting inspections or management actions. These nests will be mapped and recorded in the raptor database. These nests will be protected under the best management practices (see Section 14.4.3).

14.4.2 Habitat Enhancement

Raptors breeding on WHMP lands require a variety of habitats (Appendix 14-1). Therefore, determining raptor habitat enhancement actions may be site specific and determined opportunistically while new lands are acquired or while conducting other habitat inspections or management actions. However, a majority of the breeding raptors require old-growth and mature forest habitat for nesting, perching, or roosting. The old-growth habitat management goal and objectives require that the existing old-growth habitat connectivity be evaluated for habitat quality within 5 years of WHMP implementation (Chapter 4, *Old-Growth Habitat Management*). During these evaluations, these stands will also be evaluated for raptor habitat quality and potential enhancement actions. Following the completion of these evaluations, a schedule for implementing raptor habitat enhancement actions in mature and old-growth stands will be developed within 1 year.

The Bald Eagle Protection Rule (Washington Administrative Code 232-12-292) requires that a bald eagle site management plan be prepared for proposed activities adversely affecting eagle habitat. As a result, a bald eagle management plan will be developed for all nests within 0.5 miles (0.8 km) and all roost sites within 0.25 miles (0.4 km) of WHMP lands (Stofel 2006). This management plan will be developed by PacifiCorp in cooperation with the WDFW within 3 years of WHMP implementation and revised as needed to include new nest and roost sites.

14.4.3 Best Management Practices

The following is a list of best management practices to manage breeding raptors and their associated habitats, consistent with the management goal and objectives and in compliance with federal and state laws. Habitat and disturbance thresholds among breeding raptor species vary (Appendix 14-1). Some species-specific best management practices have been developed to account for this; however, additional best management practices may need to be developed for certain projects, depending on the species, management activity, and project's proximity to the nest.

General Raptor Best Management Practices

- Review the raptor database to determine all known raptor nest locations within 0.5 miles (0.8 km) of proposed projects that have the potential to remove or modify nesting habitat or have the potential to disturb nesting raptors.
- All raptor nests within the habitat and disturbance thresholds (Appendix 14-1) of a habitat-modifying or potentially disturbing activity will be assessed to determine the potential impacts from the activity and to determine if additional best management practices are required. The assessment will include the following:
 - Determine species nest site, which will include all physical features surrounding the active nest that are important to normal breeding behavior. These features include alternate and potential nest trees, perch trees, vegetative screening, foraging areas, frequently used flight paths, and sources of disturbance.
 - Limited operating period (critical breeding season).
 - Disturbance threshold.
 - Impacts from removing or modifying habitat.
- Conduct protocol surveys prior to implementing activities that will remove or modify nesting habitat for northern goshawks (Appendix 14-2) and peregrine falcons (Appendix 14-4).
- Conduct protocol surveys prior to implementing activities with the potential to disturb nesting northern goshawks (Appendix 14-2), northern spotted owls (Appendix 14-3), and peregrine falcons (Appendix 14-4). This would include, but not be limited to, road construction, heavy maintenance activities, and forestland management (Pagel 1992).
- Raptor nests with the potential to be adversely affected by activities will be evaluated for occupancy in the same breeding season(s) that the activity is scheduled. If the nest is unoccupied, the nesting habitat within 1,500 feet (457 m) of the raptor nest will be searched for potential nests.
- Standing live and dead trees along designated trails through WHMP lands will be maintained, based on the guidelines provided in the U.S. Forest Service Long-Range Planning for Developed Sites in the Pacific Northwest: The Context of Hazard Tree Management (Harvey and Hessburg 1992) and the Field Guide for Danger Tree Identification and Response (Toupin and Barger 2005) (Appendix 14-7).
- All trees and snags cut for safety reasons along designated trails will be left as down wood adjacent to the trail.
- Trees that fall across designated trails will be cleared or cut from the trail and left in the adjacent area as down wood.
- Manage all PacifiCorp electrical, distribution, and transmission facilities within WHMP lands according to PacifiCorp's guidelines, which are based on industry standards for avian protection on power lines. Current industry standards are based on the following documents:

- Avian Power Line Interaction Committee (1994). Mitigating Bird Collisions with Power Lines: The State of the Art in 1994.
- Avian Power Line Interaction Committee (1996). Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996.
- Avian Power Line Interaction Committee and USFWS (2005). Avian Protection Plan (APP) Guidelines.
- Avian Power Line Interaction Committee (2006). Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006.
- Industry standards for avian protection on power lines will be reviewed annually in December, and all changes to PacifiCorp guidelines will be reported in the Annual Report.

Best Management Practices for Northern Spotted Owls

The following best management practices apply specifically to northern spotted owls:

- Maintain the highest quality 70 acres (28 ha) of spotted owl habitat surrounding a northern spotted owl site center (existing and historic) until protocol surveys indicate absence for 3 years (Washington Administrative Code 222-10-041 [5]).
- Activities that necessitate the removal of suitable northern spotted owl nesting, roosting, and foraging habitat between March 1 and August 31 will be approved by the TCC and will adhere to the Limited Operating Period in the following situations:
 - Planned activities within unsurveyed suitable spotted owl (nesting, roosting, and foraging) habitat.
 - Planned activities that would remove nesting or foraging habitat within an active northern spotted owl home range that is below the incidental take thresholds of 500 acres (202 ha) and 2,663 acres (1,078 ha) of suitable habitat within a 0.7-mile (1.1-km) and 1.8-mile (2.9-km) radius, respectively, of an active northern spotted owl home range.
 - Planned activities located within the 70-acre (28-ha) core of the highest quality suitable habitat surrounding an active northern spotted owl nest.
 - Planned activities that result in the removal of foraging habitat only (i.e., the habitat lacks the structural features necessary for nesting habitat) may be subject to an early season Limited Operating Period (March 1 to June 30) to avoid disturbing spotted owls that are using the stand early in the nesting season. Foraging habitat would include midsuccessional conifer, upland mixed, and riparian mixed vegetation cover types.

- Plan activities that generate significant noise and/or smoke outside the timing window from March 1 to June 30 (the early season when spotted owls are most vulnerable to nesting failure). This Limited Operating Period applies to the following situations:
 - Planned activities that are located within the specified disturbance distance (Table 14.4.1) of unsurveyed nesting habitat
 - Planned activities that are located within the specified disturbance distance (Table 14.4.1) of an active spotted owl 100-acre (40-ha) core area
 - For projects that generate smoke, planned activities located within 0.25 miles (0.4 km) of unsurveyed nesting habitat

Type of Activity	Combined Injury Threshold Distances
Blasts ≥ 2 lbs (0.9 kg)	1 mile (1.6 km) to nesting habitat
Blasts ≤ 2 lbs (0.9 kg)	120 yards (110 m) to nesting habitat
Impact pile drivers	60 yards (55 m) to nesting habitat
Helicopters or single-engine airplanes	120 yards (110 m) to nesting habitat
Heavy equipment	35 yards (32 m) to nesting habitat
Chainsaws	65 yards (59 m) to nesting habitat

Table 14.4.1 Injury Distance Thresholds for Northern Spotted Owls

Source: Harke 2003

- WHMP lands that are greater than 2 miles (3.2 km) from the Siouxon Spotted Owl Special Emphasis Area and are within a Spotted Owl Management Circle (Status 1 to 3), and are not separated by the reservoir will be:
 - Identified as Northern Spotted Owl Management Area Objective h lands on the Appendix 14-8 figures.
 - Managed to at least 50 percent of submature habitat or better, as defined by Washington Administrative Code 222-16-085 (1) (a) (Appendix 14-9).
 - Retain all conifer trees greater than 21 inches (53 cm) dbh unless otherwise determined by the TCC.
- WHMP lands that are within 2 miles (3.2 km) of the Siouxon Spotted Owl Special Emphasis Area and are not separated by the reservoir will be:
 - Identified as Northern Spotted Owl Management Area Objective i lands on the Appendix 14-8 figures and will include the following WHMP lands in: Township 7 North, Range 4 East, Section 25; Township 7 North, Range 5 East, Sections 20, 29, and 30; and Township 6 North, Range 4 East, Sections 21, 28, 33 and WHMP lands south of the Lewis River in Sections 31 and 32.
 - Managed to at least 50 percent to provide/develop high-quality nesting spotted owl habitat, as defined by Washington Administrative Code 222-16-085 (1) (a) (Appendix 14-9).
- WHMP lands that are within the Siouxon Spotted Owl Special Emphasis Area will be:

- Identified as Northern Spotted Owl Management Area Objective j lands in the Appendix 14-8 figures.
- Managed under the Forest Practices, especially Washington Administrative Code 222-16-080 and 222-10-041 (Appendix 14-9).
- o Manage lands to mature nesting habitat, where possible.
- Trail and maintenance activities that occur within the Siouxon Spotted Owl Special Emphasis Area will follow the Forest Practices.

Best Management Practices for Bald Eagles

The following best management practices apply specifically to bald eagles.

- No habitat-modifying activities will occur within 400 feet (122 m) of an eagle nest tree (Stofel 2006).
- The following conditions apply for areas that are within 800 feet (244 m) of a bald eagle nest tree, but not within 400 feet (122 m) of the nest tree, and for activities that are within 250 feet (76 m) of the shoreline and within 0.25 miles (0.4 km) of an eagle nest tree (Stofel 2006):
 - Retain all known perch trees and all conifers greater than or equal to 24 inches (61 cm) dbh.
 - Retain all cottonwoods (Populus sp.).
 - At least 50 percent of a conifer stand with diameter distribution representative of the original stand (greater than 6 feet [1.8 m] tall) should remain following a habitat modifying activity.
 - Windowing and low limbing of trees is acceptable, provided that no more than 30 percent of the live crown is removed. Tree topping is not allowed.
- Communal roosts will be assumed to be occupied between November 15 and March 31, unless monitoring determines it to be unoccupied
- Communal roost locations will be maintained indefinitely or until a natural event causes significant changes in the roost's habitat condition, making the area no longer capable of supporting roosting bald eagles.

14.5 CONSERVATION MEASURES FOR FEDERALLY LISTED SPECIES

As part of the relicensing process, PacifiCorp consulted with the USFWS under the Endangered Species Act of 1973 on the actions required for relicensing of the dam and the actions contained in the Settlement Agreement (PacifiCorp et al. 2004). The bald eagle and northern spotted owl were the only two terrestrial species consulted with the USFWS. Although the bald eagle was officially delisted on August 9, 2007, information related to the bald eagle is included in this section because of the coordination that occurred during the relicensing process and during preparation of the WHMP. Even though they are delisted, bald eagles are still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. If additional terrestrial species are federally or state listed as threatened or endangered and known to exist in the vicinity of the Lewis River, then PacifiCorp will go into consultation with the appropriate agency and will develop a management plan for that species on WHMP lands.

14.5.1 General Conservation Measures

The USFWS assumes that the WHMP Standards & Guidelines will be adhered to in the management of all WHMP lands over the life of the licenses (USFWS 2006). Therefore, the Biological Opinion (USFWS 2006) should be consulted before modifying the WHMP Standards & Guidelines.

14.5.2 Conservation Measures for Bald Eagles

The USFWS determined that incidental take is not likely to jeopardize the continued existence of the bald eagle if the following conservation measures are implemented:

- Construction activities described in the Settlement Agreement as occurring within 1,312 feet (400 m) or 2,624 feet (800 m) line-of-sight of an active bald eagle nest or roost, respectively, will occur outside of the critical nesting period (January 1 to August 31) and the key wintering period (November 15 and March 31).
- Danger trees that are known to be used by bald eagles as perch, nests, or roost will not be felled.
- The bald eagle management plan will incorporate the recommendations in the Bald Eagle Recovery Plan (USFWS 1986) regarding the management of habitat within 2,624 feet (800 m) of a bald eagle nest tree or roost (Appendix 14-10). Therefore, it is assumed that no construction activities within proximity to recently detected nest or roost sites would affect suitable bald eagle habitat.
- To minimize disturbance to wildlife, Cresap Bay will be closed to public vehicle access during the off season. PacifiCorp will need to periodically access Cresap Bay during the off season for scheduled maintenance; these activities will be timed to minimize disturbance to wildlife and will be discussed with the TCC on an annual basis, except for emergencies.

14.5.3 Conservation Measures for Northern Spotted Owls

The USFWS determined that incidental take is not likely to jeopardize the continued existence of the spotted owl.

- If construction occurs within 0.25 miles (0.4 km) of unsurveyed suitable habitat, either:
 - The habitat will be surveyed to protocol prior to construction to confirm the presence or absence of spotted owl nesting, or
 - High-impact sound-generating activities associated with construction (such as pile driving, rock drills, or impact hammers) will be scheduled to occur outside the early nesting season of March 1 to June 30 to avoid potentially disturbing nesting spotted owls.
- Construction that requires the use of helicopters or blasting within 0.25 miles (0.4 km) of unsurveyed suitable habitat or known occupied areas will occur outside the nesting season of March 1 through September 30, which will preclude disturbance of known or assumed nesting spotted owls.
- The only forest management activity that would occur in northern spotted owl nesting habitat would be snag creation, and snags would be created outside of the critical nesting period (March 1 to June 30) to prevent disturbance to nesting spotted owls.
- Commercial thinning may occur in midsuccessional, riparian mixed, and upland mixed cover types without degrading the habitat to promote late-successional stand structure.
- Clearcut harvesting (10 to 30 acres [4 to 30 ha] in size) may be conducted in northern spotted owl roosting and foraging habitat.
- No more than 65 acres (26 ha) of midsuccessional and upland mixed vegetation will be harvested per year. This equates to 3,283 acres (1,329 ha) or 63 percent of the 5,238 acres (2,120 ha) of the extant of suitable spotted owl habitat on PacifiCorpowned lands being harvest over the next 50 years. The distribution of the loss of suitable spotted owl habitat on PacifiCorp-owned lands is anticipated to be approximately 2,047 acres (828 ha) (62 percent of the total harvested acreage) surrounding Lake Merwin, predominately on the north side of the reservoir; approximately 878 acres (355 ha) (66 percent) surrounding Yale Reservoir, predominately on the west side of the reservoir; and approximately 358 acres (145 ha) (57 percent) near Swift Reservoir, with most of the harvests occurring on the north side of the reservoir.
- To prevent disturbance to nesting spotted owls, the noise and smoke Limited Operating Periods would apply to these activities (USFWS 2006, Page 114 Objective G; PacifiCorp and Cowlitz PUD 2006, Page 56 Objective G).
- Clearcut harvesting may occur in the pole conifer cover type, as long as PacifiCorpowned lands maintain at least 50 percent of dispersal habitat or better at any point in time.

14.6 SCHEDULE AND ESTIMATED EFFORT

The table below lists the schedule, estimated effort (hours), and documentation requirements for each management action.

