Before the Federal Energy Regulation Commission

APPLICATION FOR NEW LICENSE
PACKWOOD LAKE HYDROELECTRIC PROJECT
FERC NO. 2244

Energy Northwest
Richland, Washington

ENERGY NORTHWEST

FEBRUARY 2008

Volume III (Public)
PACKWOOD LAKE HYDROELECTRIC PROJECT
FERC NO. 2244

FINAL APPLICATION FOR NEW LICENSE
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SPILL PREVENTION, CONTROL, AND COUNTERMEASURE (SPCC) PLAN
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SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN  

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SELF-CERTIFICATION STATEMENT

I certify that:

1) I am familiar with the requirements of 40 CFR Part 112.

2) I have visited and examined the facility.

3) This Spill Prevention, Control, and Countermeasure (SPCC) Plan has been prepared with accepted and sound industry practices and standards, and with the requirements of 40 CFR Part 112.

4) Procedures for required inspections and testing have been established in this SPCC Plan.

5) The SPCC Plan is being fully implemented.

6) The facility meets the qualification criteria set forth under 40 CFR Part 112.3(g).

7) The SPCC Plan does not deviate from any requirement of 40 CFR Part 112 as allowed by Part 112.7(a)(2) and 112.7(d), except as provided by paragraph (c) of this section.

8) The SPCC Plan and individuals responsible for implementing the SPCC Plan have the full approval of management and the necessary resources have been committed to fully implement the SPCC Plan.

Certified by:

Laura Schinnell, Licensing Project Manager
1.0 PURPOSE AND SCOPE

This procedure establishes a spill prevention and countermeasure plan for activities at the Packwood Lake Hydroelectric Project (Packwood) as required by state and federal requirements. The procedure describes the oil, fuel and hazardous material storage facilities, the reporting system, and the categories of hazardous materials that might be stored at the project.

The procedure will be reviewed at least annually and updates made as needed.

2.0 REFERENCES

2.1 40 CFR Part 302, Designation, Reportable Quantities, and Notification Requirements for Hazardous Substances

2.2 40 CFR, Part 112, Oil Pollution Prevention

2.3 Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations

2.4 Department of Ecology, Stormwater Management Manual for Western Washington (SWMMWW), February 2005

2.5 Washington State Department of Ecology, Toxic Clean Up Program Policies, "Policy 101, Site Discovery -- Release Reporting"

3.0 DEFINITIONS

3.1 Oil Spill - Any spill of unrefined or refined petroleum products. Spill is any discharge that will cause a film or sheen upon, or discoloration of water, or cause a sludge or emulsion to be deposited beneath the surface of water.

3.2 Hazardous Material - Any chemical or substance which could be hazardous to the environment. Many hazardous materials have reportable spill quantities established; for specifics, refer to 40 CFR Part 302 (Reference 2.1).

3.3 Discharge - Discharge means the accidental or intentional release of petroleum and/or hazardous substances, including wastes and waste constituents, such that the substance may enter or be emitted into the environment.

3.4 Release - Release includes, but is not limited to, the actions of spilling, leaking, pumping, pouring, emitting, dumping, emptying, depositing, placing, or injecting.
4.0 RESPONSIBILITIES

4.1 Regulatory Programs personnel shall have the primary responsibility for overseeing compliance with state and federal environmental regulations.

4.2 The Packwood Project Manager shall have the overall responsibility for ensuring compliance with state and federal environmental regulations.

4.3 The Packwood Station Lead shall have the primary responsibility for ensuring day-to-day project operations are in compliance with state and federal environmental regulations.

4.4 The person in direct charge is the craft assigned to the task of handling and storing oil, fuels and hazardous materials.

5.0 PROCEDURE

5.1 References to Federal Requirements of 40 CFR Part 112

In accordance with 40 CFR 112.7, the following paragraphs provide a cross-reference to the requirements listed in that part. Cross-references to requirements of 40 CRF 112.8 and 112.20(e) are also provided.

5.1.1 Part 112.7 (a) Conformance, Facility Layout, Contacts – This procedure includes current Best Management Practices for spill prevention to further reduce the likelihood of spills, and countermeasures should a spill occur. See Attachments 6.3 and 6.4 for facility layout and diagrams of the properties. See Attachment 6.5 for site personnel contact information. Paragraph 5.4.5 provides information on spill reporting; agency contacts are provided in Attachment 6.7.

5.1.2 Part 112.7 (b) Prediction of Oil Discharges for Major Failures – See Attachment 6.1 for listing of materials at Packwood. Currently, the largest quantities of oil are contained in transformers, as shown in Attachment 6.4. Should there be a failure of a transformer, the rate of flow would depend on weather conditions; during rainy weather, the material could flow with storm water runoff.

5.1.3 Part 112.7 (c) Containment and Diversionary Structures – See Attachment 6.2 and Section 5.2 for a description of acceptable structures and requirements.

5.1.4 Part 112.7 (d) Oil Spill Control Procedures – See Section 5.4.
5.1.5 Part 112.7 (e) Inspections, Tests and Records – See Sections 5.3 and 5.5.

5.1.6 Part 112.7 (f) Personnel, Training and Discharge Prevention Procedures – See Section 5.2. Training is discussed in paragraph 5.2.16. Responsibilities for spill prevention and countermeasures are described in Section 4.

5.1.7 Part 112.7 (g) Security – See paragraph 5.2.23.

5.1.8 Part 112.7 (h) Facility Tank Car/ Tank Truck Loading/ Unloading – See paragraph 5.2.11. At the present time there are no bulk material deliveries.

5.1.9 Part 112.7 (i) - Repair of Field Constructed ASTs – Not applicable at this time.

5.1.10 Part 112.7 (j) State Rules and Guidelines – See References 2.3, 2.4, and 2.5. State rules and guidelines have been used throughout this procedure.

5.1.11 Part 112.8(b) Facility drainage is described in Paragraphs 5.2.17 and 5.2.20 and shown in Appendix 6.4.

5.1.12 Part 112.8(c) Requirements related to bulk storage containers are discussed in Paragraphs 5.2.3, 5.2.5, 5.2.6, and 5.2.7.

5.1.13 Part 112.8(d)(4) Facility transfer operations; inspection of aboveground valves, piping, and appurtenances is discussed in Section 5.3 and a sample checklist related to spills is provided as Attachment 6.8.

5.1.14 Part 112.20(e) The “Certification of the Applicability of the Substantial Harm Criteria” is on file at the facility. A copy is included as Appendix 6.11.

5.2 Prevention Requirements

The following are summaries of the guidelines and requirements necessary for control and prevention of oil, fuel, and hazardous material spills. The BMPs are Mobile Fueling of Vehicles and Heavy Equipment, Maintenance and Repair of Vehicles and Equipment, Loading and Unloading Areas for Liquid or Solid Material, Liquid Storage in Permanent Above-Ground Tanks, and Storage of Liquid, Food Waste, or Dangerous Waste Containers.

5.2.1 Users of oil, fuels, and hazardous materials must have a supply of oil absorbent materials on site for cleaning up minor spills. A supply of materials and spill cleanup kits for emergency use by site personnel will be located at Packwood. These kits should include non-water absorbents.
capable of absorbing 15 gallons of diesel fuel; a storm drain plug or cover kit; a non-water absorbent containment boom of a minimum 10 feet in length with a 12-gallon capacity, a non-metallic shovel, and two empty five-gallon buckets with lids. Absorbent material used to clean spills shall be handled in accordance with Reference 2.3.

5.2.2 Attachment 6.1 lists categories of materials that may be stored on site. Material Safety Data Sheets (MSDSs) are required for all oils, fuels and hazardous materials. Copies of MSDSs are located in the Packwood office. Prior to bringing a material to Packwood, the user must forward a copy of the Material Safety Data Sheet to the Packwood Station Lead.

5.2.3 Permanent bulk storage tanks will be contained within curbed storage pads or on level storage areas surrounded by a berm or dike sized to contain a containment volume of either 10 percent of the total enclosed tank volume or 110 percent of the volume contained in the largest tank, whichever is greater, or if a single tank, 110 percent of the volume of that tank. A tank overfill protection system will be used to minimize the risk of spillage during filling. Portable tanks and barrels will be stored using prefabricated storage containers, or surrounded by a berm or dike sized to contain the containment volume of either 10 percent of the total enclosed container volume, or 110 percent of the volume contained in the largest container, whichever is greater, or if a single container, 110 percent of the volume of that container. Dikes containing hazardous waste materials shall have roofed coverings to prevent accumulation of storm water. Attachment 6.2 outlines acceptable storage dike facilities. All materials shall be stored in accordance with the Uniform Fire Code. The person in direct charge of the bulk storage area will regularly sweep and clean the storage area, and will check for leaks and spills, and have repairs made as needed. All spills made within dikes will be cleaned up as soon as practicable.

5.2.4 Where berms or dikes are used, they will be designed in such a way as to permit storm water to be drained from the area inside the berm or dike without discharging any oil, fuel or hazardous material with the water. Where a valve is used, the valve shall be left in the normally closed position. Where sump pumps are used, the pump shall normally be left disconnected. The person in direct charge shall look for evidence of contamination before opening a containment dike valve or operating a sump pump to allow discharge of storm water, and shall document that the inspection was made. Evidence of contamination can include the presence of visible sheen, color, or turbidity in the runoff. Simple pH measurements with litmus or pH paper can be used for areas subject to acid or alkaline contamination.
5.2.5 No barrels or tanks will be allowed to sit in accumulated liquids. Barrels or tanks will be covered and stored so that water cannot accumulate on top. All tanks and barrels will be stored in a manner to prevent rusting and damage to the containers. Drip pans will be placed beneath all mounted container taps and at all potential drip and spill locations during filling and unloading of containers. The person in direct charge will check containers and storage areas for leaks and spills.

5.2.6 Drums stored in an area where unauthorized persons may gain access must be secured in a manner that prevents accidental spillage, pilferage or any unauthorized use.

5.2.7 Containers of five gallons or less shall be stored in designated storage areas, generally within buildings, storage containers, and/or flammable storage lockers where spills can be contained. When the material is in use on site, small containment pans shall be used to store the material.

5.2.8 Traveling equipment, compressors and generators will be maintained properly to minimize oil, grease, and hydraulic fluid leakage. Incoming vehicles, parts, and equipment used and stored outside will be checked for leaks.

5.2.9 Use of well maintained equipment and fixtures for fueling and maintenance operations will be encouraged. Use of items such as quick couple nozzles with automatic shut-off and absorbent materials for fueling, suction pumps to drain oil, drip pans when changing oil filters and fueling, and locating waste receptacles for oil and filters on service trucks will also be encouraged. Fuel lines will not be extended across a trafficable lane. The fill nozzle will be removed and filling stopped when the automatic shut-off valve engages; there will be no "topping off" of the fuel receiving equipment. Adequate lighting shall be maintained at all filling points.

5.2.10 Equipment maintenance must be conducted in assigned areas except for approved light field servicing. All equipment working in the vicinity of Packwood Lake, ditches, storm drains, creeks, the tailrace, or the Cowlitz River must move to an area where any release can be contained and prohibited from entering Packwood Lake, the drainage system, creeks, the tailrace, and/or the Cowlitz River during servicing and fueling operations. The area should be at least 25 feet away from the nearest storm drain or inside an impervious containment with a volumetric holding capacity equal to or greater than 110 percent of the fuel tank volume. As an alternative, the storm drain may be covered to ensure no inflow of spilled or leaked oil, fuel, or grease.
5.2.11 When oils, fuels, and/or hazardous materials will be loaded or unloaded, an employee trained in spill containment shall be present. To the extent practicable, unloading or loading of solids and liquids shall be conducted in a building, under a roof, under a lean-to, or other appropriate cover, consistent with the Uniform Fire Code. Drip pans or other appropriate temporary containment devices shall be placed at hose connections, hose reels, filler nozzles, and other appropriate locations to capture any potential leak or spill. For permanent loading/unloading areas, the area shall be bermed, diked, or sloped to prevent spills from leaving the area, and to prevent stormwater from entering the area. The area shall drain to a dead-end sump, spill containment sump, a spill control oil/water separator, or other spill control device. For permanent loading/unloading areas, the area on which the transfer takes place shall be paved with a material compatible with the material being transferred, e.g., an area for transfer of gasoline would be paved with Portland cement concrete, not with asphalt.

5.2.12 Liquid waste and materials contaminated with oil or hazardous materials must be collected for salvage or disposal off-site in accordance with Reference 2.3 and the Hazardous Waste Management Plan.

5.2.13 Contractors working at Packwood are responsible for storage of materials in accordance with this procedure and Reference 2.3. The Contractor will coordinate with the Packwood Station Lead on the transport and delivery of all hazardous wastes to salvage firms for reprocessing or to approved facilities or sites for wasting. All hazardous waste material generated on behalf of Packwood and transported off-site will be done under the Packwood generator identification number. See the Hazardous Waste Management Plan for details.

5.2.14 Oil, fuel and hazardous substances shall not be introduced into plant sumps or drains or into the storm water drainage system.

5.2.15 Oil, fuel and hazardous spill prevention, and material and personnel for cleanup of oil and hazardous spills will be at user's expense. Contractors are liable for all damages resulting from use of oil and hazardous materials and waste disposal.
5.2.16 Training of site personnel involved in handling, storage and disposal of oil and hazardous materials shall be performed and documented in accordance with Section 330 of Reference 2.3. Training shall include review of procedures, definitions and regulations. All new employees will receive this training as part of their orientation. Employees will be required to participate in annual refresher training. Staff shall periodically test this procedure by either performing a table top drill or where practicable a field drill. If necessary, as a result of the drill(s), this procedure shall be revised to take advantage of lessons learned.

5.2.17 In the switchyard, there are two large transformers and two small transformers as shown in Attachment 6.4. There are two SF6-breakers and bus duct bushing oil in the area. This area was designed and constructed in the 1960’s when oil containment for switchyards was not required. A Professional Engineer has designed a bioswale (see Attachment 6.10) to prevent oil contamination to storm water drainage, the tailrace, Snyder Creek, and the Cowlitz River. Construction of the proposed bioswale or other acceptable containment structures will be scheduled to coincide with the implementation date required by the Environmental Protection Agency. Should there be a spill, evidence can include the presence of visible sheen, color, or turbidity in the runoff from the switchyard, and loss of operability of the power plant. Attachment 6.4 shows the general arrangement of the area.

5.2.18 In the warehouse area, there is a fireproof storage building for solvents and gasoline which includes a concrete dike and drip pans for open containers, a flammable storage locker for smaller materials, and a lube oil storage area with containment pallets. A standby generator is located in a small building that shares a common wall with the main warehouse. The above ground tank that supplies fuel to the generator is located outside the building in a bermed area that is adequately sized to contain 110 percent of the tank volume. Oil absorbent pads and extra booms are located in the upstairs storage area of the warehouse. Attachment 6.4 shows the general arrangement of the area.

5.2.19 The warehouse storage yard has an empty oil tank, miscellaneous materials and equipment stored outside the sheds. Salvage drums, a Bobcat loader and nitrogen cylinders are located under the shed that is enclosed in three directions. The lawn mowers, ATVs, motorcycles, and snowmobiles are located in sheds that are enclosed in all directions. Equipment is maintained in good condition to reduce the risk of leaks; however, oil containment drip pans are placed under the rolling stock to collect any leaks.
5.2.20 In the Powerhouse, oil-containing equipment is located in the turbine generator room. The generator pit and needle pit drain to a sump, which is periodically checked for materials, and is checked on receiving a high level alarm. The sump must be manually pumped to remove liquid accumulations. The Packwood Station Lead or Station Craft shall look for evidence of contamination before operating the sump pump, and shall document that the inspection was made in the plant log. Evidence of contamination can include the presence of visible sheen, color, or turbidity in the runoff. Simple pH measurements with litmus or pH paper can be used for areas subject to acid or alkaline contamination. Pumping will cease if there is evidence of contamination, and a plan formulated to ensure that contaminated material is handled in accordance with environmental regulations. The governor has a catch trough that returns oil to the reservoir. There is a drop can under the deflector ram. Absorbent has been placed in the needle pit. The turbine deck trough drains to the stilling basin (also referred to as re-regulating pond). However, the deck trough drainage has been plugged to enable plant staff to look for evidence of contamination before draining into the stilling basin. Draining will cease if there is evidence of contamination, and a plan formulated to ensure that contaminated material is handled in accordance with environmental regulations. Albeit minimal, there is a potential for bearing lube oil to enter the water that cools it. A routine inspection of the bearing lube oil cooler is conducted to detect or monitor for the loss of oil. There are two spill kits located in the powerhouse. An oil containment sea curtain is located in the stilling basin near the start of the tailrace to contain any oily material that could enter from the powerhouse. Periodic inspection is made to look for an oil sheen. If a sheen is observed, the oil will be absorbed and contaminated material disposed in accordance with the Hazardous Waste Management Plan.

5.2.21 In the Intake Structure area, there is a fish screen with two oil tanks to lubricate the gears. The likelihood of any oil spill from these tanks is minimal. An oil reservoir stores the oil used for operating the hydraulic system for project flow. A containment basin consisting of angle iron surrounds the oil reservoir and a pump. A 3” diameter PVC pipe conveys the drip oil from the containment area to a 55-gallon drum located below. The drum is elevated above the floor to prevent contamination should there be flooding, and the drum is on a containment pallet. One spill kit is located in the intake building. A diesel generator and tank are located within a concrete containment dike. The six 4160 volt box mounted oil fuse isolation switches are located within an electrical compartment.

5.2.22 At the surge tank area, the equipment is in containment, with a sump pump used to collect materials. There is no physical path for a spill to leave the surge tank area. The sump must be manually pumped to remove
liquid accumulations. Plant staff shall look for evidence of contamination before operating the sump pump, and shall document that the inspection was made in the plant log. Evidence of contamination can include the presence of visible sheen, color, or turbidity in the runoff. Simple pH measurements with litmus or pH paper can be used for areas subject to acid or alkaline contamination. Pumping will cease if there is evidence of contamination, and a plan formulated to ensure that contaminated material is handled in accordance with environmental regulations. One spill kit is located in this area.

5.2.23 The access road to the powerhouse and warehouse area is gated and kept locked outside of normal business hours. The switchyard is contained within a locked, fenced enclosure. The warehouse yard area is also within a locked, fenced enclosure unless occupied by Packwood staff. The powerhouse, warehouse, surge tank and intake buildings are locked at all times unless occupied by Packwood staff. In addition, access road gates to the Lake are kept locked at all times.

5.3 Inspection Procedure

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Action</th>
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</thead>
<tbody>
<tr>
<td>Packwood Station Lead/Designee</td>
<td>.1 Prepares an annual inventory of bulk (greater than five gallon containers) storage of oil, fuel and hazardous materials at Packwood, including storage locations, dike type and capacity, and quantities of materials.</td>
</tr>
<tr>
<td></td>
<td>.2 Reviews use, storage and handling of oil, fuel and hazardous material and assures that users are in compliance. Noncompliance will be corrected, with the noncompliance and corrective actions taken documented in plant records.</td>
</tr>
<tr>
<td></td>
<td>.3 Inspects facilities and area for compliance with environmental commitments and regulations. Inspections are performed periodically and documented in the plant log. Inspection checks shall include, but are not limited to:</td>
</tr>
<tr>
<td></td>
<td>(a) Condition of storage areas for oil, fuel and hazardous materials and wastes, and condition of containers in storage areas.</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Action</td>
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<tr>
<td>--------------------------------------</td>
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</tr>
<tr>
<td>Packwood Station Lead/Designee</td>
<td>(b) Wastes and contaminated materials collected for salvage or disposal off-site in accordance with Reference 2.3 and the Hazardous Waste Management Plan. If waste and contaminated hazardous material is stored on site, inspections of these materials and storage area is performed once weekly.</td>
</tr>
<tr>
<td></td>
<td>(c) Measures taken to prevent entry of oil, fuel and/or hazardous materials to the storm drainage system, tailrace, creek systems and the Cowlitz River, including fueling and maintenance away from storm drainage, tailrace, creeks, and the Cowlitz River.</td>
</tr>
</tbody>
</table>
|                                      | (d) Review of servicing and refueling operations.  
|                                      | (e) Spill kits and absorbent materials available on site, including materials on servicing and fueling trucks.  |

5.4 **Spill Procedure**

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Packwood Personnel .1</td>
<td>Upon discovery of any oil, fuel or hazardous material discharge, regardless of size, will notify the Packwood Station Lead immediately and take actions to contain the material in accordance with training received.</td>
</tr>
</tbody>
</table>

**NOTE:** Most hazardous substances are toxic on skin contact or inhalation. Cleanup personnel should use appropriate protective clothing, eye protection or respiratory protection. Refer to the chemical's MSDS.
<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Packwood Personnel</td>
<td>.2 Absorbent materials will be placed on spilled material. Absorbent booms will be placed around area of spill if it is believed that the spill could travel outside immediate area. Drains and catch basins in the immediate area will be covered so that no material can enter. For spills to the ground, if appropriate for the material spilled, turn soil and use absorbent materials to collect additional spilled material. If not appropriate, collect contaminated soil for disposal in accordance with Reference 2.3 and the Hazardous Waste Management Plan. Contaminated absorbent materials shall be collected and disposed of in accordance with Reference 2.3 and the Hazardous Waste Management Plan.</td>
</tr>
<tr>
<td>Packwood Station Lead/Designee</td>
<td>.3 Inspects spill area. Ensures that there are adequate provisions for immediate action to contain spills within the smallest possible area, and notify Regulatory Programs for assistance in determining requirements to report to state and federal agencies (see paragraph 5.4.5 and Attachment 6.5). Reports will be made as soon as containment measures have been initiated. Directs cleanup.</td>
</tr>
<tr>
<td></td>
<td>.4 If the spill is large enough to require a cleanup company's assistance, or cleanup requires training beyond level provided to site personnel, will arrange for services of a contractor to provide cleanup (see Attachment 6.6).</td>
</tr>
<tr>
<td>Regulatory Programs Personnel</td>
<td>.5 Determines reporting requirements to local, State of Washington and Federal agencies (see Attachment 6.7). Reports may be made either by the Packwood Station Lead/Designee or Regulatory Programs personnel.</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Action</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Regulatory Programs Personnel</td>
<td>(a) All spills will be assessed for reportability to Ecology using the guidance provided in Reference 2.5. &quot;Best professional judgment&quot; will be used to determine whether a release may pose a threat or potential threat to human health or the environment. To make this determination, the guidance contained in Reference 2.5, paragraph 6 is used, which outlines some circumstances that Ecology believes will pose a threat or potential threat to human health or the environment. A summary of the guidance follows. The release does not have to be reported if, in the individual's judgment, it does not pose a threat. However, Ecology will be notified of oil and fuel spills that cannot be cleaned as soon as practicable, require the assistance of a clean up company, or have reached or have the potential to reach the storm water drainage system, area creeks and/or the Cowlitz River. Ecology asks that notification be made if there is any question regarding reportability.</td>
</tr>
<tr>
<td></td>
<td>(b) Notifies the Forest Service of project-related spills on their property that have been reported to the Department of Ecology and/or the National Response Center.</td>
</tr>
<tr>
<td></td>
<td>(c) Oil and fuel spills, regardless of size, which have entered or have the potential to enter the Cowlitz River or its tributaries will be reported to the National Response Center and the Department of Ecology.</td>
</tr>
<tr>
<td></td>
<td>(d) Hazardous material spills in quantities greater than the reportable quantity will be reported to the National Response Center, the local Emergency Planning Committee and Ecology. Ecology asks that notification be made if there is any question regarding reportability.</td>
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<tr>
<td>Responsibility</td>
<td>Action</td>
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<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Regulatory Programs Personnel</td>
<td>(e) Ensures that project-related spills along Snyder Road, Powerhouse Road and/or other County roads leading to Packwood facilities have been reported to Lewis County.</td>
</tr>
<tr>
<td>Packwood Station Lead/Designee</td>
<td>.6 Logs spill into plant log. .7 Describes spill and all events and notifications made in relation to spill in electronic mail to Regulatory Programs and the Packwood Project Manager. Copies of reports shall be retained in the Packwood files. Attachment 6.8 lists reportable spills that have occurred at Packwood.</td>
</tr>
</tbody>
</table>

5.5 Record Retention

All records pertaining to the Spill Prevention and Countermeasure Plan shall be retained at Packwood for a minimum of five years.

6.0 ATTACHMENTS

6.1 Oil, Fuels and Hazardous Materials at the Packwood Lake Hydroelectric Project
6.2 Storage Facilities
6.3 Vicinity Map
6.4 Facility Layout
6.5 Notification List
6.6 Companies That Provide Clean Up Services
6.7 Agency Notification List
6.8 Spill Checklist
6.9 Oil, Fuel, and Hazardous Material Spills
6.10 Proposed Bioswale Design
6.11 Certification of the Applicability of the Substantial Harm Criteria
OILS, FUELS AND HAZARDOUS MATERIALS
AT THE PACKWOOD LAKE HYDROELECTRIC PROJECT

Following is a list of oils, fuels and hazardous material categories that may be stored or used at the Packwood Lake Hydroelectric Project.

(a) Fuel (e.g., diesel, kerosene)
(b) Gasoline
(c) Oil (e.g., transformer, lubricating)
(d) Solvents and thinners
(e) Paints
(f) Antifreeze
(g) Coatings and sealants
(h) Pesticides (herbicides, rodenticides, insecticides, etc.)
(i) Batteries
(j) Compressed gas

Following is the location of materials in containers greater than 5 gallons.

<table>
<thead>
<tr>
<th>TYPE OF MATERIAL</th>
<th>QUANTITY (gallons, unless otherwise specified)</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Oil</td>
<td>3,794</td>
<td>Main Transformer</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>3,560</td>
<td>Spare Transformer</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>60</td>
<td>4160 Transformer</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>50</td>
<td>Station Service Transformer</td>
</tr>
<tr>
<td>Oil contaminated with PCBs (levels in 2006: 26.9, 27.1, and 26.5 mg/Kg)</td>
<td>3 ea. @ 36 gal. = 108 gal.</td>
<td>PT Bushing</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>6 ea. @ 13 gal. = 78 gal.</td>
<td>CT Bushing</td>
</tr>
<tr>
<td>SF6</td>
<td>2 ea. @ 28lbs. = 56 lbs.</td>
<td>SF6 69-KV Breakers</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>6 ea. @ 1 gal. = 6 gal</td>
<td>Breaker Switches</td>
</tr>
</tbody>
</table>
## OILS, FUELS AND HAZARDOUS MATERIALS
### AT THE PACKWOOD LAKE HYDROELECTRIC PROJECT

### POWER HOUSE

<table>
<thead>
<tr>
<th>TYPE OF MATERIAL</th>
<th>QUANTITY (gallons, unless otherwise specified)</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Oil</td>
<td>130</td>
<td>Grounding Transformer</td>
</tr>
<tr>
<td>Oil</td>
<td>600</td>
<td>Generator Lube Oil &amp; Tank</td>
</tr>
<tr>
<td>Oil</td>
<td>2</td>
<td>Cooling Water Pumps</td>
</tr>
<tr>
<td>Mercury</td>
<td>12 each</td>
<td>Mercury Switches</td>
</tr>
<tr>
<td>Grease</td>
<td>55</td>
<td>Auto-greaser</td>
</tr>
<tr>
<td>Oil</td>
<td>650</td>
<td>Governor Oil System</td>
</tr>
<tr>
<td>Electrolyte and lead</td>
<td>20 modules</td>
<td>Absolyte II HP V-O Sealed Lead Acid Battery</td>
</tr>
<tr>
<td>Lead Acid</td>
<td>1 battery</td>
<td>Battery</td>
</tr>
</tbody>
</table>

### WAREHOUSE STORAGE AREA

<table>
<thead>
<tr>
<th>TYPE OF MATERIAL</th>
<th>QUANTITY (gallons, unless otherwise specified)</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>20</td>
<td>A.T.V. Fuel</td>
</tr>
<tr>
<td>Chevron 325 Solvent</td>
<td>50</td>
<td>55 gallon drum</td>
</tr>
<tr>
<td>Oil</td>
<td>6 ea. @ 55 gal. = 330 gal.</td>
<td>55 gallon drums</td>
</tr>
<tr>
<td>Gasoline</td>
<td>45</td>
<td>Standby Generator Fuel Tank</td>
</tr>
<tr>
<td>Oil</td>
<td>2</td>
<td>Engine Oil for Standby Generator</td>
</tr>
<tr>
<td>Antifreeze</td>
<td>4</td>
<td>Standby Generator</td>
</tr>
<tr>
<td>Grease</td>
<td>55</td>
<td>55 gallon drum</td>
</tr>
</tbody>
</table>

### SURGE TANK

<table>
<thead>
<tr>
<th>TYPE OF MATERIAL</th>
<th>QUANTITY (gallons, unless otherwise specified)</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>10</td>
<td>Butterfly Valve</td>
</tr>
</tbody>
</table>
ATTACHMENT 6.1 (3 of 3)

**OILS, FUELS AND HAZARDOUS MATERIALS AT THE PACKWOOD LAKE HYDROELECTRIC PROJECT**

<table>
<thead>
<tr>
<th>TYPE OF MATERIAL</th>
<th>QUANTITY (gallons, unless otherwise specified)</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Oil</td>
<td>95</td>
<td>Head Gate Hydraulic Unit</td>
</tr>
<tr>
<td>Oil</td>
<td>6 ea. @ 1 qt. = 6 qt.</td>
<td>4160 Volt Isolation Switches</td>
</tr>
<tr>
<td>Diesel</td>
<td>100</td>
<td>Diesel Generator</td>
</tr>
<tr>
<td>Diesel</td>
<td>20</td>
<td>Spare Cans</td>
</tr>
<tr>
<td>Engine Oil</td>
<td>14 quarts</td>
<td>Engine oil for Diesel Generator</td>
</tr>
<tr>
<td>Antifreeze</td>
<td>4</td>
<td>Diesel Generator</td>
</tr>
<tr>
<td>Gear Oil</td>
<td>2 ea. @ 2.75 gal. = 5.5 gal</td>
<td>Traveling Fish Screen Gear Drive Box</td>
</tr>
<tr>
<td>Oil</td>
<td>1 quart</td>
<td>Air Compressor</td>
</tr>
</tbody>
</table>
STORAGE FACILITIES

Acceptable containment dikes for oil, fuel and hazardous storage facilities include the following:

1. Concrete floor, concrete walls with appropriate sealants.

2. Steel, polypropylene, polyvinyl chloride (PVC) and/or polyethylene containment pans, skids, and/or containment systems.

All dikes shall be free of gaps and cracks; and shall be constructed with materials compatible with the materials being stored.

Diked areas shall have a system to drain and separate oil and water including, but not limited to, one of the following:

1. Removing the oil from the water with absorbent materials such as booms or pads before pumping or draining the water from the diked area.

2. Removing the oil from the water with oil retention valves, filters, or oil separators installed in the drain lines from the bermed area.

When used, storage cabinets and buildings shall meet Uniform Fire Code requirements. Flammable materials shall be stored in safety cabinets, outdoor safety buildings, or in containment dikes away from incompatible materials.
PACKWOOD LAKE HYDROELECTRIC PROJECT
VICINITY MAP
(Non-Internet Public)

From USGS 1:100 000-Scale Series, Mount Rainier Quadrangle
ATTACHMENT 6.4 (1 of 3)
FACILITY LAYOUT

Powerhouse, Warehouse, and Switchyard Area

Non-Internet Public
ATTACHMENT 6.4 (Page 2 of 3)
FACILITY LAYOUT
(Non-Internet Public)
Control Building

Raw Water Tank Area
ATTACHMENT 6.4 (Page 3 of 3)
FACILITY LAYOUT
(Non-Internet Public)
Intake Area at Packwood Lake
ATTACHMENT 6.5 (1 of 1)
NOTIFICATION LIST

During normal working hours, in case of an oil, fuel, or hazardous material spill, the Packwood office (360-494-5000) is to be notified immediately.

After normal working hours, please notify one of the following:

<table>
<thead>
<tr>
<th>Packwood Station Lead</th>
<th>Randy Crawford</th>
<th>360-494-5811</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station Craft</td>
<td>Jerry Baker</td>
<td>360-494-5557</td>
</tr>
</tbody>
</table>

If the spill is of a size or nature to cause a fire concern, also contact the Fire Department using 911.

Effective Date: January 1, 2004
ATTACHMENT 6.6 (1 of 1)

COMPANIES THAT PROVIDE CLEAN UP SERVICES

NRC Environmental Services
Seattle, WA 98106
Toll Free: (800) 337-7455
Telephone: (206) 546-7150
www.nrces.com

Cowlitz Clean Sweep, Inc.
Longview, WA 98632
Telephone: (360) 423-6316
Fax: (360) 423-3409

Global
Seattle, WA 98106
Toll Free: (800) 441-3483
Telephone: (206) 623-0621
Telephone: (206) 932-9036

First Strike Environmental
Oregon
Toll Free: (800) 447-3558

River City Environmental Inc.
Portland, OR 97220
Telephone: (503) 252-6144
Fax: (503) 288-3568
Local community notifications for Oil, Fuel, and/or Hazardous Material Spills:

Packwood Fire Department 911
                                Business (360) 494-2360

Lewis County Emergency Management 911 or
                                Business (360) 740-1151

State Agencies:

Department of Ecology, Southwest Region (360) 407-6300

Department of Emergency Management (800) 258-5990

Federal Agencies:

National Response Center (800) 424-8802

Environmental Protection Agency, Region X (800) 258-5990

Other Numbers:

U.S. Forest Service, Cowlitz Valley Ranger District (360) 497-1100

Lewis County, Road Hazard Reports (360) 740-1123
                                After Hours (360) 740-1105

Effective Date: June 1, 2007
SAMPLE
PACKWOOD LAKE HYDROELECTRIC PROJECT
SPILL CHECKLIST

Date of Spill: ____________________  Time Spill Observed: ______________

Spilled Material (e.g., transformer oil, diesel fuel): ______________________

Location: ______________________  Approximate Amount Spilled: _______

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes/No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorbent materials placed on spill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Booms placed around area if spill could travel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drains and catch basins covered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station Leader Inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate containment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call clean up company if help needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determine need to report to federal agencies. (Call Regulatory Programs for assistance if needed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report spill if required, note date and time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log spill report in Plant Log</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete clean up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If appropriate, turn soil to capture more spill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contaminated materials collected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispose materials per regulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>File electronic report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copies of checklist and reports in Packwood files</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Checklist Completed By: ____________________ ____________________

Name (Signature)  Title

Date Completed: ____________________

Revision 1
<table>
<thead>
<tr>
<th>Date</th>
<th>Approximate Location</th>
<th>Material Spilled</th>
<th>Approximate Quantity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/11/1977</td>
<td>Generator bearing oil cooler failure; spill went to stilling basin</td>
<td>Oil</td>
<td>200 gal</td>
<td>The spill was observed along the tailrace and the Cowlitz River by the fish barrier. The SPCC was developed as a result of this spill.</td>
</tr>
<tr>
<td>5/31/1985</td>
<td>Governor malfunction, spill went to stilling basin</td>
<td>Oil</td>
<td>80-100 gal</td>
<td>No trace of oil in the Cowlitz River</td>
</tr>
<tr>
<td>11/19/2001</td>
<td>Switchyard – Main Transformer Failure</td>
<td>Mineral Oil</td>
<td>20 gal</td>
<td>Oil bled out the top of the transformer. Because it was a rainy day, the spill spread through the switchyard. Oil absorbent and booms were used to clean up the oil.</td>
</tr>
</tbody>
</table>

There were no spills in 2002-2006.
ATTACHMENT 6.10 (1 of 1)

Certification of the Applicability of the Substantial Harm Criteria
Packwood Lake Hydroelectric Project

1. Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?
   No

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?
   No

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula ¹) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA’s “Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments” (see Appendix E to this part, section 13, for availability) and the applicable Area Contingency Plan.
   No

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula ¹) such that a discharge from the facility would shut down a public drinking water intake ²?
   ¹ If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.
   ² For the purposes of 40 CFR part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c).
   No

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil discharge in an amount greater than or equal to 10,000 gallons within the last 5 years?
   No

Based upon the above analysis, we believe that a facility response plan is not required for our facility.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Dan Ross, Project Manager  
Signature  
Name and title (type or print)  
Date  
5/30/07
APPENDIX B

ENERGY NORTHWEST RESPONSES TO AGENCY COMMENTS ON PLP
APPENDIX B
RESPONSE TO COMMENTS ON THE
PRELIMINARY LICENSING PROPOSAL (PLP)

Energy Northwest, the Licensee for the Packwood Lake Hydroelectric Project (Project), filed the Preliminary Licensing Proposal (PLP) for the Project with the Federal Energy Regulatory Commission (FERC) on September 17, 2007, for review and comment by the resource agencies, Tribes and the public by December 17, 2007. Four comment letters were received. Comments were received from FERC (dated December 4, 2007), USDA Forest Service (dated December 7, 2007), U.S. Fish and Wildlife Service (dated December 14, 2007), and National Marine Fisheries Service (dated December 18, 2007).

This following are Energy Northwest’s responses to comments received on the PLP.