Table 14.6.1 Raptor Management Schedule and Estimated Effort				
Procedures	Completion Date	Timing	Estimated Effort	Documentation
Monitoring				
Dawn Acoustical Survey for Northern Goshawk	Optional ¹	March 15 to April 30 for 1 survey season	5 hours per survey station (18 acres [7 ha])	Survey Form
Intensive Search Survey for Northern Goshawk	Optional ¹	June 20 to August 31 for 1 survey season	20 hours per 25 acres (10 ha)	Survey Form
Broadcast Acoustical Survey for Northern Goshawk	Optional ¹	June 1 to August 15	8 hours per 494 acres (200 ha)	Survey Form
Northern Spotted Owl Surveys	Optional ¹	March 1 to August 30	4 hours per 10 survey stations	Survey From
Peregrine Falcon Monitoring Protocol	Optional ¹	April 15 to June 30	15 hours per potential nest site	Survey Form
Aerial Survey for Bald Eagle Nest Occupancy	Annually	April 7 to April 25	24 hours	Database
Aerial Survey for Osprey Nest Occupancy and Bald Eagle Nest Productivity	Annually	June 10 and June 25	24 hours	Database
Known Communal Roost Monitoring	Optional ¹	November 15 to March 31	5 hours per survey per observer	Report
Potential Communal Roost Monitoring	Optional ¹	December 1 to February 28	6 hours per survey per observer	Report
Habitat Management				
Evaluate Mature and Old- growth Stands for Raptor Habitat Quality and Potential Enhancement	Within 5 years of WHMP implementation	April 15 to July 15	2 hours per acre (0.4 ha)	Survey Form
Develop a Schedule for Implementing Habitat Enhancement Actions in Old- growth and Mature Stands	Within 1 year of completing mature and old-growth stand evaluations	January 1 to December 31	20 hours	Report
Complete Bald Eagle Management Plan	Within 3 years of WHMP implementation	January 1 to December 31	80 hours	Report
Revise Bald Eagle Management Plan to Include New Nest and Roost Sites	As needed within 1 year of discovery	January 1 to December 31	10 hours	Report
Best Management Practices				
Review and Update Industry Standards for Avian Protection from Power Lines	Annually	December 1 to December 31	2 hours	Annual Report

1 Optional management actions are actions that are chosen to be implemented according to need or opportunity.

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15.0 PUBLIC ACCESS MANAGEMENT

LEWIS RIVER WILDLIFE HABITAT MANAGEMENT PLAN

<u>2008</u>

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Appendix 15-1: Road Initial Evaluation Form Appendix 15-2: Road Closure Inspection Form Appendix 15-3: Trail Inspection Form

15.1 INTRODUCTION

This chapter describes the goal and objectives, management actions, and schedule for public access management on the Lewis River WHMP lands. It compiles information on public access management from Section 4.3 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006) and Schedule 10.8 Section 2.13 of the Settlement Agreement (PacifiCorp et al. 2004).

Public access is also addressed in the recreation section of the Settlement Agreement (Section 11.2.8), which allows for appropriate non-motorized, public day use access to all existing and future PacifiCorp-owned lands and conservation easements, where possible, for wildlife viewing, angling, hunting, and other recreational purposes. The public access is subject to capacity restrictions, third party property rights, and PacifiCorp's right to charge fees; is consistent with Federal Energy Regulatory Commission requirements; and will be allowed, except where unsafe conditions exist, security needs require exclusion of the public, or public access may harm protected environmental or cultural resources.

Public access on WHMP lands is restricted to non-motorized access other than for access to and from developed recreation areas. Non-motorized access covers walking, running, bicycling, and horseback riding (PacifiCorp and Cowlitz PUD 2006). Recreation areas include the developed recreation sites for swimming, boating, picnicking, and camping and the undeveloped dispersed campsites surrounding the shorelines at Yale and Swift reservoirs.

Public access management is important for maintaining wildlife habitat quality, and reducing the number of wildlife–vehicle collisions and disturbance to wildlife species. Vehicle collisions cause direct mortality to wildlife, with birds suffering the greatest number of mortalities, followed by mammals and then reptiles and amphibians (Foreman et al. 2003). Disturbance can be minimized by managing the type and frequency of motorized access. For example, routine use of forest roads for management activities appears to be less disruptive than the intermittent use associated with hunting and other recreational activities. Closing roads entirely to vehicular traffic can minimize disturbance to the extent that the roads may be used for foraging, bedding, and travel by some species (Witmer et al. 1985, Rowlands et al. 2005).

15.2 MANAGEMENT GOAL AND OBJECTIVES

The goal, objectives, and species association for public access management are presented below (PacifiCorp and Cowlitz PUD 2006).

15.2.1 Goal

Minimize disturbance to wildlife and protect their habitats while managing access for non-motorized recreation, which includes legal hunting and fishing, and activities associated with implementation of the WHMP.

15.2.2 Objectives

- **Objective a:** Within 5 years of WHMP implementation or acquisition of Interests in Land, identify roads for closure and type of closure (abandonment, temporary closure, seasonal closure) to motorized use by the public, and schedule appropriate treatments.
- **Objective b:** Monitor the effectiveness and condition of road closure barriers at least annually and make any necessary repairs or modifications in a timely manner.
- **Objective c:** As part of the WHMP, develop criteria to protect habitat and determine the continued use or closure of dispersed recreation sites; monitor that use, identify resource concerns, and determine appropriate actions. Site pioneering and site creep should be monitored on a schedule consistent with the Recreation Resource Management Plan (PacifiCorp 2004) over the life of the licenses.
- **Objective d:** Identify pioneered "roads," trails, and paths created by unauthorized activities. Develop and implement closure plans (e.g., signs at gates, boulders), and coordinate with law enforcement to discourage these activities on WHMP lands. Prioritize these activities in sensitive habitat types.
- **Objective e:** Prior to constructing new roads or making major improvements (widening, paving) to existing roads, identify and implement measures to minimize impacts on wildlife habitat.
- **Objective f:** Provide information to recreation planners regarding wildlife and habitat when siting new or expanding existing developed recreation facilities. Consider buffers for wetland and riparian habitat and ways to minimize potential disturbances to wildlife, especially threatened, endangered, and sensitive species.

• **Objective g:** Provide vegetated buffers along roads open to the public, where needed, to conceal big game and other wildlife using adjacent habitats.

15.2.3 Species Association

No species associations were identified for public access management.

15.3 PUBLIC ACCESS MANAGEMENT AREAS

Public access management applies to all current and newly acquired WHMP lands. Roads are the primary access and consist of paved, gravel, and dirt roads that are used for utility operations, recreation, and wildlife habitat management (including forestry). Depending on use, the roads may be open, either year round or seasonally, or closed. Roads used exclusively for WHMP implementation or utility access are gated and closed to motorized public access. Roads that are open are typically associated with recreation and include both seasonally and year-round open roads. The table below lists the total miles of open and closed roads for each WHMP management unit.

Mgmt.	Open Roads	Closed Roads	Total Roads
Unit	in Miles (km) ¹	in Miles (km)	in Miles (km)
1	0.00 (0.00)	1.69 (2.70)	1.69 (2.72)
2	0.00 (0.00)	2.14 (3.44)	2.14 (3.44)
3	0.00 (0.00)	2.91 (4.68)	2.91 (4.68)
4	0.04 (0.06)	2.09 (3.36)	2.13 (3.43)
5	1.27 (2.04)	2.12 (3.41)	3.39 (5.45)
6	1.09 (1.75)	6.54 (10.52)	7.63 (12.28)
7	0.13 (0.21)	3.09 (4.97)	3.22 (5.18)
8	1.36 (2.19)	1.62 (2.61)	2.98 (4.74)
9	0.36 (0.58)	4.00 (6.43)	4.36 (7.01)
10	0.00 (0.00)	0.71 (1.14)	0.71 (1.14)
11	0.00 (0.00)	3.36 (5.40)	3.36 (5.40)
12	0.00 (0.00)	4.04 (6.50)	4.04 (6.50)
13	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
14	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
15	0.19 (0.30)	2.76 (4.44)	2.95 (4.74)
16	0.52 (0.83)	2.65 (4.26)	3.17 (5.10)
17	0.26 (0.42)	3.48 (5.60)	3.74 (6.02)
18	0.02 (0.03)	3.81 (6.13)	3.83 (6.16)
19	0.11 (0.18)	0.49 (0.79)	0.60 (0.96)
20	0.00 (0.00)	8.75 (14.08)	8.75 (14.08)
21	1.14 (1.83)	1.20 (1.93)	2.34 (3.76)
22	0.00 (0.00)	2.79 (4.49)	2.79 (4.49)
23	0.00 (0.00)	0.66 (1.06)	0.66 (1.06)
24	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
25	0.00 (0.00)	2.98 (4.79)	2.98 (4.79)
26	0.00 (0.00)	2.34 (3.76)	2.34 (3.76)
27	0.62 (1.00)	0.82 (1.32)	1.44 (2.32)
28	0.00 (0.00)	0.21 (0.34)	0.21 (0.34)
29	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
30	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
31	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
32	0.28 (0.45)	0.00 (0.00)	0.28 (0.45)
Total	7.39 (11.89)	67.25 (108.23)	74.64 (120.12)

Table 15.3.1 PacifiCorp-owned Roads on Wildlife Habitat Management Plan Lands

¹Open roads include all roads that are open seasonally and year round.

Trails also provide non-motorized public access to WHMP lands. Currently, there are three developed trails on WHMP lands: Cresap Bay Campground Loop Trail, Marble Creek Trail, and Saddle Dam – Speelyai Canal Equestrian Trail. These trails are

maintained by PacifiCorp and are associated with the Cresap Bay Campground, Merwin Park, and Saddle Dam Park recreational areas. In addition, some orphaned roads have unofficially been turned into public access trails (e.g., Cougar Creek). The Recreation Resource Management Plan and Settlement Agreement identify eight trails on WHMP lands for either proposed enhancement to an existing trail or development of a new trail (PacifiCorp 2004, PacifiCorp et al. 2004). They include the following:

- Marble Creek Trail (proposed enhancement)
- Cresap Bay Campground Loop Trail (proposed enhancement)
- Saddle Dam Speelyai Canal Equestrian Trail (proposed enhancement)
- International Paper Road (proposed enhancement)
- Cougar-Beaver Bay (proposed trail)
- Cougar Reservoir Overlook (proposed trail)
- Eagle Cliff (proposed trail)
- Vancouver–Clark Washington Parks and Recreation Department managed regional park trail (proposed trail)

15.4 INSPECTIONS

Roads and trails will initially be evaluated to determine a public access management strategy and annually inspected to determine specific issues related to unauthorized public access. The following provides the methods for completing the initial evaluations and annual inspections.

15.4.1 Initial Road Evaluation

All of the Lewis River WHMP roads will be evaluated to identify unauthorized public access management issues within 5 years of WHMP implementation. Roads on newly acquired lands will be evaluated within 1 year of acquisition.

Each road will be evaluated, and the following information will be collected on the form provided in Appendix 15-1:

- Road location (add or correct geographic information system location as necessary)
- Road use (WHMP, utility, recreation)
- Access type (open seasonally, open year round, closed)
- Road barrier (gate, blocks, etc.)
- Abandoned or orphaned roads
- Off-highway vehicle trespass
- Visual screen requirements for open roads
- Proposed management strategies (in consideration of wildlife use and disturbance issues, as well as unauthorized access management)

Upon completing the evaluation, a report will summarize the road information and provide an overall management strategy that includes a schedule for closing roads, closing and revegetating unauthorized access points, and developing vegetative screens along open roads, where needed.

15.4.2 Road Closure Inspections

Road closure barriers will be inspected annually to ensure their effectiveness and to identify new off-highway vehicle trespasses. Off-highway vehicle trespass, missing locks, and vandalized gates may be reported throughout the year as they are discovered. The locks will be replaced on site, if possible, and repairs will be schedule at monthly compliance coordination meetings. However, to ensure that each road closure is monitored annually, an annual inspection will occur between November 1 and November 30. Each gate will be inspected to ensure that there are proper signs, an effective lock, and no vandalism has occurred. Road closure and trespass barriers will be evaluated to determine if they are still impassable to motorized vehicles. The information will be recorded on the form in Appendix 15-2 and repairs will be scheduled as needed.

15.4.3 Initial Trail Evaluation

Existing trails will be evaluated to identify unauthorized public access management issues within 5 years of WHMP implementation. Trails will be evaluated, and the following information will be collected on the form provided in Appendix 15-3:

- Trail location (update geographic information system as necessary)
- Access points
- Signs of unauthorized motorized vehicle use
- Appropriate signage indicating allowed or prohibited public access activities (e.g., No Motorized Vehicles)
- Proposed management strategies (in consideration of wildlife use and disturbance issues, as well as unauthorized access management).

Upon completing the evaluation, a report will summarize the trail information and provide an overall management strategy.

15.4.4 Trail Inspections

Trails will be inspected annually between November 1 and November 30 to identify if unauthorized motorized vehicle use is occurring and to ensure that appropriate signage is in place. Information from the inspections will be used to evaluate if additional measures are required to control unauthorized motorized vehicle access and if vegetation or soil restoration is needed. The information will be recorded on the form in Appendix 15-3, and maintenance will be scheduled as needed.

15.5 MANAGEMENT ACTIONS

The following management actions include measures to meet the pubic access management goal and objectives:

• Recreation Management

- Road Construction
- Access/Disturbance Reduction

15.5.1 Recreation Management

The Recreation Resource Management Plan identifies proposed measures for existing and proposed recreation resources to be implemented by PacifiCorp under the new licenses (PacifiCorp 2004). PacifiCorp biologists are collaborating with the recreation planners to minimize recreation project impacts on wildlife and wildlife habitat. The following summarizes the roles of PacifiCorp biologists in implementation of the Recreation Resource Management Plan.

Recreation Development

The Recreation Resource Management Plan requires the expansion of existing and the development of new recreation facilities and trails. PacifiCorp biologists will review projects that are on or near WHMP lands in the design stage to assess the impacts on wildlife, determine compliancy with the WHMP goals and objectives, and provide management recommendations for reducing the impacts. Management recommendations will be site specific and will comply with the USFWS Biological Opinion (USFWS 2006), as well as any applicable state and federal regulations. Recreation projects on WHMP lands should comply with the WHMP (e.g., buffers and seasonal restrictions). However, if a proposed project is unable to comply with the WHMP, then the TCC shall consult with the Recreation Coordination Committee to collaborate on potential alternatives to minimize wildlife impacts.

Dispersed Recreation Sites

The Recreation Resource Management Plan provides a strategy for managing dispersed shoreline recreation sites (i.e., day-use and campsites). Upon receiving the licenses, PacifiCorp will conduct a complete inventory of the dispersed shoreline recreation sites. This inventory will be used to determine which sites will be designated and managed as dispersed shoreline recreation sites or will be prohibited from future use. Dispersed shoreline recreation sites that are suitable as future designated sites must meet the following criteria (PacifiCorp 2004):

- Not be in a jurisdictional wetland or affect its function
- Not affect sensitive habitat or species
- Not affect eligible cultural resource sites

- For campsites, be of suitable size for overnight use, with an adequate boat-in shoreline, adequate level tent pad space, and adequate and safe campfire space
- Have low (0 to 3 foot [0 m to 0.9 m]) to moderate (3 to 5 foot [0.9 to 1.5 m]) bank access and low erosion potential
- Not be in a location that collects large amounts of driftwood (interferes with boat beaching)

PacifiCorp biologists will asses the potential suitable sites and develop a management strategy outlining potential resource concerns and measures to minimize impacts (e.g., buffers or seasonal restrictions). The site assessments may be conducted by reviewing existing species and cover type data or conducting a site visit to gather further information.

The Recreation Resource Management Plan requires that site pioneering (i.e., newly established campsites) around the shoreline be monitored annually and that site creep (i.e., expanding the existing site by 10 or more percent) at designated dispersed shoreline sites be monitored every 4 years. PacifiCorp biologists will review the site pioneering monitoring and site creep analyses to provide a management strategy outlining potential resource concerns and measures to minimize impacts.

Dispersed upland (nonshoreline) camping will be discouraged by gating roads and providing road barriers as necessary. PacifiCorp will continue to work with adjacent landowners to restrict access from their lands onto PacifiCorp-owned lands where unauthorized motorized access occurs (e.g., the Yale/International Paper Road corridor).

15.5.2 Access/Disturbance Reduction

Controlling public access and reducing disturbance to wildlife will improve the overall quality of habitat on WHMP lands. This will be accomplished by closing roads, controlling unauthorized motorized vehicle use, and providing visual screens along open roads.

Closing Roads

Following the completion of the initial evaluation, a public access management strategy and schedule will be developed to identify roads for closing and methods to be used. Road closures can be temporary, seasonal, or permanent depending on the road's use and the resources affected by the road. Methods for closing roads can vary depending on existing vegetation and topography but may include gates, boulders, blocks, trenches, berms, and/or large down wood. All closed road should be adequately signed.

PacifiCorp has abandoned several roads under the Washington Department of Natural Resources Road Maintenance and Abandonment Planning assessments (Washington Department of Natural Resources 2004). These roads have been abandoned by blocking access and restoring the natural drainage within the area of the road. Abandoned roads are considered closed roads.

Controlling Unauthorized Motorized Vehicle Use

Unauthorized motorized vehicle trespass, gate vandalism, and the effectiveness of road barriers will be recorded on the forms included in Appendices 15-2 and 15-3 as discovered or during the annual inspections. Following the completion of these inspections, a summary report will be compiled that lists all of the areas with unauthorized motorized vehicle use. This summary report will prioritize areas for management based on the extent of vehicle use, ability to effectively control, and the amount and type of affected habitat. It will also provide a proposed management strategy and schedule for these areas. Proposed management may include signage, patrols, letters to adjacent land owners, and road closure. The report will be provided to the appropriate law enforcement agency.

Visual Screening

Roads that are open to the public, either seasonally or year round, will be evaluated during the initial road evaluation to determine if there is an adequate amount of vegetation or topography to conceal wildlife in the adjacent habitats. If the topography and vegetation are inadequate, then a visual screen may be established where slope, soils, and topography allow. Conifers provide the most effective visual screens in the winter, but dense stands of deciduous species can provide adequate screening during the winter too. Where site conditions are harsh (e.g., rock, xeric, steep road shoulder, southern aspect), effective screening may take many years to establish or may not be feasible. Big game browse and antler rubs can cause plant mortality, thus reducing the effectiveness of a visual screen. Therefore, to prevent damage from big game, animal exclosures will be constructed and plants replaced as needed.

15.5.3 Road Construction

Prior to conducting major road construction on WHMP lands, the impacts on wildlife habitat and the associated species will be assessed and measures to minimize impacts will be developed. Road construction includes the construction of new roads and major improvements, such as widening and paving, to existing roads. Measures to minimize wildlife impacts will vary according to project design, site conditions, and associated species. Therefore, each project will need to be evaluated to determine measures to minimize wildlife impacts and for compliance with the WHMP, the USFWS Biological Opinion, and any applicable state and federal regulations. The project, wildlife impacts, and measures to minimize impacts will be reviewed with the TCC prior to project implementation.

15.6 SCHEDULE AND EFFORT

The table below lists the schedule, estimated effort (hours), and documentation requirements for each task.

Table 15.6.1 Pubic Access Management Schedule and Estimated Effort				
Procedures	Completion Date ¹	Timing	Effort	Documentation
Inspections				
Initial Road Evaluation	Within 5 years of WHMP implementation	May 1 to October 15	2 hours per mile (1.6 km) of road	Forms and Report
Initial Road Evaluation on Newly Acquired Lands	Within 1 year of acquiring lands	May 1 to October 15	2 hours per mile (1.6 km) of road	Forms and Report
Road Closure Inspection	Annually	November 1 to November 30	60 hours	Data Form and Annual Report
Initial Trail Evaluation	Within 5 years of WHMP implementation	May 1 to October 15	16 hours	Forms and Report
Trail Inspections	Annually	November 1 to November 30	12 hours	Data Form and Annual Report
Management Actions		•		
Initial Evaluations of Dispersed Shoreline Campsites	Within 1 year of receiving the new licenses	January 1 to December 31	50 hours	Summary Report
Site Pioneering Monitoring	Annually	September 1 to December 31	10 hours	Annual Report
Site Creep Evaluation	Every 4 years	September 1 to December 31	40 hours	Summary Report
Controlling Unauthorized Motorized Vehicle Use	Optional ¹	January 1 to December 31	8 hours per site	Annual Report
Visual Screen	Optional ¹	January 1 to December 31	2 hours per site	Annual Report
Road Construction	Optional ¹	January 1 to December 31	8 hours per site	Memo

¹ Optional management actions are actions that are chosen to be implemented according to need or opportunity.

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16.0 MONITORING

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APPENDICES (Bound Separately as Volumes II, III, and IV)

Appendix 16-1: Lewis River Habitat Evaluation Procedure Study Memo

Appendix 16-2: Summary of Habitat Suitability Index and Suitability Index Values in the Lewis River Habitat Evaluation Procedure Study Area

16.1 INTRODUCTION

This chapter describes the goal and objectives, management actions, and schedule for monitoring the Lewis River WHMP lands. It compiles information on monitoring from Section 4.4 of the Standards & Guidelines (PacifiCorp and Cowlitz PUD 2006) and Section 10.8.4 and Schedule 10.8 Section 3 of the Settlement Agreement (PacifiCorp et al. 2004).

Monitoring is a critical part in determining the effectiveness of the Standards & Guidelines goals and objectives and the Lewis River WHMP over time (PacifiCorp and Cowlitz PUD 2006). Specifically, monitoring may show that management objectives are being achieved faster and better than expected, or are not meeting the goals and objectives as anticipated. In addition, goals, objectives, and management actions may need to change over time as habitat conditions change or new research findings result in improved management. Recognizing the importance of assessing the success of the WHMP and making changes, if needed, the Settlement Agreement and TCC include monitoring as an overall goal and objectives to the Lewis River WHMP (PacifiCorp et al. 2004, PacifiCorp and Cowlitz PUD 2006).

16.2 MANAGEMENT GOAL AND OBJECTIVES

The goal, objectives, and species association for monitoring are presented below (PacifiCorp and Cowlitz PUD 2006).

16.2.1 Goal

Promote the continued effectiveness of the WHMP in maintaining and enhancing wildlife habitat over the life of the licenses.

16.2.2 Objectives

- **Objective a**: Repeat the HEP in year 17 of the licenses using species model updates and new survey protocols, as appropriate.
- **Objective b**: Review, revise, and update the WHMP, if needed, following year 17 to meet the original HEP projections, taking model updates and new management priorities into account, as appropriate.
- **Objective c**: Conduct implementation monitoring for the measures included in each of the major habitat programs covered by the WHMPs. Include monitoring results in the Annual Report.
- **Objective d**: Consistent with the Settlement Agreement, modify specific goals and objectives included in the Standards & Guidelines document if monitoring and best available science indicates that change is warranted.

16.2.3 Species Associations

No species associations were identified for monitoring.

16.3 MONITORING MANAGEMENT AREA

Monitoring will apply to all current and newly acquired WHMP lands; therefore, there are no delineated management areas.

16.4 INSPECTIONS

Monitoring will occur during the habitat and plan-wide goal monitoring and the HEP studies. The following provides a summary and outline for achieving these monitoring types.

16.4.1 Habitat and Plan-Wide Goal Monitoring

The monitoring for each of the wildlife habitat management areas and plan-wide goals is described in Section X.4 of the corresponding chapters. The frequency of monitoring varies depending on the habitat type's management needs. Areas that are more intensively managed, such as farmland, are inspected biannually to annually. Areas that are lightly managed may be monitored at regular but longer intervals, such as once every 5 years, or opportunistically with other corresponding management actions. The Annual Report will contain the monitoring results for each habitat type and plan-wide goal for that year in either a short narrative or a data form.

16.4.2 Year 17 Habitat Evaluation Procedure

In year 17 (2025) of the licenses, the HEP will be repeated on all Lewis River WHMP lands to measure any changes in habitat values compared with the baseline HEP data, and to determine whether the original HEP projections have been met. The funding for the HEP shall be in addition to the funding stated in Section 10.8.2 of the Settlement Agreement (PacifiCorp et al. 2004).

To complete the HEP, all WHMP lands will be re-cover typed and field sampled to create a new set of HSI values, acreages, and habitat units (a "habitat unit" is calculated by multiplying the HSI value [quality of habitat] by the acres of cover type [quantity of habitat]). The 2025 habitat units would be compared to the predicted habitat units from the baseline HEP Study (PacifiCorp and Cowlitz PUD 2004a) to see if there needs to be a change in goals, objectives, or management for the remainder of the license period. The 2025 HEP would be run out through the end of the license period (target year 50), with 1 or 2 target years between 2025 and 2058.

The HEP Study was completed in 2001 for relicensing studies to determine habitat quantity and quality and to provide essential guidance for developing the goals and objectives of the Standard & Guidelines. However, these data could not be used as the baseline data or as a predictive tool for measuring the success of the WHMP. This is because the study was based on cover type mapping from 1995 and 2000, which has since been revised and corrected. Secondly, the study area included all lands within 0.5 miles (0.8 km) of the reservoir. As a result, the habitat units and the resulting average annual habitat units were based on acreages in the study area, not just the WHMP lands. Appendix 16-1 includes a memo summarizing TCC discussions and decisions regarding this topic during the October and November 2006 meetings.

To determine the HEP baseline data and target year 17 predictions, the Habitat Evaluation procedure will be rerun after the initial evaluations (e.g., shrubland, old-growth) are completed in 5 years and all the new WHMP lands are acquired. Assuming that all of the lands have been acquired, this will likely be in year 6 of the licenses. This would require cover type mapping the newly acquired lands with the same vegetation cover typing methods used during relicensing (PacifiCorp and Cowlitz PUD 2004b). Once the final cover type acres for the WHMP lands are completed, the habitat units for each species and cover type will be determined using the original HSI values (revised September 2007). Appendix 16-2 includes a table with the HSI values as reported in the HEP Study technical report and revised to include the correct values for mink (PacifiCorp and Cowlitz PUD 2004a).

These habitat units would be the benchmark or target against which the success of the WHMP will be evaluated. Target year 17 predictions will be made using these habitat units and WHMP management actions as the set of rules for predicting habitat changes over time. If the actual target year 17 habitat units are lower than the predicted habitat units, then the WHMP goals, objectives, and/or management actions may be revised.

16.4.3 Newly Acquired Wildlife Habitat Management Plan Lands

Any newly acquired WHMP lands will be included in the monitoring and will be mapped and cover-typed per Section 10.8.4.1 of the Settlement Agreement (PacifiCorp et al. 2004). The HSI values from the 2001 HEP Study will be applied to the newly acquired lands' cover type. However, if the newly acquired lands have a cover type that is new or different from what was evaluated during relicensing, then a new HSI value will be determined for that cover type. The funding for the HEP shall be in addition to the funding stated in Section 10.8.2 of the Settlement Agreement (PacifiCorp et al. 2004).

16.5 MANAGEMENT ACTIONS

The following management actions include measures to meet the monitoring goal and objectives:

Modifying the Goals and
Objectives

• Revising the WHMP

16.5.1 Modify Goals and Objectives of the Standards & Guidelines

The Standards & Guidelines goals and objectives may be modified if monitoring results or newly available science indicates that a change is warranted. A change would be warranted if the actual target year 17 habitat units are lower than predicted, regular habitat inspections determine that goals and objectives are not able to be achieved, and/or new science is available supporting the change. Any modifications to the Standards & Guidelines goals and objectives would be approved by the TCC and would not obligate PacifiCorp to any increase to the funding obligations under Section 10.8.2 of the Settlement Agreement (PacifiCorp et al. 2004). The modified Standards & Guidelines document would need to be filed with the Federal Energy Regulatory Commission.

16.5.2 Revise the Wildlife Habitat Management Plan

The WHMP may be revised as needed to meet the original projections of the HEP, or to take into account model updates and new management priorities, as appropriate. Any revisions to the WHMP would be approved by the TCC. The revised WHMP would be filed with the Federal Energy Regulatory Commission.

16.6 SCHEDULE AND EFFORT

The table below lists the schedule, estimated effort (hours), and documentation requirements for each task.

Table 16.6.1 Monitoring Schedule and Estimated Effort					
Procedures	Completion Date ¹	Timing	Effort	Documentation	
Inspections					
Habitat and Plan- wide Goal Monitoring	see corresponding chapter	See corresponding chapter	See corresponding chapter	Annual Report	
Year 17 HEP ²	Target year 17	Field work: July 1 to September 30 Analysis: January 1 to December 31	Estimated 4 hours per plot plus a total 100 hours for analysis	Data Forms and Analysis	
Newly Acquired Lands ²	Estimated to be completed by year 6	Field work: July 1 to September 30 Analysis: January 1 to December 31	Estimated 4 hours per plot plus a total 25 hours for analysis	Data Forms and Analysis	
Management Actions					
Modify the Goal and Objectives	Optional ¹	January 1 to December 31	10 hours	Revised document filed with Federal Energy Regulatory Commission	
Revise the WHMP	Optional ¹	January 1 to December 31	10 hours	Revised document filed with Federal Energy Regulatory Commission	

Optional management actions are actions that are chosen to be implemented according to need or opportunity. ² The HEP Study funding is in addition to the WHMP funding.

16.7 REFERENCES

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17.0 SPECIES ASSOCIATIONS

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- Appendix 17-1: U.S. Fish and Wildlife Service Black-Capped Chickadee Habitat Suitability Index Model
- Appendix 17-2: Corrected Mink Habitat Suitability Index Data, Mink Riparian Habitat Evaluation Procedures Memo, and U.S. Fish and Wildlife Service Mink Habitat Suitability Index Model
- Appendix 17-3: Classification of Vegetation Cover Types as Suitable Northern Spotted Owl Habitat - Lewis River Wildlife Habitat Management Area
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- Appendix 17-5: Washington Department of Fish and Wildlife Habitat Suitability Index Model Pond Breeding Amphibian and Cover Model with Revisions
- Appendix 17-6: Modified Washington Department of Fish and Wildlife Elk Model
- Appendix 17-7: Washington Department of Fish and Wildlife Savannah Sparrow Habitat Suitability Index
- Appendix 17-8: U.S. Fish and Wildlife Service Yellow Warbler Habitat Suitability Index Model

PacifiCorp Lewis River Hydroelectric Projects Federal Energy Regulatory Commission Project Nos. 935, 2071, and 2111

17.1 INTRODUCTION

The Lewis River WHMP Standards & Guidelines document has designated species to each of the habitat types that will be managed (PacifiCorp and Cowlitz PUD 2006). These species were selected for their known association with WHMP lands and their ability to be an indicator of habitat quality. These species should benefit from habitat management and are considered when implementing a management action.

This chapter of the WHMP summarizes the relevant information from the relicensing studies that were conducted from 1999 to 2001 and from implementing the Merwin Wildlife Habitat Management Program since 1983. A summary of general life-history and habitat information for each species is provided, along with the HEP for the appropriate species.

There are three categories of species associations: HEP evaluation species, analysis species, and other species. These categories, as well as vegetation cover types and habitat associations, are described below.