Energy Northwest has been meeting with the participating stakeholder agencies and Tribes to reach agreement on the proposed protection, mitigation and enhancement measures (PM&Es) that are included in the Final License Application (FLA). As part of the progress made in these meetings and to streamline the PLP comment process, reduce stakeholder effort, and diminish the effects of the short time schedule allowed for review by the ILP, Energy Northwest submitted a letter to FERC on December 13, 2007, which provided a list of issues where “agreement in concept” had already been reached. The elements described in the letter represented Energy Northwest’s proposal for Project operation, and proposed PM&Es to be implemented during the next license term; together with conditions and recommendations with respect to resources affected by the Project, which the agencies agreed to submit under their respective authorities. The participating agencies had indicated that documentation of these “agreements in concept” would allow them to focus their PLP comments on unresolved issues. Energy Northwest committed to continue to consult with the stakeholders on final content of proposed measures, and to incorporate agreed elements into the Final License Application.

Following is a point-by-point, detailed response to each comment received on the PLP. Agency comments are quoted verbatim in italics and numbers were added by Energy Northwest for ease of reference.
Energy Northwest Response to FERC comments:

FERC Letter dated December 4, 2007

**FERC (1) Comment - General:**
Throughout the PLP you propose the development and implementation of various plans such as your proposed road maintenance plan in Section 3.1.2.1. So that we may fully analyze each of your proposed measures please file all of your proposed plans when you file your license application.

**Response:**
Energy Northwest is submitting the currently existing plans that govern its management of hazard substances and spills (FLA Appendix A, Spill Prevention, Control and Countermeasure Plan), and noxious weeds (FLA Appendix E, Noxious Weed Management Plan). The Historic Properties Management Plan that will govern the treatment of historic and archaeological resources at the Project was previously filed with FERC (August 31, 2007). We anticipate that several additional resource management plans may be required by the Forest Service and other agencies for the management of resources at the Project. Decisions about the requirements of any resource management plans that may be required are not yet finalized by the agencies. We anticipate that the development of resource management plans for the new license term will require significant additional consultation with the participating agencies and tribes. The ILP process does not provide the time for development of new resource plans prior to the submittal of the FLA.

**FERC (2) Comment:**
All figures categorized as NIP and excluded from the PLP, should now be included in the final application.

**Response:**
Comment noted. Pursuant to FERC’s final rule change dated October 30, 2007, that eliminated the Non-Internet Public (NIP) category from the Critical Energy Infrastructure Information (CEII) regulations, the figures categorized as NIP in the PLP are now included in the FLA.

**FERC (3) Comment:**
Project Facilities
Section 1.1.1 – The number of acres associated solely with the transmission line and the ownership of those lands should be clearly identified.

**Response:**
The transmission line falls within the larger blocks of land reserved for other facilities of the Project or shares a similar occupancy with other utilities. Accordingly, the transmission line was specified by length in feet that it occupies for each land ownership

---

1 See Commission Order No. 702, issued October 30, 2007 (121 FERC ¶ 61,107).
block. For example, the first 748 feet of transmission line leaving the project switchyard traverses USDA Forest Service-managed land that includes the powerhouse, penstock, constant head tank, substation, warehouse, stilling basin, tailrace, and access roads. The line then runs 3,873 feet along the Energy Northwest-owned tailrace corridor. Upon reaching U.S. Highway 12, the line changes direction and runs 3,361 feet along the state highway right-of-way on poles shared by other power and telecommunication utilities until it reaches the Packwood substation, where it travels across 27 feet of Lewis County PUD land. The right-of-way varies within the Project boundary from 110 feet wide, across Highway 12, to 125 feet wide, at the end of the line near the Packwood Substation. The acreage of the line along the highway right-of-way where there is no other project component is approximately 8.78 acres of Washington State Department of Transportation land and 1.52 acres of Lewis County PUD land at the Packwood substation. This information will be added to the Project description in the FLA.

**FERC (4) Comment:**
Section 1.2.8 – On September 27, 2007, the Commission amended\(^2\) your current license and approved the construction and operation of a tailrace barrier to exclude resident and anadromous fish from the project’s tailrace. We understand that the construction of the barrier has been completed; however, the last paragraph of this section discusses the potential construction of the tailrace barrier. With the completion of the tailrace barrier, please add a section that specifically discusses the tailrace barrier and its operation.

**Response:**
The tailrace fish barrier was constructed in October 2007 and began operation in November 2007. A discussion of the fish barrier and its operation will be provided in the FLA.

**FERC (5) Comment:**
Fisheries and Water Quality
Sections 3.2.1.2 & 3.3.1.2.7 – On page 50 of the PLP, you state “the maximum spill event was estimated at 825 cfs in 1976.” However, table 3.2-5 on page 51 of the PLP indicates the maximum spill event occurred in 2006, with a spill of 889 cfs. Further, on page 175 of the PLP you state “an estimated 1,000 cfs passed over the drop structure.” Please reconcile this apparent inconsistency and correct as appropriate.

**Response:**
The USGS gauge records for Lake Creek downstream of the lake outlet (USGS No. 14225500) report that the maximum spill event occurred on December 3, 1977, with a mean daily flow of 1225 cfs and a peak flow on December 2, 1977, of approximately 1690 cfs. This flow event was computed by the USGS from the gauge record and from channel surveys taken after the high flow event occurred.

\(^2\) See 120 FERC ¶ 62,218.
The spill event in November 2006 was not recorded. The estimate of flow was computed from observations of Packwood Lake elevation and a rating for spill over the drop structure.

**FERC (6) Comment:**

*Section 3.2.3 – Low Dissolved Oxygen in the Tailrace Stilling Basin - This discussion appears to be out of place as it discusses fish use of the tailrace and stilling basin but makes no mention of dissolved oxygen or water quality.*

**Response:**

The text of the water quality section (FLA E.5.2) will be modified to discuss low dissolved oxygen levels that can occur in the tailrace when the Project is not operating. Since the tailrace fish barrier is now in place, these periods of reduced DO will not adversely affect fish populations.

**FERC (7) Comment:**

*Section 3.2.4 – Move Annual Maintenance Outage – In the fourth paragraph of this discussion it is stated that “Energy Northwest will investigate the feasibility and effectiveness of additional measures to reduce water temperatures in the project tailrace during the period of concern.” However, there is no discussion as to what additional measures will be investigated. Additionally, if this is part of Energy Northwest’s proposal, this item should be identified in the bulleted list at the beginning of the section and in detail.*

**Response:**

In response to the results of the relicensing studies, and in consultation with the resource agencies, Energy Northwest is proposing to move the timing for its annual maintenance outage. The agencies indicated concerns for ESA-listed fish in the Cowlitz River side-channel where the tailrace ends, under the current operational regime, which includes an annual maintenance outage in October. Moving the outage to August would prevent potential dewatering of any redds that could be established by spawning fish. However, an August outage may result in slight exceedance of the water quality standard. The installation of a temporary curtain weir at the upper end of the intake canal (under the foot bridge) was investigated as a potential means to reduce water temperature in the tailrace immediately before and after the outage. Water quality modeling was applied to investigate the feasibility of this measure. The modeling indicated that a curtain weir would not significantly reduce maximum daily water temperatures in the tailrace in September.
**FERC (8) Comment:**

*Section 3.3.1.1.2* – In the second paragraph, a bulleted list of six tributaries to Packwood Lake that have documented rainbow trout spawning (since 1980) is provided. In the next paragraph, you identify that during your studies Crawford Creek was also determined to have a spawning population. As such, since 1980, Crawford Creek has been identified to support spawning rainbow trout and should be added to the bulleted list. Additionally, please include spawning data that was collected through the licensing studies for Crawford Creek in Table 3.3.1-1.

**Response:**

Crawford Creek has been added to the bulleted list in the FLA. Associated spawning information gathered during licensing studies for all tributaries to Packwood Lake has been incorporated into what is now Section E.5.3.1.2.1 of the FLA. It should also be noted that the asterisk placed with Upper Lake Creek in the aforementioned table and associated subscript text made reference to the potential of the Crawford Creek spawner numbers being incorporated into Upper Lake Creek counts on some years.

Supplemental information regarding rainbow trout juvenile outmigration and Packwood Lake hydroacoustic analysis that was collected after the PLP submittal in September 2007 has also been incorporated into the FLA Section E.5.

**FERC (9) Comment:**

*Section 3.3.1.1.3* – The first sentence of the first paragraph states that the historic mean annual flow for lower Lake Creek is 101.5 cfs. Please identify the location of this measurement and the period of record.

**Response:**

The source of this data is the USGS gage at the outlet to Packwood Lake (immediately downstream of the drop structure), Gage No. 14225500. The USGS has records for the Lake Creek Gaging Station No. 14225500 from October 11, 1911 through September 30, 1980, with a total of 18,555 daily measurements for that period of record. The record, however, is not complete for that time period. Gaps exist in the data for the following periods:

- October 1925 – September 1930 (5 years)
- November 1943 – September 1948 (4 years 11 months)
- May 1954 – August 1959 (5 years 4 months)

Daily flow records were analyzed for the period of record from Water Year (WY) 1912 through WY 1962. This is the period of record prior to construction and operation of the Project. After Project startup in 1964, the USGS gages remained in operation; however, from that time the gage only reflects fish flows (i.e., instream flows, generally 3 – 5 cfs) plus any overtopping of the drop structure at the top.
FERC (10) Comment:
Section 3.3.1.4.1 – Figure 3.3.1-68 is not supportive of the text. The text states that “the lake would refill to 2856.5 on average in about 7 days.” The figure does not appear to illustrate any refill. Please resolve this inconsistency.

Response:
Figure 3.3.1-68 is now Figure E.5.3.1-78 in the FLA. This figure does not show lake level predictions. It shows only the rule curve for the Project minimum lake levels. The number of days that the lake will remain below elevation 2856.5 is a function of natural lake inflows. Estimates for a 1-ft drawdown show that lake levels would be below elevation 2856.5 between 7 and 17 days depending on the amount of inflow. The pre-outage drawdown in early August has been eliminated from the environmental measures proposed in the FLA.

FERC (11) Comment:
Section 3.3.1.4.2 – Although the project effects regarding entrainment are identified, and measures are proposed to address the effect, there is no analysis in this section on the effects/benefits of the proposed measures. Specifically, the role in which the proposed trash screens that are to be suspended from the floating booms, nearest the forebay will have on entrainment at the intake structure is unclear. Please provide additional analysis of the effect/benefits of the proposed measures and the trash screens on entrainment.

Response:
A detailed description of the 3-step, adaptive program for addressing entrainment at the Project intake is included at Exhibit E, Section E.5.3.1.3.2. The ill-fitting debris screens will be replaced so that fish cannot become trapped behind them. However, if impingement on the screens proves to be an issue, Energy Northwest proposes to remove the trash screens from in front of the trash bars, and instead hang trash screens from the trash boom. The reason for this configuration is that velocities behind the trash bars are approximately 2 ft/sec or less, depending upon lake and power production levels. Most fish can swim through these velocities, and without the trash screens in front of the trash bars, fish would be able to swim out of the intake wells. Energy Northwest consultants observed similar behavior at the Lake Chelan Hydroelectric Project intake structure (FERC No. 637). However, debris in the forebay is a real and long-standing issue. Under this scenario, Energy Northwest proposes to clean out the forebay of debris, and suspend trash screens from the boom, since most debris that enters the forebay is located in the upper portion of the water column. The benefits of this scenario would be that the entrance to the intake wells would be mostly open, with fish being able to move in and out of the wells, and not be entrained behind the screens, and debris would be captured by the screens suspended below the log boom. Energy Northwest would conduct monitoring of the effectiveness of this configuration, if employed.

FERC (12) Comment:
Section 3.3.1.4.3 – In the second paragraph of this section it is stated that a trap located near the intake structure, “…would be operated during May and June, when spawning migrations are
known to occur” and trapped fish would be moved from Packwood Lake downstream to Reach 5 in lower Lake Creek.

Further, because Packwood Lake rainbow trout are upstream spawners it appears to us that they would tend to be migrating upstream, away from the trap, during the proposed period of operation. Additionally, we assume that the proposed trash screens that will be suspended from the floating booms upstream of the forebay and intake structure, are being proposed because they will act as a behavioral deterrence to fish wishing to enter the forebay, in hopes of reducing impingement at the intake structure (as discussed in Section 3.3.1.4.2). Therefore, we ask that you clarify (a) the purpose of moving fish into reach 5 of lower Lake Creek and (b) the trap’s anticipated effectiveness; given the likely upstream movement of fish during the trap’s proposed operational period and the likely behavioral affects of the proposed trash screens on fish wishing to enter the project’s forebay.

Response:
The fish management agencies have expressed an interest in relocating fish downstream of the drop structure with the goal of bolstering the resident rainbow trout population in that 1464 ft. reach. Energy Northwest understood the rationale for this is that the relocation, associated with wood and gravel recruitment stations would increase habitat availability, thus increasing rainbow trout productivity potential in the reach. The agencies postulate that prior to the construction of the Project, a thriving trout population may have existed in this reach, since there was connectivity with the Lake where the fish population is very robust. With this proposal, Energy Northwest was attempting to respond to what it understands are the agencies’ concerns, although the obligation for relicensing is not to recreate pre-Project conditions and the lake and creek have existed in the current condition of separation for almost the last 50 years.

A majority of adfluvial rainbow trout populations are documented to migrate upstream to spawn in inlet tributaries to lakes. There are examples, however, of adfluvial populations migrating downstream into outlet tributaries to spawn. (Rainbow trout in the Alagnak River and its associated lakes and tributaries were generally caught at lake outlets and during the spawning season migrated downstream to spawn in the braided reaches of the mainstem [Meka 2000].) Visual observations of spawning activity near the drop structure in Packwood Lake lead Energy Northwest to believe that a reasonable number of fish could be collected and moved downstream of the drop structure, if required. Energy Northwest anticipates that the regular aquatic habitat forming flows (spill events) will likely move a sufficient number of fish to Lake Creek. The proposal for monitoring and moving fish as needed is included in the FLA at E.5.3.1.3.2.

FERC (13a) Comment:
Section 3.3.1.4.4 – In this section, you propose to provide a spill event of 285 cfs at least once every two years to move gravel and/or Large Woody Debris (LWD) through lower Lake Creek; however, no analysis is provided to demonstrate the adequacy of the 285 cfs spill event to accomplish this goal. Please provide an analysis of the adequacy of the proposed 285 cfs spill flow to accomplish the stated goal.
Response:
An analysis of the effects of spill events on gravel and large woody debris transport in lower Lake Creek is provided in the Gravel Transport Study Report (Watershed GeoDynamics 2007a) and the Large Wood Study Report (Watershed GeoDynamics 2007d) and in Exhibit E, Section E.5.3.1.2.7, Gravel Transport/Large Wood Studies in the license application. A painted rock study was conducted to test the effects of spills between 16 and 299 cfs on gravel movement (large woody debris was also monitored). The results of these studies suggest that gravel transport is initiated at approximately 250 cfs at most of the study transects, with more movement at 299 cfs. The 285 cfs spill was chosen because it is the estimated bankfull flow and is within the range of flows that initiate gravel transport.

FERC (13b) Comment:
In the fourth paragraph of this section, you state that in consultation with the appropriate agencies, numeric targets will be set for quantity of habitat as well as standards for measuring that habitat. This appears to be a proposal to develop a plan that will determine the necessary amount of habitat and how to measure that habitat. So that we may adequately analyze your proposal, with the filing of your final license application, please file this plan. At a minimum, the plan should identify the amount and location of the habitat to be provided including a description of the habitat types, and a schedule for providing the habitat. The plan should also describe the standards in which the habitat will be measured.

Response:
Energy Northwest will develop a monitoring and enhancement plan with the natural resource agencies and tribes.

FERC (14) Comment:
Section 3.3.1.4.6 – In the fourth paragraph of this section, you propose to “...re-route Snyder Creek to connect to a backwater channel of Hall Creek downstream of the project flume.” You propose this measure in-lieu of replacing the existing Snyder Creek culvert with one that will pass migrating fish more efficiently, due to the construction and maintenance costs associated with the replacement of the culvert. So that we may have a better understanding of your proposed re-routing of Snyder Creek, please provide a diagram/map that displays the current route of Snyder Creek, the location of the problem culvert, and the proposed location of the new stream channel. Additionally, in Section 3.6.6.1.1, first paragraph, last bullet, you propose to improve fish passage in Snyder Creek by replacing the culvert under the tailrace or by rerouting the stream. Please reconcile these two sections to accurately represent your proposal.

Response:
Energy Northwest intends to reroute Snyder Creek rather than replace the culvert. The bullets have been revised to accurately reflect Energy Northwest’s current proposal. A map/drawing has been inserted in the FLA to display the proposed new route for Snyder Creek at Figure E.5.3.1-79. In consultation with the agencies, the creek will be rerouted to run parallel to the tailrace canal (south side) until it intersects with Hall Creek. This
new route will provide better habitat and less maintenance than replacement of the existing culvert.

**FERC (15) Comment:**

*Section 3.3.2.4 – In this section you propose to consult with the agencies to develop recommendations for instream flow in lower Lake Creek to improve resources for Macro-invertebrates as well as other aquatic resources. However, in Section 3.3.1.4, you state that the proposed minimum instream flows would be 4 cfs from October to July and 7 cfs during August and September. Please reconcile this apparent discrepancy.*

**Response:**
The FLA in several places describes the instream flow regime proposed by Energy Northwest and agreed in consultation with the resource agencies.

**FERC (16) Comment:**

*Recreation & Aesthetics
Section 3.7.2.1 – On page 328, you state that the Wilderness Area along the east side of Packwood Lake is designated as “transition” in the Wilderness Resource Spectrum, while the Wilderness along the west side of the lake is designated as “pristine.” You go on to explain that these classifications include management goals that dictate the average number of people that should be encountered within these areas; however, you do not explain the basis for the classifications. In order to fully understand the recreational setting at the project, please provide a better description of the Wilderness Resource Spectrum and definitions of the classifications.*

**Response:**

Further description of the Wilderness Resource Spectrum and definitions of the classifications have been added in Exhibit E, Section 5.7.4.1 of the FLA.

**FERC (17) Comment:**

*Section 3.7.4.1 – In the third paragraph on page 339, you state that total recreation days are defined as (party size x overnights) + (1 x party size); however, this formula is unclear because recreation days are typically defined only as “party size x overnights.” Please clarify the formula and explain the purpose of adding the party size to the first part of the equation after multiplying it by 1.*

**Response:**

At most FERC-licensed hydroelectric projects, the numbers of visitors to recreation sites are counted at the campsites, day-use/boat launch sites, etc. The Forest Service estimates the number of visitors to the Packwood Lake area via Wilderness permit data obtained from the Wilderness Permit Stations located at the Wilderness boundaries. Because the Packwood Lake area has only dispersed recreation within non-Wilderness and Wilderness areas, and because it requires a 4.5-mile hike to access this area, visitors at Packwood Lake were counted at the trailhead and not at the Packwood Lake site. For this type of count, the Forest Service uses the formula of (party size x overnights) + (1 x party size) to estimate USFS Person Days Per Year (PDPY). Using
this formula for a party of five day users, the total would equal the party size or number of people that visited the Packwood Lake area for the day \((5 \times 0) + (1 \times 5) = 5\). However, for one overnight, each visitor would spend two days in the area (which is accounted for by adding the party size to the first part of the equation). For instance, if a party of five visitors stayed one night they would arrive on the first day (day 1), spend the night (1 night) then leave the following day (day 2). This would result in person days or recreation days of \((5 \times 1) + (1 \times 5) = 5 + 5 = 10\). So in fact, 5 visitors spend two days in the area if they stay overnight one night. Likewise, visitors would spend three days in the area, if they stay 2 nights. This formula may result in a slightly higher visitor use estimate than the FERC defined 24-hour recreation day; however, it is more applicable for this type of survey and is preferred by the Forest Service.

For recreation management planning purposes, and because the Forest Service owns and manages the recreation areas around Packwood Lake, the Forest Service’s Person Days formula was used to estimate Recreation Days.

**FERC (18) Comment:**

Section 3.7.4.2 – In the second paragraph of the Recreation Needs Analysis Results on page 340, you state that “regional and national recreation studies and historical trends indicate that recreation use will not grow at the same rate as population growth;” however, you do not cite any sources. Please provide citations for this information so that we may fully understand the context of these studies.

**Response:**

Citation: (IAC 2003). This citation has been added to the FLA.

**FERC (19) Comment:**

Section 3.8.2 – In the last paragraph of the Project Effects on page 357, you state that “the visual impacts of lake drawdowns are minimal because the difference in lake levels are generally not appreciably noticeable to most visitors;” however, you do not state the source of this information or provide an adequate analysis to support this statement. Therefore, please indicate the source of this information or provide an analysis of lake drawdowns on visual impacts so that we may better analyze how project operations impact visitor experiences at the project.

**Response:**

Additional references and information were added to the text regarding potential visual impacts

**FERC (20) Comment:**

*Draft Biological Assessment (Appendix B)*

Sections 1.0 & 2.2 – With the completion of the installation of the tailrace barrier, please update the discussions on the tailrace barrier.
Response:
The BA has been revised to describe the installation of the new tailrace fish barrier in October 2007.

FERC (21) Comment:
Section 5.2.1 – The project is located within critical habitat for the northern spotted owl (page 43). However, it is unclear which parts of the project are located within the critical habitat. Please include a map or description of the location of the critical habitat in relationship to project facilities and project-related maintenance activities.

Response:
The spotted owl habitat designated by the State includes all of the project facilities from Packwood Lake to a point above the powerhouse. The general powerhouse area and its associated facilities including the switchyard, transmission line, stilling basin and tailrace are outside of the designated spotted owl habitat.

FERC (22) Comment:
Section 6.2 – As discussed on page 51 of the draft BA, potential noise disturbance from vehicles accessing project facilities might disturb northern spotted owls. The proposed replacement of the existing debris screens, installation of the fish barrier, improvement to fish passage on Snyder Creek, and maintenance of Pipeline Road, Pipeline Trail, and Latch Road might also potentially disturb spotted owls. Please provide general information on these activities, including: the number, frequency, and types of vehicles accessing project facilities; the extent of the construction and maintenance activities (duration, construction equipment, etc.); and the relationship (distance, intervening vegetation and topography, etc.) of these activities to known owl nest sites and use area.

Response:
Two northern spotted owls were detected in the Lake Creek drainage in 2004, but there are no known northern spotted owl nests within the Project boundary. No studies of spotted owls were requested by the agencies or the Commission. The Project facilities from the intake structure to a point above the powerhouse are included in the Critical habitat designation. If spotted owls use this area they are already accustomed to the routine Project activities on the access roads, at the pipeline, and at the intake. No changes to the routine management of the Project are being proposed, and thus, no new source of disturbance would be anticipated.

FERC (23) Comment:
Section 6.3.2 – You indicate on pages 51-52 that the project would not affect designated critical habitat for the Howellia, Kinkaid’s sulfur lupine, and Nelson’s checker-mallow but you do not describe the location of the critical habitat. Please include a map or description of the location of the critical habitat for these species in relationship to the project.
Response:
No Critical Habitat rules have been established by the U.S. Fish and Wildlife Service for Nelson’s checker-mallow or Howellia. Howellia has not been located in Lewis County and its typical habitat is not present in the Project area. In Washington, two populations of Nelson’s checker-mallow are located in far western Lewis County in prairie and grassland habitat. This type of habitat is not present in the Project area.

Critical Habitat has been designated for Kincaid’s sulfur lupine (Federal Register: October 31, 2006 Volume 71, Number 210). In Washington, two populations of Kincaid’s sulfur lupine are located in far western Lewis County in upland prairie and open oak woodland habitat. This type of habitat is not present in the Project area.
Response to Agency Comments on PLP

Energy Northwest Response to USDA Forest Service comments:

Forest Service Letter dated December 7, 2007

FS (1) Comment:
Section 1.1.2 – On page 1, correct reference to “Baker Creek”.

Response:
The reference to Baker Creek has been deleted.

FS (2) Comment:
Section 1.1.3 – On page 3, note that only the upper approximate 50 percent of the drainage area contributes to the project release flow.

Response:
Tables 4.1-1 to 4.1-3 of the Lake Creek Instream Flow Report (EES Consulting 2007m) show the watershed delineations within lower Lake Creek. Major tributaries to Lake Creek occur all along Lake Creek down to about RM 0.7. Figure 2 of Appendix G to the Lake Creek IFIM study report illustrates the Lake Creek drainages. Appendix G shows where the tributaries empty into Lake Creek relative to the IFIM study site locations. The drainage areas and historic annual inflow into Lake Creek are shown.

FS (3) Comment:
Section 1.2.1 – On page 4, the reference to hoisting implies that the screens are periodically cleaned which appears to not be the case (J. Blum Dec 3, 2007).

Response:
The debris screens are cleaned on an as-needed basis about 3 or 4 times a year. Plant operators judge when intake performance is being inhibited by debris building up on the screens. When power generation schedules allow, water flow through the intake building is reduced and the screens are then hoisted out of the water and cleaned. Cleaning normally occurs in the spring (March-April), late summer (September) and in October during the outage. Additional cleanings may be necessary in some years during the winter months or occasionally during mid-summer.

FS (4) Comment:
Section 1.2.1 – On page 8, the report should specify what the depth of water is at still basin below the drop structure and evaluate other dam infrastructure (e.g., dam apron, pipeline) which may contribute to drop mortality or injury.

Response:
The depth of the water in the stilling basin immediately below the drop structure during times when overtopping events are not taking place is approximately 4 feet and does not present a risk to overtopped fish. The Project description in the FLA Exhibit A has been revised to include this information as well as Exhibit E, Section E.4.
**FS (5) Comment:**
Section 1.2.2, 1.2.3 and 1.2.4 – On page 8-10, identify which of the project components are located on NFS lands.

**Response:**
The Project components located on NFS lands include the intake/drop structure, pipeline/tunnels, surge tank, penstock, raw water tank and constant head tank, powerhouse, switchyard, a portion of the tailrace and transmission line, and access roads.

**FS (6) Comment:**
Section 1.2.4 – On page 10, indicate on a map the location of where the excess water from constant head tank overflow flows to Snyder Creek. Disclose the impacts to water quality and fish passage.

**Response:**
The constant head tank uses water from Packwood Lake to operate the cooling systems associated with turbine-generator. Exhibit G, Sheet 7 has been revised to include this feature. The tank provides a constant head pressure to the cooling systems and prevents over-pressurization. Excess water from the tank overflows. The overflow water flows through a short length of pipe to a natural drainage that leads a further few hundred feet to Snyder Creek. The water joins Snyder Creek near the south fence of the Powerhouse switchyard. The amount of water flowing to the creek varies by the amount of cooling demand. Accordingly, the flow tends to be seasonal, with the highest flows in the winter when the cooling demand is at its minimum, and the lowest flows (or none) in the summer months when the maximum cooling demand exists.

Water temperature was continuously monitored upstream and downstream of where the overflow joins Snyder Creek. The overflow had no effect on water temperature within Snyder Creek.

**FS (7) Comment:**
Section 1.2.8 – On page 12, reference to anadromous fish reintroduction should specify that the trap and haul operations have been in operation since 1994.

**Response:**
The reference has been added.

**FS (8) Comment:**
Section 1.2.9 – On page 13, cite references describing PCB levels.

**Response:**
The PCB levels were taken from the Phase 1 Environmental Site Assessment. This is a report prepared by Energy Northwest in April 2007 and is listed as “Energy Northwest 2007e” in the Literature Cited section of Exhibit E (Section E.9). This report can also be found on the Energy Northwest website.
**FS (9) Comment:**

*Section 2.1* – On page 17, disclose why Article 37 established a max elevation of the lake at 2858.5.

**Response:**

The maximum lake elevation in Article 37 of the license corresponds to the crest of the spillway on the drop structure. A review of plant records did not reveal the basis for this original license condition.

**FS (10) Comment:**

*Section 2.2* – On page 17, please clarify what is the minimum production capacity and associated cfs. Dec 3, 2007 referenced a minimum of 2 kW. This may be important for establishing a balance with Lake Creek fish release during low flow.

**Response:**

The Packwood power plant can operate at a minimum of approximately 1 MW, which corresponds to flow of approximately 18.9 cfs. These values were determined by testing conducted in February 2002.

**FS (11) Comment:**

*Section 2.5.1* – On page 28, establishing a baseline condition for lake level is relevant to the license. PLP should clarify the ambiguity of estimates of natural lake level prior to the project. The PLP states the lower lake surface as unknown (PLP pg. 1), and cites current management as consistent with pre project water levels. PLP pg. 65 again states that “there is only very limited information on seasonal lake level fluctuation.”

ENW also proposes a modification to lake operations. After the December 3 and 4, 2007 meetings, ENW are evaluating the Agencies instream flow recommendation thereby also evaluating the early lake drawdown proposal. Instream flow and the outage issues are to be the focus of the January 10 and 11, 2008 meetings.

**Response:**

Energy Northwest has obtained records of pre-Project lake levels from the USGS and provided the information in Section E.5.2 of the FLA. However, it should be noted that the baseline for Project relicensing is the conditions that exist under the current Project license. A licensee is not required to recreate conditions that existed before the Project.

**FS (12) Comment:**

*Section 2.6* – On page 29-30, the ENW proposes protection, mitigation and enhancement measures. As stated in the cover letter, the Agencies and ENW have been meeting to provide a consensus based PM&E proposal in the Final License Application. See Enclosure II to the matrix of issues and PM&E measures at least agreed to in concept.

**Response:**

The proposed protection, mitigation and enhancement measures in the FLA reflect the agreements reached between the agencies and tribes and Energy Northwest.
**FS (13) Comment:**

Section 3.1.1 - page 30, the document should state that the past pool grade control was a landslide and the current (approx 1960-present) control is a dam.

Response:
The description of the lake in section E.5.1.1 includes this information.

**FS (14) Comment:**

Section 3.1.2.2 – On page 37, please clarify the historic period of record (e.g., dates of air photos) used in review of bank erosion. The Drawdown Report should critically review reference documentation and past study results which offering differing opinion and document effects of drawdown including 1976 Packwood Lake Shoal Stability analysis and J.F. Corliss (Oct 22, 1971) USFS Report

Response:
Historical aerial photographs used in the analysis are listed in Table 3.2 of the Packwood Lake Drawdown Study Report (EES 2007g). A list of these photographs has been added to the Final License application in section E.5.1.2.2. The 1976 Packwood Lake Shoal Stability analysis and the 1971 USFS report were reviewed. The shoal analysis was concerned primarily with erosion of underwater shoal areas that could be subject to mass wasting if the lake level was lowered from El. 2850 to 2849 ft. The shoal analysis concluded that 7.5% of the narrow shoal area (approx. 990 lineal feet) could be subject to accelerated failures with a 1-ft reduction in lake level. However, the minimum lake elevation is not proposed to change under the new license, so these conditions will not be different.

**FS (15) Comment:**

Section 3.1.3 – On page 40, the effects listed concerning geologic/soil resources do not consider the additional erosion resulting from loss of bank vegetation that may occur during the proposed mid summer drawdown (Mid July start, 1 foot, lasting 7-10 days). The effect(s) on the lake shore and stream delta vegetation due to lake drawdown every summer during the peak of the growing season was not analyzed in any of the studies. Consequently, the magnitude of the effect to erosion rates and the effects on terrestrial or aquatic habitat along the shorelines and deltas is not known.

Response:
No specific analysis of changes in bank vegetation under a mid-summer drawdown condition was requested in the study plans or made in the studies conducted for relicensing. This scenario was proposed in response to the relicensing study results, which suggested that moving the Project outage to an earlier timeframe would have benefits for ESA-listed fish that often spawn in the Cowlitz River at or downstream of the Project tailrace. Energy Northwest recognizes that solving the issues at the tailrace may cause other issues. However, it was agreed in discussions with the Agencies that no drawdown prior to the annual outage would be proposed and that this change would better ensure the Project’s ability to provide increased instream flows in Lake Creek as well as continuity of flows in the tailrace slough after the outage. See Exhibit E, Section E.5.3.1.3.
FS (16) Comment:
Section 3.1.5 – On page 41, the statement “Erosion of these areas is primarily associated with non-Project recreational use, but Project-related fluctuations of the lake level could contribute to some minor ongoing erosion in these areas.” is subjective. Mid summer drawdown of the lake could result in additional erosion. The quantity of this effect was not analyzed in any of the studies.

Response:
No quantitative analysis of the effects of a 7-10 day mid-summer drawdown was conducted as part of the relicensing studies. As described above, the possibility of a mid-summer drawdown was only examined as a result of the relicensing studies. They were not premised upon such a proposal, so this type of analysis was not included in the study plan.

A quantitative erosion analysis of a period of drawdown this short would be difficult, since quantitative information on erosion mechanisms (primarily foot traffic in this case) are not known. Most erosion from a 7-10 day summer drawdown presumably would be associated with some level of increased foot traffic in a few portions of the reservoir drawdown area and expected to be minor.

Finally, the summer, pre-outage drawdown was eliminated in the proposed Project operations in agreement with the Agencies.

FS (17) Comment:
Section 3.3.1.3.1 – On page 225, the statement “No evidence was found of effect on spawning and rearing trout in Packwood Lake due to Project drawdown” should refer to the drawdown that occurs in September or later in the year. Effects on spawning and rearing trout such as stranding or insufficient depths for out migration of juveniles may occur during a drawdown beginning in mid July. In Section 3.3.1.2.3 page 150, the statement “because these creeks have historically dried up in the late summer months, the rainbow trout in these tributaries have adapted a strategy of emigrating from the creeks to the lake in the late summer before flow decrease drastically or dry up completely” indicates that fish would be emigrating from Trapp, Crawford and Osprey creeks to the Lake during the proposed mid July drawdown.

Response:
The statement was revised to indicate that it refers to the September drawdown after the annual maintenance outage. It should be noted that the drying up of the tributaries to Packwood Lake occurs naturally independent of Project operations. Crawford, Trap and to a much lesser extent, Osprey creeks intermittently go dry when there is a lack of snowpack and inflow from precipitation events. The timing of the drawdown and the associated Project effects are independent of the natural events that take place resulting in tributaries drying up.

FS (18) Comment:
Section 3.3.1.1.2 – On page 113, the PLP does not recognize the unique quality of wild, naturally reproducing fish of Packwood Lake. Isolated fish populations above the existing
Packwood Lake dam are believed to have evolved in the Upper Lake Creek basin and have maintained a self-sustaining population. Genetic comparisons indicate that Packwood rainbow are more similar to inland rainbow stocks (redband trout) than they were to costal rainbow stocks (Lucas and Chilcote, 1982). Available electrophoretic data from hatchery stock supports that lacustrine populations of Packwood Lake trout have not integrated with hatchery stocks introduced between 1954-1965. Given the passage limitations created by the dam, there is a significant constraint to genetic flow in and out of the lake.

Response:
Energy Northwest agrees that a robust population of unique, naturally reproducing rainbow trout exists in Packwood Lake.

FS (19) Comment:
Section 3.3.1.1.6 – On Page 115, the PLP does not recognize that the mainstem Cowlitz dams excluded anadromous fish from reaching the upper Cowlitz river for more than years dating back to the 1930’s. The Salmon Recovery Plan stress that recovery of Lower Columbia ESU is highly dependent on the successful reintroduction of salmon and steelhead. The trap and haul reintroduction program was implemented in the upper Cowlitz River 1994.

Response:
Section E.5.3.1.1.6 of the FLA includes a statement regarding the historical fish passage issues due to the installation of dams on the lower Cowlitz River.

FS (20) Comment:
Section 3.3.1.1.6 – On page 118, Pacific Lamprey is referred to as a resident. Two resident species found in Washington are commonly known as river and brook lamprey.

Response:
This text has been revised as suggested.

FS (21) Comment:
Section 3.3.1.2 – On page 118, the Forest Service provided comments regarding ENW’s final study reports e-filed with FERC on November 20, 2007. Please reference Forest Service comments as they are applicable to the PLP.

Response:
Energy Northwest has responded to the comments received regarding the relicensing study reports in a response letter filed with FERC on January 8, 2008.

FS (22) Comment:
Section 3.3.1.2.3 – On pages 148-151, the PLP does not provide sufficient evidence on how much aquatic habitat is affected by lake drawdown. The PLP does not quantify the amount or quality of lost fish (or other species) habitat resulting due to drawdown. While the report does provide some data on impacted surface area (e.g. acres exposed and relative percentage), it does not critically evaluate the quality of habitat affected by the drawdown. The Fish Distribution Study indicates that lacustrine habitat plays a vitally important role in the early developmental stages of Packwood Lake rainbow trout. It appears that reducing the lake water surface...
elevation from 2857 to 2848 has a substantial impact on the horizontal distance of exposed shoreline. The average distance of exposed lake shoreline at spawning tributaries is approximately 138 feet and ranges from 40-250 feet. (Osprey 100 ft, Trapp 150 ft; SE Trapp 40 ft, Crawford 150 ft; and Muller 250 ft).

There should be a critical review of the impact to susceptible rearing fish are may be impacted by lake drawdown during the outmigrating and early life history development. The drawdown appears to reduce the quality/quantity of lacustrine habitat critical for rearing including emergent vegetation, submerged wood and substrate.