17.1.1 Species Association Classifications

Habitat Evaluation Procedure Evaluation Species

The HEP is a standardized and collaborative process to assess the effects of a project on wildlife habitat quality (PacifiCorp and Cowlitz PUD 2004a). The Lewis River relicensing studies specifically used the HEP to provide a baseline assessment of habitat quality in the Lewis River study area (PacifiCorp and Cowlitz PUD 2006). Each HEP evaluation species has a HSI model that evaluates habitat variables to determine an overall habitat quality value for that specific vegetation cover type. In year 17 of the licenses, the HEP Study will be repeated to compare the HSI values and quantify changes in habitat quality.

Analysis Species

Analysis species are species that were the focus of the relicensing studies. Species selected varied from commonly occurring to rare and declining species, or they represented a species guild that required specific habitat and/or habitat features (PacifiCorp and Cowlitz PUD 2004b). The objective of these studies was to document the abundance and distribution in the primary study area and to determine the factors affecting distribution (PacifiCorp and Cowlitz PUD 2004b).

Other Species

Other species are species that are known to be on WHMP lands, utilize particular vegetation cover types, and would directly benefit from habitat management actions. These species were not specifically evaluated during the relicensing process, and there is no baseline data for the abundance or distribution in the area for these species.

17.1.2 Vegetation Cover Types

Habitat variables and associated cover types have been identified for each HSI model. A HEP Team, composed of a multi-agency panel, assessed each model to determine if the cover types were applicable to the Lewis River WHMP lands and to determine the corresponding vegetation cover types (PacifiCorp and Cowlitz PUD 2004a, Table 5.2-2).

17.1.3 Habitat Associations

The habitat associations provide information on wildlife habitat use in the Lewis River basin. The habitat associations are from the species/habitat matrix in Appendix 1 of the Analysis Species Assessment Report (PacifiCorp and Cowlitz PUD 2004b). This matrix identifies the habitat type(s) that a given species was observed in during the relicensing studies. The matrix was developed from a wildlife species observation database, which recorded species, number of individuals, activity, location, habitat, and comments for each wildlife observation during the relicensing studies (PacifiCorp and Cowlitz PUD 2004b).

The following sections provide general life-history and habitat information for each HEP evaluation species, analysis species, and other species. The information is specific to the Lewis River basin and WHMP lands, when possible. In addition, all relevant information from the relicensing studies for each species has been included.

17.2 BALD EAGLE (Haliaeetus leucocephalus)

17.2.1 Status and Habitat Associations

Table 17.2.1	Bald H	Eagle	Status	and A	Associated	Habitats
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Federal Status ¹ :	Species of Concern
State Status ¹ :	Threatened Species
Managed Habitat Associations ² :	Analysis species for old-growth
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Lodgepole pine, old-growth, pole conifer, riparian
	deciduous/riverine, reservoir/shoreline, and wetland

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.2.2 Habitat

Bald eagles need various habitats for nesting, perching, foraging, and roosting. Bald eagles typically nest in large trees near open water with a relatively low level of human activity (Stinson et al. 2007). In Washington, the forested habitat surrounding a nest tree can be variable, ranging from an old-growth stand to a small patch of trees. Other than adequate food supply, a large, super-dominant tree is the single-most critical habitat factor associated with bald eagle nests (Stinson et al. 2007). In addition, perch trees exist throughout the nesting territory at prominent points that provide a vast view of a foraging area. Foraging areas are generally large bodies of open water that provide an adequate supply of fish and waterfowl (Stinson et al. 2007). Roosting habitat is usually unevenaged forest stands that provide protection from weather, with the tallest and most decadent trees being selected for roosting (Stinson et al. 2007, Watson and Rodrick 2001).

Beginning in 1993, PacifiCorp documented the first nesting bald eagles on the North Fork Lewis River; since then, bald eagle nests have steadily grown to include 11 nesting territories between the confluence of Muddy Creek and the Lewis River to the Interstate-5 Bridge. There are currently 12 known or suspected winter communal roosts in the Lewis River basin, four of which occur at least partially on WHMP lands (i.e., Merwin roost, Yale Reservoir roost, Canyon Creek, and Siouxon Notch) (Anderson and Ichisaka 1986). Chapter 14 (*Raptor Management*) provides further information on PacifiCorp's management, and Appendices 14-5 and 14-6 of Chapter 14 provide specific information on bald eagle nests and roosts in the basin.

17.2.3 Seasonal Activity

Bald eagles can be found in Washington throughout the year. Courtship and nest building typically begin in January and February. Egg laying begins in February and ends in March, with a 35-day incubation period. Most eaglets fledge by mid-July but remain in the vicinity of the nest for another month (Watson and Rodrick 2001). Nesting eagles can remain on the territory year round, but most migrate to British Columbia in the late

summer and early fall (Watson and Rodrick 2001). Eagles that migrate to Washington from other areas typically arrive in October and disperse by March (Watson and Rodrick 2001). In the winter, eagles congregate at locations where food is abundant and will spend the night roosting in groups from two to more than 500 birds (Stinson et al. 2007).

PacifiCorp conducted bald eagle studies between 1984 and 1986 to determine the winter foraging concentrations and communal roost locations in the Lewis River (Anderson et al. 1985, Anderson and Ichisaka 1986). These studies, along with annual aerial surveys to locate nest sites and assess nest productivity, have provided abundant information on local and seasonal bald eagle use of the Lewis River.

17.2.4 Diet

Bald eagles eat a variety of foods that vary with the season and location. Foraging behavior observed during the 1984 through 1986 bald eagle ecology studies determined that fish is the primary prey for eagles in the Lewis River basin. However, eagles were observed scavenging on carrion and salmon carcasses and making prey attempts on common mergansers (Anderson et al. 1985).

17.3 BEAVER (Castor canadensis)

17.3.1 Status and Habitat Associations

Table 17.3.1	Beaver	Status	and	Associated	Habitats
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Federal Status ¹ :	None
State Status ¹ :	None
Managed Habitat Associations ² :	Analysis species for wetland
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Meadow/agriculture, riparian deciduous/riverine, upland deciduous,
	and wetland

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.3.2 Habitat

Beavers are found in a variety of water bodies, from roadside ditches to lakes, streams, and rivers that are bordered by trees (Verts and Carraway 1998). Their preferred habitat is small streams with a constant flow of water that meander through relatively flat terrain. They can also be found in protected inlets of larger water bodies, such as lakes and rivers (Verts and Carraway 1998). Beavers are known for constructing dams to maintain water levels in small, flowing systems and elaborate lodges and burrows for denning. Beavers exist throughout WHMP lands and are strongly associated with the larger wetland areas. As evidenced by the rising number of beaver dam issues at culverts over the past 10 years, it appears that the beaver population is increasing on WHMP lands.

17.3.3 Seasonal Activity

Beavers are active year round. Beavers live in colonies composed of family groups, usually consisting of a mated pair of adults, their yearlings, and their young-of-year. The young are born in May or June and remain with the colony for about 2¹/₂ years (Csuti et al. 1997).

17.3.4 Diet

Beavers are herbivores that eat a variety of plants, with bark of deciduous trees being their preferred food (Maser 1998).

17.4 BLACK BEAR (Ursus americanus)

17.4.1 Status and Habitat Associations

Table 17.4.1 Black Bear Status and Associated Habitats

Federal Status ¹ :	None
State Status ¹ :	None
Managed Habitat Associations ² :	Analysis species for orchards
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Midsuccessional conifer and mixed conifer/deciduous

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.4.2 Habitat

In general, black bears are associated with forested areas, with a preference for early successional habitat. A southwest Washington study found that black bears used clearcuts that were 7 to 12 years postharvest more often than any other habitat type in their home range (Verts and Carraway 1998). This is confirmed each spring by evidence of bears stripping the tree bark in similar-age stands on the WHMP lands. Winter denning sites often include hollow trees, undersides of large logs, caves, or holes dug in the ground (Maser 1998).

Home range size varies with habitat and food resources within the landscape. The male's home range is typically two times that of the females. Although bears are mostly solitary animals, their home ranges often overlap, and they will congregate in areas where food resources are abundant (e.g., a berry patch or garbage dump) (Verts and Carraway 1998).

17.4.3 Seasonal Activity

During the spring to autumn season, bears are more active during daylight and crepuscular times of day. In the months before and following winter dormancy, bears become more nocturnal (Verts and Carraway 1998). In southwest Washington, black bears begin their winter dormancy as early as October 21 to as late as November 29. They emerge from winter dormancy between March 7 and March 28 (Verts and Carraway 1998). Bears mate in early to midsummer, and cubs are born during winter dormancy in late January or February (Csuti et al. 1997).

17.4.4 Diet

Black bears are generalists with a keen sense of smell and an innate curiosity, making them skilled scavengers. There diets consist of insects, fish, and small animals, including deer (*Odocoileus hemionus*) fawns and elk (*Cervus elaphus*) calves, and more than 80 percent of their diet consists of grasses, berries, nuts, tubers, and wood fiber (WDFW 2006). In the spring, black bears consume the new growth of grasses and forbs. In the summer, their diets shift to mostly berries and fruits and in the autumn to acorns, nuts,

and berries (Verts and Carraway 1998). In the spring, bears can cause extensive damage to trees, particularly Douglas-firs (*Pseudotsuga menziesii*) and western hemlocks (*Tsuga heterophylla*), by stripping the bark off to feed on the cambium layer (Verts and Carraway 1998, Csuti et al. 1997). On at least one occasion, a bear tore down a wood duck (*Aix sponsa*) nest box that was inhabited by honeybees.

17.5 BLACK-CAPPED CHICKADEE (Poecile atricapilla)

17.5.1 Status and Habitat Associations

Federal Status ¹ :	None		
State Status ¹ :	None		
Managed Habitat Associations ² :	HEP evaluation species for riparian and forestland habitat		
Vegetation Cover Types ³ :	Lodgepole pine, mature conifer, midsuccessional conifer,		
	midsuccessional conifer – thinned, oak woodland, old-growth,		
	palustrine forested wetland, pole conifer, pole conifer –		
	thinned, upland deciduous, upland mixed, upland mixed –		
	thinned, young upland deciduous, young riparian deciduous,		
	and young riparian mixed		
Habitat Associations ⁴ :	Lodgepole pine, mature conifer, meadow/agriculture,		
	midsuccessional conifer, mixed conifer/deciduous, old-growth		
	conifer, orchard, pole conifer, reservoir/shoreline, riparian		
	deciduous/riverine, seedling/sapling, shrubland, upland		
	deciduous, and wetland		

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.5.2 Habitat

The black-capped chickadee is most common in deciduous forest but may also be in mixed coniferous-deciduous forests and occasionally in pure coniferous forests (Csuti et al. 1997). In Washington, the black-capped chickadee's preferred habitat is deciduous forests, and their abundance in deciduous forests is related to canopy volume (Marshall et al. 2003, Schroeder 1983a). Black-capped chickadees nest in cavities and are only able to excavate a cavity in the soft or rotten wood of snags or live decay trees (Schroeder 1983a). Preferred tree diameters at nest site range from 3.9 to 5.9 inches (10 to 15 cm), and tree height ranges from 1 to 40 feet (0.3 to 12.2 m) (Schroeder 1983a).

The HSI model evaluates deciduous forests, evergreen forests, and mixed deciduous and evergreen forested wetland areas (Appendix 17-1) (Schroeder 1983a). The HSI model assumes optimum habitat to be 50 to 75 percent canopy closure, with the overstory trees greater than 49.2 feet (15 m) in height, an optimum canopy volume that exceeds 33.5 cubic feet of foliage/square foot (10.2m³ of foliage/m²) of ground surface, and two snags 4 to 10 inches (10 to 25 cm) dbh per acre (0.4 ha) (Schroeder 1983a). It was decided by the Lewis River HEP Team in the August 4, 1999, meeting not to include canopy volume (variable 3) in the HSI model (PacifiCorp and Cowlitz PUD 2004a). The following table lists the HSI mean values for each habitat variable and cover type (PacifiCorp and Cowlitz PUD 2004a):

Vegetation Cover Type	Habitat Variables	Merwin	Yale	Swift
	Snag Density		1.00	
Lodgepole Pine	Tree Cover		0.79	
Forest (LP)	Tree Height		0.93	
	Overall HSI Value		0.85	0.85
	Snag Density	1.00	1.00	0.80
Mature Conifer	Tree Cover	0.71	0.84	0.74
Forest (M)	Tree Height	1.00	1.00	1.00
	Overall HSI Value	0.83	0.91	0.70
Mid-	Snag Density	1.00	0.89	1.00
successional	Tree Cover	0.75	0.83	0.74
Conifer (MS)	Tree Height	1.00	1.00	1.00
	Overall HSI Value	0.86	0.82	0.85
Mid-	Snag Density	0.75		
successional	Tree Cover	0.94		
Conifer Thinned	Tree Height	1.00		
(MS-t)	Overall HSI Value	0.72	0.72	0.72
	Snag Density	1.00	1.00	1.00
Old-growth	Tree Cover	0.89	0.86	0.73
(OG)	Tree Height	1.00	1.00	1.00
	Overall HSI Value	0.94	0.92	0.85
Palustrine	Snag Density	1.00	1.00	1.00
Forested	Tree Cover	0.85	0.84	0.82
Wetland (PFO)	Tree Height	0.92	1.00	1.00
	Overall HSI Value	0.87	0.91	0.91
	Snag Density	0.50	0.80	0.50
Pole Conifer	Tree Cover	0.66	0.68	0.70
Forest (P)	Tree Height	1.00	1.00	1.00
	Overall HSI Value	0.40	0.50	0.43
Pole Conifer	Snag Density	0.25	0.00	
Forest – thinned	Tree Cover	0.99	1.00	
(P-t)	Tree Height	1.00	0.73	
. ,	Overall HSI Value	0.25	0.00	
	Snag Density	1.00	1.00	0.25
Riparian	Tree Cover	0.81	0.60	0.66
Deciduous (RD)	Tree Height	1.00	1.00	1.00
	Overall HSI Value	0.90	0.77	0.19
	Snag Density	1.00	1.00	0.67
Riparian Mixed	Tree Cover	0.78	0.81	0.70
Forest (RM)	Tree Height	1.00	1.00	1.00
	Overall HSI Value	0.87	0.90	0.58
	Snag Density	0.67	0.71	1.00
Upland	Tree Cover	0.73	0.79	0.65
Deciduous (UD)	Tree Height	1.00	1.00	1.00
	Overall HSI Value	0.59	0.60	0.80
Upland Mixed	Snag Density	0.70	0.80	0.83
(UM)	Tree Cover	0.71	0.76	0.73
	Tree Height	1.00	1.00	1.00

Table 17.5.2 Black-capped Chickadee Habitat Suitability Index Mean Values

	Overall HSI Value	0.60	0.68	0.71
	Snag Density	0.00		
Upland Mixed -	Tree Cover	0.88		
Thinned (UM-t)	Tree Height	1.00		
	Overall HSI Value	0.00	0.00	0.00
Voung Unland	Snag Density	1.00	0.00	0.50
Deciduous Forest (YUD)	Tree Cover	0.64	0.60	0.60
	Tree Height	1.00	0.77	0.71
	Overall HSI Value	0.80	0.00	0.39
Young Upland Mixed Forests	Snag Density	0.67		
	Tree Cover	0.94		
	Tree Height	1.00		
	Overall HSI Value	0.65	0.65	0.65

Table 17.5.2 Black-capped Chickadee Habitat Suitability Index Mean Values

17.5.3 Seasonal Activity

Black-capped chickadees form loose winter flocks, with the flock size, density, and range dependent on food resources. Pairs break out of the winter flock in March to begin courtship and nesting (Marshall et al. 2003).

17.5.4 Diet

Diet is comprised mostly of caterpillars, spiders, small snails, and slugs. Black-capped chickadees will also eat seeds and fruits (Marshall et al 2003).

17.6 BLACK-TAILED DEER (Odocoileus hemionus)

17.6.1 Status and Habitat Associations

Table 17.6.1 Black-tailed Deer Status and Associated Habitats

Federal Status ¹ :	None
State Status ¹ :	Priority
Managed Habitat Associations ² :	Analysis species for shrubland, and other species for orchards,
	farmland, idle fields, meadow, and forestlands habitats
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Lodgepole pine, mature conifer, meadow/agriculture,
	midsuccessional conifer, mixed conifer/deciduous, old-growth
	conifer, orchard, pole conifer, riparian deciduous/riverine,
	reservoir/shoreline, shrubland, seedling/sapling, upland
	deciduous, wetland, and disturbed

¹Source: WDFW 2008.

²Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.6.2 Habitat

The average home range size for the black-tailed deer is 0.5 to 1 square miles (1.3 to 2.6 km^2) (Watson and Schirato 1990). Within their home range, the mosaic of cover and forage vary between 40 to 60 and 60 to 40 percent, respectively. Optimum foraging habitats are open and within 600 feet (183 m) of cover (Watson and Schirato 1990). Cover habitat consists of vegetation dense enough to hide 90 percent of an adult deer from 200 feet (60 m) or less and between 5 and 36 acres (2 and 15 ha) in size (Watson and Schirato 1990).

Black-tailed deer habitat requirements vary depending on the landscape and the season. In the winter, deer prefer lower elevations and moderate slopes with south to southeast exposures. In the spring, during fawning season, deer prefer flat areas that are in proximity to water and provide succulent forage. Ideal fawning habitat includes riparian areas with low shrubs or forestlands with a mix of small trees (2 to 6 feet [0.6 to 1.8 m] tall) and tall overstory trees that comprise approximately 50 percent canopy cover. Summer habitats are variable but typically are in areas near water that have ample forage (Watson and Schirato 1990).

17.6.3 Seasonal Activity

Breeding occurs in November and December, and fawning occurs May through July (Watson and Schirato 1990). Black-tailed deer are year-round residents on the WHMP lands, but some movement may occur from higher to lower elevations in the winter.

17.6.4 Diet

Deer are browsers, consuming a variety of plants. Forbs may comprise 50 to 75 percent of the summer diet and only 10 percent of their winter diet. Winter diet is comprised of the new growth on shrubs and trees, especially those shrubs and trees that are high in fat content (Verts and Carraway 1998).

17.7 CASCADE TORRENT SALAMANDER (Rhyacotriton cascadae)

17.7.1 Status and Habitat Associations

Table 17.7.1 Cascade Torrent Salamander Status and Associated Habitats

Federal Status ¹ :	None
State Status ¹ :	Candidate
Managed Habitat Associations ² :	Analysis species for riparian habitats
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Riverine, upland deciduous, and rock

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.7.2 Habitat

Larvae of the Cascade torrent salamander are fully aquatic, and the adults are strongly associated with water, such that individuals are typically found in contact with free water or in a saturated substratum (Washington Department of Natural Resources 2008b). Cascade torrent salamanders are most abundant in high-gradient, cold, rock-dominated streams, waterfall splash zones, and seeps in mature forest or forests with thick canopy cover (Jones et al. 2005, Washington Department of Natural Resources 2008). Within the streams, the salamanders are usually found in stream segments or off-channel habitats that are shallow and slow flowing, with adequate gravel or rock rubble that is silt-free. During rainy, wet periods, adults may be found away from streams or seepages in wet terrestrial forests (Washington Department of Natural Resources 2005).

17.7.3 Seasonal Activity

Cascade torrent salamanders may be active year round at lower elevations. Breeding and egg laying usually occur between March and June, and the eggs take 7 to 10 months to hatch (Csuti et al. 1997).

17.7.4 Diet

Diet likely varies by location, season, and life-history stage. The diet of the larval salamander likely consists of aquatic invertebrates. Metamorphosed salamanders likely feed upon both aquatic and terrestrial invertebrates (Jones et al. 2005).

17.8 GREAT BLUE HERON (Ardea herodias)

17.8.1 Status and Habitat Associations

Table 17.8.1	Great Blue	Heron Status	and Associated	Habitats
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Federal Status ¹ :	None
State Status ¹ :	Priority
Managed Habitat Associations ² :	Analysis species for wetland habitat
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Riverine, reservoir/shoreline, and wetland

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.8.2 Habitat

Great blue herons occur near most fresh and saltwater habitat types (seashores, rivers, swamps, marshes, and ditches) (Quinn and Milner 1999). They are colonial nesters and nest in rookeries that contain from a few to several hundred nests (Csuti et al. 1997). Rookery locations are determined by proximity and availability of food, level of disturbance, and suitability of substrate. Nests are typically located at heights between 30 and 85 feet (9 and 26 m) and in the tallest trees available but may be located in bushes and artificial structures (Quinn and Milner 1999). Great blue herons forage in salt- and freshwater-environments, including shallow waters and the shores of lakes, ponds, marshes, streams, estuaries, bays, and oceans up to 2 feet (6.6 m) deep (Marshall et al 2003).

17.8.3 Seasonal Activity

Great blue herons gather at the rookeries in late January to mid-March. Herons are highly asynchronous nesters, so egg laying may occur between late February and April, and young fledge from early June through mid-August (Marshall et al. 2003).

17.8.4 Diet

The great blue heron's diet varies but primarily consists of fish, amphibians, aquatic invertebrates, reptiles, mammals, and birds (Marshall et al. 2003).

17.9 LARCH MOUNTAIN SALAMANDER (Plethodon larselli)

17.9.1 Status and Habitat Associations

Federal Status ¹ :	Species of Concern
State Status ¹ :	Sensitive
Managed Habitat Associations ² :	Analysis species for old-growth and unique area habitat
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Riparian deciduous/riverine, disturbed, and rock

Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.9.2 Habitat

Larch Mountain salamanders are strongly associated with areas of accumulated rock (talus, scree, gravelly soils) where interstitial spaces exist between the rocks and the soil (Washington Department of Natural Resources 2008). They will inhabit a variety of vegetation types if adequate surface rock exists, including old-growth forests, young naturally regenerated forest with residual late-successional features (e.g., large logs, bark piles), shrub-dominated communities, scree, talus, and lava-tube entrances (Jones et al. 2005). Nonforested areas are typically north facing with nonvascular plants (e.g., mosses) dominating the ground cover (Jones et al. 2005). In the central portion of their range, the species occupies old-growth forests that lack exposed rock if there is adequate woody debris (Jones et al. 2005). The only Larch Mountain salamander population known to exist on the Lewis River WHMP lands is on the face of Yale Dam (PacifiCorp and Cowlitz PUD 2004b).

17.9.3 Seasonal Activity

Surface activity is associated with the cool, wet weather conditions of the spring and fall, with ideal conditions being when temperatures are between 39°F (4°C) and 59°F (14°C) and the soil is saturated to a depth of about 12 inches (30 cm) (Washington Department of Natural Resources 2008). In the Cascade Range, the activity periods are approximately April through late June, and late September to late November (Washington Department of Natural Resources 2008). Breeding takes place in the fall and spring months.

17.9.4 Diet

Diet is comprised of invertebrates including small, ground-dwelling arthropods such as mites, springtails, spiders, and beetles (Jones et al. 2005). Large individuals can prey upon snails and earthworms (Csuti et al. 1997).

17.10 MARTEN (*Martes americana*)

17.10.1 Status and Habitat Associations

Table 17.10.1 Marten Status and Associated Habitats

Federal Status ¹ :	None
State Status ¹ :	Priority
Managed Habitat Associations ² :	Analysis species for old-growth habitat
Vegetation Cover Types ³ :	No vegetation cover types identified
Habitat Associations ⁴ :	No habitat associations identified

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.
 ³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.10.2 Habitat

The marten prefers dense, old-growth conifer and mixed stands with a canopy closure of at least 40 percent and an adequate amount of understory vegetation and down wood to provide cover and den sites (Snyder 1991). Martens den in hollow logs, holes in stumps, and the hollows of trees (Maser 1998).

17.10.3 Seasonal Activity

Martens are active year round. The breeding season is between late July and August, but egg implementation is delayed until the spring (Csuti et al. 1997).

17.10.4 Diet

Martens are primarily carnivorous and feed on small mammals such as shrews (Sorex spp.), voles (*Microtus* sp.), wood rats (*Neotoma* spp.), rabbits, squirrels, and mountain beavers (Aplodontia rufus). They also eat birds, insects, berries, and carrion (Csuti et al. 1997).

17.11 MINK (Mustela vison)

17.11.1 Status and Habitat Associations

Table 17.11.1 Mink Status	s and Associated Habitats
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Federal Status ¹ :	None
State Status ¹ :	Priority
Managed Habitat Associations ² :	HEP evaluation species for wetland and riparian habitats
Vegetation Cover Types ³ :	Palustrine emergent, palustrine forested wetland, palustrine
	scrub-shrub, palustrine unconsolidated bottom, lacustrine and
	riverine
Habitat Associations ⁴ :	Riparian deciduous/riverine, disturbed, and rock

¹Source: WDFW 2008. ²Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

The mink is a HEP evaluation species for wetland and riparian habitats (PacifiCorp and Cowlitz PUD 2006). Although the mink has been designated as a HEP evaluation species for riparian habitats, the HSI values were not assessed at streams during the original HEP Study, so there is no baseline mink data for the riparian vegetation cover types (i.e., riparian deciduous, riparian mixed, riparian deciduous shrubland, riparian grassland, and young riparian mixed).

To determine baseline information for riparian vegetation cover types, the mink HSI model will be applied to the existing WHMP lands and conducted at the same time the HEP Study is being applied to newly acquired lands. The mink HSI model will be applied to perennial fish-bearing streams that extend greater than 328 feet (100 m) onto WHMP lands (Allen 1986). The streams will be assessed using the assumptions, equations, and suitability index values that apply to the riverine cover type (i.e., percent of year with surface water present, percent shoreline cover within 3 feet [1 m] of water's edge, and percent canopy cover of trees and shrubs within 328 feet [100 m] of the stream's edge) in the mink HSI model (Allen 1986 [Figure 6]). A memo describing this procedure is provided in Appendix 17-2.

17.11.2 Habitat

Although mink will occasionally use upland habitats, they are closely associated with aquatic habitats, such as freshwater streams, rivers, lakes, marshes, and marine shore habitats. The extent and density of mink populations are proportionate to the distribution and abundance of such habitats (Maser 1998, Verts and Carraway 1998). Mink's dependency on aquatic prey limits their use of upland habitat, and most mink observations occur within 656 feet (200 m) of water (Allen 1986). Mink require extensive woody and persistent herbaceous vegetation for cover, denning, and foraging. The amount of cover required is dependent on the size and percent of surface water year round, but optimum appears to be greater than 75 percent canopy cover (Allen 1986).

The HSI model evaluates riverine, lacustrine, palustrine forested, palustrine scrub/shrub, and palustrine emergent wetland cover types (Appendix 17-2) (Allen 1986). The model assumes optimum habitat to have surface water for greater than 75 percent of the year, greater than 75 percent tree and shrub cover, between 50 and 75 percent emergent vegetation cover within the aquatic habitat, greater than 75 percent tree and shrub cover with 328 feet (100 m) of the wetland's edge, and 100 percent dense cover on the shorelines of lakes and rivers. The following table lists the HSI mean values for each habitat variable (PacifiCorp and Cowlitz PUD 2004a):

Vegetation Cover Type	Habitat Variables	Merwin	Yale	Swift
Lacustrine	Tree/Shrub Cover greater than 328 feet (100 m)	1.00	1.00	1.00
Unconsolidated	Shoreline	0.20	0.21	0.22
Bottom (LUB)	Overall HSI Value	0.45	0.46	0.47
Doluctrino	Shrub Cover	0.10	0.25	0.24
Emorgant	Tree Cover	0.14	0.40	0.27
Wetland	Tree/Shrub Cover greater than 328 feet (100 m)	0.80	0.80	0.90
(PEM)	Emergent Vegetation Cover	1.00	1.00	1.00
	Overall HSI Value*	0.96	0.96	0.98
Doluctrino	Shrub Cover	0.38	0.32	0.35
Forested Tree, Wetland Emer (PFO) Over	Tree Cover	0.80	0.85	0.76
	Tree/Shrub Cover greater than 328 feet (100 m)	0.80	0.80	0.90
	Emergent Vegetation	0.68	0.76	0.60
	Overall HSI Value	0.90	0.90	0.94
	Shrub Cover	0.76	0.53	0.91
Palustrine	Tree Cover	0.10	0.10	0.10
Scrub-Shrub Wetland (PSS)	Tree/Shrub Cover greater than 328 feet (100 m)	0.80	0.80	0.90
	Emergent Vegetation	1.00	0.97	1.00
	Overall HSI Value*	0.90	0.90	0.95
Riverine	Tree/Shrub Cover greater than 328 feet (100 m)	0.58		
Unconsolidated	Shoreline	0.38		
Bottom (RUB)	Overall HSI Value	0.47		

Table 17.11.2 Mink Habitat Suitability Index Mean Values

Source: PacifiCorp and Cowlitz PUD 2004a.

* The overall HSI values in PacifiCorp and Cowlitz PUD (2004a) were incorrectly reported. They have been corrected for this document and should be used for future reference.

17.11.3 Seasonal Activity

Mink are active year round and are primarily nocturnal, although it is not uncommon to see a mink during the day. Breeding season begins in late January or early February and lasts through March to early April. Kits are born during April or May and remain with the family until fall (Maser 1998).

17.11.4 Diet

Mink are dependent on aquatic or wetland-associated prey species and will predate on both vertebrate and invertebrate animals (Allen 1986).

17.12 NORTHERN FLYING SQUIRREL (*Glaucomys sabrinus*)

17.12.1 Status and Habitat Associations

Table 17.12.1 Northern Flying Squirrel Status and Associated Habitats

Federal Status ¹ :	None
State Status ¹ :	None
Managed Habitat Associations ² :	Analysis species for forestland habitat
Vegetation Cover Types ³ :	No vegetation cover types identified
Habitat Associations ⁴ :	No habitat associations identified

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.
 ³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.12.2 Habitat

This species is associated with tall trees in deciduous, mixed, and coniferous forests. They commonly den in cavities of snags or live decay trees (Gomez et al. 2005). Their preferred food source is truffles, so they are closely associated with forestlands with large amounts of woody debris (Maser 1998).

17.12.3 Seasonal Activity

Northern flying squirrels are active year round. Breeding season starts in March, and most young are born in May and June (Csuti et al. 1997).

17.12.4 Diet

Diet is comprised mostly of underground fungi (truffles) with lesser amounts of nuts, seeds, fruits, insects, and green vegetations. Northern flying squirrels play an important role in forests by spreading the spores of mycorrhizal fungi (Csuti et al. 1997).