The PLP should disclose how lake drawdown influences fish passage. Additional consideration should be given to relationship of drawdown period and the emigration movement patterns of adfluvial rainbow trout in Packwood Lake. If peak spawning is June 18 and it takes 45 days for rainbow trout to emerge from the gravel, there may be little or no time before sac fry (approximately 20 mm fish) are forced to follow the declining flows and move from the streams to the lake. With the lake drawdown, comes the potential loss of stream depth and cover and increase risk of stranding due to loss of channel connectivity. Maintaining channel connectivity to the lake appears to be vitally important to supporting fry (newly emerged fish) at this high susceptible early life stage.

**Response:**
Energy Northwest has agreed with the resource agencies regarding the optimal time for plant outage and has eliminated any prior drawdown from the proposed operations.

As noted in the Stream Connectivity Report (Watershed GeoDynamics and EES Consulting 2007), downstream fish passage is not impacted by lake drawdown level, but rather by flow level within the major tributaries. Several of the creeks, notably Crawford and Trapp creeks, and occasionally Osprey Creek, dry up naturally during late summer without regard to Project operation. Fry emergence and migration studies conducted by EES Consulting during 2007 indicated that fry have migrated from the streams into the lake by mid to late August. This migration is not triggered by reduced lake level but by decreasing stream flow levels in the creeks.

**FS (23) Comment:**
Section 3.3.1.2.6 – On page 169, the PLP should expand on limiting factor analysis or WUA and describe with variable is the actual constraint (depth, velocity, substrate). This has significance to the restoration proposal and help respond to questions of migration potential.

The report does not recognize the function of off channel habitat as it pertains to coho rearing. Side channels inundated at higher flows (higher than 2 cfs) play a considerable role in rearing capacity. It appears that low velocity off channel rearing habitat for coho is important to restore in Lake Creek. The dam has a dampening effect on flows in the 400-600 cfs range. These flows have been reduced by an average of 78 percent.

**Response:**
Due to the difference in habitat suitability indices, different species and life stages have different constraints related to rearing and spawning habitat. For example, coho
juveniles and trout rearing in the winter prefer shallow depths and low velocities and use larger substrates (boulders) and cover. Steelhead juveniles prefer deeper waters and faster currents than the other species. As noted, off-channel rearing habitat is important for coho salmon juveniles. The off-channel habitat, mostly created by the November 2006 flood event, is part of the area to be considered under the restoration plan being developed by Energy Northwest.

Energy Northwest has proposed the instream flows agreed with the natural resource agencies and the tribes.

**FS (24) Comment:**

Section 3.3.1.4.4 – On page 235, increasing flows higher than the proposed 4 cfs October through July and 7 cfs in August and September is recommended. The quantity of habitat the 4 and 7 cfs flows would provide even with successful restoration of Lower Lake would not compensate for the project’s effect of continued loss of habitat throughout Lower Lake Creek but especially for the lowest mile, into the next license period. The Northwest Forest Plan Aquatic Conservation Strategy includes maintaining or restoring instream flows sufficient to create and sustain aquatic habitats and along with providing physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic species.

The Lake Creek Instream Flow Study Report and subsequent information allowed the synthesis of modeled habitat information to estimate monthly flow rates necessary for providing preferred habitat for each fish species. Lowest flows for each month that would meet the following criteria were used: 50% of “natural” WUA for primary spawning, 50% of “natural” for steelhead and rainbow trout rearing in April-October, and at least 100% of incubation needed for eggs in gravel. Monthly flow recommendations for January, February and December were increased to provide adequate flow to Reach 5 which has minimal inflows and to accommodate for adverse effect of freezing during artificially low flows. These flow recommendations also assume that they offer a 3 foot wide and 1 foot deep travel corridor from the mouth of Lower Lake Creek to above the Highway Bridge.

Recommendation for Design Criteria for Stream Habitat Restoration of the Lower Lake Creek below RM 1.03 should be jointly developed with Agencies. Construction criteria examples such as, provide at least 15 large wood structures between the Highway Bridge and the first partial fish barrier will be specified. Geomorphic Criteria and Habitat Criteria may also be specified such as increase residual pool depth, decrease channel width to depth ratio and increasing spawning habitat by importing spawning gravel.

Recommendations for a monitoring plan to be developed for the Lower Lake Creek Restoration. Recommend contingency measures to attain target(s) if target(s) are not met initially.

**Response:**

Subsequent analysis of the cross-sectional data from transects below the Highway 12 Bridge indicates that passage criteria are met at all flows examined for both salmon and trout. Energy Northwest and the natural resource agencies and tribes have agreed to an instream flow regime for Lake Creek (both below the lake and in the anadromous
zone), but also to jointly develop design criteria and a monitoring plan for habitat restoration.

**FS (25a) Comment:**
Section 3.3.1.4.7 – On page 248, shifting the outage and corresponding mid summer lake drawdown to provide additional protection to spawning Chinook in the tailrace causes effects to aquatic habitats around the lake. Alternatives to remedying the effects to spawning Chinook around the tailrace should be considered. Analysis and documentation of the effects of a mid summer drawdown has not been completed.

**Response:**
Energy Northwest has agreed with the agencies to begin the annual maintenance outage on August 15 and complete it by September 15 or sooner if all required work is completed. One of the goals of shifting the outage is to minimize the impacts, not only to anadromous fish in the tailrace slough, but to the natural resources within and around Packwood Lake.

**FS (25b) Comment:**
Effects include wetland habitat degradation from lake drawdown. The Packwood Lake drawdown study results indicated that the hydrology of the wetland complex at the upper end of the lake was affected by lake levels. The study results were limited to analysis of effects during the September and October drawdown period and did not estimate effects of drawdown in mid-July during the height of vegetation growing season. A mid July Drawdown may affect wetland vegetation in Upper Lake and Muller Creek as backwater from the lake at full pool would not occur to the same extent during the growing season.

**Response:**
No pre-outage drawdown is proposed, thus, no effects to vegetation around the lake will occur.

**FS (25c) Comment:**
A mid July Drawdown may affect amphibians in the few existing suitable lacustrine areas (shallow vegetated areas) in the southeast end of Packwood Lake between the mouths of Upper Lake Creek and Muller Creek. Varying lake levels may disrupt amphibian breeding, egg hatching and metamorphosis from May thru mid September (Section 3.4.3.2.2.).

**Response:**
Only one type of amphibian breeding in lacustrine fringe wetlands at the head of Packwood Lake is likely to be adversely affected by the fall/winter drawdown. Energy Northwest has agreed to survey this area to determine if amphibians are impacted. See FLA section E.5.4.3.3.

**FS (26) Comment:**
Section 3.4.2.2.2 – On page 265, the section refers to the species detected during project surveys, including coastal giant salamander, Dicamptodon tenebrosus, in stream habitats. However, because no DNA analysis was done for captured larval giant salamanders below 55mm SVL (snout-vent length), the occurrence of Cope’s giant salamander, Dicamptodon copei,
a Forest Service Sensitive species, cannot conclusively be ruled out, even if larval specimens examined appeared morphologically to meet the criteria for coast giant salamander. It should be included and addressed as potentially occurring, similar to the way the two semi-aquatic species, Cascades torrent salamander and Van Dyke’s salamander, are addressed at the end of section 3.4.2.2.2. In fact, based on factors such as local distribution and known amphibian-habitat relationships, it is more likely that Cope’s giant salamander occurs in lower Lake Creek (but was not documented during surveys) than the latter two species, which probably are really absent from Lake Creek as stated in the final paragraph.

Response:
The possible occurrence of Cope’s giant salamander is acknowledged on the same page in Footnote #1, which states, “A related species, Cope’s giant salamander (Dicamptodon copei) was not documented on the basis of morphological characteristics, coloration, and developmental patterns, but could nevertheless be present. If this species does occur in lower Lake Creek, habitat use patterns should be similar to those displayed by coastal giant salamander.”

FS (27) Comment:
Section 3.4.3.2.2 – On page 268, paragraph 1 the final sentence states that “… the loss of some larvae from drawdown is not distinctly different from mortality that might have occurred in pre-Project conditions when lake levels reportedly dropped seasonally to 2854 ft MSL, which may also have been sufficient to dewater depressions on the edge of the lake”. COMMENT: this sentence is purely conjectural, as witnessed by the use of the qualifying words “might”, “reportedly”, “may also”. There is no way to validate this statement, and the historic, pre-project nature of lake “drawdown” is distinctly different than the relatively rapid nature that now occurs both in terms of regularity and variability. I suggest dropping this final statement, and just state that the loss of some (Northwestern salamander) larvae may occur.

Response:
The sentence has been deleted.

FS (28) Comment:
Section 3.4.3.2.2 – On page 268, paragraph 4: similar to the above statement, “… at the upper end of Packwood Lake may be similar to and probably not more than the groundwater level…” COMMENT: again, conjectural comment, the fact remains that the drawdown could result in stranding of salamander larvae and this should just be stated as such.

Response:
The sentence has been deleted.

FS (29) Comment:
Section 3.4.3.2.2 – On page 268 Last paragraph in section - the duration of lake drawdown would change if power plant outage was in August.

Response:
Proposed changes to the drawdown are discussed in Section E. 4.3.2
FS (30) Comment:

Section 3.4.4.2 – On page 269-270, the conclusion that “amphibians breeding in lacustrine fringe wetlands at the head of Packwood Lake are unlikely to be affected by the earlier drawdown except in one small, isolated depression where Cascade frog larvae were found in 2006” ignores the previous statements that the existing drawdown had the potential to isolate Northwestern salamander larvae, a consequence which would also occur during this earlier drawdown as well.

Response: A pre-outage drawdown (August) has been eliminated from the proposed environmental measures. Only one type of amphibian breeding in lacustrine fringe wetlands at the head of Packwood Lake is likely to be adversely affected by the fall/winter drawdown. Energy Northwest has agreed to survey this area to determine if amphibians are impacted. See FLA section E.5.4.3.3.

FS (31) Comment:

Section 3.5.2.2 – On page 274, the high clay content of soil may not remain near saturation if lake drawdown occurs in mid July, early August when air temperatures are high.

Response: Drawdown during this time is no longer proposed.

FS (32) Comment:

Section 3.5.4 – On page 278, disagree with the conclusion that no negative effects to wetlands will result as a consequence of scheduling a drawdown in August for the reasons stated under comment for Section 3.3.1.4.7 Page 248. Mid July lake levels are dependent upon snow melt timing and are not necessarily lowered significantly. Mid August lake levels would be a more consistent time to see the lowering of lake levels that would closely mimic pre-project conditions.

Response: Drawdown during this time is no longer proposed.

FS (33) Comment:

Section 3.6.5.2.2 – On page 312, The Forest Service does not agree with the statement “No adverse effects on Forest Service sensitive wildlife species are postulated.” See previous comments concerning presence/absence of Cope’s giant salamander. Because the presence of this aquatic salamander cannot be ruled out due to the lack of genetic analysis of larval Dicamptodon, and the alteration of the natural flow regime of Lake Creek has, at minimum, the potential to adversely affect aquatic amphibians, the statement should be revised to say (utilizing standardized language in USDA Forest Service Biological Evaluations), “the Project may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species”.

Response: The text has been changed as suggested.
FS (34) Comment:
Section 3.6.5.2.2 – On page 312, the northern bald eagle has reverted to a Pacific Northwest Regional Forester (R-6) Sensitive species following its delisting by the U.S. Fish and Wildlife Service, and should be addressed in the Sensitive species section.

Response:
The text has been revised as requested.
Response to Agency Comments on PLP

Energy Northwest Response to U.S. Fish and Wildlife Service comments:

U.S. Fish and Wildlife Service Letter dated December 14, 2007

**USFWS (1) Comment:**
The absence of a comment on a specific item within the PLP does not indicate Service agreement or disagreement with that item. Rather, ongoing negotiations with ENW and the development of mutually agreed upon PM&E’s for inclusion in the FLA is of greater priority than specific items as described in the PLP.

**Response:**
Comment noted.

**USFWS (2) Comment:**
Section 2.6 – On page 29-30, ENW proposes PM&E measures. As stated in the cover letter, the Agencies and ENW have been meeting to provide a consensus based PM&E proposal in the FLA. See Enclosure III for the PM&E measures agreed to in concept thus far.

The Service is also interested in developing at a minimum, in collaboration with ENW and the other resource agencies and tribes, PM&E’s for an Adaptive Management Plan and a Monitoring and Evaluation Plan. These plans may be incorporated into other plans or be separate, overarching plans.

**Response:**
Energy Northwest has included in the FLA the protection, mitigation and enhancement measures that have been agreed to with the USFWS and the other resource agencies. We anticipate that they, in turn, at the appropriate time, will submit conditions and recommendations under their various authorities that reflect the consensus achieved in our discussions.

**USFWS (3) Comment:**
Section 3.3.1.1.6 – On page 118, Pacific Lamprey is referred to as a resident species. Two other resident lamprey species found in Washington are commonly known as river and brook lamprey.

**Response:**
See response to USFS Comment 20.

**USFWS (4) Comment:**
Section 3.3.1.4.4 – On page 235, the quantity of habitat the proposed 4 and 7 cfs flows would provide, even with successful restoration of lower Lake Creek, would not compensate for the project’s effect of continued loss of habitat throughout lower Lake Creek, particularly for the lowest mile, into the next license period. The Northwest Forest Plan Aquatic Conservation Strategy includes maintaining or restoring instream flows sufficient to create and sustain aquatic habitats and along with providing physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic species.
The Lake Creek Instream Flow Study Report and subsequent information allowed the synthesis of modeled habitat information to estimate monthly flow rates necessary for providing preferred habitat for each fish species. Lowest flows for each month that would meet the following criteria were used: 50% of “natural” WUA for primary spawning, 50% of “natural” for steelhead and rainbow trout rearing in April-October, and at least 100% of incubation needed for eggs in gravel (see Enclosure IV). Monthly flow recommendations for January, February and December were increased to provide adequate flow to Reach 5 which has minimal inflows and to accommodate for adverse effect of freezing during artificially low flows. These flow recommendations also assume that they offer a 3 foot wide and 1 foot deep travel corridor from the mouth of lower Lake Creek to above the Highway Bridge.

A lower Lake Creek Habitat Restoration Plan should be jointly developed with the Agencies. Construction criteria such as, provide at least 15 large wood structures between the Highway Bridge and the first partial fish barrier, will be specified. Geomorphic Criteria and Habitat Criteria will also be specified such as, increase residual pool depth, decrease channel width to depth ratio and increasing spawning habitat by importing spawning gravel. This plan should also include a monitoring and evaluation component with measurable criteria and a schedule.

Response:
Energy Northwest, USFWS, and the other fish management agencies engaged in focused discussions to determine the appropriate flows and habitat enhancement goals for lower reach of Lake Creek. These agreed measures are included in the FLA as the proposed parameters for Project operation. Energy Northwest anticipates that a significant amount of additional consultation will be required to further develop these measures.

USFWS (5) Comment:
Section 3.3.1.4.7 – On page 248, a mid July drawdown may affect amphibians in the existing suitable lacustrine areas (shallow vegetated areas) in the southeast end of Packwood Lake between the mouths of Upper Lake Creek and Mueller Creek. Varying lake levels may disrupt amphibian breeding, egg hatching and metamorphosis from May thru mid September (Section 3.4.3.2.2.). Additional analysis should be conducted dependant on the exact timing, magnitude, and duration of lake drawdown.

Response:
A more detailed discussion of the timing, magnitude, and duration of the drawdown has been added. Neither the current or proposed fall/winter drawdown occurs during a time when any amphibian species is breeding or when eggs would be present. Lake levels will continue to be held relatively constant prior to the August outage. The likelihood of larval stranding is minimal at the expected ramping rates for the much slower Packwood Lake fall/winter drawdown because larvae will be able to move to contiguous areas of deeper water. Nevertheless, Energy Northwest will conduct surveys to determine if amphibians are affected. See Exhibit E, Section E.5.4.3.3.
USFWS (6) Comment:
Section 3.6.5.2.2 – On page 312, the bald eagle has reverted to a federal Species of Concern following its delisting by the Service, and should be addressed in the Sensitive species section. The bald eagle remains under the authority of the Bald and Golden Eagle Protection Act. If, during the term of the new license, eagles or eagle nests are detected within the vicinity of the project, then ENW would be required to obtain a permit for activities that may disturb eagles.

Response:
Comment noted. Text addressing bald eagle has been inserted under USDA Forest Service Sensitive species.

USFWS (7) Comment:
Section 3.5 on the Draft Biological Assessment
Update the proposed Project Action and PM&E’s pending the outcome of ongoing negotiations with the Agencies.

Response:
Comment noted. The proposed Project for the FLA and the BA reflect the results of the discussions between Energy Northwest and the resource management agencies.

USFWS (8) Comment:
Section 4.0, 5.2, 6.2, and 8.0 on the Draft Biological Assessment
Provide information on Canada lynx and marbled murrelet and any critical habitat within the project vicinity and provide an effect determination and justification.

Response:
Text addressing these species has been added as requested. Based on all available information, neither species occurs in the Project vicinity.

USFWS (9) Comment:
Section 6.2 on the Draft Biological Assessment
Separate the species by sub-section, similar to Section 6.3. Provide clear effect determinations and supporting justifications.

Response:
Comment noted. Where available, additional information has been provided to aid in your analysis of future project operations. No surveys for spotted owls were requested for relicensing, and therefore none were conducted. Critical habitat for the spotted owl has been designated by the State and includes the area from the Project intake down to a point above the powerhouse. However, if spotted owls use the habitat near the
Project, they must be accustomed to the kinds of noise and activity that are normally associated with its operation. Depending on the time of year, spotted owl surveys are required by the USFS prior to starting new projects that have the potential to generate noise.

**USFWS (10) Comment:**

*Overall on the Draft Biological Assessment*

The draft BA does not contain enough specific information for us to analyze and make a decision regarding your effects determinations for species or critical habitat. At a minimum, include additional information on recreation, tailrace barrier, lake drawdown, and noise generating activities and their impacts to Service listed species and/or critical habitat.

**Response:**

Comment noted. Where available, additional information will be provided to aid analysis of future project operations.
Energy Northwest Response to National Marine Fisheries Service comments:

National Marine Fisheries Service Letter dated December 18, 2007

NMFS (1) Comment:
Page 109: Section 3.2.4
The fish barrier has been installed. An operation, monitoring and maintenance plan, meeting the requirements of the Biological Opinion: Construction, Post-construction Monitoring and Evaluation of a Tailrace Barrier at Packwood Lake Hydroelectric Project, September 24, 2007 should be included in the License. NMFS supports changing the annual outage to reduce attraction flows and limit spring Chinook spawning in the tailrace slough.

Response:
Comment noted.

NMFS (2) Comment:
Page 216: Section 3.3.1.2.11
As described in the PLP, the section of the Project outfall below the fish barrier is referred to as the tailrace slough. This slough is intermittently connected to the mainstem Cowlitz River. When the slough is connected to the mainstem Cowlitz River, Project flows have little effect on water levels in the slough. However, during periods when the slough is not connected, water levels in the slough are almost entirely dependent on Project flows.

As the analysis in the PLP describes, spring Chinook salmon redds are at the greatest risk for dewatering under current Project operations. The proposed shift of Project outage, and accompanying reduction of flows and water level during the period when fish select locations for spawning, should greatly reduce this risk. However, during periods when Project flows supply the majority of water in the slough (i.e., mainstem Cowlitz not connected to the slough) redds or fry of all species present are subject to dewatering during unplanned Project shutdowns. The applicant should conduct a risk analysis based on frequency and duration of unplanned shutdowns and develop plans for maintaining flow to redds dependent on project flows and rescue of stranded fish. This plan should be incorporated into the license.

Response:
As agreed with the resource agencies, Energy Northwest has proposed a modified operational regime where the Project outage will occur beginning August 15 and ending September 15, with no prior lake drawdown. This will prevent flows in the tailrace slough during the time they might provide attraction to spawning ESA listed fish and will ensure to the extent possible, continuous flows after the Project comes back online. Additional measures that Energy Northwest will implement are found at Exhibit E, Section E.5.3.1.3.
**NMFS (3) Comment:**

Page 231: Section 3.3.1.4

NMFS supports the mitigation and enhancement of lower Lake Creek as described in this section. However, specific levels of flow increase and habitat enhancement need further development before a final version is included in the license.

**Response:**

Comment noted. Energy Northwest, NMFS, and the other fish management agencies engaged in focused discussions to determine the appropriate flows and habitat enhancement goals for lower reach of Lake Creek. These agreed measures are included in the FLA as the proposed parameters for Project operation. Energy Northwest anticipates that a significant amount of additional consultation will be required to further develop these measures.
APPENDIX C

USDA FOREST SERVICE AND
U.S. FISH AND WILDLIFE SERVICE
PRELIMINARY TERMS AND CONDITIONS
Electronically Filed

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: US Department of Agriculture Forest Service COMMENTS on Energy Northwest Preliminary Licensing Proposal, Packwood Lake Hydroelectric Project, Project No. P-2244

Dear Secretary Bose:

Energy Northwest (ENW) filed the Preliminary Licensing Proposal (PLP) for the Packwood Lake Hydroelectric Project (Project) with the Federal Energy Regulatory Commission (FERC) on September 17, 2007. In response the USDA Forest Service (Forest Service) is filing the following documents.

Enclosure I: Resource specific comments regarding the PLP.

Enclosure II: The PM&E’s that ENW and the Agencies have agreed to in concept.

The Agencies and ENW agreed to meet in December 2007 and in January 2008 with the goal to identify all issues and specific PM&E measures necessary to mitigate continuing Projects affects, and to reach consensus on as many of the PM&E measures for ENW’s inclusion in the Final License Application (FLA). On December 3 and 4, 2007 the Agencies and ENW met to identify and discuss all issues that would require PM&E measures. As an outcome of these meetings numerous PM&E’s have been agreed to in concept. The Agencies and ENW have scheduled January 10 and 11, 2008 and January 29 and 30, 2008 as additional meeting dates to discuss the remaining issues and PM&E measures.

The Forest Service appreciates ENW’s and the other agencies willingness to work collaboratively to identify all PM&E’s measures necessary to mitigate the continuing Project affects and to reach consensus on the measures for inclusion into the FLA. If you have any questions related to these comments please contact Mike Gerdes, Forest Hydropower Coordinator at 541-416-6521 or by e-mail at mgerdes@fs.fed.us.
Sincerely,

/s/ KRISTIE L. MILLER
KRISTIE L. MILLER
Cowlitz Valley District Ranger

Enclosure

cc: Michael Gerdes
Dan Ross, Energy Northwest (dlross@energy-northwest.com)
ENCLOSURE I

Resource specific comments regarding ENW Preliminary Licensing Proposal

Section 1.1.2 – On page 1, correct reference to “Baker Creek”.

Section 1.1.3 – On page 3, note that only the upper approximate 50 percent of the drainage area contributes to the project release flow.

Section 1.2.1 – On page 4, the reference to hoisting implies that the screens are periodically cleaned which appears to not be the case (J. Blum Dec 3, 2007).

Section 1.2.1 – On page 8, the report should specify what the depth of water is at still basin below the drop structure and evaluate other dam infrastructure (eg. dam apron, pipeline) which may contribute to drop mortality or injury.

Section 1.2.2, 1.2.3 and 1.2.4 – On page 8- 10, identify which of the project components are located on NFS lands.

Section 1.2.4 – On page 10, indicate on a map the location of where the excess water from constant head tank overflow flows to Snyder Creek. Disclose the impacts to water quality and fish passage.

Section 1.2.8 – On page 12, reference to anadromous fish reintroduction should specify that the trap and haul operations have been in operation since 1994.

Section 1.2.9 – On page 13, cite references describing PCB levels.

Section 2.1 – On page 17, disclose why Article 37 established a max elevation of the lake at 2858.5.

Section 2.2 – On page 17, please clarify what is the minimum production capacity and associated cfs. Dec 3, 2007 referenced a minimum of 2 kW. This may be important for establishing a balance with Lake Creek fish release during low flow.

Section 2.5.1 – On page 28, establishing a baseline condition for lake level is relevant to the license. PLP should clarify the ambiguity of estimates of natural lake level prior to the project. The PLP states the lower lake surface as unknown (PLP pg. 1), and cites current management as consistent with pre project water levels. PLP pg. 65 again states that “there is only very limited information on seasonal lake level fluctuation.”

ENW also proposes a modification to lake operations. After the December 3 and 4, 2007 meetings, ENW are evaluating the Agencies instream flow recommendation thereby also evaluating the early lake drawdown proposal. Instream flow and the outage issues are to be the focus of the January 10 and 11, 2008 meetings.
Section 2.6 – On page 29-30, the ENW proposes protection, mitigation and enhancement measures. As stated in the cover letter, the Agencies and ENW have been meeting to provide a consensus based PM&E proposal in the Final License Application. See Enclosure II to the matrix of issues and PM&E measures at least agreed to in concept.

Section 3.1.1 - page 30, the document should state that the past pool grade control was a land slide and the current (approx 1960- present) control is a dam.

Section 3.1.2.2 – On page 37, please clarify the historic period of record (eg. dates of air photos) used in review of bank erosion. The Drawdown Report should critically review reference documentation and past study results which offering differing opinion and document effects of drawdown including 1976 Packwood Lake Shoal Stability analysis and J.F. Corliss (Oct 22, 1971) USFS Report

Section 3.1.3 – On page 40, the effects listed concerning geologic/soil resources do not consider the additional erosion resulting from loss of bank vegetation that may occur during the proposed mid summer drawdown (Mid July start, 1 foot, lasting 7-10 days). The effect(s) on the lake shore and stream delta vegetation due to lake drawdown every summer during the peak of the growing season was not analyzed in any of the studies. Consequently, the magnitude of the effect to erosion rates and the effects on terrestrial or aquatic habitat along the shorelines and deltas is not known.

Section 3.1.3 – On page 41, the statement “Erosion of these areas is primarily associated with non-Project recreational use, but Project-related fluctuations of the lake level could contribute to some minor ongoing erosion in there areas.”, is subjective. Mid summer drawdown of the lake could result in additional erosion. The quantity of this effect was not analyzed in any of the studies.

Section 3.1.3.1 – On page 225, the statement “No evidence was found of effect on spawning and rearing trout in Packwood Lake due to Project drawdown” should refer to the drawdown that occurs in September or later in the year. Effects on spawning and rearing trout such as stranding or insufficient depths for out migration of juveniles may occur during a drawdown beginning in mid July. In Section 3.3.1.2.3 page 150, the statement “because these creeks have historically dried up in the late summer months, the rainbow trout in these tributaries have adapted a strategy of emigrating from the creeks to the lake in the late summer before flow decrease drastically or dry up completely” indicates that fish would be emigrating from Trapp, Crawford and Osprey creeks to the Lake during the proposed mid July drawdown.

Section 3.3.1.1.2 – On page 113, the PLP does not recognize the unique quality of wild, naturally reproducing fish of Packwood Lake. Isolated fish populations above the existing Packwood Lake dam are believed to have evolved in the Upper Lake Creek basin and have maintained a self sustaining population. Genetic comparisons indicate that Packwood rainbow are more similar to inland rainbow stocks (redband trout) than they were to costal rainbow stocks (Lucas and Chilcote, 1982). Available electrophoretic data from hatchery stock supports that lacustrian populations of Packwood Lake trout have not integrated with hatchery stocks introduced between 1954-1965. Given the passage limitations created by the dam, there is a significant constraint to genetic flow in and out of the lake.
Section 3.3.1.1.6 – On Page 115, the PLP does not recognize that the mainstem Cowlitz dams excluded anadromous fish from reaching the upper Cowlitz river for more than years dating back to the 1930’s. The Salmon Recovery Plan stress that recovery of Lower Columbia ESU is highly dependent on the successful reintroduction of salmon and steelhead. The trap and haul reintroduction program was implemented in the upper Cowlitz River 1994.

Section 3.3.1.1.6 – On page 118, Pacific Lamprey is referred to as a resident. Two resident species found in Washington are commonly known as river and brook lamprey.

Section 3.3.1.2 – On page 118, the Forest Service provided comments regarding ENW’s final study reports efiled with FERC on November 20, 2007. Please reference Forest Service comments as they are applicable to the PLP.

Section 3.3.1.2.3 – On pages 148-151, the PLP does not provide sufficient evidence on how much aquatic habitat is affected by lake drawdown. The PLP does not quantify the amount or quality of lost fish (or other species) habitat resulting due to drawdown. While the report does provide some data on impacted surface area (eg. acres exposed and relative percentage), it does not critically evaluative the quality of habitat affected by the drawdown. The Fish Distribution Study indicates that lacustrine habitat plays a vitally important role in the early developmental stages of Packwood Lake rainbow trout. It appears that reducing the lake water surface elevation from 2857 to 2848 has a substantial impact on the horizontal distance of exposed shoreline. The average distance of exposed lake shoreline at spawning tributaries is approximately 138 feet and ranges from 40-250 feet. (Osprey 100 ft, Trapp 150 ft; SE Trapp 40 ft, Crawford 150 ft; and Muller 250 ft.).

There should be a critical review of the impact to susceptible rearing fish are may be impacted by lake drawdown during the outmigrating and early life history development. The drawdown appears to reduce the quality/quantity of lacustrine habitat critical for rearing including emergent vegetation, submerged wood and substrate.

The PLP should disclose how lake drawdown influences fish passage. Additional consideration should be given to relationship of drawdown period and the emigration movement patterns of adfluvial rainbow trout in Packwood Lake. If peak spawning is June 18 and it takes 45 days for rainbow trout to emerge from the gravel, there may be little or no time before sac fry (approximately 20 mm fish) are forced to follow the declining flows and move from the streams to the lake. With the lake drawdown, comes the potential loss of stream depth and cover and increase risk of stranding due to loss of channel connectivity. Maintaining channel connectivity to the lake appears to be vitally important to supporting fry (newly emerged fish) at this high susceptible early life stage.

Section 3.3.1.2.6 – On page 169, the PLP should expand on limiting factor analysis or WUA and describe with variable is the actual constraint (depth, velocity, substrate). This has significance to the restoration proposal and help respond to questions of migration potential.

The report does not recognize the function of off channel habitat as it pertains to coho rearing. Side channels inundated at higher flows (higher than 2 cfs) play a considerable role in rearing
capacity. It appears that low velocity off channel rearing habitat for coho is important to restore in Lake Creek.

The dam has a dampening effect on flows in the 400-600 cfs range. These flows have been reduced by an average of 78 percent.

**Section 3.3.1.4.4** – On page 235, increasing flows higher than the proposed 4 cfs October through July and 7 cfs in August and September is recommended. The quantity of habitat the 4 and 7 cfs flows would provide even with successful restoration of Lower Lake would not compensate for the project’s effect of continued loss of habitat throughout Lower Lake Creek but especially for the lowest mile, into the next license period. The Northwest Forest Plan Aquatic Conservation Strategy includes maintaining or restoring instream flows sufficient to create and sustain aquatic habitats and along with providing physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic species.

The Lake Creek Instream Flow Study Report and subsequent information allowed the synthesis of modeled habitat information to estimate monthly flow rates necessary for providing preferred habitat for each fish species. Lowest flows for each month that would meet the following criteria were used: 50% of “natural” WUA for primary spawning, 50% of “natural” for steelhead and rainbow trout rearing in April-October, and at least 100% of incubation needed for eggs in gravel. Monthly flow recommendations for January, February and December were increased to provide adequate flow to Reach 5 which has minimal inflows and to accommodate for adverse effect of freezing during artificially low flows. These flow recommendations also assume that they offer a 3 foot wide and 1 foot deep travel corridor from the mouth of Lower Lake Creek to above the Highway Bridge.

Recommendation for Design Criteria for Stream Habitat Restoration of the Lower Lake Creek below RM 1.03 should be jointly developed with Agencies. Construction criteria examples such as, provide at least 15 large wood structures between the Highway Bridge and the first partial fish barrier will be specified. Geomorphic Criteria and Habitat Criteria may also be specified such as increase residual pool depth, decrease channel width to depth ratio and increasing spawning habitat by importing spawning gravel.

Recommendations for a monitoring plan to be developed for the Lower Lake Creek Restoration.

Recommend contingency measures to attain target(s) if target(s) are not met initially.

**Section 3.3.1.4.7** – On page 248, shifting the outage and corresponding mid summer lake drawdown to provide additional protection to spawning Chinook in the tailrace causes effects to aquatic habitats around the lake. Alternatives to remedying the effects to spawning Chinook around the tailrace should be considered. Analysis and documentation of the effects of a mid summer drawdown has not been completed.

Effects include wetland habitat degradation from lake drawdown. The Packwood Lake drawdown study results indicated that the hydrology of the wetland complex at the upper end of the lake was affected by lake levels. The study results were limited to analysis of effects during the September and October drawdown period and did not estimate effects of drawdown in mid-
July during the height of vegetation growing season. A mid July Drawdown may affect wetland vegetation in Upper Lake and Muller Creek as backwater from the lake at full pool would not occur to the same extent during the growing season.

A mid July Drawdown may affect amphibians in the few existing suitable lacustrine areas (shallow vegetated areas) in the southeast end of Packwood Lake between the mouths of Upper Lake Creek and Muller Creek. Varying lake levels may disrupt amphibian breeding, egg hatching and metamorphosis from May thru mid September (Section 3.4.3.2.2.).

**Section 3.4.2.2.2** – On page 265, the section refers to the species detected during project surveys, including coastal giant salamander, *Dicamptodon tenebrosus*, in stream habitats. However, because no DNA analysis was done for captured larval giant salamanders below 55mm SVL (snout-vent length), the occurrence of Cope’s giant salamander, *Dicamptodon copei*, a Forest Service Sensitive species, cannot conclusively be ruled out, even if larval specimens examined appeared morphologically to meet the criteria for coast giant salamander. It should be included and addressed as potentially occurring, similar to the way the two semi-aquatic species, Cascades torrent salamander and Van Dyke’s salamander, are addressed at the end of section 3.4.2.2.2. In fact, based on factors such as local distribution and known amphibian-habitat relationships, it is more likely that Cope’s giant salamander occurs in lower Lake Creek (but was not documented during surveys) than the latter two species, which probably are really absent from Lake Creek as stated in the final paragraph.

**Section 3.4.3.2.2** – On page 268, paragraph 1 the final sentence states that “… the loss of some larvae from drawdown is not distinctly different from mortality that might have occurred in pre-Project conditions when lake levels reportedly dropped seasonally to 2854 ft MSL, which may also have been sufficient to dewater depressions on the edge of the lake”. **COMMENT:** this sentence is purely conjectural, as witnessed by the use of the qualifying words “might”, “reportedly”, “may also”. There is no way to validate this statement, and the historic, pre-project nature of lake “drawdown” is distinctly different than the relatively rapid nature that now occurs both in terms of regularity and variability. I suggest dropping this final statement, and just state that the loss of some (Northwestern salamander) larvae may occur.

**Section 3.4.3.2.2** – On page 268, paragraph 4: similar to the above statement, “… at the upper end of Packwood Lake may be similar to and probably not more than the groundwater level…” **COMMENT:** again, conjectural comment, the fact remains that the drawdown could result in stranding of salamander larvae and this should just be stated as such.

**Section 3.4.3.2.2** – On page 268 Last paragraph in section - the duration of lake drawdown would change if power plant outage was in August.

**Section 3.4.4.2** – On page 269-270, the conclusion that “amphibians breeding in lacustrine fringe wetlands at the head of Packwood Lake are unlikely to be affected by the earlier drawdown except in one small, isolated depression where Cascade frog larvae were found in 2006” ignores the previous statements that the existing drawdown had the potential to isolate Northwestern salamander larvae, a consequence which would also occur during this earlier drawdown as well.
Section 3.5.2.2 – On page 274, the high clay content of soil may not remain near saturation if lake drawdown occurs in mid July, early August when air temperatures are high.

Section 3.5.4 – On page 278, disagree with the conclusion that no negative effects to wetlands will result as a consequence of scheduling a drawdown in August for the reasons stated under comment for Section 3.3.1.4.7 Page 248. Mid July lake levels are dependent upon snow melt timing and are not necessarily lowered significantly. Mid August lake levels would be a more consistent time to see the lowering of lake levels that would closely mimic pre-project conditions.

Section 3.6.5.2.2 – On page 312, The Forest Service does not agree with the statement “No adverse effects on Forest Service sensitive wildlife species are postulated.” See previous comments concerning presence/absence of Cope’s giant salamander. Because the presence of this aquatic salamander cannot be ruled out due to the lack of genetic analysis of larval *Dicamptodon*, and the alteration of the natural flow regime of Lake Creek has, at minimum, the potential to adversely affect aquatic amphibians, the statement should be revised to say (utilizing standardized language in USDA Forest Service Biological Evaluations), “the Project may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species”.

Section 3.6.5.2.2 – On page 312, the northern bald eagle has reverted to a Pacific Northwest Regional Forester (R-6) Sensitive species following its delisting by the U.S. Fish and Wildlife Service, and should be addressed in the Sensitive species section.
**ENCLOSURE II**

*PM&E’s that ENW and the Agencies\(^1\) have agreed to in concept*

**Implementation of Activities on National Forest System Lands, Site-Specific Plans and Cost Reimbursement**

The Licensee shall not commence implementation of habitat or ground-disturbing activities on National Forest System (NFS) lands until the USDA Forest Service has approved site-specific project designs and issued a notice to proceed.

**Additional NFS Lands.** If additional NFS lands are included within the Project boundary, the Licensee shall obtain a special-use authorization for occupancy and use of NFS lands added to the Project area boundary from the USDA Forest Service. Within six months of License issuance and before any habitat or ground-disturbing activities, the Licensee shall obtain from the USDA Forest Service and file with the Commission a special-use authorization for occupancy and use of NFS lands added to the Project area boundary in the License.

Additional lands authorized for use by the Licensee in a new special-use authorization shall be subject to laws, rules, and regulations applicable to the NFS. The terms and conditions of the USDA Forest Service special-use authorization are enforceable by the USDA Forest Service under the laws, rules, and regulations applicable to the NFS. The special-use authorization shall also be subject to applicable sanctions and enforcement procedures of the Commission at the request of the USDA Forest Service. Should additional NFS lands be needed for this Project over the License term, the special-use authorization shall be amended to include any additional NFS lands.

**Approval of Changes on NFS Lands after License Issuance.** Notwithstanding any License authorization to make changes to the Project, the Licensee shall receive written approval from the USDA Forest Service prior to making changes in the location of any constructed Project features or facilities on NFS lands, or in the uses of Project land and waters on NFS lands, or any departure from the requirements of any approved exhibits for Project facilities located on NFS lands filed by the Licensee with the Commission. Following receipt of such approval from the USDA Forest Service, and at least 60 days prior to initiating any such changes or departure, the Licensee shall file a report with the Commission describing the changes, the reasons for the changes, and showing the approval of the USDA Forest Service for such changes. The Licensee shall file an exact copy of the report with the USDA Forest Service at the time it is filed with the Commission.

**Coordination with Other Authorized Uses on NFS Lands.** In the event that portions of the Project area are under federal authorization for other activities and permitted uses, the Licensee shall consult with the USDA Forest Service to coordinate such activity with authorized uses before starting any activity on NFS land that the USDA Forest Service determines may affect another authorized activity.

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\(^1\) USDA Forest Service, NOAA/National Marine Fisheries Service, US Fish and Wildlife Service, and Washington Department of Fish and Wildlife
Site-Specific Plans. The Licensee shall prepare site-specific plans subject to review and approval by the USDA Forest Service for habitat and ground-disturbing activities on NFS lands, and review and approval by the Agencies for other lands affected by the Project required by the License, including activities contained within resource management plans required by the License prepared subsequent to License issuance. The Licensee shall prepare site-specific plans for activities one year in advance of implementation dates required by the License.

Site-specific plans shall include:

1. A map depicting the location of the proposed activity and GPS coordinates.
2. A description of the USDA Forest Service land management area designation for the location of the proposed activity and applicable standards and guidelines and other Agency management direction.
3. A description of alternative locations, designs and mitigation measures considered including erosion control and implementation and effectiveness monitoring designed to meet applicable standards and guidelines.
4. Draft biological evaluations or assessments including survey data as required by regulations applicable to habitat or ground-disturbing activities on NFS and other lands affected by the Project in existence at the time the plan is prepared.
5. An environmental analysis of the proposed action consistent with the Agencies National Environmental Policy Act (NEPA) policy in existence at the time the plan is prepared for FERC licensed projects on NFS and other lands affected by the Project.

Cost Reimbursement. The Licensee shall provide funding to the Agencies for all costs associated with the analysis, review, inspection, and monitoring required for implementing habitat and ground-disturbing activities on NFS and other lands affected by the Project required by the License, including activities contained within resource management plans required by the License prepared subsequent to License issuance. Funding for the analysis, review, inspection, and monitoring of site-specific projects on NFS and other lands affected by the Project required by the License shall be through the use of a Collection Agreement or other instrument consistent with the respective Agencies regulations in effect at the time the Project is proposed and shall be executed by the Licensee and the respective Agencies.

Resource Coordination

Within one year of License issuance, the Licensee shall, in consultation with and approval by the Agencies, prepare a Resource Coordination Plan (RCP) and file the plan with the Commission for approval. The RCP shall establish a process for information exchange and coordinate efforts for implementation of License conditions and ongoing Project operations and maintenance (O&M) activities impacting NFS and other lands affected by the Project. The RCP shall provide for coordination of the implementation of the various management plans required under the License to the extent they impact NFS and other lands affected by the Project, such as but not limited to: recreation resource management; cultural resource management; integrated weed management; road management; Threatened, Endangered and sensitive species management;
facilities monitoring; erosion control and other resource protection plans. The RCP plan shall require the Licensee to:

1. Consult with the Agencies each year during the 60 days preceding the anniversary of the License, or as agreed to by USDA Forest Service, to evaluate the past year’s activities and develop a proposed implementation schedule for the upcoming year’s activities and measures required by the License for NFS and other lands affected by the Project. Within 60 days following such consultation, the Licensee shall file with the Commission evidence of the consultation with any recommendations made by the Agencies.
2. Document the requirements, tasks and methods and reports related to monitoring the effects of Project operations and facilities on natural and/or social resources and effectiveness of protection, mitigation, and enhancement measures where the monitoring is required by the Agencies terms and conditions, prescriptions and recommendations.
3. Provide a mechanism for revising implementation strategies and methods to reflect improvement in sampling procedures and/or changes in regulations or environmental conditions.
4. Identify practices for record keeping and annual reporting.
5. Include provisions for the routine updating of the RCP, including incorporation of monitoring measures identified in site-specific plans prepared under the requirements of the Agencies Condition No. 1 (Implementation of Activities on NFS lands, Site-Specific Plans and Cost Reimbursement).
6. Develop a field manual identifying standard operating procedures, including cultural resource identification and reporting procedures that the Licensee and its contractors shall follow while conducting activities on NFS and other lands affected by the Project.
7. Develop a process to resolve disagreements regarding the implementation of the RCP.
8. Designate an Environmental Coordinator to coordinate the implementation of the RCP and Licensee activities with the Agencies.

**Fire Prevention Plan**

Within one year of License issuance, the Licensee shall, in consultation with and approval by the USDA Forest Service and in consultation with appropriate State and local fire agencies, prepare a Fire Prevention Plan for NFS lands within the Project boundary and NFS lands adjacent to the Project boundary that are impacted by the Project and file the plan with the Commission for approval. The Fire Prevention Plan shall require the Licensee to:

1. Analyze fire prevention needs to ensure that prevention equipment and personnel are available.
2. Identify fire hazard reduction measures (e.g., eliminating ladder fuels, reducing fuel loading).
3. Provide the USDA Forest Service a list of the location of available fire prevention equipment and the location and availability of fire prevention personnel.
Recreation Management

Within one year of License issuance, the Licensee shall finalize the Packwood Lake Recreation Management Plan (Recreation Plan) and file the Recreation Plan with the Commission for approval. The Recreation Plan shall be inclusive of appropriate License requirements and also address Project-related recreation resources located on NFS and other lands affected by the Project within the existing Project boundary or as otherwise ordered by the Commission. The Recreation Plan shall include provisions for adaptive management to address changing recreation needs and preferences and shall be updated as appropriate every six years in conjunction with filing the Commission Form 80. The Licensee shall implement the Recreation Plan.

The Recreation Plan shall be prepared in coordination with the Agencies. The Licensee shall include with the Recreation Plan documentation of coordination, copies of comments and recommendations on the completed Recreation Plan after it has been prepared and provided to the Agencies, and specific descriptions of how the Agencies comments are addressed by the Recreation Plan. The Licensee shall allow a minimum of 60 days for the Agencies to comment and to make recommendations prior to filing the Recreation Plan with the Commission for approval. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information.

The Recreation Plan shall include an annual implementation schedule, consultation, and approval procedures and include:

1. Measures to adequately address the Agencies resource concerns and standards of quality (e.g. Meaningful Measures) throughout the License term;
2. Development and install a composting toilet at the Packwood Lake recreation site;
3. Over the life of the new license, provide for Operation and Maintenance annual funding for the composting toilet;
4. Over the life of the new license, ENW will provide for Operation and Maintenance or provide annual funding to address impacts from dispersed recreation (3 months of seasonal salary);
5. Development of a Road Maintenance Plan for the Pipeline Road (FS Road 1260-066) (level 2-drainage maintenance), Pipeline Trail (Trailhead No. 74) (maintaining the trail [drainage, trail clearing, and vegetation management to USDA Forest Service standard] and install and maintain a Kiosk for signage for “Pack it In/Pack it Out”), and Latch Road (FS Road 1262 above the gate) (level 2-drainage maintenance and vegetation management - brushing), in consultation with the Agencies. Coordinate the Road Maintenance Plan with the Integrated Weed Management Plan.
6. Continue to provide electricity to the USDA Forest Service guard station; and
7. As repairs and maintenance to the all project intake related structures or facilities are performed, Energy Northwest will consult with the USDA Forest Service on appropriate paint colors and materials to make the building blend in with the surrounding area.

Pipeline, Surge Tank and Penstock Monitoring

Within one year of License issuance, the Licensee shall, in consultation with and approved by the Agencies prepare a Pipeline, Surge Tank and Penstock Monitoring Plan and file the plan with
the Commission for approval. The goal of the plan is to provide protection to NFS and other lands affected by Project from Project waterway system leakage or failure. The plan shall:

1. Document the requirements, tasks, methods and reports related to monitoring the Project waterway system.
2. Document detailed technical descriptions of monitoring methods and data analysis and techniques necessary for the Licensee to conduct specific monitoring tasks.
3. Provide a mechanism for revising monitoring strategies and methods to reflect improvement in sampling procedures and/or changes in regulations or environmental conditions.
4. Identify practices for record keeping and reporting.
5. Include provisions for the routine updating of the monitoring plan, in consultation with and approved by the Agencies, and subsequent filing with the Commission.

**Exotic and Invasive Vegetative Management**

Within one year of License issuance, the Licensee shall prepare and implement a cooperative Integrated Weed Management Plan (IWMP) for the prevention, suppression, containment, eradication and/or control, according to goals by species and location, of invasive non-native plant species, including noxious weeds in and adjacent to the Project area. The intent of this plan is to enhance and promote the coordinated management of noxious weeds with entities responsible for weed management in the Packwood Hydroelectric Project vicinity. The plan shall include the following:

1. The IWMP shall be developed cooperatively between the Licensee, USDA Forest Service, county and other appropriate Agencies. The Licensee shall include provisions to update the plan in 5 year intervals to keep the plan contemporary with new weed management science and practices. Changes to the weed list will be incorporated in the year in which they are made.
2. The IWMP shall require the Licensee to:
   a. Develop communication and coordination protocols for the Licensee and interested parties including:
      i. Defining participants’ roles and responsibilities
      ii. Schedules for annual reports and work plan, meeting, review and updates
   b. Define the geographic scope of the plan’s implementation efforts
      i. Include the FERC Project area and areas adjacent to the Project that are affected by the Project. This would include transportation corridors and lake shore adjacent to the Project where introduced weeds could spread.
   c. Identify noxious weed management goals and objectives
      i. Identify zones with control objectives. For example, on the lake shore adjacent to the wilderness, the control goal for invasive weeds such as reed canary grass and Canada thistle would be eradication. At the powerhouse, adjacent to large populations of these weeds, they may not be designated for control.
   d. Develop weed species and habitat overview/descriptions
i. Use current Gifford Pinchot list of invasive plants, including Lewis County weed list and Forest species of concern.

ii. Location description/mapping of populations using Geographic Information Systems

iii. Current site (habitat) condition

iv. Data gap; identify and implement needed site-specific surveys and methodology, as appropriate

e. Describe the desired conditions

f. Make recommendations for site-specific management consistent with federal state and county laws and regulations
   i. Tier to current Forest Service management direction for required, recommended, and allowable weed control methods

g. Schedule for periodic inventory using common inventory and mapping protocols

h. Develop Best Management Practices (BMP) that pertain to all ground disturbing projects and proactive prevention measures to stop new infestations, consistent with Federal and State initiatives

i. Develop and implement an effectiveness monitoring program

j. Modify practices when objectives and trends are not achieved

3. The IWMP shall be prepared in coordination with the Agencies. The Licensee shall include with the plan documentation of coordination, copies of comments and recommendations on the completed IWMP after it has been prepared and provided to the Agencies, and specific descriptions of how the USDA Forest Service comments are addressed by the IWMP. The Licensee shall allow a minimum of 60 days for the USDA Forest Service to comment and to make recommendations prior to filing the IWMP with the Commission for approval. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information.

**Threatened, Endangered and Sensitive Species**

Within one year of License issuance, the Licensee shall, in coordination with the Agencies prepare a Threatened, Endangered and Sensitive Species (Federal and State listed and identified) Management Plan that shall be filed with the Commission for approval. The goal of the plan is to provide protection, management, enhancement and monitoring of threatened, endangered, and sensitive species and their habitats that may be affected by project operation or project-related activities over the life of the license. The plan shall require the Licensee to:

1. Prepare an initial species list - The initial list should include threatened, endangered and sensitive species that occur within the project boundary or on lands affected by project operation or project-related activities. For each species, the list should reference the relicensing studies that documented occurrence and/or evaluated project effects. The list should be accompanied by maps showing locations of threatened, endangered, and sensitive species and habitats in relation to project features.

2. Update the species list - The plan should provide for annual consultation, review, and updating of the list. Species would be added or removed according to changes in their status or changes in the potential for project effects (e.g., construction of new facilities).
3. Conduct baseline surveys - The plan should provide for baseline surveys of species currently on the list if no surveys have been completed at sites where project operations or project-related activities could affect them. Baseline surveys should also be conducted for species that may be added to the list if they occur at sites where the project could affect them.

4. Prepare biological evaluations - Where Forest Service Sensitive species may be affected, ENW should consult with the Forest Service to prepare a draft biological evaluation, in accordance with the Agencies Condition No. 1 (Implementation of Activities on National Forest System Lands, Site-Specific Plans and Cost Reimbursement).

5. Monitor project effects - For Agencies Sensitive species and Federal Species of Concern, the plan should include monitoring to identify project effects at confirmed sensitive species sites every 2 years for 6 years following license issuance and at 3-year intervals thereafter, unless a determination can be made at year 6 that no additional monitoring is necessary. For other threatened, endangered, and sensitive species, ENW should consult with the agencies and tribes to determine an appropriate monitoring frequency, based on site-specific conditions.

6. Implement protective measures - The plan should provide for designing and implementing protection, mitigation, enhancement or restoration measures if monitoring results show project-related effects.

7. Conduct effectiveness monitoring and implement adaptive management - The plan should include follow-up monitoring to measure the effectiveness of any protective measures that are implemented, and use of this information to modify and improve the Threatened, Endangered, and Sensitive Species Management Plan.

8. Update the Threatened, Endangered, and Sensitive Species Management Plan - The plan should provide for annual reporting and consultation, with updates to the plan as needed.

**Cultural Resources**

The Licensee shall completely and fully comply with all provisions of the August 30, 2007, Historic Properties Management Plan (HPMP) as filed with the Federal Energy Regulatory Commission. The HPMP provides for the protection, management, and interpretation of historic properties within the area of potential effect (APE) for the Project and for mitigation of Project-related impacts to historic properties.

**Spill Event Every Other Year**

The objective of spill events is to provide flows of sufficient magnitude, duration, and frequency in order to sustain habitat forming and maintaining processes in lower Lake Creek. Some of these processes include the recruitment, mobilization, and deposition of sediment, wood and other organic material.

ENW shall provide a spill event greater than or equal to 285 cfs for 24 hours or as long as lake inflows can sustain that flow. ENW will take the necessary measures to adjust lake elevation and power generation to ensure that the spill event is achieved and maintained for up to 24 hours.
The frequency of the spill event will be achieved every other water year\(^2\) or 3 out of 6 water years. If the frequencies of the spill events cannot be achieved, the Agencies will be consulted for an alternate plan.

The Agencies will be provided an annual report on spill event attempts and activities including the magnitude, duration, and frequency of these events and associated power generation in order to achieve the stated objectives. The Agencies will be consulted on the adequacy of spill event activities and will develop an alternate plan, if necessary.

**Below the Drop Structure Wood and Gravel Placement Plan**

Within one year of license issuance, ENW in consultation with the Agencies will develop a plan to enhance the habitat quality and quantity immediately below the drop structure, (the first 1400 ft) in lower Lake Creek. This plan will be developed as part of the Lower Lake Creek Habitat Restoration Plan.

Starting in year one of the new license and continuing every other year for the term of the license, ENW will place wood and gravel at recruitment stations located below the drop structure.

Variables to be included during Lower Lake Creek Plan development include:

- *Location and timing* – Place wood and gravel in the bankfull width, above the wetted channel during a low flow time of year.
- *Quantity* - ? yd\(^3\) of gravel and ? linear ft. of wood
- *Size* - Ranges, minimum, maximum – to be recruited and transported by the 285 cfs spill event flow and is suitable for rainbow trout spawning.

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\(^2\) Water year is defined as an annual precipitation cycle, October 1 through September 30.
United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fish and Wildlife Office
510 Desmond Drive SE, Suite 102
Lacey, Washington 98503

DEC 14 2007

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426


Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) has been involved in negotiations on the relicensing of the Packwood Lake Hydroelectric Project (Project), Federal Energy Regulatory Commission Project # 2244. This facility, operated by Energy Northwest (ENW), is located on Lake Creek and the Cowlitz River in Lewis County, Washington. We submit the following comments under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 et seq.), the Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. § 661 et seq.), and the Federal Power Act (16 U.S.C. § 791a, et seq.).

The Service along with other resource agencies (Agencies) and ENW met on December 3 and 4, 2007 with the goal to identify issues and specific Protection, Mitigation and Enhancement measures (PM&E) measures necessary to mitigate continuing Project affects, and to reach consensus on as many of the PM&E measures for ENW’s inclusion in the Final License Application. As an outcome of this meeting numerous PM&E’s have been agreed to in concept. The Agencies and ENW have scheduled January 10, 11, 29, and 30, 2008 as additional meeting dates to discuss the remaining issues and PM&E measures.

The Service is filing the following documents.

Enclosure I: U.S. Fish and Wildlife Service Goals and Objectives

Enclosure II: Resource Specific Comments Regarding ENW Preliminary Licensing Proposal

Enclosure III: PM&E’s that ENW and the Agencies have agreed to in concept

Enclosure IV: Table showing potential instream flows for lower Lake Creek
Kimberely D. Bose

Enclosure V: U.S. Fish and Wildlife Comments on the Draft Biological Assessment

The Service appreciates the opportunity to comment during the planning stages of the Project. We also appreciate ENW’s and the other Agencies willingness to work collaboratively to identify PM&E measures necessary to mitigate the continuing Project affects and to reach consensus on the measures for inclusion into the Final License Application. If you have any questions regarding this response, please contact Brian Peck at the above address or by telephone at (360) 753-9560 or by email at brian_peck@fws.gov.

Sincerely,

James S. Michaels

Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

Enclosures
ENCLOSURE I

U.S. Fish and Wildlife Service Goals and Objectives

The Service seeks the accomplishment of several resource goals and objectives through the licensing process for the Project. General goals include the following:

1. Ensure that protection, mitigation and enhancement measures are commensurate with Project effects and help meet regional fish and wildlife objectives for the basin.

2. Recover federally proposed and listed species.

3. Conserve, protect, and enhance the habitats for fish, wildlife, and plants that continue to be affected by the Project.

4. Ensure that once the licensing process is complete, there is an adaptive management plan to allow the use of new information or new management strategies over the term of the license, bringing us closer to the desired level of protection for fish and wildlife resources. The adaptive approach is particularly appropriate where there are insufficient data and/or biological uncertainties about those measures that will be most effective for meeting ecosystem goals and objectives.

Goals for Aquatic Ecosystems

1. Protect, enhance, or restore, diverse high quality aquatic and riparian habitats for plants, animals, food webs, and communities in the watershed and mitigate for loss or degradation of these habitats.

2. Maintain and/or restore aquatic habitat connectivity in the watershed to provide movement, migration, and dispersal corridors for salmonids and other aquatic organisms and provide longitudinal connectivity for nutrient cycling processes.

3. Restore naturally reproducing stocks of native anadromous and resident fish to historically accessible riverine habitat, using stocks that are native to the Cowlitz River basin where feasible, with priority given to the restoration of listed native stocks.

4. Provide an instream flow regime that meets the spawning, incubation, rearing, and migration requirements of wild salmonids and other resident fish and amphibian species, throughout the project area.

5. Meet or exceed federal and state regulatory standards and objectives for water quality in the basin.

6. Minimize project operation effects on water temperature and the potential negative effects on downstream fishery resources.
Goals for Terrestrial Resources

1. Protect, enhance and restore wetlands, wetland functions and wetland buffer areas in the basin, and mitigate for loss or degradation due to project impact.

2. Protect, enhance and restore terrestrial and riparian habitats and associated wildlife populations in the basin and mitigate for loss or degradation due to project impact.

3. Reduce the effect of the fluctuation zone on wildlife habitat and seek opportunities to enhance this habitat.

4. Reduce project induced recreation disturbance to terrestrial habitat and wildlife species.

Goals for Endangered, Threatened and Proposed Species

1. Reduce project effects on marbled murrelets, spotted owls, and other threatened, endangered, and proposed species.

2. Explore opportunities for potential protection, mitigation and enhancement measures for threatened, endangered, and proposed species.

3. If bull trout are discovered within the Cowlitz River basin, gain a better understanding on bull trout population trends, migration, habitat loss, present usage and continuing impacts as related to the Project.

In addition, an overarching Service goal for the new licensing of the Project is to succeed in having the Commission include as license conditions, protection, mitigation and enhancement measures that sustain normal ecosystem functional processes including geomorphic, hydrologic and hydraulic patterns, and water chemical and physical parameters. Maintaining and improving these functional processes throughout the term of the new license will, in turn, provide the habitat to support healthy fish and wildlife populations.
Resource Specific Comments Regarding ENW Preliminary Licensing Proposal

The absence of a comment on a specific item within the PLP does not indicate Service agreement or disagreement with that item. Rather, ongoing negotiations with ENW and the development of mutually agreed upon PM&E’s for inclusion in the FLA is of greater priority than specific items as described in the PLP.

Section 2.6 – On page 29-30, ENW proposes PM&E measures. As stated in the cover letter, the Agencies and ENW have been meeting to provide a consensus based PM&E proposal in the FLA. See Enclosure III for the PM&E measures agreed to in concept thus far.

The Service is also interested in developing at a minimum, in collaboration with ENW and the other resource agencies and tribes, PM&E’s for an Adaptive Management Plan and a Monitoring and Evaluation Plan. These plans may be incorporated into other plans or be separate, overarching plans.

Section 3.3.1.1.6 – On page 118, Pacific Lamprey is referred to as a resident species. Two other resident lamprey species found in Washington are commonly known as river and brook lamprey.

Section 3.3.1.4.4 – On page 235, the quantity of habitat the proposed 4 and 7 cfs flows would provide, even with successful restoration of lower Lake Creek, would not compensate for the project’s effect of continued loss of habitat throughout lower Lake Creek, particularly for the lowest mile, into the next license period. The Northwest Forest Plan Aquatic Conservation Strategy includes maintaining or restoring instream flows sufficient to create and sustain aquatic habitats and along with providing physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic species.

The Lake Creek Instream Flow Study Report and subsequent information allowed the synthesis of modeled habitat information to estimate monthly flow rates necessary for providing preferred habitat for each fish species. Lowest flows for each month that would meet the following criteria were used: 50% of “natural” WUA for primary spawning, 50% of “natural” for steelhead and rainbow trout rearing in April-October, and at least 100% of incubation needed for eggs in gravel (see Enclosure IV). Monthly flow recommendations for January, February and December were increased to provide adequate flow to Reach 5 which has minimal inflows and to accommodate for adverse effect of freezing during artificially low flows. These flow recommendations also assume that they offer a 3 foot wide and 1 foot deep travel corridor from the mouth of lower Lake Creek to above the Highway Bridge.

A lower Lake Creek Habitat Restoration Plan should be jointly developed with the Agencies. Construction criteria such as, provide at least 15 large wood structures between the Highway Bridge and the first partial fish barrier, will be specified. Geomorphic Criteria and Habitat Criteria will also be specified such as, increase residual pool depth, decrease channel width to depth ratio and increasing spawning habitat by importing spawning gravel. This plan should also include a monitoring and evaluation component with measurable criteria and a schedule.
Section 3.3.1.4.7 – On page 248, a mid July drawdown may affect amphibians in the existing suitable lacustrine areas (shallow vegetated areas) in the southeast end of Packwood Lake between the mouths of Upper Lake Creek and Mueller Creek. Varying lake levels may disrupt amphibian breeding, egg hatching and metamorphosis from May thru mid September (Section 3.4.3.2.2.). Additional analysis should be conducted dependant on the exact timing, magnitude, and duration of lake drawdown.

Section 3.6.5.2.2 – On page 312, the bald eagle has reverted to a federal Species of Concern following its delisting by the Service, and should be addressed in the Sensitive species section. The bald eagle remains under the authority of the Bald and Golden Eagle Protection Act. If, during the term of the new license, eagles or eagle nests are detected within the vicinity of the project, then ENW would be required to obtain a permit for activities that may disturb eagles.
ENCLOSURE III

PM&E’s that ENW and the Agencies\(^1\) have agreed to in concept

The following measures, management plans, and proposed agency conditions have been agreed to in concept between ENW and the participating stakeholders in this relicensing action:

- Conditions for Implementation of Activities on National Forest System lands
- Resource Coordination Plan for Activities on National Forest System lands
- Fire Protection Plan for National Forest System lands
- Packwood Lake Recreation Management Plan
- Installation, operation and maintenance of a composting toilet at Packwood Lake
- Contribution to operation and maintenance of the dispersed recreation sites on National Forest System lands
- Road Maintenance Plan for specified roads and trails on National Forest System lands
- Provide electric power to the Gifford Pinchot National Forest guard station
- Follow National Forest System aesthetics requirements for intake building external repairs
- Pipeline, Surge Tank and Penstock Leakage Monitoring plan
- Integrated Weed Management Plan
- Threatened, Endangered and Sensitive Species Management Plan
- Historic Properties Management Plan (filed August 30, 2007)
- Reroute Snyder Creek around Project tailrace canal within 5 years of license issuance
- Perform maintenance and monitor effectiveness of Tailrace Fish Barrier installed in October, 2007
- Provide a small wood recruitment station in Lake Creek below the Drop Structure (concept)
- Provide gravel recruitment stations in Lake Creek below the Drop Structure (concept)
- Provide for periodic spill events down Lake Creek
- Provide downstream fish transport at Drop Structure (concept)

Details of these preliminary agreements have not been agreed upon, but they are expected to be finalized and included in the Final License Application. Resolution of the remaining issues may require minor changes to those listed above.

\(^1\) USDA Forest Service, NOAA/National Marine Fisheries Service, US Fish and Wildlife Service, and Washington Department of Fish and Wildlife
For the text below, items in **bold underline** have been edited from the language agreed upon at the December 3 and 4 meeting.

**Implementation of Activities on National Forest System Lands, Site-Specific Plans and Cost Reimbursement**

The Licensee shall not commence implementation of habitat or ground-disturbing activities on National Forest System (NFS) lands until the USDA Forest Service has approved site-specific project designs and issued a notice to proceed.

**Additional NFS Lands.** If additional NFS lands are included within the Project boundary, the Licensee shall obtain a special-use authorization for occupancy and use of NFS lands added to the Project area boundary from the USDA Forest Service. Within six months of License issuance and before any habitat or ground-disturbing activities, the Licensee shall obtain from the USDA Forest Service and file with the Commission a special-use authorization for occupancy and use of NFS lands added to the Project area boundary in the License.

Additional lands authorized for use by the Licensee in a new special-use authorization shall be subject to laws, rules, and regulations applicable to the NFS. The terms and conditions of the USDA Forest Service special-use authorization are enforceable by the USDA Forest Service under the laws, rules, and regulations applicable to the NFS. The special-use authorization shall also be subject to applicable sanctions and enforcement procedures of the Commission at the request of the USDA Forest Service. Should additional NFS lands be needed for this Project over the License term, the special-use authorization shall be amended to include any additional NFS lands.

**Approval of Changes on NFS Lands after License Issuance.** Notwithstanding any License authorization to make changes to the Project, the Licensee shall receive written approval from the USDA Forest Service prior to making changes in the location of any constructed Project features or facilities on NFS lands, or in the uses of Project land and waters on NFS lands, or any departure from the requirements of any approved exhibits for Project facilities located on NFS lands filed by the Licensee with the Commission. Following receipt of such approval from the USDA Forest Service, and at least 60 days prior to initiating any such changes or departure, the Licensee shall file a report with the Commission describing the changes, the reasons for the changes, and showing the approval of the USDA Forest Service for such changes. The Licensee shall file an exact copy of the report with the USDA Forest Service at the time it is filed with the Commission.

**Coordination with Other Authorized Uses on NFS Lands.** In the event that portions of the Project area are under federal authorization for other activities and permitted uses, the Licensee shall consult with the USDA Forest Service to coordinate such activity with authorized uses before starting any activity on NFS land that the USDA Forest Service determines may affect another authorized activity.

**Site-Specific Plans.** The Licensee shall prepare site-specific plans subject to review and approval by the USDA Forest Service for habitat and ground-disturbing activities on NFS lands,
and review and approval by the Agencies for other lands affected by the Project required by the License, including activities contained within resource management plans required by the License prepared subsequent to License issuance. The Licensee shall prepare site-specific plans for activities one year in advance of implementation dates required by the License.

Site-specific plans shall include:

1. A map depicting the location of the proposed activity and GPS coordinates.
2. A description of the USDA Forest Service land management area designation for the location of the proposed activity and applicable standards and guidelines and other Agency management direction.
3. A description of alternative locations, designs and mitigation measures considered including erosion control and implementation and effectiveness monitoring designed to meet applicable standards and guidelines.
4. Draft biological evaluations or assessments including survey data as required by regulations applicable to habitat or ground-disturbing activities on NFS and other lands affected by the Project in existence at the time the plan is prepared.
5. An environmental analysis of the proposed action consistent with the Agencies National Environmental Policy Act (NEPA) policy in existence at the time the plan is prepared for FERC licensed projects on NFS and other lands affected by the Project.

**Cost Reimbursement.** The Licensee shall provide funding to the Agencies for all costs associated with the analysis, review, inspection, and monitoring required for implementing habitat and ground-disturbing activities on NFS and other lands affected by the Project required by the License, including activities contained within resource management plans required by the License prepared subsequent to License issuance. Funding for the analysis, review, inspection, and monitoring of site-specific projects on NFS and other lands affected by the Project required by the License shall be through the use of a Collection Agreement or other instrument consistent with the respective Agencies regulations in effect at the time the Project is proposed and shall be executed by the Licensee and the respective Agencies.

**Resource Coordination**

Within one year of License issuance, the Licensee shall, in consultation with and approval by the Agencies, prepare a Resource Coordination Plan (RCP) and file the plan with the Commission for approval. The RCP shall establish a process for information exchange and coordinate efforts for implementation of License conditions and ongoing Project operations and maintenance (O&M) activities impacting NFS and other lands affected by the Project. The RCP shall provide for coordination of the implementation of the various management plans required under the License to the extent they impact NFS and other lands affected by the Project, such as but not limited to: recreation resource management; cultural resource management; integrated weed management; road management; Threatened, Endangered and sensitive species management; facilities monitoring; erosion control and other resource protection plans. The RCP plan shall require the Licensee to:
1. Consult with the Agencies each year during the 60 days preceding the anniversary of the License, or as agreed to by the Agencies, to evaluate the past year’s activities and develop a proposed implementation schedule for the upcoming year’s activities and measures required by the License for NFS and other lands affected by the Project. Within 60 days following such consultation, the Licensee shall file with the Commission evidence of the consultation with any recommendations made by the Agencies.

2. Document the requirements, tasks and methods and reports related to monitoring the effects of Project operations and facilities on natural and/or social resources and effectiveness of protection, mitigation, and enhancement measures where the monitoring is required by the Agencies terms and conditions, prescriptions and recommendations.

3. Provide a mechanism for revising implementation strategies and methods to reflect improvement in sampling procedures and/or changes in regulations or environmental conditions.

4. Identify practices for record keeping and annual reporting.

5. Include provisions for the routine updating of the RCP, including incorporation of monitoring measures identified in site-specific plans prepared under the requirements of the Agencies Condition No. 1 (Implementation of Activities on NFS lands, Site-Specific Plans and Cost Reimbursement).

6. Develop a field manual identifying standard operating procedures, including cultural resource identification and reporting procedures that the Licensee and its contractors shall follow while conducting activities on NFS and other lands affected by the Project.

7. Develop a process to resolve disagreements regarding the implementation of the RCP.

8. Designate an Environmental Coordinator to coordinate the implementation of the RCP and Licensee activities with the Agencies.

**Fire Prevention Plan**

Within one year of License issuance, the Licensee shall, in consultation with and approval by the Agencies and in consultation with appropriate State and local fire agencies, prepare a Fire Prevention Plan for NFS lands within the Project boundary, NFS lands adjacent to the Project boundary, and other lands that are within the project boundary or are impacted by the Project and file the plan with the Commission for approval. The Fire Prevention Plan shall require the Licensee to:

1. Analyze fire prevention needs to ensure that prevention equipment and personnel are available.
2. Identify fire hazard reduction measures (e.g., eliminating ladder fuels, reducing fuel loading).
3. Provide the Agencies a list of the location of available fire prevention equipment and the location and availability of fire prevention personnel.
**Recreation Management**

Within one year of License issuance, the Licensee shall finalize the Packwood Lake Recreation Management Plan (Recreation Plan) and file the Recreation Plan with the Commission for approval. The Recreation Plan shall be inclusive of appropriate License requirements and also address Project-related recreation resources located on NFS and other lands affected by the Project within the existing Project boundary or as otherwise ordered by the Commission. The Recreation Plan shall include provisions for adaptive management to address changing recreation needs and preferences and shall be updated as appropriate every six years in conjunction with filing the Commission Form 80. The Licensee shall implement the Recreation Plan.

The Recreation Plan shall be prepared in coordination with the Agencies. The Licensee shall include with the Recreation Plan documentation of coordination, copies of comments and recommendations on the completed Recreation Plan after it has been prepared and provided to the Agencies, and specific descriptions of how the Agencies comments are addressed by the Recreation Plan. The Licensee shall allow a minimum of 60 days for the Agencies to comment and to make recommendations prior to filing the Recreation Plan with the Commission for approval. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information.

The Recreation Plan shall include an annual implementation schedule, consultation, and approval procedures and include:

1. Measures to adequately address the Agencies resource concerns and standards of quality (e.g. Meaningful Measures) throughout the License term;
2. Development and install a composting toilet at the Packwood Lake recreation site;
3. Over the life of the new license, provide for Operation and Maintenance annual funding for the composting toilet;
4. Over the life of the new license, ENW will provide for Operation and Maintenance or provide annual funding to address impacts from dispersed recreation (3 months of seasonal salary);
5. Development of a Road Maintenance Plan for the Pipeline Road (FS Road 1260-066) (level 2-drainage maintenance), Pipeline Trail (Trailhead No. 74) (maintaining the trail [drainage, trail clearing, and vegetation management to USDA Forest Service standard] and install and maintain a Kiosk for signage for “Pack it In/Pack it Out”), and Latch Road (FS Road 1262 above the gate) (level 2-drainage maintenance and vegetation management - brushing), in consultation with the Agencies. Coordinate the Road Maintenance Plan with the Integrated Weed Management Plan.
6. Continue to provide electricity to the USDA Forest Service guard station; and
7. As repairs and maintenance to the all project intake related structures or facilities are performed, Energy Northwest will consult with the USDA Forest Service on appropriate paint colors and materials to make the building blend in with the surrounding area.
**Pipeline, Surge Tank and Penstock Monitoring**

Within one year of License issuance, the Licensee shall, in consultation with and approved by the Agencies prepare a Pipeline, Surge Tank and Penstock Monitoring Plan and file the plan with the Commission for approval. The goal of the plan is to provide protection to NFS and other lands affected by Project from Project waterway system leakage or failure. The plan shall:

1. Document the requirements, tasks, methods and reports related to monitoring the Project waterway system.
2. Document detailed technical descriptions of monitoring methods and data analysis and techniques necessary for the Licensee to conduct specific monitoring tasks.
3. Provide a mechanism for revising monitoring strategies and methods to reflect improvement in sampling procedures and/or changes in regulations or environmental conditions.
4. Identify practices for record keeping and reporting.
5. Include provisions for the routine updating of the monitoring plan, in consultation with and approved by the Agencies, and subsequent filing with the Commission.