17.13 NORTHERN SPOTTED OWL (Strix occidentalis)

17.13.1 Status and Habitat Associations

Federal Status ¹ :	Threatened
State Status ¹ :	Endangered
Managed Habitat Associations ² :	Analysis species for old-growth and forestland habitats
Vegetation Cover Types ³ :	Appendix 17-3 is a memo that classifies the vegetation cover
	types into suitable northern spotted owl habitats
Habitat Associations ⁴ :	Mature conifer habitat

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.13.2 Habitat

Spotted owls are typically associated with older conifer forest habitats that have characteristics necessary for successful nesting and roosting. These are forests with a moderate to high canopy closure (60 to 90 percent), a multilayered, multi-species canopy with large overstory trees (with dbh greater than 30 inches [76 cm]), a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence), large snags, large accumulations of fallen trees and other woody debris on the ground, and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). Although nesting and roosting habitats support foraging owls, they will forage in forested habitats that have fewer habitat characteristics such that they do no support successful nesting pairs (USFWS 2007). Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities (USFWS 1992).

17.13.3 Seasonal Activity

Spotted owls remain on their territory year round. Their breeding season starts in March, with the young fledging in late May or June. The young remain in the territory until September (Marshall et al. 2003).

17.13.4 Diet

Diet includes about 90 percent forest mammals and is dominated by flying squirrels. They will also take small birds, insects, and an occasional snake or frog (Marshall et al. 2003).

17.14 PACIFIC WESTERN BIG-EARED BAT (*Plecotus townsendii*)

17.14.1 Status and Habitat Associations

Table 17.14.1 Pacific Western Big-eared Bat Status and Associated Habitats

Federal Status ¹ :	Species of Concern
State Status ¹ :	Candidate
Managed Habitat Associations ² :	Analysis species for unique area habitats
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Rock habitat

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.
 ³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.14.2 Habitat

Pacific western big-eared bats are found in a variety of habitats. West of the Cascades, they are typically found in coniferous forests. They are known as a cave-dwelling bat and can be found roosting in buildings, mines, and caves (Csuti et al. 1997).

17.14.3 Seasonal Activity

The mating season is late-fall and during the winter hibernation. A single young is born in June (Csuti et al 1997).

17.14.4 Diet

Their primary food is moths, but they will also eat beetles, true bugs, and flies. This bat will take insects in flight and on foliage (Csuti et al. 1997).

17.15 PAPILLOSE TAIL-DROPPER (Prophysaon dubium)

17.15.1 Status and Habitat Associations

Table 17.15.1 Papillose tail-Dropper Status and Associated Habitats

Federal Status ¹ :	None
State Status ¹ :	None
Managed Habitat Associations ² :	Analysis species for riparian habitat
Vegetation Cover Types ³ :	No vegetation cover types identified
Habitat Associations ⁴ :	No habitat associations identified

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.15.2 Habitat

According to Burke (2000), the papillose tail-dropper is found in moist late-successional conifer forest stands with a hardwood component, but may be found in second-growth stands if sufficient habitat elements remain. Forest habitat elements include a moist conifer plant association, moist layers of litter and duff, and abundant amount of large and small woody debris (both conifer and hardwood). Within the stand, the papillose tail-dropper has a strong association to hardwood logs and leaf litter.

17.15.3 Seasonal Activity

They are thought to be active year round, but their above-ground surface activity is mainly in the late fall and early winter after the first frost (Pearce et al. 2008).

17.15.4 Diet

Papillose tail-droppers are primarily mycophagus (fungus eater). They have been observed eating above-ground fungal fruiting bodies, and fecal analysis has identified spores from a variety of underground truffles (Burke 2000).

17.16 PILEATED WOODPECKER (Dryocopus pileatus)

17.16.1 Status and Habitat Associations

Table 17.16.1 Pileated Woodpecker Status and Associated Habitats

Federal Status ¹ :	None				
State Status ¹ :	Candidate				
Managed Habitat Associations ² :	HEP evaluation species for old-growth, riparian, and forestland				
	habitat				
Vegetation Cover Types ³ :	Lodgepole pine forest, mature conifer forest, midsuccessional				
	conifer forest, midsuccessional conifer forest - thinned, old-				
	growth conifer forest, pole conifer forest, pole conifer forest –				
	thinned, palustrine forested wetland, riparian deciduous forest,				
	riparian-mixed forest, upland mixed, upland mixed – thinned,				
	upland deciduous forest, and young riparian mixed forest				
Habitat Associations ⁴ :	Lodgepole pine, mature conifer, meadow/agriculture, mixed				
	conifer/deciduous, old-growth conifer, pole conifer, riparian				
	deciduous/riverine, reservoir/shoreline, seedling/sapling, upland				
	deciduous, and wetland				

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.16.2 Habitat

Pileated woodpeckers are found in several seral stages of both deciduous and coniferous forests (Csuti et al. 1997). Because of their dependency on large snags and fallen trees, pileated woodpeckers are more closely associated with mature and old-growth forest habitats (Lewis and Azerrad 2003). Critical components of pileated woodpecker habitat are large snags, large trees, diseased trees, dense forest stands, and high snag densities (Schroeder 1983b). Nest and roost trees are usually the larger and taller snags or live decay trees (i.e., greater than or equal to 90 feet [27 m] and 30 inches [76 cm] dbh). A variety of forest seral stages can be used as foraging habitat if there is an adequate amount of large trees and snags (i.e., greater than 20 inches [51 cm] dbh) capable of supporting an abundant amount of insects (Lewis and Azerrad 2003).

The HSI model evaluates deciduous forests, evergreen forests, and deciduous and evergreen forested wetlands (Appendix 17-4) (Schroeder 1983b). It was decided by the Lewis River HEP Team in the February 3, 2000, meeting to modify the USFWS HSI model by replacing and changing some of the habitat variables (Appendix 17-4) (PacifiCorp and Cowlitz PUD 2004a). The following are the variables used in the HSI model and describes optimum habitat quality (PacifiCorp and Cowlitz PUD 2004a, Schroeder 1983b):

- Seventy-five percent or greater percent tree canopy closure
- Thirty or more trees greater than 20 inches (51 cm) dbh per 1.0 acre (0.4 ha)
- Ten or more tree stumps greater than 1 foot (0.3 m) in height and greater than 7 inches (18 cm) diameter and/or logs greater than 7 inches (18 cm) diameter per 1.0 acre (0.4 ha)

- 0.15 or more snags per 1.0 acre (0.4 ha) that are greater than 20 inches (51 cm) dbh
- Average snag dbh that is 30 inches (76 cm) or greater for snags greater than 20 inches (51 cm) dbh (*This variable was included in the HEP data but was not stated in the PacifiCorp and Cowlitz PUD [2004a] Appendix 2-13*).
- At least 0.0046 snags per 1.0 acre (0.4 ha) that are greater than 30 inches (76 cm) dbh and 75 feet (23 m) tall
- Twelve or more snags per 1.0 acre (0.4 ha) that are greater than 25 inches (76 cm) dbh and 30 feet (9 m) tall

The following table lists the HSI mean values for each habitat variable (PacifiCorp and Cowlitz PUD 2004a):

Vegetation Cover Type	Habitat Variables	Merwin	Yale	Swift
	Trees greater than 20 inches (51 cm) dbh		0.08	
	Snags greater than 20 inches (51 cm) dbh		0.33	
	Tree cover		0.31	
Lodgepole	Average dbh of snags greater than 20 inches (51cm)		0.17	
Pine Forest	Number of logs and stumps		1.00	
(LP)	Snags greater than 10 inches (25 cm) dbh		0.90	
	Snags greater than 30 inches (76 cm) dbh		0.90	
	Presence of red cedar		0.90	
	Overall HSI values		0.21	0.21
	Trees greater than 20 inches (51 cm) dbh	0.87	1.00	0.80
	Snags greater than 20 inches (51 cm) dbh	1.00	0.50	0.80
	Tree cover	1.00	0.91	1.00
Mature	Average dbh of snags greater than 20 inches (51 cm)	0.77	0.50	0.75
Conifer	Number of logs and stumps	1.00	1.00	1.00
Forest (M)	Snags greater than 10 inches (25 cm) dbh	0.93	0.93	0.96
	Snags greater than 20 inches (76 cm) dbh	0.90	0.93	0.90
	Presence of red cedar	0.90	0.90	0.90
	Overall HSI values	0.91	0.72	0.78
	Trees greater than 20 inches (51 cm) dbh	0.84	0.91	0.43
	Snags greater than 20 inches (51 cm) dbh	0.64	0.22	0.40
Ma	Tree cover	0.83	0.99	0.94
Mid-	Average dbh of snags greater than 20 inches (51 cm)	0.74	0.22	0.22
Conifer	Number of logs and stumps	0.99	1.00	1.00
(MS)	Snags greater than 10 inches (25 cm) dbh	0.96	0.93	0.92
(1415)	Snags greater than 10 inches (76 cm) dbh	0.90	0.90	0.90
	Presence of red cedar	0.91	0.90	0.90
	Overall HSI values	0.69	0.59	0.47
Mid-	Trees greater than 20 inches (51 cm) dbh	0.76		
successional	Snags greater than 20 inches (51 cm) dbh	0.13		
Conifer	Tree cover	0.77		
Thinned	Average dbh of snags greater than 20 inches (51 cm)	0.12		
(MS-t)	Number of logs and stumps	1.00		
	Snags greater than 10 inches (25 cm) dbh	0.93		

Table 17.16.2 Pileated Woodpecker Habitat Suitability Index Mean Values

Vegetation Cover Type	Habitat Variables	Merwin	Yale	Swift
	Snags greater than 30 inches (76 cm) dbh	0.90		
	Presence of red cedar	0.91		
	Overall HSI values	0.47	0.47	0.47
	Trees greater than 20 inches (51 cm) dbh	0.98	1.00	0.99
	Snags greater than 20 inches (51 cm) dbh	0.33	1.00	0.83
	Tree cover	1.00	0.96	0.99
Old-growth	Average dbh of snags greater than 20 inches (51 cm)	0.33	0.93	0.81
Cover Type Cover Type Old-growth (OG) Palustrine Forested Wetland (PFO) Pole Conifer Forest (P) Pole Conifer Forest (P) Pole Conifer Forest (P)	Number of logs and stumps	1.00	1.00	1.00
	Snags greater than 10 inches (25 cm) dbh	0.90	0.97	0.97
	Snags greater than 10 inches (76 cm) dbh	0.90	0.93	0.92
	Presence of red cedar	0.90	0.90	0.92
	Overall HSI values	0.65	0.97	0.89
Vegetation Cover Type Habitat Variables Mervin Y Snags greater than 30 inches (76 cm) dbh 0.90 0.90 0.91 Orderall HSI values 0.47 0 0 Old-growth (OG) Trees greater than 20 inches (51 cm) dbh 0.98 1 Average dbh of snags greater than 20 inches (51 cm) 0.33 1 Tree cover 1.00 0 1 Snags greater than 10 inches (25 cm) dbh 0.90 0 Patester than 10 inches (25 cm) dbh 0.90 0 Overall HSI values 0.66 0 Outer HI HSI values 0.66 0 Overall HSI values 0.66 0 Tree cover 0.66 0 Average dbh of snags greater than 20 inches (51 cm) 0.33 0 Tree cover 0.66 0 0 Average dbh of snags greater than 20 inches (51 cm) 0.33 0 Pole Number of logs and stumps 1.00 1 Snags greater than 20 inches (51 cm) dbh 0.90 0 Overall HSI values	0.00	0.26		
	Snags greater than 20 inches (51 cm) dbh	0.33	0.17	0.00
Palustrine	Tree cover	0.66	0.75	0.60
Forested	Average dbh of snags greater than 20 inches (51cm)	0.33	0.17	0.00
Wetland	Number of logs and stumps	1.00	1.00	1.00
(PFO)	Snags greater than 10 inches (25 cm) dbh	0.97	0.93	0.95
~ /	Snags greater than 30 inches (76 cm) dbh	0.90	0.92	0.90
	Presence of red cedar	0.90	0.90	0.90
	Overall HSI values	0.18	0.08	0.25
	Trees greater than 20 inches (51 cm) dbh	0.14	0.27	0.06
	Snags greater than 20 inches (51 cm) dbh	0.13	0.20	0.17
	Tree cover	1.00	1.00	1.00
Pole	Average dbh of snags greater than 20 inches (51cm)	0.13	0.00	0.17
Conifer Forest (P)	Number of logs and stumps	0.89	1.00	1.00
	Snags greater than 10 inches (25 cm) dbh	0.91	0.90	0.90
	Snags greater than 30 inches (76 cm) dbh	0.90	0.90	0.90
	Presence of red cedar	0.90	0.90	0.90
	Overall HSI values	0.16	0.20	0.18
	Trees greater than 20 inches (51 cm) dbh	0.36		
D.1.	Shags greater than 20 inches (51 cm) dbh	0.00		
Pole Conifer	Average dbh of spage greater than 20 inches (51 cm)	0.91		
Forest	Average doll of shags greater than 20 mones (510m)	0.00		
thinned (P-	Spage greater than 10 inches (25 cm) dbh	0.03		
t)	Snags greater than 30 inches (76 cm) dbh	0.93		
•,	Presence of red cedar	0.90		
	Overall HSI values	0.25		
	Trees greater than 20 inches (51 cm) dbh	0.19	0.00	0.49
	Snags greater than 20 inches (51 cm) dbh	0.00	1.00	0.49
	Tree Cover	1.00	1.00	1.00
	Average dbh of snags greater than 20 inches (51cm)	0.00	0.31	0.00
Riparian	Number of logs and stumps	1.00	1.00	1.00
Deciduous	Snags greater than 10 inches (25 cm) dbh	0.90	0.90	0.93
(RD)	Snags greater than 30 inches (76 cm) dbh	0.90	0.90	0.90
	Presence of red cedar	0.90	0.90	0.90
	Overall HSI values	0.26	0.37	0.32

 Table 17.16.2 Pileated Woodpecker Habitat Suitability Index Mean Values

Vegetation Cover Type	Habitat Variables	Merwin	Yale	Swift
	Trees greater than 20 inches (51 cm) dbh	0.29	0.91	0.29
	Snags greater than 20 inches (51 cm) dbh	0.33	0.50	0.33
	Tree Cover	0.92	1.00	1.00
Riparian	Average dbh of snags greater than 20 inches (51cm)	0.61	0.50	0.33
Mixed	Number of logs and stumps	1.00	1.00	1.00
Forest (RM)	Snags greater than 10 inches (25 cm) dbh	0.90	0.95	0.93
	Snags greater than 30 inches (76 cm) dbh	0.90	0.90	0.93
	Presence of red cedar	0.93	0.95	0.90
	Overall HSI values	0.57	0.74	0.46
	Trees greater than 20 inches (51 cm) dbh	0.07	0.24	0.13
	Snags greater than 20 inches (51 cm) dbh	0.00	0.71	0.25
	Tree cover	0.98	0.95	1.00
Upland	Average dbh of snags greater than 20 in(51cm)	0.00	0.67	0.25
Deciduous	Number of logs and stumps	1.00	0.98	0.97
(UD)	Snags greater than 10 inches (25 cm) dbh	0.92	0.91	0.93
	Snags greater than 30 inches (76 cm) dbh	0.90	0.90	0.90
	Presence of red cedar	0.92	0.90	0.90
	Overall HSI values	0.13	0.55	0.28
	Trees greater than 20 inches (51 cm) dbh	0.79	0.53	0.27
	Snags greater than 20 inches (51 cm) dbh	0.40	0.60	0.00
Upland Mixed (UM)	Tree cover	1.00	1.00	0.99
	Average dbh of snags greater than 20 in(51cm)	0.36	0.60	0.00
	Number of logs and stumps	1.00	0.86	1.00
	Snags greater than 10 inches (25 cm) dbh	0.94	0.90	0.92
	Snags greater than 30 inches (76 cm) dbh	0.90	0.90	0.90
	Presence of red cedar	0.91	0.90	0.92
	Overall HSI values	0.63	0.60	0.19
	Trees greater than 20 inches (51 cm) dbh	0.33		
	Snags greater than 20 inches (51 cm) dbh	0.00		
	Tree cover	1.00		
Upland	Average dbh of snags greater than 20 inches 51cm)	0.00		
Mixed –	Number of logs and stumps	1.00		
I hinned	Snags greater than 10 inches (25 cm) dbh	0.90		
(UM-t)	Snags greater than 30 inches (76 cm) dbh	0.90		
	Presence of red cedar	0.90		
	Overall HSI values	0.35	0.35	0.35

 Table 17.16.2 Pileated Woodpecker Habitat Suitability Index Mean Values

17.16.3 Seasonal Activity

Pileated woodpeckers defend their territory year round. Breeding season begins in April, and the young remain at the natal site until fall (Marshall et al. 2003). Pileated woodpeckers glean, peck, and scale bark off of trees to find insects.