**Exotic and Invasive Vegetative Management**

Within one year of License issuance, the Licensee shall prepare and implement a cooperative Integrated Weed Management Plan (IWMP) for the prevention, suppression, containment, eradication and/or control, according to goals by species and location, of invasive non-native plant species, including noxious weeds in and adjacent to the Project area. The intent of this plan is to enhance and promote the coordinated management of noxious weeds with entities responsible for weed management in the Packwood Hydroelectric Project vicinity. The plan shall include the following:

1. The IWMP shall be developed cooperatively between the Licensee, the Agencies and the county. The Licensee shall include provisions to update the plan in 5 year intervals to keep the plan contemporary with new weed management science and practices. Changes to the weed list will be incorporated in the year in which they are made.
2. The IWMP shall require the Licensee to:
   a. Develop communication and coordination protocols for the Licensee and interested parties including:
      i. Defining participants’ roles and responsibilities
      ii. Schedules for annual reports and work plan, meeting, review and updates
   b. Define the geographic scope of the plan’s implementation efforts
      i. Include the FERC Project area and areas adjacent to the Project that are affected by the Project. This would include transportation corridors and lake shore adjacent to the Project where introduced weeds could spread.
   c. Identify noxious weed management goals and objectives
      i. Identify zones with control objectives. For example, on the lake shore adjacent to the wilderness, the control goal for invasive weeds such as reed canary grass and Canada thistle would be eradication. At the
powerhouse, adjacent to large populations of these weeds, they may not be
designated for control.
d. Develop weed species and habitat overview/descriptions
   i. Use current Gifford Pinchot list of invasive plants, including Lewis
      County weed list and Forest species of concern.
   ii. Location description/mapping of populations using Geographic
       Information Systems
   iii. Current site (habitat) condition
   iv. Data gap; identify and implement needed site-specific surveys and
       methodology, as appropriate
e. Describe the desired conditions
f. Make recommendations for site-specific management consistent with federal state
   and county laws and regulations
   i. Tier to current Forest Service management direction for required,
      recommended, and allowable weed control methods
g. Schedule for periodic inventory using common inventory and mapping protocols
h. Develop Best Management Practices (BMP) that pertain to all ground disturbing
   projects and proactive prevention measures to stop new infestations, consistent
   with Federal and State initiatives
   i. Develop and implement an effectiveness monitoring program
   j. Modify practices when objectives and trends are not achieved
3. The IWMP shall be prepared in coordination with the Agencies. The Licensee shall
   include with the plan documentation of coordination, copies of comments and
   recommendations on the completed IWMP after it has been prepared and provided to the
   Agencies, and specific descriptions of how the Agencies comments are addressed by the
   IWMP. The Licensee shall allow a minimum of 60 days for the Agencies to comment
   and to make recommendations prior to filing the IWMP with the Commission for
   approval. If the Licensee does not adopt a recommendation, the filing shall include the
   Licensee's reasons, based on Project-specific information.

**Threatened, Endangered and Sensitive Species**

Within one year of License issuance, the Licensee shall, in coordination with the Agencies
prepare a Threatened, Endangered and Sensitive Species (Federal and State listed and Sensitive
species) Management Plan that shall be filed with the Commission for approval. The goal of the
plan is to provide protection, management, enhancement and monitoring of threatened,
endangered, and sensitive species and their habitats that may be affected by project operation or
project-related activities over the life of the license. The plan shall require the Licensee to:

1. Prepare an initial species list - The initial list should include threatened, endangered and
   sensitive species that occur within the project boundary or on lands affected by project
   operation or project-related activities. For each species, the list should reference the
   relicensing studies that documented occurrence and/or evaluated project effects. **The last
   sentence was deleted.**
2. Update the species list - The plan should provide for annual consultation, review, and updating of the list. Species would be added or removed according to changes in their status or changes in the potential for project effects (e.g., construction of new facilities).
3. Conduct baseline surveys - The plan should provide for baseline surveys of species currently on the list if no surveys have been completed at sites where project operations or project-related activities could affect them. Baseline surveys should also be conducted for species that may be added to the list if they occur at sites where the project could affect them.
4. Prepare biological evaluations - Where Forest Service Sensitive species may be affected, ENW should consult with the Forest Service to prepare a draft biological evaluation, in accordance with the Agencies Condition No. 1 (Implementation of Activities on National Forest System Lands, Site-Specific Plans and Cost Reimbursement).
5. Monitor project effects - For Agencies Sensitive species and Federal Species of Concern, the plan should include monitoring to identify project effects at confirmed sensitive species sites every 2 years for 6 years following license issuance and at 3-year intervals thereafter, unless a determination can be made at year 6 that no additional monitoring is necessary. For other threatened, endangered, and sensitive species, ENW should consult with the Agencies and tribes to determine an appropriate monitoring frequency, based on site-specific conditions.
6. Implement protective measures - The plan should provide for designing and implementing protection, mitigation, enhancement or restoration measures if monitoring results show project-related effects.
7. Conduct effectiveness monitoring and implement adaptive management - The plan should include follow-up monitoring to measure the effectiveness of any protective measures that are implemented, and use of this information to modify and improve the Threatened, Endangered, and Sensitive Species Management Plan.
8. Update the Threatened, Endangered, and Sensitive Species Management Plan - The plan should provide for annual reporting and consultation, with updates to the plan as needed.

**Cultural Resources**

The Licensee shall completely and fully comply with all provisions of the August 30, 2007, Historic Properties Management Plan (HPMP) as filed with the Federal Energy Regulatory Commission. The HPMP provides for the protection, management, and interpretation of historic properties within the area of potential effect (APE) for the Project and for mitigation of Project-related impacts to historic properties.

**Spill Event Every Other Year**

The objective of spill events is to provide flows of sufficient magnitude, duration, and frequency in order to sustain habitat forming and maintaining processes in lower Lake Creek. Some of these processes include the recruitment, mobilization, and deposition of sediment, wood and other organic material.
ENW shall provide a spill event greater than or equal to 285 cfs for 24 hours or as long as lake inflows can sustain that flow. ENW will take the necessary measures to adjust lake elevation and power generation to ensure that the spill event is achieved and maintained for up to 24 hours. The frequency of the spill event will be achieved every other water year\(^2\) or 3 out of 6 water years. If the frequencies of the spill events cannot be achieved, the Agencies will be consulted for an alternate plan.

The Agencies will be provided an annual report on spill event attempts and activities including the magnitude, duration, and frequency of these events and associated power generation in order to achieve the stated objectives. The Agencies will be consulted on the adequacy of spill event activities and will develop an alternate plan, if necessary.

**Below the Drop Structure Wood and Gravel Placement Plan**

Within one year of license issuance, ENW in consultation with the Agencies will develop a plan to enhance the habitat quality and quantity immediately below the drop structure, (the first 1,400 ft) in lower Lake Creek. This plan will be developed as part of the Lower Lake Creek Habitat Restoration Plan.

Starting in year one of the new license and continuing every other year for the term of the license, ENW will place wood and gravel at recruitment stations located below the drop structure.

Variables to be included during Lower Lake Creek Plan development include:

- **Location and timing** – Place wood and gravel in the bankfull width, above the wetted channel during a low flow time of year.

- **Quantity** – specify a yd\(^3\) of gravel and linear ft. of wood

- **Size** - Ranges, minimum, maximum – to be recruited and transported by the 285 cfs spill event flow and is suitable for rainbow trout spawning.

\(^2\) Water year is defined as an annual precipitation cycle, October 1 through September 30.
ENCLOSURE IV

Tables showing potential instream flows for lower Lake Creek

<table>
<thead>
<tr>
<th>Time Period</th>
<th>“Natural” flows (cfs) at drop structure</th>
<th>Median accretion (cfs)</th>
<th>80% exceedence accretion</th>
<th>Maximize steelhead rearing in warm months and 90+% “natural” WUA for all other species &amp; life stages</th>
<th>80+% “natural” WUA for all species &amp; life stages</th>
<th>70+% “natural” WUA all species &amp; life stages</th>
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<tr>
<td>August 1-31</td>
<td>76</td>
<td>9</td>
<td>7</td>
<td>76 (steelhead rearing)</td>
<td>40 (steelhead rearing)</td>
<td>25 (steelhead rearing)</td>
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<tr>
<td>September 1-30</td>
<td>56</td>
<td>8</td>
<td>6</td>
<td>56 (steelhead rearing)</td>
<td>30 (steelhead rearing)</td>
<td>30 (steelhead rearing)</td>
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<tr>
<td>October 1-31</td>
<td>63</td>
<td>8</td>
<td>6</td>
<td>63 (steelhead rearing)</td>
<td>35 (steelhead rearing)</td>
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<td>November 1-30</td>
<td>86</td>
<td>16</td>
<td>10</td>
<td>86 (coho spawning)</td>
<td>35 (coho spawning)</td>
<td>20 (coho spawning)</td>
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<tr>
<td>December 1-31</td>
<td>105</td>
<td>30</td>
<td>17</td>
<td>70 (100% coho spawning)</td>
<td>20 (coho spawning)</td>
<td>10 (coho incubation)</td>
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<td>January 1-31</td>
<td>88</td>
<td>41</td>
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<td>88 (coho spawning)</td>
<td>60 (coho spawning)</td>
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<td>February 1-28/29</td>
<td>73</td>
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<td>22</td>
<td>65 (coho incubation)</td>
<td>45 (coho incubation)</td>
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<td>46 (coho incubation)</td>
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<td>83</td>
<td>31</td>
<td>21</td>
<td>83 (steelhead spawning &amp; rearing)</td>
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<td>36 (coho incubation)</td>
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<td>25</td>
<td>18</td>
<td>153 (steelhead rearing)</td>
<td>75 (steelhead spawning &amp; rearing)</td>
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<td>June 1-30</td>
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<td>120 (steelhead rearing)</td>
<td>80 (rainbow rearing)</td>
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<td>July 1-31</td>
<td>153</td>
<td>14</td>
<td>10</td>
<td>95 (rainbow rearing)</td>
<td>85 (rainbow rearing)</td>
<td>50 (rainbow rearing)</td>
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### 50% WUA (Flows for use if more than fully restored)

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<th></th>
<th>Top (Drop Structure)</th>
<th>Bottom</th>
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<tr>
<td>January</td>
<td>4</td>
<td>57</td>
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ENCLOSURE V

U.S. Fish and Wildlife Service Comments on the Draft Biological Assessment

Section 3.5
Update the proposed Project Action and PM&E’s pending the outcome of ongoing negotiations with the Agencies.

Section 4.0, 5.2, 6.2, and 8.0
Provide information on Canada lynx and marbled murrelet and any critical habitat within the project vicinity and provide an effect determination and justification.

Section 6.2
Separate the species by sub-section, similar to Section 6.3. Provide clear effect determinations and supporting justifications.

Provide additional detail on known northern spotted owl locations or suitable habitat within one mile of the project boundary. In addition, provide information on the time of year, location, maintenance activities, frequency, duration, and equipment that will generate noise.

Overall
The draft BA does not contain enough specific information for us to analyze and make a decision regarding your effects determinations for species or critical habitat. At a minimum, include additional information on recreation, tailrace barrier, lake drawdown, and noise generating activities and their impacts to Service listed species and/or critical habitat.
APPENDIX D

BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT
APPENDIX D

BIOLOGICAL ASSESSMENT

FOR

PACKWOOD LAKE HYDROELECTRIC PROJECT
FERC NO. 2244

PREPARED BY:

ENERGY NORTHWEST

PREPARED BY:

EES Consulting

1155 N. State Street, Suite 700
Bellingham, WA 98225

FEBRUARY 2008
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1.0 INTRODUCTION

The purpose of this Biological Assessment (BA) is to evaluate the potential effects of the relicensing of the Packwood Lake Hydroelectric Project (Project), FERC No. 2244, on species listed under the Endangered Species Act (ESA) (16 U.S.C. 1531, et seq.). The Project licensee, Energy Northwest, has applied to the Federal Energy Regulatory Commission (FERC) for a new license to operate the 26-megawatt Project, located near Packwood, Washington. Section 7 of the ESA requires a Federal agency to ensure that any action, “authorized, funded, or carried out” by the agency is not likely to “jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat of such species.” The purpose of the ESA is to provide a means whereby the ecosystems upon which endangered or threatened species depend may be conserved, and to provide a program for the conservation of such endangered and threatened species. FERC’s issuance of a new license for the Project requires Section 7 consultation with the agencies responsible for listed species at the Project.

The U.S. Department of the Interior/U.S. Fish and Wildlife Service (USFWS), U.S. Department of Commerce/National Marine Fisheries Service (NMFS) and the USDA Forest Service are the agencies charged with responsibility for the federally listed fish, wildlife, and terrestrial species designated as Threatened, Endangered and Sensitive, which could potentially be affected by the relicensing of the Project. FERC designated Energy Northwest as its nonfederal representative to consult with USFWS and NMFS, to comply with the requirements of Section 7 of the ESA (See correspondence in Appendix BA-1).

This BA documents the consultation conducted by Energy Northwest with the resource management agencies and other stakeholders and evaluates the effects of the proposed operation of the Project, as described in the Final Application for New License, on ESA-listed species.
2.0 FEDERAL ACTION AND ACTION AREA

2.1 Packwood Lake Project Relicensing

The federal action to which this BA pertains is the issuance by FERC of a new license for continued operation of the Project. The existing 50-year license for the Project will expire on February 28, 2010. Energy Northwest filed its Preliminary Application Document (PAD) on November 10, 2004, including its list of proposed studies for relicensing.

On March 1, 2004, Energy Northwest filed its request to be designated as FERC’s nonfederal representative for purposes of ESA Section 7 consultation related to Project relicensing. FERC responded in the affirmative on March 10, 2004, and informal consultation ensued between Energy Northwest and the resource agencies. On January 12, 2005 in the Notice of Intent to File a License Application, FERC initiated informal consultation with USFWS and NMFS for relicensing.

Energy Northwest’s Final Application for New License is required to be filed no later than February 28, 2008. Energy Northwest is requesting that FERC issue a new 50-year license, considering the magnitude of expenditures for relicensing and the extensive measures for protection, mitigation and enhancement of Project resources in relation to the Project’s size and effects, and the resulting impact of relicensing and requirements of a new license on Project economics.

The Action Area for purposes of the ESA Consultation related to Project relicensing is the area within and immediately surrounding the Project boundary, and includes the following areas:

- Packwood Lake and the lower reaches of its tributaries
- Bypassed reach of Lake Creek (lower Lake Creek)
- Hall Creek under the tailrace flume
- Snyder Creek at the tailrace crossing
- Side channel of the Cowlitz River (“tailrace slough”) where flow from the Project tailrace enters the river

These are the areas in which there could be direct or indirect effects to ESA-listed species from continued Project operation under a new license.

Figures BA.3-1 and BA.3-2 below show the location of the Project and Project features.

2.2 Previous Federal Action – Tailrace Barrier

The original Project license contained a condition (License Article 27) requiring “construction, operation and maintenance” of prescribed “fish protective devices, including fish screens and racks.” A barrier screen was installed at what was then the terminus of the Project tailrace, but in the late 1970s the screen, along with
approximately 1,400 ft of the original tailrace was washed out by flooding and channel change in the Cowlitz River, which shortened the tailrace canal. It is currently approximately 6,690 ft in length (Butler Surveying 2004), and a rip-rap lined levee was constructed along the river bank to protect the tailrace and airstrip. This action halted the southern migration of the high flow channel. In the vicinity of the tailrace, the main low flow channel migrated progressively southward across the broad high flow channel, toward the rip rap, tailrace, and the airstrip through the mid-1990s.

After the tailrace and screen were washed out, the Washington Department of Fisheries and Washington Department of Game (now Washington Department of Fish and Wildlife) agreed it was not necessary to replace the barrier at that time, but reserved the right to require it if anadromous fish were reintroduced to the upper Cowlitz basin (Sandison and Larson 1978). Reintroduction of listed anadromous salmonids to the Upper Cowlitz River Subbasin began in the 1960s after the construction of Mayfield (1962) and Mossyrock dams (1968). Lake Creek was planted with 24,500 coho in 1976; 297,500 spring Chinook were planted in 1977, and 107,800 coho were planted in 1986 (Stober 1986). Fish passage via trap and haul began in 1994 as one of the FERC license requirements for the lower Cowlitz River hydroelectric projects (Cowlitz River Hydroelectric Project [FERC No. 2016] and Cowlitz Falls Hydroelectric Project [FERC No. 2833]).

When contact was made with the fisheries resource agencies in the preliminary stages of consultation for relicensing the Project, the issue of the tailrace barrier arose. After consultation with NMFS, the other agencies, tribes, and FERC, Energy Northwest obtained authorization (BA and Biological Opinion issued in 2007), and installed a permanent fish barrier drum screen near the end of the lined tailrace in October 2007. The design is based on two 14-ft long by 4-ft diameter drum screens. The drum screens lower into guide slots in the concrete weir structure within the tailrace using a rail/hoist system and connect to a mechanical system that turns the drums.

The fish barrier was constructed within the bounds of the original canal and consists of an approximately 50 x 30 ft rectangular concrete weir to control water velocity with two 4 x 14 ft drum screens to prevent fish passage. The drum screens are mechanically rotated to pass debris downstream and are covered with a steel mesh with 1/4-in openings to prevent fish from passing upstream into the tailrace. Two vertical perforated panels are located directly above the drums to prevent fish passage during flood events on the Cowlitz River that may cause water surface elevations to rise above the top of the drum screens. These perforated panels have been manufactured by drilling 1/4-in holes on 5/16-in staggered centers. The panels are hinged at the top, so they can be swung out of the way to pass debris or to allow tailrace water to pass if the drum screens were to be completely plugged with debris (emergency conditions). They can be locked in place during flood events. A similar perforated panel was manufactured to fit in a vertical guide slot located upstream of the drum screens so that one of the drums may be removed for maintenance without the loss of the screen function. This panel is normally stored until needed. Figures BA.2-1 and BA.2-2 present the plan and sectional views of the drum screens.
Figure BA.2-1. Packwood Tailrace Barrier Preliminary Design – Plan View Drum Screen
Figure BA.2-2. Packwood Tailrace Barrier – Drum Screen Section View
3.0 DESCRIPTION OF THE PROJECT

3.1 Project Area and Facilities

The Project is located near the unincorporated town of Packwood, Washington below Packwood Lake (See Figure BA.3-1). It consists of an intake canal; a concrete drop structure (dam); an intake building on Lake Creek located about 424 ft downstream from the outlet of Packwood Lake; a 21,691-ft system of concrete pipe and tunnels; a 5,621-ft penstock; a surge tank; a powerhouse with a 26,125 kW turbine generator; stilling basin; a 8,009-ft 69 kV transmission line; a 6,690-ft long tailrace canal and a tailrace fish barrier (See Figure BA.3-2). The source of water for the Project, Packwood Lake, is situated at an elevation of approximately 2857 ft above mean sea level (MSL), about 1,800 ft above the powerhouse. Water discharged from the Project is returned to the Cowlitz River via the tailrace canal. Instream flows to lower Lake Creek below the Project intake are delivered by way of pipeline with a butterfly valve that is used to bypass water around the drop structure. Power from the Project is delivered over an 8,009-ft long, 69 kV transmission line to the Packwood substation. The majority of the Project is located in the Gifford Pinchot National Forest, and part of Packwood Lake is surrounded by the Goat Rocks Wilderness. The lake itself is not part of the wilderness area, which starts at El. 2860 ft MSL, at the edge of the Project boundary.

The upper portions of the Project, including the facilities at Packwood Lake, are not accessible by road. Operation and maintenance of the Project facilities are accomplished by using foot trails and all-terrain vehicles (ATVs), or snowmobiles, depending on the time of year. High snow accumulation can lead to limited accessibility; this period usually begins in November and extends through April and during certain years through the first half of May.

A description of the Project facilities follows.

3.1.1 Packwood Lake

Packwood Lake is located within the Gifford Pinchot National Forest, in the upper Cowlitz River watershed, in the eastern half of Water Resource Inventory Area (WRIA) 26. Packwood Lake existed as a natural lake prior to the Project. It was formed when a large mass of soil and rock slid off Snyder Mountain and dammed Lake Creek approximately 1,100 years ago (Swanson 1996). Water that originates as rainfall and snowmelt in the Goat Rocks Wilderness Area and the Cascade Mountains drains into Packwood Lake via several tributaries, including Osprey, Trap, Muller, Upper Lake, and Crawford creeks. Lower Lake Creek serves as the outlet to Packwood Lake. The Project diverts water approximately 424 ft downstream in Lake Creek from the outlet of the lake and returns the diverted flow to the Cowlitz River approximately 4 miles downstream from the mouth of Lake Creek. The normal surface area of the lake is 452 acres at elevation 2857 ft MSL. The natural range of elevation varied between elevation 2856 and 2858 ft MSL during the peak runoff months of May, June, and July (Energy Northwest 1965).
Figure BA.3-1. Packwood Lake Hydroelectric Project Location
Figure BA.3-2. Packwood Lake Hydroelectric Project Features
The current license requires that Packwood Lake be maintained at a constant elevation of approximately 2857 ft MSL during the recreation season, May 1 through September 15. This elevation corresponds to a normal lake surface area of approximately 452 acres. During the remainder of the year, the license allows lowering the lake level not more than eight ft below the summer lake level down to an elevation of 2849 ft MSL (422 acre minimum surface area). The 8 ft of vertical storage allows the Project to store and utilize winter runoff for power generation. When seasonal high runoff exceeds the Project capacity and the available lake storage capacity, the drop structure is overtopped. When the lake level rises above elevation 2858.5 ft MSL (maximum surface area of about 456 acres), flow across the uncontrolled spillway begins and, excess runoff is directed down Lake Creek. Considering the maximum (2858.5) and minimum (2849) reservoir elevations in the original license, the storage of the project is approximately 4162 acre-feet. This usable storage is reduced under the original license to approximately 452 acre-ft between May 1 and September 14 because of the requirement to maintain a lake elevation of 2857 +/- 0.5 ft MSL. Plant operations during this period must be restricted to match inflows in order to maintain a relatively constant lake elevation. The maximum depth of the lake is between 110 and 120 feet, with a mean depth of 71 feet. The lake volume is approximately 28,000 acre-feet. The length of the shoreline is approximately 4.26 miles (Washington Department of Ecology 1991).

3.1.2 Intake Structure

The Project intake structure is located approximately 424 ft downstream from the outlet of Packwood Lake. The intake structure is connected to the lake by an excavated inlet canal. This canal was excavated to an invert elevation of approximately 2843.5 ft MSL. This corresponds to a water depth of approximately 13.5 ft when the lake is at its summertime elevation of approximately 2857 ft MSL.

The intake structure contains two fixed trash rack screens that were installed to protect the intake structure from large debris. These two vertical trash racks are each approximately 10 ft by 11 ft in dimensions with 2-5/16-inch openings. They cover the building intake openings and are located between elevations 2840 and 2850 ft MSL. The flow through these vertical trash racks is supplemented by two horizontal gratings located at elevation 2850 ft MSL. These two horizontal grates are approximately 10 ft by 3 ft in dimension with 1-3/16-inch openings.

An outer layer of expanded-metal screen material has been placed over the vertical intake openings to capture small debris and keep it from fouling the permanent trash racks. These debris screens can be hoisted out of the water for cleaning. The debris screens are cleaned on an as-needed basis about 3 to 4 times a year. Plant operators judge when intake performance is being inhibited by debris building up on the screens. When power generation schedules allow, water flow through the intake building is reduced and the screens are then hoisted out of the water and cleaned. Cleaning normally occurs in the spring (March-April), late summer (September) and in October during the outage. Additional cleanings may be necessary in some years during the winter months or occasionally during mid-summer. The screen material has oval
shaped openings approximately 1-1/8 inches by 2-1/8 inches. Floating booms are located at the lake entrance to the intake canal and near the intake building to prevent the largest debris (e.g., logs) from reaching the intake building as well as to prevent access by boats for safety reasons.

Inside the intake building and situated between the outer trash racks and the entrance to the pipeline are two traveling screens. These traveling screens operate automatically, as needed, or can be manually operated from either the powerhouse or the intake building. These screens each consist of 9-ft-wide connected metal basket frames that are covered with a wire cloth. This screen material is a 4 x 4 mesh (wires per inch) with a wire thickness of 0.080 inches that results in an opening size of 0.170 inches. The screens extend from the bottom of the intake building at elevation 2840 ft MSL to a point above the upper floor of the building (2868 ft MSL) to cover the wide range of lake elevations. The total surface area of the traveling screens is a function of the lake level and ranges between 162 square ft at minimum pool (elevation 2849 ft MSL) to 306 square ft at the summertime pool elevation of 2857 ft MSL. If the differential pressure (i.e., water elevation) across the screens increases due to fouling of the screens, the screens are automatically rotated when the setpoint is exceeded.

A fixed-wheel gate controls the water entering the 72-inch concrete pipeline that supplies water to the powerhouse. This gate is not used to regulate the flow of water entering the pipeline and is either full open or closed. The opening and closing of the gate is controlled by a hydraulic system. The system includes hydraulic accumulators that are designed to close the gate on loss of AC power. The headgate also can be manually operated from either the powerhouse or the intake building. Powerplant safety control circuits are designed to close the gate during automatic plant shutdowns or as a result of excess flow in the pipeline system.

Flow through the pipeline is measured downstream of the headgate using two ultrasonic flow sensors connected to signal processing and display instrumentation in the intake building (GE Panametrics ultrasonic liquid flowmeter). The resulting flow signal is sent via underground cable to the powerhouse where it creates a permanent record on a circular chart recorder. This chart recorder also utilizes software to convert the flow signal to volume in ac-ft for recording by staff in the daily plant logs.

The intake structure also houses a 24-inch pipeline and butterfly valve that is used to bypass water around the drop structure for release into Lake Creek. The control valve can be operated either from the intake building or remotely from the powerhouse. The pipeline operates by gravity flow and is, therefore, dependent on the position of the control valve and the level of the lake (i.e., the hydraulic head). It has a maximum flow of about 32 cfs at a lake elevation of 2857 ft MSL. The upstream opening of this pipe is located inside the intake building (centerline elevation 2846.5 ft MSL) adjacent to the main pipeline and downstream of the traveling screens. Flow through this bypass pipe is measured at its discharge point in the stilling basin immediately below the drop structure. Two ultrasonic flow sensors are used to measure the flow. These sensors are connected to signal processing and display instrumentation in the intake building.
(GE Panametrics ultrasonic liquid flowmeter). The resulting flow signal is sent via underground cable to the powerhouse where it creates a permanent record on a circular chart recorder. This chart recorder also utilizes software to convert the flow signal to volume in acre-ft for recording by staff in the daily plant logs.

### 3.1.3 Drop Structure

A concrete drop structure (dam) constructed across Lake Creek, adjacent to the intake structure, diverts water to the powerhouse. The drop structure rises approximately 10.5 ft above the level of lower Lake Creek, and extends 80 ft in width at the dam crest. The structure is tied into impervious earth fill cutoff walls on each side that extend into the natural embankment. This structure does not have spillway gates or other means to release water down Lake Creek. The name “drop structure” refers to the design of the uncontrolled spillway that allows water to free fall the short distance to the stilling basin below, which is approximately 4 ft deep. The crest of the drop structure spillway is located at elevation 2858.5 ft MSL and water will spill over the structure only when the lake level rises above this level. Spill flow across the drop structure is calculated from rectangular weir formulas using lake elevation to determine the flow of water over the crest.

### 3.1.4 Pipeline and Tunnels

Approximately 16,759 ft of 72-inch pipe and two tunnels convey water from the lake to the surge tank. The 72-inch pretensioned concrete pipeline is buried in a trench on a pipeline bench varying between 20 and 150 ft in width depending upon terrain. The pipe has a minimum wall thickness of 2-1/16 inches with standard lengths of 32 ft except in areas where 20-ft lengths were used to follow sharper contours of the mountainside. Pretensioned concrete cylinder pipe consists of a 3/16-inch welded steel cylinder, steel joint rings welded to its ends, and a 3/8-inch steel reinforcing rod wound around the cylinder under measured tension. This steel core is then protected with a 3/4-inch thick concrete coating inside and out to provide corrosion protection.

Two tunnels carry Project waters in areas where the steep terrain or unstable material made construction of a pipeline undesirable. The first tunnel (Tunnel No. 1), located approximately 1,299 ft downstream from the outlet of Packwood Lake, is approximately 1,730 ft long and is lined in a circular configuration with a 6-ft diameter. The second tunnel (Tunnel No. 2), located approximately 4,741 ft below the downstream outlet of Tunnel No. 1, is roughly 3,202 ft in length and is partly lined with concrete in a configuration with rectangular walls and an arched ceiling. The width of the concrete-lined sections of Tunnel No. 2 is 6.5 feet, and the height is 8.5 feet. Approximately 256 ft of Tunnel No. 2 were repaired in 2001, making the dimensions of the repaired section 7 ft tall by 5 ft wide.
3.1.5 Surge Tank and Penstock Isolation Valve

The Project’s surge tank is 14 ft in diameter and rises approximately 191 ft above the pipeline invert and approximately 135 ft above ground level. The inner chamber of the tank is 5.5 ft in diameter. The surge tank is painted green and is visible from the community of Packwood. The penstock isolation (butterfly) valve is located at the base of the surge tank and is used to isolate the 21,690-ft pipeline from Packwood Lake from the steel penstock that transports water to the powerhouse. The surge tank also serves as a location for radio antennas and transmitters for state and county agencies, the nearby national park, and a local community radio service.

3.1.6 Penstock

The steel penstock connecting the pipeline to the powerhouse is approximately 5,621 ft long, and is secured along the route by concrete anchors located at numerous points where the contour of the mountain requires changes in alignment or grade. The wall thickness of the steel in the penstock varies from 3/8 to 1-5/16 inches, with an outside diameter varying from 57 inches down to 46.5 inches where it enters the powerhouse (American Pipe and Construction Drawing D-4269). The normal static water pressure in the penstock at the powerhouse is about 780 psi. The penstock is buried throughout its length from the surge tank to the powerhouse. There are nine manholes providing access to the pipe. The nominal design discharge of the pipeline and penstock system is 236 cfs (Drawing 124-C-302P).

Monitoring has been performed annually since the Project began operation to verify the integrity of the water conveyance. Monitoring includes visual inspections of penstock, pipeline, and control piping, both internally and externally where possible. External inspections include the condition of the surrounding terrain, with particular attention to land movement, wet spots, changes in drainage patterns, and erosion (Council 1994).

3.1.7 Raw Water Tank and Constant Head Tank

The raw water tank is connected to the penstock and provides water for fire suppression and backup cooling water supply for the powerhouse. It has a capacity of about 20,000 gallons and is located about 1,150 ft from the powerhouse. The constant head tank is located about 300 ft from the powerhouse and prevents overpressurization of the powerhouse cooling water system. The constant head tank uses water from Packwood Lake to operate the cooling systems associated with turbine-generator and has a capacity of approximately 2,500 gallons. Excess water from the tank overflows through a short length of pipe to a natural drainage that leads to Snyder Creek. The water joins Snyder Creek near the south fence of the Powerhouse switchyard (see Exhibit G, Sheet 7 of the FLA). The amount of water flowing to the creek varies by the amount of cooling demand. Accordingly, the flow tends to be seasonal, with the highest flows in the winter when the cooling demand is at its minimum, and the lowest flows (or none) in the summer months when the maximum cooling demand exists.
3.1.8 Electrical Supply and Control Cables

Underground electrical supply and communications cables have been buried alongside the penstock and pipeline to provide power and control functions to the penstock isolation valve building near the surge tank and to the intake building located at Packwood Lake. The cables were buried next to the pipe with the exception of the two tunnels where the cables were routed through the tunnel. Large electrical junction boxes are located on the surface along the pipeline route for servicing the cables.

A 4160 volt AC electric service cable and a multiple pair communications cable provide the necessary services. The communications cable provides powerhouse control functions and transmits instrument signals such as lake level and pipeline flows. The electrical supply cable is connected to transformers (non-PCB dry type) that are located at each of the facilities to step down the voltage to a usable range. A separate electrical supply to the USDA Forest Service ranger station at Packwood Lake has also been provided from the intake building.

3.1.9 Powerhouse

The Project powerhouse is located just east of the community of Packwood with the power production portion constructed below ground and the control building and office located above ground (See Figure BA.3-3). Associated with the powerhouse are a warehouse and maintenance shop building, and a fenced storage yard with storage sheds for plant support equipment.

![Powerhouse Cross-Section](Image)
3.1.10 Turbine Generator

The Pelton turbine was manufactured by Allis Chalmers and is a 36,700 horsepower, horizontal shaft, double-jet impulse wheel with ellipsoidal buckets. The runner operates at 360 rpm under a total head of approximately 1,800 ft and an effective head of approximately 1,650 feet. The turbine runner is directly connected by means of a horizontal shaft to a single 26,125-kilowatt electric generator (nameplate rating of 27,500 kVA at 0.95 power factor) that converts the mechanical energy into electrical energy. The generator is capable of higher outputs for short periods of time. The generator produces electricity at 13,800 volts that is increased to 69,000 volts (69 kV) by the step-up transformer in the station switchyard. A Woodward hydraulic governor and a solid-state ABB excitation system control the turbine generator unit.

3.1.11 Tailrace

The water from the powerhouse turbine is released into a shallow constructed stilling basin that leads to an asphalt-lined tailrace canal. The tailrace canal is trapezoidal in shape, with a width at the top of the asphalt lining of approximately 29 ft and approximately 9 ft at the base. The average depth of the lined part of the tailrace is 5.75 feet. The tailrace canal discharges to the Cowlitz River at RM 125.2, approximately 4 miles downstream of the mouth of Lake Creek. The majority of the tailrace is protected with a 6-ft security fence for safety.

Snyder Creek passes under the tailrace canal near the powerhouse stilling basin. This crossing is accomplished by means of a 75-foot-long, 48-inch-diameter corrugated metal pipe. The upper end of the pipe terminates in a 6-ft diameter vertical drop inlet and the lower end empties into a broad 14 ft by 18 ft concrete apron area. The lower apron rises in elevation to control the water surface elevation throughout the pipe.

A flume was constructed to pass the tailrace water over Hall Creek and its associated wetland. The open-topped flume is roughly circular in shape with a diameter of about 10.4 ft and a length of approximately 356 feet. Another culvert pipe was constructed to pass the water under U.S. Highway 12. This oval-shaped culvert (approximately 8 by 5 ft in cross-section) is about 240 ft in length.

The original tailrace canal was approximately 8,100 ft in length. However, in 1977, the Cowlitz River changed its channel and approximately 1,400 ft of the constructed tailrace canal was washed out, including the fish screens that had been installed at its terminus to keep fish from entering the tailrace. Following the flood, the tailrace canal was shortened and reconstructed with bank protection. It is currently approximately 6,690 ft in length (Butler Surveying 2004).

When the washout of the tailrace screen occurred, the fishery management agencies did not require Energy Northwest to replace the fish screen, but reserved the right to require construction of a new fish barrier if anadromous fish were re-introduced in the
upper Cowlitz River (Sandison and Larson 1978). Anadromous fish were re-introduced in 1994 into the upper Cowlitz River through a trap and haul operation by Tacoma Power. The agencies requested Energy Northwest to install a fish barrier. Accordingly, new fish screens (tailrace barrier) were constructed in the tailrace canal in October 2007 and began operation in November 2007. Additional information is included in Section 2.2.

3.1.12 Switchyard

In the switchyard, there are two large transformers; a main 40 MVA step-up transformer and a 24 MVA spare transformer. There are two small transformers, a station service transformer, and a 4,160 volt transformer that takes power generated by the plant and steps it down for use at the intake structure. There are also two SF6 circuit breakers that will open to disconnect the 69 kV line. Energy Northwest has been actively phasing out PCB-contaminated equipment for many years. A review of records indicates that transformers and other equipment at the Project do not contain PCBs. CT bushings that had contained PCBs in the range of 80.6 to 87.1 mg/kg were drained of oil in October 2005 (Energy Northwest 2007). No other equipment at the Project is reported to contain PCBs (Energy Northwest 2007). The Project also has a Spill Prevention, Control and Countermeasure (SPCC) Plan, which is included as Appendix A of the FLA.

3.1.13 Transmission System

The power from the Project is delivered over an 8,009 foot, 69 KV transmission line to the Packwood substation owned by Public Utility District No. 1 of Lewis County (Lewis PUD) (Butler Surveying 2004). The power is then delivered by Lewis PUD to the Bonneville Power Administration federal transmission system at the Silver Creek substation in Lewis County.

Because of Lewis County PUD’s transmission system and substation configuration, when there is a loss of the Lewis County PUD transmission line service, the Project output can be isolated from the grid and used to supply power to the local communities.

3.1.14 Access Roads

Several access routes to Packwood Lake are available. Three roads and two trails are used to provide access to the lake from the town of Packwood. The roads include Snyder Road (FS Road 1260), Pipeline Road (FS Road 1260-066), and Latch Road (FS Road 1262) and Trail Nos. 74 and 78 (See Figure BA.3-4). Access to the lake from Packwood (Highway 12) is by traveling east on Snyder Road, which is approximately 5.9 miles long with a parking lot at the end. The public can then either use Trail #78 or return a short distance down Snyder Road to the entrance of the Pipeline Road. Operation and maintenance of the Project facilities are accomplished by using ft trails and all-terrain vehicles (ATVs) or snowmobiles, depending on the time of year.
Snyder Road (FS Road 1260) is a double-lane paved road that extends 5.8 miles from Highway 12 to the parking lot at Trail No. 78. Lewis County has jurisdiction for the road segment leading to the Forest Service boundary (MP 0 to MP 0.83) and maintains the road to MP 1.2. Snyder Road is designated by the Forest Service as a maintenance level 2 (ML2) road from MP 1.2 to the trailhead at MP 5.8. ML2 means the road is passable by high-clearance vehicles, drainage structures are maintained, and the tread is maintained to accommodate speeds of 15 mph or less. The parking area at the end of Snyder Road is utilized by hikers, horseback riders, and ATV's. Energy Northwest uses Snyder Road generally once per week for accessing either the Latch Road or the Pipeline Road and Trail No. 74.

Pipeline Road (FS Road 1260-066) is a single-lane native surface road with wide spots. This road is gated at MP 0.03 and is 1.3 miles in length. Trail No. 74, which extends from the end of the Pipeline Road, is another 2.3 miles in length where it reaches Packwood Lake. This road is located near the end of Snyder Road beginning at MP 5.55 (See Figure BA.3-4). The Pipeline Road and Trail No. 74 provide motorized access to Packwood Lake. The Pipeline Road and Trail No. 74 are maintained by Energy Northwest and are Energy Northwest’s primary access for operation and maintenance of the Project’s intake facilities during the summer. The Pipeline Road junction is located approximately 100 yards from the parking lot at the end of Snyder Road. Energy Northwest’s use of the Pipeline Road and Trail No. 74 is generally once per week, to check on intake facilities and perform needed maintenance. Public access on foot, horseback, bicycles or by all terrain vehicles (ATVs) is allowed by the Forest Service around Energy Northwest’s locked vehicle gate on the Pipeline Road.

Latch Road (FS Road 1262) is a single-lane gravel road with few turnouts. This road begins 1.66 miles up Snyder Road. Approximately 3 miles of Latch Road is in the Lake Creek drainage. Latch Road is gated and locked approximately 2.4 miles from the junction with Snyder Road. There is no public vehicular traffic behind the gate, although a few hunters may use the road up to the gate in the fall. From this gate, it is another
Figure BA.3-4. Project Access Routes
2.2 miles to where the road ends and a short access trail connects to Trail No. 74. Energy Northwest uses Latch Road and one mile of the connecting Trail No. 74 to access the intake facilities, mainly in the months when snow makes access difficult on the Pipeline Road and Trail. Forest Service trail crews also use this road for working on trails in the Packwood Lake area.

3.2 Current Project Operation

The Project is controlled from the powerhouse and is operated in an automatic mode according to the current license conditions, water availability, and power contracts. During the summer, the Project’s generation is dictated by the current FERC license lake level requirement of 2857 ft MSL plus or minus 6 inches. From May 1 to September 15, the Project generation flow is adjusted to match lake inflow in order to hold the lake elevation relatively constant. After mid-September, the lake level may be drawn down as much as 8 ft to a level no lower than 2849 ft MSL. The 8 ft of vertical storage allows the Project to store and utilize winter runoff for power generation. When seasonal high runoff exceeds the Project capacity and the available lake storage capacity, the drop structure is overtopped (at elevation 2858.5 ft MSL) and excess runoff flows over the spillway and down Lake Creek.

Under any water conditions, the priorities for plant operations are, from highest to lowest, to: 1) provide the required bypass flow down lower Lake Creek, 2) maintain the required lake levels specified in the license, and 3) to generate electricity with the balance of the water in accordance with Energy Northwest’s power sales contracts. During dry periods with very low inflows, the Project currently may be shut down in order to maintain the required lake level. Bypass flow releases to Lake Creek continue whether the Project is operating or not.

The dependable capacity of the Project is based on a flow duration curve for water years 1912 - 1962. Based on those calculations, the dependable annual average capacity for the Project is calculated at 10 MW. This original estimate has been confirmed with an actual value of about 10.4 MW calculated for the period 1965 to 2007.

Average annual gross generation for the period 1965 to 2007 was 90,998 megawatt-hours (MWh) and annual average net generation was 90,567 MWh. The Project has a lifetime capacity factor of approximately 35% (based on a maximum capacity of 30 MW). Average monthly gross energy production for this period varied from 0 MWh to 20,737 MWh in July 1972. The highest annual gross generation recorded was for 1997 with 133,270 MWh generated. The lowest annual gross generation recorded was in 2001, with 61,546 MWh generated.

3.3 Project Purpose and Objectives

The purpose of the Packwood Lake Hydroelectric Project is power generation. Energy Northwest provides electric power to Benton and Franklin Public Utility Districts under long-term contractual agreements.
3.4 Existing Resource Protection Measures

Energy Northwest currently has provisions for Best Management Practices (BMPs) related to stormwater pollution prevention, spill prevention, control and countermeasures, and noxious weed control. Copies of these plans can be found in the Final License Application, Appendices A and E, respectively. Energy Northwest has also developed a Historic Properties Management Plan, which was submitted to FERC on August 30, 2007. The Project also has in place a new tailrace fish barrier that was installed in October 2007 as described above in Section 2.2.

3.5 Description of Proposed Action

The Proposed Action to be considered in this BA is the issuance of a new license for the Project. Energy Northwest is requesting a 50-year license term. Energy Northwest's proposed Project operation and protection, mitigation and enhancement measures are described in this section.

3.5.1 Proposed Project Operation

The current Project license specifies a maximum water surface elevation of 2858.5 ft MSL and a minimum water surface elevation of 2849.0 ft MSL for Packwood Lake. Energy Northwest proposes that the current maximum water surface elevation of 2858.5 ft MSL be eliminated. The maximum water surface elevation allowed under the terms of the current Project license physically corresponds to the drop structure spillway crest. The drop structure spillway is uncontrolled (no spillway gates) and lake levels that exceed this elevation are self-regulating and cannot be directly controlled by the Project. Any spill over the drop structure currently exceeds the existing license elevation limit, causing a “non-compliance” with the license. Because water spilling over the drop structure is an expected condition and is projected to occur more frequently under the proposed terms of a new license, Energy Northwest proposes to eliminate this unnecessary upper lake elevation limit.

Energy Northwest proposes to continue to shut down the Project annually to perform scheduled equipment maintenance. The Project will begin shutting down for the annual outage on August 15 of each operating year. The intent is to complete all major maintenance and inspections within the first three weeks of the outage and perform all testing and preparation for startup in the fourth week. Operations will resume by September 15, or earlier if all necessary work has been completed. If the Project experiences an unscheduled outage, emergency maintenance will be conducted as needed to restore the unit to operating status. Currently the lake is drawn down prior to the outage. Energy Northwest proposes that this pre-outage drawdown be eliminated.

Energy Northwest proposes to maintain a minimum lake elevation of 2856.5 ft MSL between May 1 and September 15. Between September 16 and April 30, the minimum lake elevation will be 2849 ft MSL. The minimum winter lake level is necessary to
provide sufficient water for increased bypass flows in Lake Creek, for Project generation that provides continuous flows through the tailrace to the tailrace slough following the maintenance outage, and to allow cleaning and maintenance of the permanent intake screens. Due to the elimination of the pre-outage drawdown, the lake level will stay higher before and during the annual outage, which will result in higher groundwater level than previously.

Instream flows to Lake Creek will be increased according to the schedule below.

<table>
<thead>
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<th>Month</th>
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<td>20</td>
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<td>15</td>
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<td>10</td>
</tr>
<tr>
<td>November</td>
<td>7</td>
</tr>
<tr>
<td>December</td>
<td>4</td>
</tr>
</tbody>
</table>

### 3.5.2 Proposed Resource Protection, Mitigation and Enhancement Measures

Energy Northwest proposes that the following resource protection, mitigation and enhancement (PM&E) measures be incorporated in the new license for the Project for the benefit of ESA-listed fish species. The measures are discussed below under the potential Project effects to which they relate.

- Increase the annual minimum bypass flow to Lake Creek as shown in Table BA.3-1 above.
- Increase the frequency of gravel and wood movement in Lake Creek by providing a spill event of 285 cfs for as long as lake inflows can sustain that flow, or a maximum of 24 hours, every other water year or 3 out of every 6 water years.
- Increase the Lake Creek anadromous spawning and rearing habitat by installing wood and boulder stream structures to provide for additional pools, gravel retention, and other beneficial habitat features in Lake Creek (RM 0-1). Gravel will be added to these structures to immediately improve habitat.
- Monitor stream enhancement measures to verify improvements to habitat.
- Supplement stream structures with gravel recruitment stations to provide adequate movement of gravel into the anadromous reach.
- Move the annual maintenance outage to August 15 through September 15 in order to minimize impacts to spring Chinook salmon spawning and incubation by eliminating attraction flows in the tailrace slough and to avoid discharge of naturally
warmed Packwood Lake water to the tailrace during periods of peak summer temperatures.

- Maintain a minimum lake elevation of 2849.0 ft MSL from September 15 – April 30 of each year, to allow continued project operation to protect Chinook incubation in tailrace slough.
- Eliminate mandatory maximum elevation year round.
- Improve anadromous fish passage on Snyder Creek where it crosses the tailrace canal by rerouting the stream.

3.5.2.1 *Measures to Address Effects on Fish Habitat in Lower Lake Creek*

Energy Northwest proposes to increase the instream flow below the drop structure during all months of the year based on agreement with the resource agencies, including NOAA/NMFS, WDFW, WDOE, USFS, Cowlitz and Yakama Tribes and the USFWS. In addition, Energy Northwest proposes to increase anadromous spawning and rearing habitat in Reach 1 and the lower portion of Reach 2 (RM 0.70 – 1.0) of Lake Creek by installing wood and boulder stream structures to provide for additional pools, gravel retention, and other beneficial habitat features in Lake Creek (RM 0-1). Gravel will be added to these structures to immediately improve habitat and gravel recruitment stations will also be established. The purpose of the habitat enhancement structures is to stabilize and retain spawning gravel in the anadromous reach of Lake Creek and to provide pools, cover, and habitat diversity for all fish species and life stages.

Based on field surveys of LWD in Lake Creek, Reach 1 (accessible to all anadromous fish) has very little LWD in the wetted channel (Figure BA.3.5-1). This lack of LWD results in spawning-sized gravel being washed through the system or stored on the channel margins where it is rarely functional as spawning habitat for ESA-listed salmonids. Results of the Lake Creek Instream flow study (EES Consulting 2007g) also concluded that spawning habitat for both anadromous and resident fish in Lake Creek is scarce and comprises on average less than 1% of the total habitat available (Figure BA.3.5-2; Table BA.3-2).
Figure BA.3-5. Large Wood in Wetted Channel (2005 inventory).

Figure BA.3-6. Spawning habitat for salmon and trout in Lake Creek study reaches as a percentage of total habitat.
Due to past logging, it is unlikely that large trees will be present near the stream banks to furnish LWD in Reach 1 of Lake Creek. Energy Northwest proposes to enhance the habitat in Reach 1 (RM 0.0 – 0.7) and the lower portion of Reach 2 (RM 0.7 – 1.0) with the following enhancement measures including:

- Increase the annual minimum bypass flow to Lake Creek as shown in Section 3.5.1
- Increase the frequency of gravel and wood movement in Lake Creek by providing a spill event of 285 cfs for as long as lake inflows can sustain that flow, or a maximum of 24 hours, every other water year or 3 out of 6 water years.
- Increase the Lake Creek anadromous spawning and rearing habitat by installing wood and boulder stream structures to provide for additional pools, gravel retention, and other beneficial habitat features in Lake Creek (RM 0-1).
- Gravel will be added to these structures to immediately improve habitat.
- Monitor stream enhancement measures to verify improvements to habitat.
- Supplement stream structures with gravel recruitment stations to provide adequate movement of gravel into the anadromous reach.

Success of the proposed PM&E measures will require agreement with the resource agencies on clear goals, thorough planning, careful execution, and adequate monitoring. Numeric targets will be set for a specific quantity of habitat, and standards for measuring the habitat will be followed. Monitoring at specified intervals and areas will be carried out with consultation and input of the appropriate resource agencies.

Tables BA.3-3 and BA.3-4 show the detailed effects of the proposed instream flows (including accretion) and habitat enhancement in Reach 1. It is important to note that even though proposed enhancement will be limited to Reach 1 and the lower portion of Reach 2, the analysis is based on the entire area of use for Chinook and coho salmon, and steelhead, rainbow and cutthroat trout in Lake Creek.
| Month/Period | Rearing Habitat (sq ft/1000 linear ft of stream) | | | | | |
|--------------|-----------------------------------------------|---|---|---|---|---|---|
| | Chinook | Coho | Steelhead | Rainbow | Cutthroat | Winter Trout | Mean |
| August | | | | | | | |
| Pre-Project | 4,959.6 | 3,438.6 | 5,161.0 | 3,675.1 | 4,093.0 | 4,265.5 |
| Current | 3,157.9 | 4,600.8 | 1,686.2 | 1,745.6 | 1,994.5 | 2,637.0 |
| Proposed | 6,907.3 | 6,915.9 | 4,181.1 | 3,876.8 | 5,161.8 | 5,408.6 |
| September | | | | | | | |
| Pre-Project | 4,983.6 | 3,470.0 | 4,624.1 | 3,367.4 | 4,017.6 | 4,092.5 |
| Current | 2,938.0 | 4,641.1 | 1,539.8 | 1,648.7 | 1,842.0 | 2,521.9 |
| Proposed | 7,550.4 | 5,997.0 | 4,722.5 | 4,284.9 | 5,497.8 | 5,610.5 |
| October | | | | | | | |
| Pre-Project | 4,998.6 | 3,459.0 | 4,571.2 | 3,346.0 | 4,009.4 | 4,076.8 |
| Current | 2,938.0 | 4,641.1 | 1,539.8 | 1,648.7 | 1,842.0 | 2,521.9 |
| Proposed | 5,857.1 | 7,380.2 | 3,521.7 | 3,421.3 | 4,523.4 | 4,940.7 |
| November | | | | | | | |
| Pre-Project | 4,962.2 | 3,434.3 | N/A | N/A | N/A | 5,782.2 |
| Current | 4,116.1 | 4,363.9 | N/A | N/A | N/A | 8,091.6 |
| Proposed | 6,534.4 | 6,998.7 | N/A | N/A | N/A | 7,770.7 |
| December | | | | | | | |
| Pre-Project | 5,174.1 | 3,241.6 | N/A | N/A | N/A | 5,487.2 |
| Current | 4,937.6 | 3,650.3 | N/A | N/A | N/A | 7,148.0 |
| Proposed | 7,466.1 | 5,979.3 | N/A | N/A | N/A | 7,590.0 |
| January | | | | | | | |
| Pre-Project | 5,297.7 | 3,127.1 | N/A | N/A | N/A | 5,266.8 |
| Current | 5,085.4 | 3,405.1 | N/A | N/A | N/A | 6,629.7 |
| Proposed | 7,754.2 | 5,046.3 | N/A | N/A | N/A | 7,678.7 |
| February | | | | | | | |
| Pre-Project | 5,067.7 | 3,363.9 | N/A | N/A | N/A | 5,705.0 |
| Current | 5,061.6 | 3,478.0 | N/A | N/A | N/A | 6,830.3 |
| Proposed | 7,717.6 | 5,362.8 | N/A | N/A | N/A | 7,588.5 |
| March | | | | | | | |
| Pre-Project | 4,930.7 | 3,459.1 | N/A | N/A | N/A | 5,758.4 |
| Current | 4,937.6 | 3,650.3 | N/A | N/A | N/A | 7,148.0 |
| Proposed | 7,466.1 | 5,979.3 | N/A | N/A | N/A | 6,679.2 |
| April | | | | | | | |
| Pre-Project | 5,304.1 | 3,092.7 | 6,046.8 | 4,023.4 | 4,222.8 | 4,538.0 |
| Current | 4,974.3 | 3,608.5 | 3,472.3 | 2,530.1 | 3,582.0 | 3,633.4 |
| Proposed | 7,680.2 | 5,510.9 | 5,162.6 | 4,130.5 | 5,556.5 | 5,608.1 |
| May | | | | | | | |
| Pre-Project | 5,639.8 | 1,955.1 | 7,124.7 | 4,839.3 | 4,281.9 | 4,768.2 |
| Current | 4,726.5 | 3,886.4 | 3,094.4 | 2,406.6 | 3,326.4 | 3,488.1 |
| Proposed | 7,908.3 | 5,048.9 | 5,433.8 | 4,568.7 | 5,746.2 | 5,741.2 |
| June | | | | | | | |
| Pre-Project | 5,609.8 | 1,889.6 | 7,055.5 | 4,952.0 | 4,147.4 | 4,730.8 |
| Current | 4,591.8 | 4,017.7 | 2,901.5 | 2,340.0 | 3,187.2 | 3,407.7 |
| Proposed | 7,536.7 | 5,932.8 | 4,834.6 | 4,094.9 | 5,520.7 | 5,583.9 |
### Table BA.3-3. All Sites Lake Creek Habitat Duration Analysis, 50% Exceedance Values

<table>
<thead>
<tr>
<th>Month/Period</th>
<th>Chinook</th>
<th>Coho</th>
<th>Steelhead</th>
<th>Rainbow</th>
<th>Cutthroat</th>
<th>Winter Trout</th>
<th>Mean</th>
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### Table BA.3-4. All Sites Lake Creek Habitat Duration Analysis, 50% Exceedance Values

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<th>Month/Period</th>
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Table BA.3-4. All Sites Lake Creek Habitat Duration Analysis, 50% Exceedance Values

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<th>Month/Period</th>
<th>Chinook</th>
<th>Coho</th>
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<td>51.4</td>
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<tr>
<td>Proposed</td>
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<td>192.2</td>
<td>192.2</td>
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<td>481.9</td>
<td>197.8</td>
<td>340.1</td>
<td>189.1</td>
<td>317.2</td>
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</table>

For each species, spawning habitat is substantially increased with the proposed flow and habitat enhancement when compared to without-Project and current conditions. The clear benefit shown in these comparisons, underscores the high value of habitat enhancement in creating conditions for fish populations to thrive in Lake Creek. When examining rearing habitat for all species modeled per each month and on an annual basis, rearing habitat is increased over without-Project and current conditions.

Information collected as part of the large wood study indicated that the majority of instream wood in Lake Creek comes from local sources. The numerous channel constrictions and large boulders make it nearly impossible for wood to be transported very far in the stream. No wood in the large size class, 6% of medium wood, and 12% of small wood showed signs of fluvial transport during the 2005 inventory. Fluvially transported wood was either old or very old, further reinforcing the hypothesis that large woody debris is transported very infrequently in lower Lake Creek. Since nearly all of the small amount of large wood in Lake Creek is derived from local sources rather than wood transport, the proposed stream structures and associated gravel placement in the lower 1 mile of Lake Creek will make up for the lack of instream LWD caused by past
forest management practices. The placement of gravel-retaining structures is an integral part of enhanced fish habitat and will help channel maintenance flows form desired features, such as scour pools, while helping to retain needed spawning gravel.

Channel forming discharge events are also a critical factor in creating and maintaining diverse and beneficial habitat features. Flows of approximately 285 cfs in Lake Creek have been shown to move gravel and some wood, and appear to be adequate flushing flows (Watershed GeoDynamics 2007a; 2007b). Movement of painted rocks placed at gravel study sites throughout lower Lake Creek suggest that high flows (on the order of 250-300 cfs) are needed to mobilize the largest sized spawning gravels (3-4 in. diameter) across the entire channel width. Lower flows would likely mobilize smaller gravels if they occurred in the middle of the channel, but the majority of gravel is stored on the channel margins or behind boulders/logs, requiring the higher flows to be mobilized. In 2006, approximately 299 cfs was released for 24 hours; and release was maintained above 250 cfs for an additional 24+ hours. In 2007, the 284 cfs release was maintained for approximately 12 hours, with flows dropping to 250 near the end of that period. The test results suggested that: 1) gravel transport initiates in a narrow range between 285 and 325 cfs; and 2) a longer duration but lower magnitude flow release results in more transport.

Whether caused by natural runoff events or planned overtopping, the channel forming discharges in conjunction with gravel-retaining structures will provide the necessary conditions for beneficial changes in stream morphology and habitat to support spawning for ESA-listed species in Reach 1 of Lake Creek.

3.5.2.2 Measures to Address Effects on Fish Passage at Snyder Creek Tailrace Crossing

Snyder Creek currently passes through a 75-ft long culvert under the Project tailrace and joins Hall Creek downstream of the tailrace. This crossing creates a partial barrier to upstream migration of anadromous species currently listed under the ESA. Energy Northwest has observed both coho salmon and cutthroat trout utilizing Snyder Creek above the tailrace crossing. The crossing is complex and completely backwatered, but does not allow for full passage of all species and life stages at all times. Past high flow events had also filled the culvert with sediment, further impeding upstream passage. The culvert as currently configured does not meet WDFW criteria for size relative to the stream channel downstream nor slope, given the 90° connecting culvert at the upstream end.

Because the analysis showed that the existing culvert does not allow full fish passage, Energy Northwest initially proposed to clean out the existing culvert, and consult with the agencies and tribes regarding the methodology and precautions needed to successfully restore full fish passage. In meetings of the Water Quality and Aquatic Resources Committee, the following options were discussed regarding the Snyder Creek crossing of the tailrace:
1. Clean out the culvert to provide passage if the culvert, as currently configured, is passable;  
2. Abandon the culvert and divert Snyder Creek back into Hall Creek downstream of the tailrace; or  
3. Replace the culvert with a new structure.

Energy Northwest cleaned out the culvert in August 2007. As requested by the Water Quality and Aquatic Resources Committee, to determine if Option 2 is viable, Energy Northwest examined a drainage path that runs parallel to the tailrace, entering Hall Creek just downstream of the flume. This reach is approximately 800 ft in length. The 300 ft closest to Snyder Creek is dry, but has a bankfull width of about 10 ft. The next 300 ft is a backwater (no discernable flow – bankfull width of approximately 20 ft), which then connects to a dry reach as it enters Hall Creek (bankfull width at this location is approximately 2 ft). There are no barriers to upstream anadromous migration within this 800 ft reach.

After consulting with the natural resources agencies and tribes, Energy Northwest proposes to re-route Snyder Creek to connect to the backwater channel of Hall Creek downstream of the Project flume. A conceptual drawing of the re-routing of Snyder Creek is included as Figure BA.3-7. Energy Northwest will retain stream restoration specialists and consult with the natural resource agencies and tribes in the re-routing of this creek.

Figure BA.3-7. Snyder Creek Crossing, Existing and Proposed
Since the culvert currently does pass fish (although the percentage is not known) Energy Northwest proposes that this culvert be maintained and kept in operating condition until 2015. By this time, Energy Northwest proposes to have Snyder Creek rerouted into Hall Creek downstream of the Project tailrace so as to provide full passage to anadromous fish.

3.5.2.3 Measures to Address Project Effects on Anadromous Salmonids in the Tailrace Slough

Energy Northwest proposes to change the timing of the annual outage in order to provide additional protection to spawning Chinook in the tailrace and additional instream flows for lower Lake Creek. These changes address the following impacts:

- Potential stranding of incubating eggs and fry in the tailrace slough
- Decreased flows and habitat in lower Lake Creek
- Water Temperatures in the tailrace

The tailrace slough is a highly dynamic side channel and is altered by high-flow events in the Cowlitz River. Some years the tailrace slough is largely dependent upon the Cowlitz River during low flow months; however, in other years, a greater percentage of the flow in the tailrace slough comes from the Project than from the river. Under the current operational regime, the Project’s annual outage for maintenance occurs during October. Spring Chinook periodicity indicates that spawning timing ranges from the middle of August through the end of September. If the Project were to continue its current operation, in years when the Cowlitz River contributes little flow to the tailrace side channel, Spring Chinook could be attracted to the tailrace slough by Project waters, spawn, and then have incubating eggs in the tailrace potentially dewatered when the Project shuts down for annual maintenance. Low Packwood Lake inflows during August and September have also forced the Project to shut down on weekends, since mandatory lake elevation could not be maintained with continuous power production. This also potentially subjects incubating eggs and fry to the risks of dewatering or stranding during weekend outages.

Energy Northwest proposes to shift the time of the annual maintenance outage to August 15 to September 15 in order to minimize the possible effects on spring Chinook salmon by eliminating attraction flows, created by project discharge, into the tailrace slough. The shifting of the outage to this earlier period also avoids the discharge of naturally warmed Packwood Lake water to the Cowlitz River, when summer temperatures are at their highest.

Several measures will be required during the outage to protect fish in the tailrace area:

- Prior to the annual Project shutdown Energy Northwest will inspect the Cowlitz River side channel that flows into the tailrace slough area. The purpose of this inspection is to verify that the river is providing flow through the side channel into the slough and document the results of the inspection in the station logs. If there is flow
through the side channel, no fish rescue is required. If the side channel is dry, a fish rescue will be initiated within 12 hours of cessation of flows through the Project tailrace. If fish are stranded, then fish rescue protocols will be followed to capture them and move them into safe habitat in the Cowlitz River.

- In accordance with the established schedule developed to determine the efficiency of the tailrace fish barrier, the section of tailrace upstream of the fish barrier will be inspected and electrofished, as necessary, within 12 hours of the Project's annual maintenance outage. A block net will be installed where the tailrace exits the stilling basin prior to commencing the tailrace fish rescue. The stilling basin will be seined within 72 hours of the shutdown. All captured fish will be recorded and the information provided to the aquatics resource panel in the annual report.
4.0 ESA CONSULTATION

On February 9, 2007, FERC requested that NMFS and USFWS provide their lists of Threatened, Endangered and Sensitive Species. NMFS responded with its list of species on March 8, 2007 and the USFWS indicated via letter on February 28, 2007 that Energy Northwest should obtain a list from its website (letters attached as Appendix BA-1). Energy Northwest also updated the lists by going to the websites for NMFS and USFWS; their lists were updated on February 7, 2008 and August 8, 2007, respectively.

Species for which no habitat exists in the Project vicinity (including species outside of their known or potential range), or which have been shown not to occur by prior surveys are not addressed in this BA. Copies of the letters and species lists are provided in Appendix BA-1 of this Biological Assessment.

NMFS and USFWS identified the following listed and proposed fish species that may occur within the Project area: Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), chum salmon (*O. keta*), steelhead trout (*O. mykiss*), and bull trout (*Salvelinus confluentus*). Chum salmon and bull trout are not considered to be distributed in the upper Cowlitz River subbasin. Sea-run cutthroat trout (*O. clarki clarki*) were once proposed for listing, but USFWS withdrew the species from consideration. Accordingly, bull trout, chum salmon, and sea-run cutthroat trout are not addressed.

The USFWS website indicated that the northern spotted owl, gray wolf and grizzly bear are ESA-listed terrestrial species for Washington. Critical habitat for Canada lynx does not occur in or near the project area (Johnson and Cassidy 1997). Critical habitat for marbled murrelet exists about 1.5 miles northwest of the Project area (USFWS Critical Habitat Portal). Energy Northwest reviewed the WDFW Priority Habitats and Species (PHS – updated October 23, 2007) database, which indicates the presence or absence of both federally listed and state-listed species.

Effective June 28, 2007, the bald eagle was officially de-listed by the USFWS but it retains Forest Service Sensitive Species status. It is, however, included in Exhibit E, Section E.5.6.2.2 (USDS Forest Service Sensitive Species) of the Final Application for New License. Information on bald eagles was also provided in the biological assessment submitted to FERC and the agencies, with the license amendment application for installation of the tailrace fish barrier April 9, 2007.

The USFWS and the Washington Natural Heritage Program (WNHP) indicated that three federally listed or proposed plant species have the potential to occur within the Packwood Lake Hydroelectric Project Rare Plant Study area (USFWS 2007b, USFS 2006b, WNHP 1997). Table BA.4-1 summarizes all of the federally listed species that are known to occur or may potentially occur in the Packwood Lake Project vicinity.
<table>
<thead>
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<th>Common Name</th>
<th>Species Name</th>
<th>Status</th>
<th>Found in Project Area</th>
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</thead>
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<td></td>
<td></td>
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<tr>
<td>Chinook Salmon</td>
<td>Oncorhynchus tshawytscha</td>
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<td>Coho Salmon</td>
<td>O. kisutch</td>
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<td>Steelhead Trout</td>
<td>O. mykiss</td>
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<td>Bull Trout</td>
<td>Salvelinus confluentus</td>
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<td>Grizzly Bear</td>
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<td>Sidalcea nelsoniana</td>
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5.0 STATUS OF SPECIES AND CRITICAL HABITAT

5.1 Listed Fish Species and ESUs/DPS and Critical Habitat

The following ESA fish species and critical habitat were indicated to be within the Project Area. (See NMFS letter of March 8, 2007 in Appendix BA-1; list updated on August 8, 2007.)

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<th>Species/ESU</th>
<th>ESA Listing</th>
<th>ESA Critical Habitat</th>
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<td>Designated 9/2/05(70FR52630)</td>
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<tr>
<td>Lower Columbia River Coho</td>
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<td>Being Developed</td>
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<tr>
<td>Columbia River Steelhead</td>
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<td>Designated 9/2/05(70FR52630)</td>
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<td>Steelhead Trout Critical Habitat</td>
<td>Designated 1/2/2006 (50 CFR Part 26)</td>
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</tbody>
</table>

The construction of the Mayfield Dam (Cowlitz River Hydroelectric Project [FERC No. 2016]) in 1961 eliminated access by anadromous fish to the upper Cowlitz River, and thus, to the Packwood Lake Project area prior to construction of the Project. The Cowlitz River Project was initially required to plant spring Chinook and coho salmon fry and fingerlings in tributaries of the upper Cowlitz River. Records show that 24,500 coho were planted in Lake Creek in 1976; 297,500 spring Chinook were planted in 1977; and 107,800 coho were planted in 1982 (Stober 1986). A returning trap and haul program began in 1994 for spring Chinook, fall Chinook, steelhead, and coho (Northwest Power and Conservation Council [NPCC] 2004b). As part of the Cowlitz River Hydroelectric Project settlement agreement of August 10, 2000, adult anadromous fish are being trapped and hauled to the upper Cowlitz River above Barrier, Mossyrock, and Cowlitz Falls dams. The target species under this agreement are Chinook, coho, and steelhead. There were also plans developed to release cutthroat trout above the dams (City of Tacoma 2000). These salmonids now have access to the upper Cowlitz River and tributaries, including Lake, Hall, and Snyder creeks. Fish no longer have access to the Project tailrace or stilling basin following construction of the tailrace barrier in October, 2007.

Energy Northwest, as part of its relicensing process, conducted two years of studies in the tailrace complex, the Cowlitz River, and Lake, Hall, and Snyder creeks. All three listed species (Chinook and coho salmon and steelhead trout) have been documented in the Project area.

Table BA.5-2 lists the beginning and ending dates of anadromous spawning surveys within the Project study area and the locations at which surveys were terminated (by river mile). Surveys were done twice monthly for the duration of the term listed below. The anadromous spawner surveys and the associated habitat data are discussed in further detail in the Anadromous Salmonid Habitat and Spawning Survey Report (EES
Consulting 2007a) and the Tailrace Slough Use by Anadromous Salmonids Report (EES Consulting 2007g).

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<tr>
<th>Creek</th>
<th>Beginning Date</th>
<th>Ending Date</th>
<th>Terminus Location (RM)</th>
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<td>7/26/06</td>
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<td>4/12/05</td>
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<td>3.70</td>
</tr>
<tr>
<td>Tailrace Slough (Including Cowlitz River)</td>
<td>7/26/04</td>
<td>7/26/06</td>
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5.1.1 Lower Columbia River Chinook Salmon

Background
West coast Chinook salmon (O. tshawytscha) found in the Cowlitz River system belong to the Lower Columbia River Evolutionarily Significant Unit (ESU), as defined by NMFS. NMFS completed a comprehensive status review of 15 ESU's and on March 24, 1999 listed the Lower Columbia River ESU of Chinook as threatened. That status was reaffirmed on June 28, 2005. The ESU includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River, as well as seventeen artificial propagation programs: the Sea Resources Tule Chinook Program, Big Creek Tule Chinook Program, Astoria High School (STEP) Tule Chinook Program, Warrenton High School (STEP) Tule Chinook Program, Elochoman River Tule Chinook Program, Cowlitz Tule Chinook Program, North Fork Toutle Tule Chinook Program, Kalama Tule Chinook Program, Washougal River Tule Chinook Program, Spring Creek NFH Tule Chinook Program, Cowlitz spring Chinook Program in the Upper Cowlitz River and the Cispus River, Friends of the Cowlitz spring Chinook Program, Kalama River spring Chinook Program, Lewis River spring Chinook Program, Fish First spring Chinook Program, and the Sandy River Hatchery (ODFW stock #11) Chinook hatchery programs (http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/CKLCR.cfm).

The abundances of natural-origin spawners range from near extirpation for most of the spring-run populations to over 7,841 for the Lewis River bright population. The fall-run Tule populations include a substantial percentage of hatchery-origin spawners in the spawning areas and may be sustained largely by hatchery production. Although quantitative information is not yet available, preliminary examination of scales indicates that almost all current spring-run spawners in the Washington part of this ESU are of hatchery origin. The majority of the spring run populations have been extirpated, largely as the result of dams blocking access to their high elevation habitat. The two bright Chinook populations (i.e., Lewis and Sandy) have relatively high abundances, particularly the Lewis population (cited from http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/Index.cfm).
Other streams in which fry and fingerlings were planted include Johnson Creek, Butter Creek, Skate Creek, Hall Creek, Smith Creek, Silver Creek, and the Ohanapecosh River. Chinook have been observed below the Project tailrace and in Lake Creek below the chute at RM 1.03 (from Energy Northwest PAD, 2004).

**Current Status of Species**
The Lower Columbia River ESU exhibits three major life history types: fall run (tules), late-fall run (brights), and spring run. The ESU spans three ecological zones: coastal (rain-driven hydrograph), western Cascade (snow- or glacial-driven hydrograph), and Columbia Gorge (transitioning to drier interior Columbia River basin ecological zones). The fall-run Chinook salmon populations are currently dominated by large-scale hatchery production, relatively high harvest, and extensive habitat degradation (discussed in previous status reviews). The Lewis River late-fall-run Chinook salmon population is the healthiest in the ESU and has a reasonable probability of being self-sustaining. The spring-run populations are largely extirpated as the result of dams, which block access to their high-elevation habitat. Abundances have largely declined since the last status review update (1998), and trend indicators for most populations are negative, especially if hatchery fish are assumed to have a reproductive success equivalent to that of natural-origin fish. In 2001, however, abundance estimates increased over the previous few years for most of the lower Columbia River ESU Chinook salmon populations. (Status information cited from [http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/CKLCR.cfm](http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/CKLCR.cfm)).

**Life History**
Historically, spawning of spring Chinook occurred above Tacoma’s Mayfield Dam site, particularly in the main stem Cowlitz River above Packwood and in the Cispus River. The historical upper Cowlitz adult population is estimated from 35,000 to 60,000 fish (Northwest Power and Conservation Council [NPCC] 2004a). Completion of the dam blocked access above the dam. Spring Chinook were passed over the dam from 1962-1966. From 1974-1980, spring Chinook were hauled to the upper Cowlitz. A returning adult trap and haul program began in 1994. Spring Chinook enter the Cowlitz River from March through June (NPCC 2004b). Natural spawning for spring Chinook occurs between late August and early October, with spawning primarily occurring in the main stem upper Cowlitz River above Packwood and in the Cispus River between Iron and East Canyon creeks (NPCC 2004a). Fry emerge between November and March, depending on time of egg deposition and water temperature; spring Chinook fry spend one full year in fresh water, and emigrate in their second spring as age-2 smolts (NPCC 2004b, from Energy Northwest PAD, 2004).

Historically, fall Chinook were distributed from the mouth to upper tributaries such as the Ohanapecosh and Tilton rivers. Fall Chinook were passed over the dam from 1962-1966. From 1967 to 1980, small numbers of fall Chinook were hauled to the Tilton and upper Cowlitz. A returning adult trap and haul program began in 1994. Fall Chinook enter the Cowlitz River from early September to late November. Natural spawning
occurs between September and November; the peak is usually around the first week of November. Fry emerge around March or April, depending on time of egg deposition and water temperature; fall Chinook fry spend the spring in fresh water and emigrate in the summer as subyearlings (NPCC 2004b, from Energy Northwest PAD, 2004).

**Current Distribution in Proposed Action Area**

Currently, the Cowlitz River Hydroelectric Project traps and hauls spring Chinook salmon from below the project’s dams to the upper Cowlitz River. Lower Columbia River Spring Chinook have been found in the upper Cowlitz River, lower Lake Creek and in the side channel of the Cowlitz River downstream of the Project tailrace (known as the Tailrace Slough). A natural barrier at RM 1.03 prevents access above that point in Lake Creek. See the Anadromous Salmonid Habitat and Spawning Survey Final Report (EES Consulting 2007a) for further details.

Ongoing efforts are directed at preserving and enhancing runs of these species in the upper basin above Cowlitz Falls. Chinook and coho salmon and steelhead trout are trapped at the Barrier Dam adjacent to the Cowlitz Falls Project salmon hatchery and are hauled to three sites in the upper Cowlitz Basin and released for spawning. A majority of the fish are released just upstream of the fish facility in Lake Scanewa, allowing upstream access to the remainder of the Cowlitz River Basin including the Cispus River. Fish are also released at a site directly on the Cispus River and at Packwood on the mainstem Cowlitz River (Franklin Bridge). Table BA.5-3 summarizes releases since 2005 of Chinook salmon.