17.16.4 Diet

Their diet consists mostly of carpenter antes (*Camponotus* spp.) and thatching ants (*Formica* spp.). They have been observed eating fruit and nuts in some parts of their range (Marshall et al. 2003).

17.17 POND-BREEDING AMPHIBIANS

17.17.1 Status and Habitat Associations

Pond-breeding amphibians are a HEP evaluation species for wetland habitat. The HSI model is unique in that it includes several species and is specific to areas west of the Cascade Mountains (PacifiCorp and Cowlitz PUD 2006). Pond-breeding amphibians are associated with palustrine forested wetland, palustrine scrub-shrub wetland, palustrine emergent wetland, and palustrine unconsolidated bottom vegetation cover types (PacifiCorp and Cowlitz PUD 2004a).

Common Name	Species Name	Federal Status ¹	State Status ¹	Species Known to Exist on Project Lands ²	Habitat Associations ²
Long-toed salamander	Ambystoma macrodactylum	None	None	Yes	wetland
Northern red- legged frog	Rana aurora	None	None	Yes	old-growth, riparian deciduous/riverine, wetland
Northwestern salamander	Ambystoma gracile	None	None	Yes	riparian deciduous /riverine, wetland
Oregon spotted frog	Rana pretiosa	Candidate	Endangered	No	none
Pacific treefrog	Pseudacris regilla	None	None	Yes	meadow/ agriculture, midsuccessional conifer, old- growth, riparian deciduous /riverine, upland deciduous, wetland
Rough- skinned newt	Taricha granulosa	None	None	Yes	mature conifer, meadow/ agriculture, mixed conifer /deciduous, old-growth, riparian deciduous /riverine, upland deciduous, wetland
Western toad	Bufo boreas	None	State Candidate	Yes	riparian deciduous /riverine, upland deciduous, wetland

 Table 17.17.1 Pond-breeding Amphibians Status and Associated Habitats

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2004b.

17.17.2 Habitat

The HSI model evaluates palustrine emergent wetland, palustrine shrub-scrub wetland, and palustrine forested wetland cover types (Appendix 17-5) (WDFW 1997). The Lewis River HEP Team decided to revise the HSI model to add an adjacent habitat variable and to modify the water permanence suitability index values (Appendix 17-5) (PacifiCorp and Cowlitz PUD 2004a, Appendix 1 February 3, 2000, meeting notes). The following are the variables listed in the order that are used in the HSI model and assumes optimum habitat (PacifiCorp and Cowlitz PUD 2004a, Schroeder 1983b):

- Six to 12 months of permanent water
- Fifteen to 35 percent of the wetland area has a permanent water presence

- Water velocities that are 2 inches/second (5 cm/s) or less
- At least 75 percent of the wetland is between 4 and 40 inches (10 and 100 cm) in water depth between December and March
- Wetland vegetation that provides greater than or equal to 50 percent cover, unless it is dominated by non-native invasive plant species
- Shoreline vegetation that is greater than or equal to 75 percent cover
- Adjacent land use consists of cover that is equal to or greater than a clearcut that is 2 or more years since harvest

Although bullfrogs (*Rana catesbeiana*) are not included in the HSI model, specific management actions have been developed to decrease and discourage bullfrog use. Therefore, to assist in bullfrog management, they have been included in the habitat, seasonal activity, and diet portions of this section.

Bullfrog

Bullfrog habitat is permanent water sources that include ponds, marshes, and slow river backwaters. Bullfrogs prefer sunny, warm water with adequate aquatic vegetation on the banks. Egg masses are laid on the surface of warm water (Corkran and Thoms 1996). Tadpoles live in the warm shallows with dense aquatic vegetation.

Long-toed Salamander

The long-toed salamander breeds in waters that are less than 1.6 feet (0.5 m) deep such as seasonal ponds, shallow lake edges, or very slow streams through wet meadows. Eggs are attached to a fine stem, a leaf, or pebble. Tadpoles live in the surface sediments or under rocks, rotting leaves, or logs in shallow water. Juveniles may be found under rocks near the pond edges, whereas the adults are mostly underground during the dry season and under rocks and logs during the rainy season.

Northern Red-legged Frog

The northern red-legged frog breeds in cool, well-shaded waters that may be either permanent or seasonal waters that last through metamorphism. They are typically found in water with little to no flow, are 1.6 to 6.6 feet (0.5 to 2.0 m) deep, contain underwater vegetation or debris to attach eggs to, and are between 46 and 64°F (8 and 18°C) (PacifiCorp and Cowlitz PUD 2004a). Tadpoles persist in the warmer parts of ponds. The adults remain along the water in moist sedges and brush around the ponds or in damp areas (logs or debris) of moist coniferous or deciduous forests or forested wetlands.

Northwestern Salamander

The northwestern salamander breeds in permanent ponds, beaver ponds, or stream backwaters. Eggs are attached to small diameter sticks or rigid stems of aquatic vegetation that are 1.6 to 6.6 feet (0.5 to 2.0 m) below the surface. The juveniles live under submerged logs or in surface sediments in waters deeper than 1.6 feet (0.5 m). Adults live underground in moist forests or partly wooded areas.

Oregon Spotted Frog

The Oregon spotted frog lives in waters and associated shorelines of marshes, springs, permanent ponds, lakes, and slow meandering streams with abundant aquatic vegetation. They breed in the shallow waters, which include the flooded meadows beside a pond or stream or water pooled on top of flattened, dead vegetation at the edge of a pond. Eggs are laid on the bottom on low vegetation. The tadpoles live in the warmest part of the ponds, making them vulnerable to predation by bullfrogs.

Pacific Treefrog

Adult Pacific tree frogs are found in marshes, mountain meadows, woodlands, brush, and disturbed areas. They breed in shallow portions of ponds, seasonal pools, stock tanks, or slow streams that are between 54 and 59°F (12 and 15° C) in areas with the highest vegetation cover (PacifiCorp and Cowlitz PUD 2004a). They attach their eggs to submerged grasses or twigs that lay on the bottom in waters less than 1.6 feet (0.5 m) deep. Tadpoles live in the shallowest and warmest water available. Adults live in wet meadows, riparian areas, or areas away from water in brush or woods.

Rough-Skinned Newt

Newts are found in forested, partially wooded and developed areas. They breed in ponds, lakes, or stream backwaters that are 1.6 to 6.6 feet (0.5 to 2.0 m) deep with abundant aquatic plants. Newts attach their eggs to stems or floating vegetation, and the tadpoles live in vegetation surface sediments or under debris. Adults live in or under logs in forested areas or in ponds year round.

Western Toad

Western toads are found in forests, brush, and mountain meadows. They breed in ponds or shallow lakes edges. They lay their eggs on the bottom in shallow waters between 6 and 12 inches (15 and 30 cm) deep (PacifiCorp and Cowlitz PUD 2004a). Hatchlings and tadpoles live in the shallowest and warmest water. The adults can be found underground, under large debris, and in grass and brush.

Most of the wetlands in the WHMP lands include open water and provide moderate quality habitat for native amphibians. Several breeding populations of northern red-legged frogs were documented in the wetlands (PacifiCorp and Cowlitz PUD 2004b).

The persistence of open water for most or all of the year (high water permanence) reduces the quality of amphibian habitat in many wetlands. High water permanence tends to favor the non-native bull frog, which requires water year round, instead of the native species, which are adapted to more ephemeral wetlands. The following table identifies the HSI values for each habitat variable in the vegetation cover types.

Vegetation Cover Type	Suitability Index	Merwin	Yale	Swift
	Cover	0.93	0.75	1.00
Vetland (PFM)	Reproduction	0.27	0.57	0.55
	Overall HSI Value	0.27	0.46	0.55
	Cover	1.00	0.88	1.00
(PEO)	Reproduction	0.51	0.28	0.52
(FFO)	Overall HSI Value	0.51	0.28	0.52
	Cover	0.93	0.83	0.80
Wetland (PSS)	Reproduction	0.52	0.54	0.00
wettalla (155)	Overall HSI Value	0.52	0.54	0.00
	Cover	0.90	0.87	0.90
Palustrine Unconsolidated Bottom (PUB)	Reproduction	0.47	0.51	0.54
Bottom (FOB)	Overall HSI Value	0.47	0.51	0.54

Table 17.17.2 Pond-breeding Amphibians Habitat Suitability Index Mean Values

Source: PacifiCorp and Cowlitz PUD 2004a.

17.17.3 Seasonal Activity

Table 17.17.3 outlines the breeding season for each of the pond-breeding amphibian species.

17.17.4 Diet

Although diet varies per species, in general the diet of the pond-breeding amphibians consists mostly of invertebrates.
Species	Life History	Winter 12/1- 2/15	Early Spring 2/16-3/31	Mid Spring 4/1- 4/30	Late Spring 5/1-5/30	Early Summer 6/1 - 7/15	Late Summer 7/15 - 9/15	Early Fall 9/16 - 10/31	Late Fall 11/1- 11/30
	Pond Occupancy						· · · · · · · · · · · · · · · · · · ·		
D 116	Egg Laying								
Builfrog	Eggs Hatch								
	Metamorphose								
	Pond Occupancy								
Long-toed	Egg Laying								
Salamander	Eggs Hatch								
	Metamorphose								
	Pond Occupancy								
Northwestern	Egg Laying								
Salamander	Eggs Hatch								
	Metamorphose								
	Pond Occupancy								
Oregon	Egg Laying								
Spotted Frog	Eggs Hatch								
	Metamorphose								
	Pond Occupancy								
Pacific	Egg Laying								
Treefrogs	Eggs Hatch								
	Metamorphose								
	Pond Occupancy								
Red-legged	Egg Laying								
Frog	Eggs Hatch								
	Metamorphose								
	Pond Occupancy								
Roughskin	Egg Laying								
Newt	Eggs Hatch								
	Metamorphose								
	Pond Occupancy								
Western Tood	Egg Laying								
western road	Eggs Hatch								
	Metamorphose								

 Table 17.17.3 Pond-breeding Amphibian Seasonal Activity

17.18 ROOSEVELT ELK (Cervus elaphus)

17.18.1 Status and Habitat Associations

Table 17.18.1	Roosevelt Elk	Status and	Associated	Habitats
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Federal Status ¹ :	None	
State Status ¹ :	Priority	
Managed Habitat Associations ² :	HEP evaluation species for shrubland, farmland, idle fields,	
	meadows, orchard, right-of-way, and forestland habitats	
Vegetation Cover Types ³ :	All vegetation cover types	
Habitat Associations ⁴ : Lodgepole pine, mature conifer, meadow/agriculture,		
	midsuccessional conifer, mixed conifer/deciduous, old-growth	
	conifer, pole conifer, riparian deciduous/riverine, shrubland,	
	seedling/sapling, upland deciduous, wetland, and disturbed	

¹ Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.18.2 Habitat

Roosevelt elk's home range averages from 1,500 to 4,000 acres (607 to 1,619 ha) (U.S. Natural Resources Conservation Service 1999). Within this home range, a mosaic of cover and forage varies between 40 and 60 and 60 and 40 percent, respectively. Optimum forage habitats are open areas with 50 to 100 percent herbaceous vegetation, preferably less than 26 acres (11 ha) in size, and within 600 feet (183 m) of cover (Edge 1992). According to Verts and Carraway (1998), approximately 90 percent of elk foraging occurs within 394 feet (120 m) of cover. Cover habitat consists of vegetation capable of hiding 90 percent of an adult elk at 200 feet (60 m) and at least 600 feet (183 m) wide or 3 acres (1 ha) in size (Edge 1992). Elk can be sensitive to human disturbance and may avoid habitats that are frequently disturbed. Vehicle traffic on roads that are open to the public (open roads) is the most common source of disturbance. Elk habitat use will significantly decrease if the open road density is greater than 2 miles per square mile (3.2 km per km²) (Edge 1992).

A modified WDFW model using road density, percent cover, enhanced forage, and forage was used to determine the overall HSI values (Appendix 17-6) (PacifiCorp and Cowlitz PUD 2004a). The model is designed to be applied to areas ranging in size from 640 to 4,000 acres (259 to 1,619 ha). Therefore, evaluation units ranging from 340.3 to 2,814.6 acres (137.8 to 1,139.5 ha) were created for the HEP Study (PacifiCorp and Cowlitz PUD 2004a). To determine overall HSI values for the evaluation units, vegetation cover types were categorized into three variables: hiding cover, forage habitat, and enhanced forage. As a result, there are no HSI values per vegetation cover type as there are with other HEP evaluation species. The WHMP lands had overall low to moderate HSI values (range 0.41 to 0.96, median 0.43, average 0.50), with forage habitat being the limiting factor (PacifiCorp and Cowlitz PUD 2004a).