<table>
<thead>
<tr>
<th>Table BA.5-3. Chinook Releases by WDFW (2005-2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>2005 Chinook</td>
</tr>
<tr>
<td>2006 Chinook</td>
</tr>
<tr>
<td>Totals</td>
</tr>
</tbody>
</table>

Chinook in the upper Cowlitz River typically spawn in August and September (J. Serl, personal communication, May 10, 2007). It is important to note that along with a variety of environmental factors that affect spawn timing, the trap and haul program is responsible for distributing fish to the upper Cowlitz River Basin. The dates of transport vary depending on return timing of fish downstream of the dam.

**Lake Creek**

Three adult Chinook salmon were documented in Lake Creek over the two years of surveys. Two Chinook salmon were documented in Lake Creek on August 11, 2004 and one was observed on August 25, 2004 along with a potential redd. These were the only Chinook salmon observed in Lake Creek during the course of the surveys.
Packwood Lake Hydroelectric Project  Biological Assessment  
FERC No. 2244  
February 2008

Cowlitz River

No pertinent salmonids or redds were observed in the 2000 ft section of the Cowlitz River immediately downstream of Lake Creek, which was surveyed in 2005 and 2006.

Hall Creek

Spawning surveys were shifted to the stream section upstream of Snyder Road, where substrate, velocities and channel type were suitable for salmonid spawning. The surveys were conducted from this point to RM 3.70, which is identified as the anadromous barrier in the Fish Passage Barriers Study Report (EES Consulting 2007b). No Chinook salmon were observed during the spawning survey period.

Snyder Creek

Snyder Creek from its confluence with Hall Creek, immediately below the Project tailrace, upstream to the end of the anadromous zone (RM 0.36), was surveyed twice-monthly from April 12, 2005 thru July 26, 2006. The survey ended at a culvert under a Forest Service road (see Fish Passage Barriers Study Report [EES Consulting 2007b]). No Chinook or redds were documented in Snyder Creek during the spawning survey period.

Tailrace Slough (Cowlitz River Side Channel)

The entire tailrace slough downstream of the mouth of the Project tailrace to its confluence with the mainstem Cowlitz River was surveyed twice monthly from July 26, 2004 to July 26, 2006. No Chinook salmon were observed over the course of the surveys. During some of the surveys the left side channel of the tailrace slough that possesses a majority of the accessible spawning habitat was dry.

Critical Habitat

The Endangered Species Act (Act) defines "critical habitat" for a threatened or endangered species as:

(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 1533 of this title (e.g., the Federal ESA), on which are found those physical or biological features
   (I) essential to the conservation of the species, and
   (II) which may require special management considerations or protection;
(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 1533 of this title (e.g., the Federal ESA), upon a determination by the Secretary that such areas are essential for the conservation of the species.
A final designation was published on September 2, 2005, for Lower Columbia River Chinook Salmon ESU, Upper Cowlitz River subbasin, effective January 2, 2006. Critical habitat is found in the mainstem Cowlitz River, but does not include Lake Creek or other tributaries within the Project (Figure BA.5-1).

5.1.2 Lower Columbia River Coho Salmon

Background
Originally part of a larger Lower Columbia River/Southwest Washington ESU, Lower Columbia coho were identified as a separate ESU and listed as threatened on June 28, 2005. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon, as well as 25 artificial propagation programs: the Grays River, Sea Resources Hatchery, Peterson Coho Project, Big Creek Hatchery, Astoria High School (STEP) Coho Program, Warrenton High School (STEP) Coho Program, Elochoman Type-S Coho Program, Elochoman Type-N Coho Program, Cathlamet High School FFA Type-N Coho Program, Cowlitz Type-N Coho Program in the Upper and Lower Cowlitz Rivers, Cowlitz Game and Anglers Coho Program, Friends of the Cowlitz Coho Program, North Fork Toutle River Hatchery, Kalama River Type-N Coho Program, Kalama River Type-S Coho Program, Washougal Hatchery Type-N Coho Program, Lewis River Type-N Coho Program, Lewis River Type-S Coho Program, Fish First Wild Coho Program, Fish First Type-N Coho Program, Syverson Project Type-N Coho Program, Eagle Creek National Fish Hatchery, Sandy Hatchery, and the Bonneville/Cascade/Oxbow complex coho hatchery programs (cited from: http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Coho/

Current Status of Species
Completion of Mayfield Dam in 1962 blocked access above the dam for coho. A returning adult trap and haul program began in 1994. The record shows coho were historically abundant in the Cowlitz River, with an estimated historical upper Cowlitz adult coho population ranging from 20,000 to 70,000 fish (NPCC 2004b). Thompson and Rothfus (1969 as cited in Harza 1996) reported coho spawning in most reaches and tributaries of the Cowlitz River, with coho counts at the Mayfield Dam site ranging from 22,701 to 31,000 between 1961 through 1969. Adult hatchery escapement at the Cowlitz Falls Salmon Hatchery ranged from 4,913 to 63,407 during 1967 - 1994, with an average return of 23,000 adults (Harza 1996).
Figure BA.5-1. Final Critical Habitat for the Lower Columbia River, Chinook Salmon ESU, Upper Cowlitz River Subbasin
**Life History**

Coho life histories are extremely variable, and coho examined in different years or from different locations or habitats within a basin may display different life history characteristics. The majority of coho salmon adults are 3-year-olds, having spent approximately 18 months in saltwater. The primary exception to this pattern are jacks, sexually mature males that return to freshwater to spawn after only 5-7 months in the ocean (Weitkamp et al. 1995).

The timing of upstream migrations is influenced by many factors; one of the most important appears to be river flow (Weitkamp et al. 1995). Coho salmon wait for freshets before entering rivers, so a delay in fall rains delays river entry and, potentially, time of spawning as well. Adult coho typically begin to enter the Cowlitz River from the ocean from August through February.

The majority of coho returns are late stock, which spawn from late November to March. Natural spawning occurs in the main stem and tributaries of the upper Cowlitz, Cispus, and Tilton rivers. Juvenile rearing occurs upstream and downstream of spawning areas. Juveniles rear for a full year before migrating as yearlings in the spring (NPCC 2004a, from Energy Northwest PAD 2004).

Coho juveniles in the Cowlitz River appear to reside in the river for one year before migrating downstream. While in freshwater streams, juvenile coho generally require habitat created by large woody debris and streamside vegetation. To survive during the winter, juvenile coho need to find shelter to avoid being swept downstream in the high currents. Coho escape to slow flowing backwater areas, side-channels, beaver ponds, and wetlands.

Habitat destruction (including lack of suitable winter habitat and increases in stream temperatures during the summer months), overfishing, artificial propagation, and poor ocean conditions have been cited as the causes of decline for coho salmon. Up to 80% of coho spawning in the Cowlitz are hatchery stock (Harza 1996; DE&S 1999).

**Current Distribution in Proposed Action Area**

Currently, the lower Cowlitz River projects trap and haul coho salmon from below the dams to the upper Cowlitz River. Coho have been found in the upper Cowlitz River, lower Lake Creek and in the side channel of the Cowlitz River adjoining the tailrace (tailrace slough). The natural barrier at RM 1.03 on Lake Creek prevents access above that point in Lake Creek to coho salmon. See Anadromous Salmonid Habitat and Spawning Survey Final Report (EES Consulting 2007a) for further details. Coho salmon are the most abundant of the Federal ESA-listed species in the vicinity of the proposed tailrace fish barrier as well as having been found in the Project stilling basin and tailrace.
Coho Salmon Spawning Surveys

Releases of Coho in the Upper Cowlitz River Basin far exceed the releases of any other anadromous species as depicted in Table BA.5-4 for 2004-2006. Coho salmon and/or their redds were observed in all streams surveyed.

<table>
<thead>
<tr>
<th>Species</th>
<th>Cispus</th>
<th>Franklin Bridge</th>
<th>Scanewa Day Use</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004/2005 Coho</td>
<td>733</td>
<td>4657</td>
<td>30698</td>
<td>36088</td>
</tr>
<tr>
<td>2005/2006 Coho</td>
<td>360</td>
<td>643</td>
<td>2557</td>
<td>3560</td>
</tr>
<tr>
<td>Totals</td>
<td>1093</td>
<td>5300</td>
<td>33255</td>
<td></td>
</tr>
</tbody>
</table>

Lake Creek

The anadromous zone of Lake Creek was surveyed on twice monthly beginning in July 2004 and through July 2006. Over the two-year period, a total of 85 fish were seen and 56 definite redds were documented. Of the 86 fish visually identified, 83 were coho and 55 of the 56 redds were made by coho. No carcasses were observed during any of the surveys. Peak spawning behavior for coho in Lake Creek during the two years of surveys fell between November 1 and January 31. Over 90% of fish and redds were identified during this period both years.

Figure BA.5-2 displays coho release timing at three sites in the upper Cowlitz River basin relative to spawning activity at sites surveyed by Energy Northwest, (lower Lake Creek, Hall Creek and the tailrace side channel).

During the 2004/2005 coho spawning period, a total of 36,088 coho adult salmon were released into the upper Cowlitz Basin, beginning the week of August 29, 2004 and continuing until the week of February 8, 2005. Spawning activity in the Energy Northwest survey area (lower Lake and Hall creeks and the tailrace slough), took place between the weeks of October 28, 2004 and February 8, 2005. Only 3,560 coho adults were released during the 2005/2006 season between the week of December 15, 2005 and the week of January 12, 2006 and all spawning activity in the survey area took place between the week of December 15, 2005 and March 9, 2006.
The entire tailrace slough downstream of the mouth of the Packwood tailrace to its confluence with the mainstem Cowlitz River was surveyed twice monthly from July 26, 2004 to July 26, 2006. A total of 34 coho salmon and 57 redds were observed over the two-year period. All but one of the 34 coho and all 57 definite redds were observed during the 2004/2005 season. For a majority of the 2005/2006 coho salmon spawning period, the water was abnormally high and turbid, making observations of fish and redds difficult. If water clarity was deemed even remotely acceptable when the biologists were on-site twice monthly, a survey took place. During some of the surveys, the left side channel of the tailrace slough that possesses a majority of the accessible spawning habitat was dry.

The entire coho spawning period during the 2004/2005 season in the tailrace slough took place between November 11 and December 21, 2004. Table BA.5-5 summarizes the surveys conducted during this period. The peak number of observations occurred on December 9, 2004 when 14 fish and 45 redds were observed. No carcasses were observed during any of the surveys.
Hall Creek

Spawning surveys were shifted to the stream section upstream of Snyder Road, where substrate, velocities and channel type were suitable for salmonid spawning. The surveys were conducted from this point to RM 3.70, which is documented as the anadromous barrier in the Fish Passage Barriers Study Report (EES Consulting 2007b). A total of 34 coho were observed along with 10 redds. All fish and redds were seen between December 29, 2005 and January 26, 2006. Table BA.5-6 summarizes the coho spawning period for the 2005/2006 season.

Snyder Creek

Snyder Creek from its confluence with Hall Creek, immediately below the Project tailrace, upstream to the end of the anadromous zone (RM 0.36), was surveyed twice monthly from April 12, 2005 thru July 26, 2006. The survey ended at a culvert under a Forest Service road (see Fish Passage Barriers Study Report [EES Consulting 2007b]). No adult anadromous salmonids or any redds were observed during any of the surveys; however, juvenile coho salmonids were observed in Snyder Creek during many of the surveys, as were cutthroat trout. A total of 24 coho salmon juveniles were observed below the barrier located immediately below the Forest Service Culvert crossing during the Fish Species Distribution and Composition Study (EES Consulting 2007c).

Cowlitz River Surveys

No salmonids or redds were observed in the 2000 ft section of the Cowlitz River immediately downstream of Lake Creek which was surveyed in 2005 and 2006 or the portion of the Cowlitz River below the tailrace slough surveyed from July 2004 to July.
2006. Surveys of this area were conducted concurrent with the surveys done on lower Lake Creek and the tailrace slough.

**Critical Habitat**
There is currently no critical habitat proposed for Lower Columbia River coho salmon.

### 5.1.3 Lower Columbia River Steelhead Trout

**Background**
Lower Columbia River steelhead (*O. mykiss*) populations were listed as a threatened species on March 19, 1998; threatened status was reaffirmed on January 5, 2006. The DPS includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind rivers, Washington (inclusive), and the Willamette and Hood rivers, Oregon (inclusive), as well as 10 artificial propagation programs: the Cowlitz Trout Hatchery (in the Cispus, Upper Cowlitz, Lower Cowlitz, and Tilton rivers), Kalama River Wild (winter- and summer-run), Clackamas Hatchery, Sandy Hatchery, and Hood River (winter- and summer-run) steelhead hatchery programs. Excluded are *O. mykiss* populations in the upper Willamette River basin above Willamette Falls, Oregon, and from the Little and Big White Salmon rivers, Washington. (cited from: [http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Steelhead/STLCR.cfm](http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Steelhead/STLCR.cfm))

**Current Status of Species**
Historically, winter steelhead trout were distributed throughout the upper Cowlitz, Cispus, and Tilton rivers. The estimated upper Cowlitz winter steelhead adult population is 2,000 to 17,000 fish (Northwest Power and Conservation Council 2004a). The state of Washington has initiated the Lower Columbia Steelhead Conservation Initiative (LCSCI) in an effort to develop a comprehensive approach to evaluate and restore Washington steelhead populations.

**Life History**
Steelhead trout, the anadromous form of rainbow trout, have a variable life history pattern. There are two distinct races of steelhead in the Cowlitz River - summer-run and winter-run, determined by the timing of spawning and extent of sexual maturity upon return to freshwater (Harza 1996).

Summer-run steelhead were rare in the Cowlitz River prior to implementation of a planting program in 1968. Of the 54,044 steelhead counted from 1962 through 1966 at Mayfield Dam, only 75 were observed during the July through October period (Thompson and Rothfus 1969, as cited in Harza 1996). The Cowlitz Trout Hatchery now produces 400,000 summer-run smolts annually for a projected return of 12,700 fish for sport harvest. Average return to the hatchery has ranged from 2,410 in 1988/89 to 16,429 in 1993/94 (Harza 1996, Table 4.5-2). Currently summer steelhead enter the Cowlitz River as immature fish from April through October, with spawning occurring from December through May. Fry emergence begins in March. Juvenile steelhead...
spend two years in freshwater, the first year rearing as smolts in the hatchery (WDW 1990 as cited in Harza 1996).

Winter steelhead were historically more abundant in the Cowlitz River prior to construction of the Mayfield Dam, with an annual run estimated at 22,000 fish (Moore and Clark 1948 as cited in Harza 1996). Currently the Cowlitz Trout Hatchery production goals are 600,000 smolts annually, with estimated adult returns ranging from 8,339 in 1990/91 to 30,200 in 1994/95 (Harza 1996 Table 4.5-2).

Known spawning areas included the mainstem Cowlitz River near Riffe and the reach between the Muddy Fork and the Clear Fork and the lower Ohanapecosh River. Adult migration timing for Cowlitz winter steelhead is from December through April (NPCC 2004b). Spawning time is generally March to June. Juvenile rearing occurs both downstream and upstream of the spawning areas (Northwest Power and Conservation Council 2004a). Wild steelhead fry emerge from March through May; juveniles generally rear in fresh water for two years; juvenile emigration occurs from April to May, with peak migration in early May (NPCC 2004b). A returning adult trap and haul program began in 1994 (NPCC 2004b) ([from Energy Northwest PAD, 2004]).

Adult steelhead trout require cool, deep holding pools during the summer and fall to rest in, prior to spawning. Habitat requirements for young steelhead include large woody debris, and a complex habitat of slow-flowing backwater areas, side-channels, beaver ponds, and wetlands to escape high flows during the winter months. The lack of the latter is believed to be a major factor in the decline of natural populations. Another factor is the decrease of summer stream flows from diversions, coupled with a lack of streamside vegetation, resulting in increased stream temperatures and reduced oxygen content of the water (State of Washington 1998; DE&S 1999).

**Current Distribution in Proposed Action Area**

Currently, the lower Cowlitz River projects trap and haul steelhead trout from below the project’s dams to the upper Cowlitz River. Spawner surveys for the Packwood Lake relicensing have not documented the presence of steelhead trout in lower Lake Creek and in the tailrace slough below the Project tailrace; however, a steelhead redd was noted in Lake Creek (approximately RM 0.3) in May 2007. An analysis of the natural barriers in Lake Creek indicated that a steelhead in excellent condition would be able to successfully navigate the barrier at RM 1.03. The next natural barrier, however, a falls at RM 1.95 on Lake Creek prevents access to steelhead trout above that point. See the Anadromous Salmonid Habitat and Spawning Survey Final Report (EES Consulting 2007a) and the Fish Barriers Report for the Packwood Lake Hydroelectric Project (EES Consulting 2007b) for further details.

**Critical Habitat**

Figure BA.5-3 shows Final Critical Habitat for the Lower Columbia River Steelhead ESU, upper Cowlitz River Subbasin. The Critical Habitat designation includes the mainstem Cowlitz River in the vicinity of the Project, as well as Lake, Hall and Johnson creeks.
Known spawning areas included the main stem Cowlitz near Riffe and the reach between the Muddy Fork and the Clear Fork and the lower Ohanapecosh River. Adult steelhead trout have not been observed in lower Lake Creek; however, juvenile steelhead trout have been captured in the Project stilling basin. One steelhead trout redd was observed during the Spring, 2007.

Steelhead trout release numbers were not available; however, a large majority of them are released just upstream of Cowlitz Falls in Lake Scanewa (personal communication, John Serl to Cory Warnock, January 20, 2007). Appendix BA-3 displays spawning survey information collected by WDFW in the upper Cowlitz River Basin over the past two years.

Steelhead Trout Spawning Surveys

Steelhead trout spawn in the Upper Cowlitz River Basin between February and June. Releases are managed concurrent with run timing downstream of Barrier Dam. No steelhead trout were observed in any of the survey areas during the two-year spawning survey study.

5.2 Listed Wildlife Species and Critical Habitat

The USFWS website included the following list of species and/or critical habitat that are considered to occur within the area and may be affected by the Project as shown in Table BA.5-7 below (see USFWS letter to FERC on March 6, 2007 and listing obtained from the web site in Appendix BA-1; list updated on August 8, 2007). As stated earlier, the bald eagle has been delisted since the March 2007 information was obtained.

<table>
<thead>
<tr>
<th>Table BA.5-7. Listed Terrestrial Species in the Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species</strong></td>
</tr>
<tr>
<td>Gray wolf</td>
</tr>
<tr>
<td><em>Canis lupus</em></td>
</tr>
<tr>
<td>Grizzly bear</td>
</tr>
<tr>
<td><em>Ursus arctos</em></td>
</tr>
<tr>
<td>Canada lynx</td>
</tr>
<tr>
<td><em>Lynx canadensis</em></td>
</tr>
<tr>
<td>Northern spotted owl</td>
</tr>
<tr>
<td>(<em>Strix occidentalis caurina</em>)</td>
</tr>
<tr>
<td>Marbled murrelet</td>
</tr>
<tr>
<td><em>Brachyramphus marmoratus</em></td>
</tr>
</tbody>
</table>
Figure BA.5-3. Final Critical Habitat for the Lower Columbia River, Steelhead Trout ESU, Upper Cowlitz River Subbasin
5.2.1 **Northern Spotted Owl**

**Background**
The northern spotted owl was listed as federally threatened on June 26, 1990 (USFWS 1990). Since that time, USFWS has conducted numerous status reviews and evaluations, determined critical habitat, and issued draft recovery plans. Revisions to the recovery plan have been recently proposed and are currently in the public comment period (USFWS 2007a). The revised plan includes an option to adopt greater flexibility in conservation area management, as well as research and experimental management focused on the possible role of barred owls in affecting northern spotted recovery. Historically, there have been approximately 11 northern spotted owl nest sites within the Packwood Lake Late Successional Reserve, of which the Project is a part.

**Life History**
The northern spotted owl is a medium-sized owl, cryptic in nature and coloration, closely resembling its cousin, the barred owl. Northern spotted owls inhabit temperate forests of the Pacific Coast region from southwestern British Columbia, through the Olympic and Cascade ranges in Washington and Oregon to north central California.

Northern spotted owls are principally nocturnal and spend much of the daylight hours inconspicuously perched in a protected roost location. Nest sites are generally located in previously excavated cavities or on platforms in large trees and northern spotted owls may use nests built by other species (USFWS 1992). Established pairs normally remain in the same territories from year to year and foraging areas may reach nearly 2500 acres (USFWS 1992)

**Biological Requirements**
Information on biological requirements as summarized in USFWS (1992) indicates the northern spotted owl is commonly associated with old-growth or mature conifer forest stands, especially during nesting, although younger stands that have late-successional stand remnant structures are also sometimes used, especially during times of dispersal (Thomas et al. 1990). Northern spotted owls typically roost in areas with large diameter trees and a high canopy closure; in the summer, roost sites are often in cooler locations, such as near a stream. A variety of forest types where prey (especially woodrats [*Neotoma* spp.] and northern flying squirrels [*Glaucomys sabrinus*]) occur are suitable as foraging habitat. During post-breeding periods of dispersal, northern spotted owls may prefer denser vegetation to avoid predation by great horned owls or may temporarily use stop-over habitats, lacking late succession characteristics (if prey items are available), which may otherwise be unsuitable for breeding.

**Factors of Decline**
Factors contributing to the decline of the northern spotted cited in the original USFWS Draft Recovery Plan (1992) include limited and declining habitat, predation and competition, and vulnerability to natural disturbance. Most recently, the USFWS (2007a) has proposed revisions to the northern spotted owl recovery plan, citing habitat loss, significant habitat modification, and competition with the more aggressive barred
owl as the most important threats to the recovery of the species. The revised plan includes an option to adopt greater flexibility in conservation area management, as well as research and experimental management focused on the possible role of barred owls in affecting northern spotted recovery.

**Population Trends**
No information is available on the numbers of birds or the distribution of the northern spotted owl prior to the arrival of settlers and subsequent forest practices. The USFWS (2007a) Recovery Plan indicates that in 1994 over 5,000 nesting pairs or resident single birds were recorded. Current data are insufficient to draw regional or local conclusions as to the trends of the northern spotted owl; statistical analysis results suggest the population in the vicinity of Mt. Rainier (approximately 12 miles from the Project area) is apparently in decline (USFWS 2007a).

**Current Status of Species**
The northern spotted owl is believed to be in decline throughout much of its range.

Since the northern spotted owl was listed, there were an estimated 11 northern spotted owl nest sites recorded within the Packwood Lake Late Successional Reserve. According to USFS (2004), two northern spotted owls were detected in the Lake Creek drainage in 2004. Habitat conditions are considered good; however, the number of barred owls in the area is a negative feature. Barred owls may competitively exclude northern spotted owls from suitable habitat (Courtney et al. 2004, USFS 2004).

**Critical Habitat**
The Project lies partially within an area designated as Critical Habitat (CHU WA-37) for northern spotted owl (USFWS 1992) (Figure BA.5-4). A large area suitable as northern spotted owl nesting, roosting, and foraging habitat occurs in the Packwood Late-Successional Reserve (LSR), and, more specifically, in the vicinity of the Project. Habitat conditions are considered good, but the presence of barred owls may inhibit the smaller northern spotted owls from calling, and thus affects standard survey procedures for this threatened species (USFWS 2007a). All designated critical habitat is upland and will not be affected by the Project.

No studies were requested by USFWS or other agencies participating in the relicensing, and none were performed by the Licensee to investigate the presence or status of northern spotted owls in the Project area. No nests have been observed in the vicinity of the Project and Energy Northwest is unaware of the locations of any nests in the area designated as Critical Habitat. Northern spotted owl is an upland, terrestrial species unlikely to be affected by routine Project operations. Unusual circumstances requiring repair to Project-associated facilities, e.g., major repair to access roads or the pipeline, if they involved prolonged use of large machinery, are a potential source of noise disturbance. In such an event, Energy Northwest will contact agency staff to determine whether northern spotted owls occur in the vicinity, or whether survey or other actions may be necessary.
5.2.2  Gray Wolf

Background
The gray wolf was originally listed as federally endangered in the conterminous 48 states in 1978. Since then the gray wolf has changed protection status in some locations, but in Washington State, the gray wolf is still considered endangered. In 1987, the USFWS issued a recovery plan for the Northern Rocky Mountain segment of gray wolf, of which the extreme portion of eastern Washington is part. Subsequently, Washington State gray wolves were included in the Western DPS with Northern Rocky Mountain wolves. Currently, the USFWS has not issued a recovery plan for gray wolf in western Washington or recovery objectives specific to this area, and has no plans to initiate recovery efforts.

Life History
The gray wolf is a highly social, but reclusive animal that forms packs consisting of breeding pair, their offspring and possibly other non-breeding adults or sub-adults. By age two to three, mature breeding pairs (i.e., alpha pair) produce young which are
nearly fully grown and capable of hunting on their own by age one. Following development into maturity, individuals may remain with the pack or disperse to find mates from other packs and start packs of their own (Smith 2002).

**Biological Requirements**
Historically, wolves utilized a broad spectrum of habitats, reflecting the habitat requirements of their prey. The USFWS (1987) Recovery Plan for gray wolf indicates that the key components of habitat are: (1) a sufficient, year-round prey base of ungulates (big-game) and alternate prey; (2) suitable and somewhat secluded den and rendezvous sites; and (3) sufficient space with minimal exposure to humans. Riparian habitats may be important as travel corridors.

**Factors of Decline**
Human-induced mortality was the primary factor in the historical decline of the species. Currently, illegal killing, poisoning, legal control, and collisions with automobiles are the most important sources of mortality impeding gray wolf recovery (Smith 2002).

**Population Trends**
Historically, the gray wolf ranged from coast to coast throughout much of North America. Following the arrival of colonizers in the east and later migrating western settlers, and aggressive predator control programs, gray wolf populations plunged to near extinction. Currently, there are over 300 wolves in the Northern Rocky Mountain region, including at least 30 breeding pairs (USFWS 2007c). Current numbers of wolves or their population trends are not known for Washington State, but there is no evidence for a breeding population in the state (Smith 2002).

**Current Status of Species**
The gray wolf is extremely rare in western Washington, with sporadic sightings mostly in the North Cascades (Johnson and Cassidy 1997, Smith 2002, USFS 2006a). There are no known breeding wolves or wolf packs on the Gifford Pinchot National Forest or in Washington State and no substantiated reports of gray wolf occurring in the state (WDFW 2006). According to Smith (2002), gray wolves observed in Washington probably represent transient individuals that have not formed packs and are not expected to increase in numbers given the current management approach. Unconfirmed sightings of gray wolves in the adjacent Goat Rocks Wilderness may be misidentifications (USFS 2004). Currently, the USFWS has not issued a recovery plan for gray wolf in western Washington or recovery objectives specific to this area. Current recovery plans for the gray wolf are most applicable to the eastern portion of the state mapped within the recovery zone. To date, the USFWS has no plans to initiate recovery efforts west of the Cascade crest.

**Critical Habitat**
No critical habitat for the species has been designated.

No studies were requested or performed by the Licensee to investigate the presence or status of the gray wolf in the Project area. Gray wolves are not known to occur in the
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Project vicinity. The gray wolf is an upland, terrestrial species unlikely to be affected by the Project.

5.2.3 Grizzly Bear

Background
The grizzly bear was originally listed as federally threatened in 1975 in the lower 48 conterminous states. USFWS has established several recovery zones throughout the western United States; the North Cascades Ecosystem Recovery Zone is the only zone in western Washington. The USFWS (2004) has determined that reclassification of grizzly bears in the North Cascades zone as endangered is warranted, but currently precluded.

Life History
The grizzly bear is a massive, long-lived species that is generally solitary in nature and has a large home range; apart from breeding periods, adult bears are generally not observed together. Following mating in late spring and summer, cubs are birthed and nursed in denning sites and continue to remain with the mother for up to three years before dispersing; sexual maturity is not reached until at least 5-7 years of age (USFWS 1993b).

Biological Requirements
Preferred habitats of grizzly bears include sub-alpine meadows and open or semi-open forests, but individuals are very wide-ranging and can be found in diverse habitats. Dens are typically located far away from human activity on steep slopes where snow accumulation is deep and persistent. Seasonal movements often occur associated with patterns of newly sprouted vegetation, ripening berries, spawning salmon runs, and the availability of other prey, such as marmots.

Factors of Decline
In the past grizzly bears were killed in large numbers under predator control programs, fur trapping, unregulated hunting, and to eliminate perceived threats to human life. Loss of habitat and fragmentation of remaining habitats, road building into previously remote areas, and conflicts with other human activities also contributed to the decline of the species (USFWS 1993b).

Population Trends
Historically, an estimated 50,000 grizzly bears may have roamed the Western United States. The species was subsequently extirpated throughout much of this area, and the current population in the lower 48 states may be fewer than 1,000 bears, concentrated in a few discontinuous areas. Population trends are believed to be stable or slowly increasing in most of these areas (USFWS 2004).

Current Status of Species
Current population levels in western Washington (North Cascades Recovery Zone) are unknown, but are believed to be very low, possibly fewer than 20 animals (USFWS
2004). Although this species is probably not established south of Snoqualmie Pass, individual grizzly bears are wide-ranging and occasional, possible detections have been reported as far south as the Mount St. Helens area (Johnson and Cassidy 1997). These reports typically lack detailed documentation, and may often represent misidentified black bears. Grizzly bear is unlikely to occur in the Project vicinity other than as a rare transient (USFS 2004).

**Critical Habitat**
The USFWS has not designated critical habitat for grizzly bear, opting instead to establish recovery zones. The North Cascades zone of north central Washington is located more than 100 miles north of the Action area. To date, the Service has not issued a recovery plan for grizzly bear in the Cascades or recovery objectives for this area, and has no plans to initiate recovery efforts.

No studies were requested or performed by the Licensee to investigate the presence or status of the grizzly bear in the Project area. Grizzly bears are not known to occur in the Project vicinity. The grizzly bear is an upland, terrestrial species unlikely to be affected by the Project.

### 5.2.4 Canada Lynx

**Background**
The Canada lynx was originally listed as federally threatened in 2000 in the lower 48 conterminous states. USFWS has established several core recovery areas throughout the northern United States; the North Cascades is the only core recovery area in western Washington; secondary and peripheral areas also occur in western Washington. A Lynx Recovery Plan has been adopted by the Washington Department of Fish and Wildlife (WDFW 2001).

**Life History**
The Canada lynx is a medium-sized cat that is highly mobile and has a large home range. Its population and distribution is closely tied to its main prey, snowshoe hare (Ruediger et al 2000). Populations in northern boreal regions fluctuate in response to snowshoe hare population level cycles; however this cycling has not been found in Washington (Stinson 2001)

**Biological Requirements**
Canada lynx inhabit mesic coniferous forests with cold, snowy winters. Canada lynx survivorship, distribution, and population dynamics are closely tied to those of snowshoe hare, its primary prey. Den sites are commonly composed of large woody debris in older regenerating stands or mature forests.

**Factors of Decline**
Canada lynx mortality is most commonly due to fur trapping and starvation due to low snowshoe hare numbers. Lynx are killed on highways in collisions with automobiles.
and predated by mountain lion, coyote, wolverine, gray wolf, and other lynx (Ruediger et al 2000).

Population Trends
Information on historical Canada lynx populations are scarce; it is assumed that the species was never very abundant; however populations did decline in the 1900s (Stinson 2001).

Current Status of Species
Current population levels in Washington probably number fewer than 100 individuals (Stinson 2001). Canada lynx is unlikely to occur in the Project Area.

Critical Habitat
Six Lynx Management Zones have been identified by WDFW in Washington including the Okanogan Forest and others in the northeast part of the state (WDFW 2001).

No studies were requested or performed by the Licensee to investigate the presence or status of the Canada lynx in the Project area. Canada lynx are not known to occur in the Project vicinity. The Canada lynx is an upland, terrestrial species unlikely to be affected by the Project.

5.2.5 Marbled Murrelet

Background
The marbled murrelet was originally listed as federally threatened in 1992 in Washington, Oregon, and California. USFWS has established six conservation zones along the Pacific coast from Washington to California; Zones 1 and 2 occur in western Washington.

Life History
The marbled murrelet is a small diving seabird that ranges along the Pacific coast from Alaska to California. Nesting occurs in inland coniferous forests and females lay one egg per year. The primary food source is fish and invertebrates in nearshore marine environments (USFWS 1997).

Biological Requirements
The marbled murrelet nests in primarily old-growth or mature forests in trees with large branches. They require nearshore marine waters with sufficient prey resources for feeding.

Factors of Decline
Marbled murrelet mortality is most commonly due to loss of nesting habitat, poor reproductive success due to vulnerability to predators in highly fragmented habitat, net fishing and oil spills (USFWS 1997)
**Population Trends**

Historically, marbled murrelets were considered numerous in Washington. Declines occurred due to habitat loss in the 1900s. Population trends are believed to be stable or slowly decreasing in the state (USFWS 1997).

**Current Status of Species**

Current breeding numbers in western Washington are estimated at 5000 birds. Marbled murrelet is unlikely to occur in the Project Area.

**Critical Habitat**

The USFWS has designated critical habitat for the marbled murrelet. The nearest critical habitat is 1.5 miles west of the Project area; the USFWS is proposing this habitat near the Project be excluded from critical habitat designation (USFWS 2006).

No studies were requested or performed by the Licensee to investigate the presence or status of the marbled murrelet in the Project area. Marbled murrelets are not known to occur in the Project vicinity.

### 5.3 Listed Plants Species and Critical Habitat

The USFWS and USDA Forest Service provided a list of federally listed and proposed endangered and threatened plant species that have the potential to occur within the Packwood Lake Hydroelectric Project Rare Plant Study area (USFWS 2007b; USDA Forest Service 2006b). The combined list includes three plant species shown below in Table BA.5-8.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Federal Status</th>
<th>Habitat</th>
<th>Habitat suitability in Study area</th>
<th>Identification period</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Howellia aquatilis</em></td>
<td>Howellia</td>
<td>Threatened</td>
<td>Low elevation minerotrophic wetland community types, 10 to 2300 ft in elevation.</td>
<td>Low</td>
<td>April - August</td>
</tr>
<tr>
<td><em>Lupinus sulphureus ssp. Kincaidii</em></td>
<td>Kinkaid’s sulfur lupine</td>
<td>Threatened</td>
<td>Native upland prairies and open oak woodlands at low elevations.</td>
<td>Low</td>
<td>April – June</td>
</tr>
<tr>
<td><em>Sidalcea nelsoniana</em></td>
<td>Nelson’s checker-mallow</td>
<td>Threatened</td>
<td>Along streams and in meadows, prairies, grasslands and other open places at low elevations.</td>
<td>Low</td>
<td>May – Sept.</td>
</tr>
</tbody>
</table>

Comprehensive field surveys for rare plants, including federally listed species, occurred in the Project area in 2005 and 2006. No federally listed plant species or appropriate habitats were located in the Study area (Beck 2007).

The following section describes the life history, habitat requirements, distribution, and other factors important for survival for each species.
5.3.1 Howellia

Howellia (Howellia aquatilis) is a member of the bellflower family (Campanulaceae). This species historically occurred over a large area in the Pacific Northwest. It is a hydrophytic annual plant that grows from 4 – 24 inches in height. It has extensively branched stems with submerged and emergent flowers. Low genetic variability of howellia limits the species to a highly specific habitat (USFWS 1994). Howellia is restricted to seasonally inundated, shallow water areas, and the edges of deep ponds that are partially bordered by deciduous trees. Seed germination for this species occurs only when ponds dry out and the seeds are exposed to air. The size of the population typically varies from year to year depending on the extent of the area that becomes desiccated (WNHP 1997). The species is therefore very sensitive to any changes in the surface or subsurface hydrology, and subtle changes to this environment can be devastating to a population. Howellia is threatened by competition from exotic species, impacts due to timber harvest, and grazing and trampling by livestock (WNHP 1997).

Howellia was placed on the federal list of threatened species in 1994. Currently howellia is known to exist in Washington, Montana and Idaho, but has been extirpated from California, Oregon, and some sites in Washington and Idaho (WHNP 1997). The wetland habitats in the Project study area do not have the specific seasonal inundation and desiccation regime that is required to support howellia.

5.3.2 Kinkaid's Sulfur Lupine

Kinkaid’s sulfur lupine (Lupinus sulphureus spp. kincaidii) is a member of the pea family (Fabaceae). This species historically occurred west of the Cascade Mountains from Douglas County, Oregon to Lewis County, Washington. It is a perennial plant that grows 16 to 32 inches in height. It is associated with native upland prairies and open oak woodlands that have a history of fire disturbance. Kincaid’s sulfur lupine is restricted to mesic to slightly xeric soils in native upland prairies. Seed dispersal occurs when seed pods dry and expel their seeds. This species requires occasional burning to limit shading by trees, although it is found in association with fire-resistant Oregon white oak. Kincaid’s sulfur lupine is threatened by habitat loss due to agricultural activities, urban development, roadside maintenance, and herbicide application (WNHP 1997).