Habitat	Merwin Evaluation Units	Yale Evaluation Units	Swift Evaluation Units
Variables	M-1 through M-8 ¹	Y-1 through Y-6 ¹	S-1 through S-4 ¹
Open Road Miles	0.0 to 5.8 mi/mi ²	$0.2 \text{ to } 9.0 \text{ mi/mi}^2$	$0.2 \text{ to } 31.0 \text{ mi/mi}^2$
open Roud Miles	$(0.0 \text{ to } 9.3 \text{ km/km}^2)$	$(0.3 \text{ to } 14.5 \text{ km/km}^2)$	$(0.3 \text{ to } 49.9 \text{ km/km}^2)$
Closed Road Miles	0.3 to 6.3 mi/mi ²	0.3 to 8.2 mi/mi ²	0.0 to 11.7 mi/mi^2
Closed Road Whies	$(0.5 \text{ to } 10.1 \text{ km/km}^2)$	$(0.5 \text{ to } 13.2 \text{ km/km}^2)$	$(0.5 \text{ to } 18.8 \text{ km/km}^2)$
Total Dood Miles	0.3 to 10.8 mi/mi^2	2.8 to 17.2 mi/mi^2	0.2 to 33.6 mi/mi ²
Total Road Willes	$(0.5 \text{ to } 17.4 \text{ km/km}^2)$	$(4.5 \text{ to } 27.7 \text{ km/km}^2)$	$(0.3 \text{ to } 54.1 \text{ km/km}^2)$
Road Dansity	0.0 to 3.8 mi/mi ²	0.5 to 6.7 mi/mi ²	0.2 to 7.0 mi/mi ²
Road Delisity	$(0.0 \text{ to } 6.1 \text{ km/km}^2)$	$(0.8 \text{ to } 10.7 \text{ km/km}^2)$	$(0.0 \text{ to } 11.3 \text{ km/km}^2)$
Total Open Lane less than 200			
feet (61 m) of open habitat	0.0 to 8.6	0.0 to 11.9	0.0 to 13.5
(mile)			
Lanes less than 200 feet with	0.0 to 0.30 0.0 to 5.0		0.0 to 0.3
screening (mile)			0.010 0.3
Percent without Screening	0% to 14%	0% to 3%	0% to 50%
Total Percent Cover	73.9% to 99.4%	75.1% to 99.9%	78.5% to 96.5%
Total Percent Forage	9.6% to 27.2%	1.2% to 23.3%	5.5% to 69.4%
Total Percent Enhanced Forage	1.2% to 70.9%	0.0% to 54.4%	0.2% to 94.2%
Overall HSI Values	0.42 to 0.73	0.41 to 0.51	0.43 to 0.96

Table 17.18.2 Elk Habitat Suitability Index Values for Evaluations Units

¹Elk HSI values were determined by evaluation units instead of per vegetation cover type. Source: PacifiCorp and Cowlitz PUD 2004a.

17.18.3 Seasonal Activity

Breeding in the Pacific Northwest occurs between the end of September and early October (September 15 to October 15). Depending on weather conditions, elk will migrate to and use their winter range between November 15 and March 15. The spring range is a transitional range between winter and summer range and is used between March 15 and June 15. Parturition occurs May 1 to June 30. Both resident herds and migratory animals use WHMP lands.

17.18.4 Diet

Diets vary with season and locations and consist of grasses, forbs, sedges, and woody plants (Verts and Carraway 1998). Nutritional requirements for elk are the highest in the summer (May 15 to September 1), particularly for females following parturition. During the spring (April 1 to May 15) and fall (September 1 to November 1), elk nutritional requirements are reduced, with the winter months (November 1 to April 1) being the season for lowest nutritional requirements (Keating 2001).

17.19 SAVANNAH SPARROW (Passerculus sandwichensis)

17.19.1 Status and Habitat Associations

Table 17.19.1 Savannal	n Sparrow	Status and	Associated	Habitats
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Federal Status ¹ :	None
State Status ¹ :	None
Managed Habitat Associations ² :	HEP evaluation species for farmland/idle fields/meadow,
	transmission line rights-of-way, and forestland habitats
Vegetation Cover Types ³ :	Right-of-way, new seedling-sapling, meadow, pasture
Habitat Associations ⁴ :	Meadow/agriculture

¹Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.19.2 Habitat

In western Washington, preferred habitat for savannah sparrows is open grasslands such as open fields, plains, and meadows at lower elevations (WDFW 1978). Although savannah sparrows prefer areas with low woody cover (less than 1 percent), they will use small trees, shrubs, fence posts, wire, and tall herbaceous stems as song perches for defending their territory (Swanson 1998). Although territory size ranges from 0.4 to 4.3 acres (0.2 to 1.7 ha), savannah sparrows are sensitive to habitat fragmentation and will rarely nest in small habitat fragments. Based on research in Illinois and Maine, it is recommended that grasslands should be contiguous habitat and a minimum of 20 acres (8 ha) in size (The Nature Conservancy 1999).

Other savannah sparrow habitat variables include litter, grasses, and forbs. Savannah sparrows primarily forage on seeds and insects and have been known to concentrate their feeding around grass clumps and areas with low grass cover (under 4 inches [10 cm] in height) (WDFW 1978). In breeding territories, the grass cover comprises between 62 and 100 percent of the total cover, with a mean of 88 percent (WDFW 1978). In addition, there is a positive correlation between savannah sparrows and percent forb cover in Washington (Swanson 1998). Forb height within the breeding territories ranged from 2.7 to 19.6 inches (6.9 to 49.8 cm), with a mean of 7.8 inches (19.8 cm), and cover ranged from 20 to 35 percent (WDFW 1978). Savannah sparrows nest on the ground in a depression that is well concealed with litter or a clump of vegetation. Therefore, litter is considered an important variable of savannah sparrow habitat and should preferably be between 0.4 and 3.0 inches (1 and 7.6 cm) in depth.

A WDFW HSI model (Appendix 17-7) was used to determine optimum habitat for savannah sparrows with the following habitat variables:

- Average litter depth that is greater than or equal to 0.4 inches (1 cm)
- Greater than or equal to 70 percent ground covered by litter
- A forb height between 5 and 8 inches (13 and 20 cm)
- A forb cover between 15 and 35 percent

- A grass cover greater than or equal to 65 percent
- A relative shrub and tree density that is low and consists of a few shrubs throughout the site
- An average grass height between 4 and 12 inches (10 and 30 cm)

Vegetation Cover Type	Habitat Variable	Merwin	Yale	Swift
	Percent Forb Cover	0.43		1.00
	Average Forb Height	0.50		0.50
Maadama	Average Grass Height	0.15		1.00
(MD)	Percent Grass Cover	0.74		0.67
(MD)	Percent Litter Cover	0.94		1.00
	Average Litter Height	1.00		1.00
	Overall HSI Value	0.37		0.44
	Percent Forb Cover	0.58	0.97	
	Average Forb Height	0.50	0.50	
A ani au ltuna	Average Grass Height	0.42	0.21	
Agriculture	Percent Grass Cover	0.98	1.00	
(AU)	Percent Litter Cover	1.00	0.98	
	Average Litter Height	1.00	1.00	
	Overall HSI Value	0.35	0.52	
	Percent Forb Cover	0.80	0.60	
Transmission	Average Forb Height	0.59	0.50	
Lino Dight	Average Grass Height	0.29	0.32	
of Way	Percent Grass Cover	0.69	0.82	
(ROW)	Percent Litter Cover	0.90	1.00	
(\mathbf{ROW})	Average Litter Height	1.00	1.00	
	Overall HSI Value	0.47	0.46	
	Percent Forb Cover	0.76		0.78
	Average Forb Height	0.58		0.71
Now Clearaut	Average Grass Height	0.50		1.00
New Clearcut	Percent Grass Cover	0.59		0.07
(66)	Percent Litter Cover	0.83		0.57
	Average Litter Height	1.00		1.00
	Overall HSI Value	0.42	0.42	0.33

 Table 17.19.2 Savannah Sparrow Habitat Suitability Index Mean Values

Source: PacifiCorp and Cowlitz PUD 2004a.

17.19.3 Seasonal Activity

Spring migration may occur as early as the end of March, with the peak of migration occurring in April. Nest building occurs in early May, and fledglings are seen between late May and June. Fall migration begins in September and continues into November for nonbreeding migrants (Marshall et al. 2003).

17.19.4 Diet

Diet consists of insects, larvae, eggs, and other invertebrates in the spring and summer and seeds and fruits in the winter supplemented with insects when available (Marshall et al. 2003).

17.20 VAN DYKE'S SALAMANDER (Plethodon vandykei)

17.20.1 Status and Habitat Associations

Table 17.20.1 Van Dyke's Salamander Status and Associated Habitats

Federal Status ¹ :	Species of Concern
State Status ¹ :	Candidate
Managed Habitat Associations ² :	Analysis species for unique area habitats
Vegetation Cover Types ³ :	No vegetation cover types identified
Habitat Associations ⁴ :	Riparian deciduous/riverine and rock

¹ Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.20.2 Habitat

Van Dyke's salamanders are often found in exfoliating rock that is associated with valley wall seeps, the splash zones at the base of waterfalls, and stream chutes and cascades. They have been reported in forested talus, upland sites, and cave entrances (Washington Department of Natural Resources 2008). In the Cascade Range, they are usually found under cobble and sometimes in wood within a few meters of a stream (Jones et al. 2005).

17.20.3 Seasonal Activity

Most of the Van Dyke's salamander's surface activity takes place in the spring after snowmelt and before summer drought, and in the fall after the onset of fall rains and before temperatures approach freezing (Washington Department of Natural Resources 2008). The ideal conditions are when soil moisture is high (moist or wet) and soil temperatures are between 39°F and 59°F (4°C and 14°C). However, because this species may occupy wet habitats, it is sometimes surface active even in the summer. Nests found on the Olympic Peninsula (elevations below 2,296 feet [700 m]) were laid in early May, and development was completed by early October. Females brood and guard the eggs during the summer (Washington Department of Natural Resources 2008).

17.20.4 Diet

Diet is comprised of small invertebrates (Jones et al. 2005).

17.21 WOOD DUCK (Aix sponsa)

17.21.1 Status and Habitat Associations

Table 17.21.1	Wood Duck	Status and	Associated	Habitats
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Federal Status ¹ :	None
State Status ¹ :	Priority
Managed Habitat Associations ² :	Analysis species for wetland habitat
Vegetation Cover Types ³ :	No vegetation cover types have been identified
Habitat Associations ⁴ :	Riparian deciduous/riverine and wetland

¹ Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.21.2 Habitat

Wood ducks occur in wooded swamps and riparian areas of rivers, streams, marshes, sloughs, and lakes (Marshall et al. 2003). They prefer slow-moving or standing shallow waters with irregular shorelines with coves and backwaters near forested habitat (WDFW 2000). Optimum habitat has woody debris (logs, trees, and stumps) to provide loafing areas and overhanging vegetation to provide cover for broods (WDFW 2000). They nest in tree cavities and use nest boxes when available (Marshall et al. 2003).

17.21.3 Seasonal Activity

Wood ducks migrate south early in the fall and return to nesting areas in March or early April (WDFW 2000). Egg laying occurs in April and May, and the young hatch by early June (Marshall et al. 2003).

17.21.4 Diet

Wood ducks feed on acorns, seeds, shrubs, aquatic plants, berries, and grapes (Marshall et al. 2003). About 10 percent of their diet is composed of aquatic insects, dragonflies, beetles, crickets, and grasshoppers. For the first 10 days, young are fed insects (Csuti et al. 1997).

17.22 YELLOW WARBLER (Dendroica petechia)

17.22.1 Status and Habitat Associations

Table 17.22.1 Yellow	Warbler	Status and	Associated	Habitats
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Federal Status ¹ :	None
State Status ¹ :	None
Managed Habitat Associations ² :	HEP evaluation species for wetland, riparian, and shrubland
	habitats
Vegetation Cover Types ³ :	Riparian shrub, palustrine scrub-shrub wetland, riparian
	deciduous, palustrine forested wetland, riparian mixed, and
	shrubland
Habitat Associations ⁴ :	Riparian deciduous/riverine, shrubland, seedling/sapling, and
	wetland

Source: WDFW 2008.

² Source: PacifiCorp and Cowlitz PUD 2006.

³ Source: PacifiCorp and Cowlitz PUD 2004a.

⁴ Source: PacifiCorp and Cowlitz PUD 2004b.

17.22.2 Habitat

Preferred habitat for the yellow warbler is in wet areas with abundant shrubs or small trees. The Breeding Bird Census reported that 66 percent of deciduous shrub-dominated cover types and 100 percent of shrub wetland areas were occupied by yellow warblers (Schroeder 1982). The Breeding Bird Census reported approximately 66 percent of forested draws and riparian forests in the western United States were occupied, but overall frequency is low (Schroeder 1982). In the Pacific Northwest, yellow warblers are most commonly found in riparian woodlands and thickets, particularly those dominated by willows (*Salix* spp.) or cottonwoods (*Populus* spp.), although they will occupy a variety of low and tall shrub species (Marshall et al. 2003). Yellow warblers typically avoid areas with dense canopy cover; therefore, they are rarely found in coniferous forests (Schroeder 1982). Based on research in Colorado, nest selection is based on the characteristics of the nest bush itself (Marshall et al. 2003).

The HSI model evaluates deciduous shrubland and deciduous scrub-shrub wetland cover types for yellow warblers (Appendix 17-8) (Schroeder 1982). The HSI model assumes optimum habitat to be the following:

- Shrub crown cover of 60 to 80 percent crown
- Shrubs to be comprised of 100 percent hydrophytic species
- Average shrub height of 6.6 feet (2 m)
- Minimum habitat patch size of 0.37 acres (0.15 ha)

Hydrophytic shrubs are shrubs with a wetland indicator status of Facultative (FAC), Facultative-Wetland (FACW), and Obligate (OBL) (PacifiCorp and Cowlitz PUD 2004a). The following table lists the HSI mean values for each habitat variable (PacifiCorp and Cowlitz PUD 2004a):

Vegetation Cover Type	Habitat Variables	Merwin	Yale	Swift
Riparian Shrub (RS)	Percent of Hydrophytic Shrubs	0.88	0.90	0.97
	Percent Deciduous Shrub Cover	1.00	0.31	0.81
	Average Shrub Height	1.00	0.92	1.00
	Overall HSI Value	0.96	0.63	0.92
Palustrine Scrub- Shrub Wetland (PSS)	Percent of Hydrophytic Shrubs	1.00	0.55	0.99
	Percent Deciduous Shrub Cover	0.65	0.60	1.00
	Average Shrub Height	1.00	0.98	0.85
	Overall HSI Value	0.87	0.63	0.95
Riparian Deciduous (RD)	Percent of Hydrophytic Shrubs	0.29	0.81	0.65
	Percent Deciduous Shrub Cover	0.71	0.78	0.65
	Average Shrub Height	1.00	0.85	0.86
	Overall HSI Value	0.58	0.81	0.65
Palustrine Forested Wetland (PFO)	Percent of Hydrophytic Shrubs	0.90	0.89	0.94
	Percent Deciduous Shrub Cover	0.40	0.30	0.35
	Average Shrub Height	0.91	0.76	0.50
	Overall HSI Value	0.67	0.57	0.54
Riparian Mixed (RM)	Percent of Hydrophytic Shrubs	0.58	0.26	0.40
	Percent Deciduous Shrub Cover	0.71	0.56	0.69
	Average Shrub Height	0.89	0.92	1.00
	Overall HSI Value	0.69	0.50	0.45
Shrubland (SH)	Percent of Hydrophytic Shrubs	0.10	0.50	0.30
	Percent Deciduous Shrub Cover	0.48	0.79	0.48
	Average Shrub Height	0.92	1.00	0.53
	Overall HSI Value	0.31	0.68	0.42
Palustrine Emergent Wetland (PEM)	Percent of Hydrophytic Shrubs	0.00	0.37	0.97
	Percent Deciduous Shrub Cover	0.00	0.21	0.19
	Average Shrub Height	0.53	0.63	0.83
	Overall HSI Value	0.00	0.26	0.54

 Table 17.22.2 Yellow Warbler Habitat Suitability Index Mean Values

Source: PacifiCorp and Cowlitz PUD 2004a.

17.22.3 Seasonal Activity

Spring migration may occur as early as April, with the peak of migration occurring mid to late May. Nest building occurs in late May, and fledglings are seen between early to mid-July. Fall migration begins early, peaking between mid-August to early September (Marshall et al. 2003).

17.22.4 Diet

Approximately 90 percent of their diet is insects (Schroeder 1982).

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