Kincaid’s sulfur lupine was placed on the federal list of threatened species on January 25, 2000. It is listed as threatened by the state of Washington. Kincaid's lupine is known to exist at two sites in Lewis County Washington (USFWS 2000). The Project study area does not have undisturbed prairie and, thus, lacks suitable habitat. Any existing grasslands in the lowland portions of the Project study area have been subjected to repeated disturbances, including residential development, agriculture, grazing, mowing, and invasion by non-native species.
5.3.3 **Nelson’s Checker-Mallow**

Nelson’s checker-mallow (*Sidalcea nelsoniana*) is a member of the mallow family (Malvaceae). This species historically occurred in western Oregon and Washington between southern Benton County, Oregon and Lewis County, Washington. It is a perennial herb that grows between 16 and 40 inches in height. Flowering occurs as early as mid-May and as late as September. It is associated with streams, meadows, swales, wet depressions, riparian areas, and other open areas (WNHP 1997). This species occurs in areas of little or no shade and does not tolerate encroachment by woody species. Its habitat requirements were met by the periodic burning that selected against trees and other woody species. Nelson’s checker-mallow is threatened by habitat loss due to grazing, agricultural activities, urban development, roadside maintenance, fire suppression, and stream alterations (USFWS 1993a). Any suitable habitat in the lowland portions of the Project study area have been subjected to repeated disturbances, including residential development, agriculture, mowing, fire suppression, grazing, and invasion by non-native species.

Nelson’s checker-mallow was placed on the federal list of threatened species in 1993. It is listed as threatened in Washington. Nelson’s checker-mallow is known from two sites in Lewis County, Washington (WNHP 1997, USFWS 1993a). Any appropriate habitat for Nelson’s checker-mallow in the lowland portions of the Project study area has been subjected to repeated disturbances, including residential development, agriculture, grazing, mowing, and invasion by non-native species.
6.0 EFFECTS OF THE ACTION ON LISTED SPECIES

Energy Northwest has conducted a series of studies within the Packwood Lake Hydroelectric Project boundaries and associated study areas to examine potential Project effects on existing federally listed Threatened or Endangered species. The summary of these Project effects is found below.

6.1 Fish

Studies conducted to date have determined that Project effects as they relate to fisheries issues and the associated habitat inside the Project boundaries are limited.

6.1.1 Packwood Lake

No threatened or endangered fish are found in Packwood Lake, since natural barriers in lower Lake Creek (at RM 1.03 and RM 1.95) prevent access to the lake from the Cowlitz River. Therefore, there is No Effect to these species in Packwood Lake and its tributaries.

6.1.2 Lake Creek

Energy Northwest currently releases a minimum of 3 cfs of Packwood Lake water into lower Lake Creek to protect resident stream fish and other aquatic species. Additional accretion as a result of snowmelt and groundwater occurs along the 5.4 mile stretch of lower Lake Creek prior to the confluence with the Cowlitz River.

No threatened or endangered fish are found in the 1,464-ft-long reach immediately below the drop structure, because natural barriers in lower Lake Creek prevent access to the reach. Therefore, there is No Effect to listed species in that reach.

Very little spawning habitat (gravel substrate) exists in the lowest 0.8 mile of the creek above its confluence with the river. There are few pieces of large wood or other large roughness elements in this lower section of Lake Creek that would provide gravel retention areas. The lack of large wood is likely the result of past forest practices and human disturbance that is not Project related. The low amount of spawning-sized gravel in the lower 0.8 miles of Lake Creek is likely the combined result of the lack of structure to hold gravel, few sediment sources downstream of the drop structure, and reduced transport from upstream reaches.

Results of the Lake Creek Instream Flow Study (EES Consulting 2007i) indicate that spawning and rearing habitat is limited by the current instream flow releases from the drop structure when compared to maximum WUA. However, as described above, analysis of spawning habitat on selected transects indicates that gravel is scarce in lower Lake Creek, and that much of the gravel that is present in lower Lake Creek is often perched higher on the banks.
Energy Northwest proposes to increase flows in lower Lake Creek according to the schedule in Table BA.3-1, above.

In addition, Energy Northwest proposes to enhance the habitat in lower Lake Creek via the addition of instream structures and importation of gravels. These activities will increase the amount of spawning and rearing habitat in Lake Creek over the current Project operation and the without-Project scenarios. Therefore, the Project May Affect, but is Not Likely to Adversely Affect, the threatened species in Lake Creek.

6.1.3 Hall Creek

Energy Northwest surveyed the Project flume over Hall Creek in 2004 (EES Consulting 2005). Coho salmon adults were found spawning upstream of Snyder Road, above the Project flume. It was determined that the Project flume did not impede fish passage in any way and was not a barrier to upstream migration for any of the species listed under the Endangered Species Act (see Fish Passage Barriers Study Report, EES Consulting 2007b). Therefore, there is No Effect to listed fish species in Hall Creek.

6.1.4 Snyder Creek

Analysis concluded this crossing would be considered a partial barrier to upstream migration of adult coho salmon. No Chinook salmon or steelhead trout have been documented or observed in Snyder Creek. Energy Northwest proposes to reroute the tailrace crossing to bypass the barrier within the first five years of the new license term, in consultation with the natural resource agencies and tribes. With these actions the Snyder Creek crossing May Affect, Not Likely to Adversely Affect coho, Chinook or steelhead.

6.1.5 Tailrace Slough

Currently, the Project shutdown for maintenance purposes occurs on or about October 1 and typically lasts until the third week in October. During this period, the water supplied via generation to the tailrace slough is stopped. The shutdown coincides with the spawning timing for Chinook salmon, and rearing for coho salmon and steelhead, rainbow and cutthroat trout.

The percent of the water contributed from the Project tailrace into the tailrace slough is highly variable from year to year (and sometimes monthly) due to the dynamic nature of the Cowlitz River. During some years, a large amount of river water flows through the side channel into which the Project tailrace empties. During other years, however, with the current timing of the project outage, water from the Project may be important in providing necessary habitat for spawning and rearing anadromous salmonids, particularly for incubating eggs. Fish presence surveys and analysis, and associated habitat quantification studies have been conducted to assess the circumstances that currently exist. The Tailrace Use by Anadromous Salmonids Study Report (EES Consulting 2007g) documented fish species presence in the tailrace slough at different
times during the year. The Tailrace Slough Instream Flow Study (EES Consulting 2007h) analyzed the tailrace slough and the potential impacts of the Project, as the tailrace slough was configured during the summer of 2006.

The operation of the Project as proposed for the new license term with planned outage to begin August 15, and with a fish barrier in place, May Affect, but is Not Likely to Adversely Affect coho, Chinook or steelhead spawning in the Cowlitz River side channel below the tailrace. The tailrace barrier was previously addressed in the BA and Biological Opinion for that structure issued by NOAA/NMFS September 24, 2007.

The operation of the Project as proposed for the new license term with planned outage to begin August 15, and with a fish barrier in place, May Affect, but is Not Likely to Adversely Affect coho, Chinook or steelhead spawning in the Cowlitz River side channel below the tailrace. The tailrace barrier was previously addressed in the BA and Biological Opinion for that structure issued by NOAA/NMFS September 24, 2007.

Tailrace slough is the discharge point for the Project’s tailrace water and Spring Chinook, coho salmon, and steelhead trout are all known to spawn in the Cowlitz River in or near the tailrace slough. There is a potential for these species to spawn in areas that may later become dewatered as a result of unplanned outages from the Project.

The tailrace slough area of the Cowlitz River is a dynamic channel where habitat and flow characteristics change frequently depending on high water events in the mainstem Cowlitz River. Scenarios ranging from a majority of the Cowlitz River flowing through the tailrace slough to none of the Cowlitz River directed down the slough have occurred in the past 3 years.

A total of 22 unplanned outages occurred during the last 10 years between June 30, 1998 and the end of 2007. A variety of unanticipated malfunctions led to these outages including:

- Line faults
- Lightning strikes
- Governor issues
- Exciter issues

The duration of the outages varied greatly depending on the cause. Over 72% of the outages that occurred over the last 10 years were less than 19 hours from shutdown to re-start. The other 28% of the outages ranged from 48 hours to 441 hours in total duration. The longest outage was the result of a main transformer failure. Forced outages occurred for approximately 973.3 hours during this 10 year period. A transformer failure is quite rare and removing the single transformer failure (440.5 hours) results in revised approximately 532.8 hours of unplanned outages. Given an operating potential of 87,600 hours over that 10 year period, only 0.6% of that time resulted in unplanned outages. Figure BA.5-5 documents these unplanned outages and their individual durations.
Figure BA.5-6 shows the unplanned outages and spawning and incubation periodicity with median daily Cowlitz River flows at Packwood between 1998 and 2007. Eighteen of the 22 unplanned outages occurred during at least one of the three species incubation periods.

- **Steelhead** – Five unplanned outages occurred in the last 10 years during the period of time when steelhead could potentially be incubating in the tailrace slough (April – July). Median daily Cowlitz River flows during this period of time fluctuated between 1095 cfs and 3980 cfs. The lower range of river flow could cause the slough to dewater during an unplanned outage. It is also important to note that during two years (2004-2006) of comprehensive spawning surveys done by Energy Northwest on a bi-weekly basis in the tailrace slough, no steelhead spawners or redds were observed (EES Consulting 2007a).

- **Spring Chinook** - Twelve unplanned outages took place in the last 10 years during the incubation period for Spring Chinook in the tailrace slough (October – March). Median daily Cowlitz River flows ranged from 631 cfs to 2340 cfs. The lower range of river flow could cause the slough to dewater during an unplanned outage. The longest outage occurred during this time (440.5 hours) as a result of a main transformer failure which is an extremely unusual event. During the two years of
spawning surveys conducted by Energy Northwest in the tailrace slough from 2004 to 2006, no Chinook spawners or redds were observed.

- **Coho** - Seven unplanned outages occurred during the coho incubation period (December – May) in the tailrace slough in the last 10 years. The median daily Cowlitz River flows fluctuated from 752 cfs to 2340 cfs. The lower range of river flow could cause the slough to dewater during an unplanned outage. During the two years of spawning surveys conducted by Energy Northwest in the tailrace slough, a total of 34 coho and 57 redds were observed during this time period (EES Consulting 2007a).

Some of the outages noted above are described twice due to their occurrence during more than one species incubation period. A total of 18 unplanned outages occurred during the potential timing of incubation for the three species in the tailrace slough. As the secondary y-axis on Figure BA.5-6 describes, 13 of the 18 outages (72%) were less than 19 hours in duration. It is likely that incubating steelhead, Chinook and coho residing in the gravel could withstand this short duration of potential dewatering due to the time required for the stilling basin and tailrace canal to empty, the residual water remaining in the slough, and the intragravel water present in the river.

Based on the low percentage of operating time for unplanned outages (0.6%), the short duration of most (72%) of the outages, the natural Cowlitz flows and intragravel water that will protect incubating salmon and steelhead during most of the year, and the continuation of flows in the tailrace during the low-flow period from September 15 through October; Energy Northwest considers the risk of unplanned outages to be extremely low to listed fish species downstream of the project tailrace in the tailrace slough area. It is also important to note that a major component of entrance and spawn timing is related to the timing of the trap and haul program conducted by WDFW. Further, the number of fish that are transported from Barrier Dam to the Skate Creek Road Bridge (Franklin Bridge) and the dates of transport vary depending on the returns of fish downstream of Barrier Dam.
Figure BA.5-6. Median Daily Cowlitz River Flows Correlated With Unplanned Outages and Fish Species Periodicity
6.2 Wildlife

The Project is not likely to affect listed wildlife species.

6.2.1 Gray Wolf

The gray wolf is an upland, terrestrial species unlikely to be affected by the Project. It is not currently known to occur in the Project area, but is possible as a transient.

6.2.2 Grizzly Bear

The grizzly bear is an upland, terrestrial species unlikely to be affected by the Project. It is not currently known to occur in the Project area, but is possible as a transient.

6.2.3 Northern Spotted Owl

Northern spotted owl is known to occur in the Gifford Pinchot Forest in the general vicinity of the Project, although no nesting sites have been documented within the Project boundary or within the area around Packwood Lake. Energy Northwest is unaware of the locations of spotted owl nests within a mile of the Project area. No studies of spotted owls were requested for relicensing, so no surveys were conducted, so only observations incidental to other studies have been made.

USFS (2004) suggests there is the possibility that noise generated from Energy Northwest employees accessing Project facilities might disturb northern spotted owls. Should this species nest in the future near a Project facility, there is a low potential for disturbance (noise or visual). Northern spotted owls are upland, terrestrial species and it is therefore unlikely that the Project will impact them. Furthermore, since the Critical Habitat includes the area where the Project facilities have existed for many years, and routine operation of the Project has been ongoing, if a spotted owl nest has existed near the Project, or if an owl established a new nest within the Project boundary, they obviously will not be disturbed by any noise from the Project. The Project will have no foreseeable effect on the Critical Habitat Unit for Northern Spotted owl.

6.2.4 Canada Lynx

Canada lynx is an upland, terrestrial species unlikely to be affected by the Project. It is not currently known to occur within or near the Project area. Therefore the Project will have no foreseeable effect on Canada lynx.

6.2.5 Marbled Murrelet

Marbled murrelet is an inland-nesting seabird unlikely to be affected by the Project. It is not currently known to occur within the Project area; however critical habitat is located
1.5 miles west of the Project area (USFWS 2006). The USFWS is proposing that this habitat be excluded from critical habitat designation (USFWS 2006).

6.3 **Plants**

The habitat suitability for the three listed plants in the Project area is low. There are no likely effects of the action on any of the listed species.

6.3.1 **Howellia**

The Project is anticipated to have no effect on Howellia or its habitat. Critical habitat has not been designated for this species. The Project area does not presently contain the requisite habitat features, nor has any Howellia been located in the Project study area. Therefore, the continued operation of the Project is anticipated to have no effect on either individual plants or the continuation of the species.

6.3.2 **Kinkaid’s Sulfur Lupine**

The Project is anticipated to have no effect on Kinkaid’s sulfur lupine or its critical habitat. Critical Habitat has been designated for Kincaid’s sulfur lupine (Federal Register: October 31, 2006 Volume 71, Number 210). In Washington, two populations of Kincaid’s sulfur lupine are located in far western Lewis County in upland prairie and open oak woodland habitat. The Project area does not presently contain the requisite habitat features, nor has any Kinkaid’s sulfur lupine been located in the Project study area. Therefore the continued operation of the Project is anticipated to have no effect on either individual plants or the continuation of the species.

6.3.3 **Nelson’s Checker-Mallow**

The Project is anticipated to have no effect on Nelson’s checker-mallow or its habitat. Critical habitat has not been designated for this species. In Washington, two populations of Nelson’s checker-mallow are located in far western Lewis County in prairie and grassland habitat. The Project area does not presently contain the requisite habitat features, nor has any Nelson’s checker-mallow been located in the Project study area. Therefore the continued operation of the Project is anticipated to have no effect on either individual plants or the continuation of the species.
7.0 CUMULATIVE EFFECTS

Cumulative effects are those effects of future State or private activities, not involving Federal activities that are reasonably certain to occur within the action area (50 CFR 404.02).

7.1 Previous and Ongoing Projects in the Action Area

There are no other ongoing projects or activities in the Action Area that would affect the listed resources. Below the Action Area, the Cowlitz River Hydroelectric Project received a new federal license in 2003. The Cowlitz River Project includes the Barrier, Mossyrock and Mayfield dams. The licensee, Tacoma Power, is engaged in activities to restore listed anadromous fish to the Cowlitz River and provide passage into the upper watershed where they can reach the Packwood Lake Hydroelectric Project area. Other activities that affected fish and wildlife habitat in the area include previous logging, recreation and development.

7.2 Fish

No non-federal activities are known within the action area that would have a cumulative negative impact on federally listed fish.

7.3 Wildlife

No non-federal activities are known within the action area that would have a cumulative negative impact on federally listed wildlife.

7.4 Plants

No non-federal activities are known within the action area that would have a cumulative negative impact on federally listed plant species.
8.0 CONCLUSIONS

8.1 Fish

Based on the results of the studies for the Project, the proposed action listed in Section 3.4.1 would likely have an overall beneficial effect on federally listed fish species. Beneficial effects on critical habitat and habitat used by all listed fish species would primarily occur in the lower 1.0 miles of Lake Creek. In this section of the creek Chinook spawning and rearing habitat, coho spawning habitat and steelhead spawning and rearing habitat would be increased due to increased flows, LWD structures, spawning gravel and channel maintenance flows. Accretion between the Project drop structure at RM 5.4 and the anadromous barriers adds substantial flow to Lake Creek.

As a result of the actions proposed by Energy Northwest, as outlined in Section 6.1, Energy Northwest has made the following determinations:

- Chinook Salmon: May Affect, Not Likely to Adversely Affect
- Coho Salmon: May Affect, Not Likely to Adversely Affect
- Steelhead Trout: May Affect, Not Likely to Adversely Affect
- Chinook Critical Habitat: May Affect, Not Likely to Adversely Affect
- Steelhead Critical Habitat: May Affect, Not Likely to Adversely Affect

8.2 Wildlife

Northern spotted owl is the only federally listed wildlife species currently likely to occur in the Project area. No specific aspect of Project operations has been identified that is likely to affect this species. Continued operation of the Project “may affect, but is unlikely to adversely affect” northern spotted owl.

The possible transient occurrence of gray wolf or grizzly bear is unlikely to be affected by the Project.

Canada lynx is not likely to occur within or near the Project area.

Marbled murrelet is not likely to occur within the Project area; the nearest critical habitat for marbled murrelet is 1.5 miles west of the Project area (USFWS Critical Habitat Portal).

8.3 Plants

No federally listed Endangered or Threatened species were located in the Packwood Lake Hydroelectric Project area. The potential federally listed species for this Project require low elevation prairie, grassland habitats or other specialized habitats. The habitats required for these listed species are not present in the Study area and thus, the Project is determined to have “no effect” on federally listed species.
9.0 REFERENCES


Energy Northwest. 1965. Appraisal-Impact on Recreation Resources; Exhibit No. 11 “Packwood Lake Level Comparison Historical Limits and License Limits During Recreation Season.”


USDA Forest Service. 2006b. Region 6 USFS Sensitive Species Plant List, April 2006.


APPENDIX BA-1

ESA SECTION 7 CORRESPONDENCE AND SPECIES LISTS

FOR

PACKWOOD LAKE HYDROELECTRIC PROJECT RELICENSING
In a letter dated February 23, 2004, Energy Northwest (EN) asked the Federal Energy Regulatory Commission (Commission) to designate it as the non-federal representative for the purpose of informal consultation with the U.S. Fish & Wildlife Service (FWS), pursuant to Section 7 of the Endangered Species Act, for the Packwood Lake Hydroelectric Project. By copy of this letter, the Commission designates NE as the Commission's non-federal representative to conduct informal consultation with your agency.

The role of the non-federal representative includes conducting studies, developing and supplying information, attending meetings, ensuring that pertinent endangered species information is maintained in a project file, developing a draft biological assessment, participating in informal consultation with the FWS, and keeping FERC apprised of its actions. We recommend that NE set up a meeting with your office to discuss how the informal consultation will be conducted.
The Commission’s contact person for this project is Kenneth Hogan. If you have any questions please contact Mr. Hogan at (202) 502-8434 or via e-mail at kenneth.hogan@ferc.gov.

Sincerely,

Timothy J. Welch
Branch Chief
Hydro West Branch 2

cc:  Mr. D. W. Coleman
Manager, Regulatory Programs
Mail Drop PE20
P.O. Box 968
Richland, WA  99352-0968

Ms. Laura Schinnell
Project Scientist, Regulatory Services
Mail Drop 1030
P.O. Box 968
Richland, WA  99352-0968
Dear Messrs. Peck and Bellerud:

In a letter dated February 23, 2004, Energy Northwest (EN) asked the Federal Energy Regulatory Commission (Commission) to designate it as the non-federal representative for the purpose of informal consultation with the U.S. Fish & Wildlife Service (FWS), pursuant to Section 7 of the Endangered Species Act, for relicensing of the Packwood Lake Hydroelectric Project. By letter dated March 10, 2004, the Commission designated EN as the Commission's non-federal representative to conduct informal consultation with the FWS. In this letter, we are clarifying that EN is considered the Commission’s non-federal representative to conduct informal consultation with NOAA Fisheries as well. We expect that this informal consultation would pertain both to relicensing of the project and the possible installation of a tailrace barrier at the project.\(^1\)

---

\(^1\) For a brief history of the project, see the Commission’s letter to the licensee, dated September 29, 2005.
The role of the non-federal representative includes conducting studies, developing and supplying information, attending meetings, ensuring that pertinent endangered species information is maintained in a project file, developing a draft biological assessment, participating in informal consultation with the FWS and NOAA Fisheries, and keeping FERC apprised of its actions.

In order for us to timely proceed, please identify any of the following that may be found in the project area:

- Federally listed threatened or endangered species;
- Species proposed for listing as threatened or endangered;
- Designated critical habitat;
- Proposed critical habitat; or
- Candidate species

Within 30 days of the date of this letter, please file your response with: Magalie R. Salas, Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Washington, D.C. 20426. In addition, please send a copy of your response to EN, our non-federal representative. If you have any questions, please call Kenneth Hogan at (202) 502-8434.

Sincerely,

Timothy J. Welch, Chief
Hydro West Branch 2

cc: Public Files
Service List
Mailing List

Ms. Laura Schinnell
Energy Northwest, Mail Drop 1030
P.O. Box 968
Richland, WA 99352-0968
March 8, 2007

Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Species List Request for construction of the Packwood Lake Hydroelectric Project tailrace barrier (FERC No. 2244-012)

Dear Secretary Salas:

On February 9, 2007, the National Marine Fisheries Service (NMFS) received a letter from the Federal Energy Regulatory Commission (FERC) designating Energy Northwest as FERC’s non-Federal representative for tailrace barrier construction and requesting an updated list of endangered and threatened species. Species currently listed as threatened or endangered under the Endangered Species Act that occur in the Upper Cowlitz Basin (which contains the probable action area of the project) include:

<table>
<thead>
<tr>
<th>ESU</th>
<th>ESA Listing Status</th>
<th>FSA Critical Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Columbia River Chinook</td>
<td>Threatened 6/28/05 (70 FR 37160)</td>
<td>Designated 9/2/05 (70 FR 52630)</td>
</tr>
<tr>
<td>Lower Columbia River Coho</td>
<td>Threatened 6/28/05 (70 FR 37160)</td>
<td>Under Development</td>
</tr>
<tr>
<td>Lower Columbia River Steelhead</td>
<td>Threatened 1/5/06 (71 FR 834)</td>
<td>Designated 9/2/05 (70 FR 52630)</td>
</tr>
</tbody>
</table>

The Pacific Fisheries Management Council, which was established under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), described and identified essential fish habitat (EFH) in each of its fisheries management plans. EFH includes “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.” The Upper Cowlitz River is designated EFH for coho and Chinook salmon (O. tshawytscha). Federal consultation requirements exist for these species under the MSA, pursuant to section 305(b) and (16 USC 1855(b)), which require development of conservation recommendations for proposed activities that may adversely affect designated EFH. More detailed information on EFH...
consultations can be found on our website at:
http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/consalt_index.htm

This letter constitutes the required notification of the presence of a Federally-listed threatened or
dangerous species or critical habitat under NMFS' jurisdiction in the area that may be affected
by the proposed project (Appendix A to Part 330, section C.13(5)(I)).

If you have any questions regarding this letter, please contact Blane Bellerud at (503)231-2238
or Blane.Bellerud@noaa.gov.

Sincerely,

Keith Kirkendall, Chief
FERC & Water Diversions Branch
Hydropower Division

Cc: Laura Schinnell (Energy Northwest)
    Service List

Note: list downloaded on February 18, 2008; updated February 7, 2008.
CERTIFICATE OF SERVICE

I hereby certify that I have this day served, by electronic mail, the foregoing document to Magalie R. Salas, Federal Energy Regulatory Commission, from the National Marine Fisheries Service regarding Species List Request for construction of the Packwood Lake Hydroelectric Project tailrace barrier (FERC No. 2244-012) and the foregoing document and this Certificate of Service have been served to each person designated on the official service list compiled by the Commission in the above captioned proceeding.


Bethany Downs

Bethany Downs
Re: Species and critical habitat list request for the Packwood Lake Hydroelectric Project,
Federal Energy Regulatory Commission Project # P-2244-012

Dear Ms. Salas:

The E-Government Act of 2002 strives to enhance services and increase business efficiencies
through the use of technology. As such, we developed a website where you can obtain your
species lists electronically and in a timely fashion. Therefore, we ask that you obtain your

To assist you in evaluating the effects of your project, site-specific information of listed species
occurrences in Washington State may be obtained from the Washington Department of Fish and
Wildlife Priority Habitat and Species Program at (360)-902-2543 or their website
www.wdfw.wa.gov/hab/phspage.htm and from the Washington Department of Natural
Resources Natural Heritage Program at (360) 902-1667 or their website at
www.dnr.wa.gov/nhp/.

When you submit a request for section 7 consultation, we request that you include your
downloaded species list, and the date it was downloaded, as an attachment. This will document
your compliance with 50 CFR 402.12 (c).

We hope our website meets your needs. If you have any questions or suggestions regarding this
website or your species list, please contact John Grettenger at (360) 753-6044.

Sincerely,

[Signature]

Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

cc:
Energy Northwest, Kalaama, WA (L. Schinnell)
<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
<th>RECOVERY PRIORITY NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Endangered Animals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown pelican</td>
<td>Pelecanus occidentalis</td>
<td>9</td>
</tr>
<tr>
<td>Columbian white-tailed deer</td>
<td>Odocoileus virginianus leucurus</td>
<td>9c</td>
</tr>
<tr>
<td>Gray wolf</td>
<td>Canis lupus</td>
<td>3c</td>
</tr>
<tr>
<td>Leatherback sea turtle</td>
<td>Dermochelys coriacea</td>
<td>1</td>
</tr>
<tr>
<td>Short-tailed albatross</td>
<td>Phoebastria albatrus</td>
<td>8</td>
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<tr>
<td><strong>Endangered Plants</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bradshaw's desert-parsley</td>
<td>Lomatium bradshawii</td>
<td>2</td>
</tr>
<tr>
<td>Marsh sandwort</td>
<td>Arenaria paludicola</td>
<td>5</td>
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<tr>
<td><strong>Threatened Animals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bull trout (Coastal-Puget Sound</td>
<td>Salvelinus confluentus</td>
<td>9c</td>
</tr>
<tr>
<td>and Columbia River DPS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada lynx</td>
<td>Lynx canadensis</td>
<td>15</td>
</tr>
<tr>
<td>Green sea turtle</td>
<td>Chelonia mydas</td>
<td>1c</td>
</tr>
<tr>
<td>Grizzly bear</td>
<td>Ursus arctos horribilis</td>
<td>3c</td>
</tr>
<tr>
<td>Loggerhead sea turtle</td>
<td>Caretta caretta</td>
<td>7c</td>
</tr>
<tr>
<td>Marbled murrelet</td>
<td>Brachyramphus marmoratus</td>
<td>2</td>
</tr>
<tr>
<td>Northern spotted owl</td>
<td>Strix occidentalis caurina</td>
<td>6c</td>
</tr>
<tr>
<td>Olive ridley sea turtle</td>
<td>Leptodochelys olivacea</td>
<td>8c</td>
</tr>
<tr>
<td>Oregon silverspot butterfly</td>
<td>Speyeria zerana hippolyta</td>
<td>3c</td>
</tr>
<tr>
<td>Western snowy plover</td>
<td>Charadrius alexandrinus nivosus</td>
<td>3c</td>
</tr>
<tr>
<td><strong>Threatened Plants</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golden paintbrush</td>
<td>Castilleja levisecta</td>
<td>2</td>
</tr>
<tr>
<td>Kincade's lupine</td>
<td>Lupinus sulphurens ssp. Kincadei</td>
<td>9</td>
</tr>
<tr>
<td>Nelson's checker-mallow</td>
<td>Sidereal nelsoniana</td>
<td>5</td>
</tr>
<tr>
<td>Water howellia</td>
<td>Howella aquatilis</td>
<td>7</td>
</tr>
</tbody>
</table>

**Designated Critical Habitat**
- Marbled murrelet
- Northern spotted owl
- Western snowy plover, Pacific Coast Population
- Bull Trout
- Kincade’s lupine

**Proposed Species**
- Dolly Varden (Salvelinus malma) similarity of appearance

**Proposed Critical Habitat**
- Revised marbled murrelet critical habitat
- Revised northern spotted owl critical habitat
<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisher (West Coast DPS)</td>
<td>Martes pennanti</td>
</tr>
<tr>
<td>Mardon skipper</td>
<td>Polites mardon</td>
</tr>
<tr>
<td>Mazama pocket gopher</td>
<td>Thomomys mazama (ssp. couchi, douglasii, glacialis, leavii, melanops, pygotes, tacomensis, tunni, yelmensis)</td>
</tr>
<tr>
<td>Oregon spotted frog</td>
<td>Rana pretiosa</td>
</tr>
<tr>
<td>Streaked horned lark</td>
<td>Eremophila alpestris strigata</td>
</tr>
<tr>
<td>Taylor's (Whluge or Edith's) checkerspot butterfly</td>
<td>Euphydryas editha taylori</td>
</tr>
<tr>
<td>Yellow-billed cuckoo</td>
<td>Coccyzus americanus</td>
</tr>
<tr>
<td><strong>Candidate² Plants</strong></td>
<td></td>
</tr>
<tr>
<td>Northern wormwood</td>
<td>Artemisia campestris ssp. borealis var. wormskioldii</td>
</tr>
</tbody>
</table>

**Animal Species of Concern²**

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aleutian Canada goose</td>
<td>Branta canadensis leucopareia</td>
</tr>
<tr>
<td>Bald eagle</td>
<td>Haliaeetus leucocephalus</td>
</tr>
<tr>
<td>Beller's ground beetle</td>
<td>Agonum belleri</td>
</tr>
<tr>
<td>California bighorn sheep</td>
<td>Ovis canadensis canadensis</td>
</tr>
<tr>
<td>California floater (muscle)</td>
<td>Oncorhynchus mykiss</td>
</tr>
<tr>
<td>California wolverine</td>
<td>Gulo gulo</td>
</tr>
<tr>
<td>Cascades frog</td>
<td>Rana cascadae</td>
</tr>
<tr>
<td>Cassin's anktet</td>
<td>Pygopus melanopus</td>
</tr>
<tr>
<td>Coastal cutthroat trout</td>
<td>Oncorhynchus clarki clarki</td>
</tr>
<tr>
<td>Columbia pebblesnail</td>
<td>Plumatella colombiana</td>
</tr>
<tr>
<td>Columbia torrent salamander</td>
<td>Salamandra salamandra</td>
</tr>
<tr>
<td>Destruction Island shrew</td>
<td>Sorex trowbridgii destructioni</td>
</tr>
<tr>
<td>Fender's solpuriian streamfly</td>
<td>Saphella fenderi</td>
</tr>
<tr>
<td>Fringed myotis (bat)</td>
<td>Myotis lamberti</td>
</tr>
<tr>
<td>Hatch's click beetle</td>
<td>Eumenes laciniatus</td>
</tr>
<tr>
<td>Island large marble butterfly</td>
<td>Euchloe aurinia insulana</td>
</tr>
<tr>
<td>Larch Mountain salamander</td>
<td>Pseudotriton sarungi</td>
</tr>
<tr>
<td>Long-nosed myotis</td>
<td>Myotis longipennis</td>
</tr>
<tr>
<td>Long-legged myotis</td>
<td>Myotis volans</td>
</tr>
<tr>
<td>Makah's copper butterfly</td>
<td>Lycaena mariposa charlottensis</td>
</tr>
<tr>
<td>Margined sculpin</td>
<td>Cottus marginatus</td>
</tr>
<tr>
<td>Newcomb's fitterine snail</td>
<td>Algaomora newcombiana</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>Accipiter gentilis</td>
</tr>
<tr>
<td>Northern sea otter</td>
<td>Enhydra lutris kenyoni</td>
</tr>
<tr>
<td>Northwestern pond turtle</td>
<td>Emys (= Clemmys) marmorata marmorata</td>
</tr>
<tr>
<td>Olive-sided flycatcher</td>
<td>Contopus cooperi</td>
</tr>
<tr>
<td>Olympic torrent salamander</td>
<td>Salamandra olympica</td>
</tr>
<tr>
<td>Oregon vesper sparrow</td>
<td>Poecetes gramineus affinis</td>
</tr>
<tr>
<td>COMMON NAME</td>
<td>SCIENTIFIC NAME</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Pacific lamprey</td>
<td><em>Lampetra tridentata</em></td>
</tr>
<tr>
<td>Pacific Townsend's big-eared bat</td>
<td><em>Corynorhinus townsendii townsendi</em></td>
</tr>
<tr>
<td>Pala Townsend's big-eared bat</td>
<td><em>Corynorhinus townsendii pallidescens</em></td>
</tr>
<tr>
<td>Peregrine falcon</td>
<td><em>Falco peregrinus</em></td>
</tr>
<tr>
<td>River lamprey</td>
<td><em>Lampetra ayresi</em></td>
</tr>
<tr>
<td>Small-footed myotis</td>
<td><em>Myotis ciliolabrum</em></td>
</tr>
<tr>
<td>Slender-billed white-breasted nuthatch</td>
<td><em>Sitta carolinensis aculeata</em></td>
</tr>
<tr>
<td>Tailed frog</td>
<td><em>Ascaphus truei</em></td>
</tr>
<tr>
<td>Tufted puffin</td>
<td><em>Fratercula arctica</em></td>
</tr>
<tr>
<td>Valley silverspot butterfly</td>
<td><em>Speyeria zerene bremeri</em></td>
</tr>
<tr>
<td>Van Dyke's salamander</td>
<td><em>Plethodon vanryki</em></td>
</tr>
<tr>
<td>Western gray squirrel</td>
<td><em>Sciurus griseus griseus</em></td>
</tr>
<tr>
<td>Westslope cutthroat trout</td>
<td><em>Oncorhynchus (=Salmo) clarki lewisi</em></td>
</tr>
<tr>
<td>Western toad</td>
<td><em>Bufo boreas</em></td>
</tr>
<tr>
<td><strong>Plant Species of Concern</strong></td>
<td></td>
</tr>
<tr>
<td>Barron's beardless</td>
<td><em>Pentaphragma burrettii</em></td>
</tr>
<tr>
<td>Clackamas corydalis</td>
<td><em>Corydalis aqua-gelidae</em></td>
</tr>
<tr>
<td>Clustered lady's slipper</td>
<td><em>Cypripedium fasciculatum</em></td>
</tr>
<tr>
<td>Columbia yellow-cress</td>
<td><em>Rorippa columbiana</em></td>
</tr>
<tr>
<td>Cotton's milk-vetch</td>
<td><em>Astragalus australis var. olympicus</em></td>
</tr>
<tr>
<td>Footsteps of spring; bear's foot</td>
<td><em>Sanicula arctopoides</em></td>
</tr>
<tr>
<td>Sanicle</td>
<td></td>
</tr>
<tr>
<td>Frigid shootingstar</td>
<td><em>Dedecathion austrofrigidum</em></td>
</tr>
<tr>
<td>Gorge daisy</td>
<td><em>Erigeron oreagnus</em></td>
</tr>
<tr>
<td>Howell's daisy</td>
<td><em>Erigeron howelli</em></td>
</tr>
<tr>
<td>Obscure paintbrush</td>
<td><em>Castilleja cryptantha</em></td>
</tr>
<tr>
<td>Oregon sullivantia</td>
<td><em>Sullivantia oreagnana</em></td>
</tr>
<tr>
<td>Pale blue-eyed grass</td>
<td><em>Sisyrinchium sarmentosum</em></td>
</tr>
<tr>
<td>Pale larkspur</td>
<td><em>Delphinium leucophaeum</em></td>
</tr>
<tr>
<td>Pink sandvervain</td>
<td><em>Abronia umbellata ssp. Acutata</em></td>
</tr>
<tr>
<td>Queen of the forest</td>
<td><em>Philpenda occidentalis</em></td>
</tr>
<tr>
<td>Rose checker-mallow</td>
<td><em>Sidalcea malviflora ssp. Virgata</em></td>
</tr>
<tr>
<td>Seely's silene</td>
<td><em>Silene seelyi</em></td>
</tr>
<tr>
<td>Stalked moonwort</td>
<td><em>Botrychium pedunculosum</em></td>
</tr>
<tr>
<td>Tall bugbane</td>
<td><em>Clinicifluga elata</em></td>
</tr>
<tr>
<td>Torrey's peavine</td>
<td><em>Lathyrus torreyi</em></td>
</tr>
<tr>
<td>Triangular-lobed moonwort</td>
<td><em>Botrychium ascendens</em></td>
</tr>
<tr>
<td>Whitebark pine</td>
<td><em>Pinus albicaulis</em></td>
</tr>
<tr>
<td>White meconella</td>
<td><em>Meconella oreagnana</em></td>
</tr>
<tr>
<td>White-top aster</td>
<td><em>Sertocarpus rigidosus</em></td>
</tr>
</tbody>
</table>
Hyperlinks are provided for electronic recovery plans where available. Only recovery plans revised or finalized since 1989 are available electronically. Alternate hyperlink to final rule listing the species is substituted where available, or hyperlink connects to status information.

Candidate species are those species for which FWS has sufficient information to propose for listing. Hyperlinks are provided where available for electronic candidate forms or Federal Register notice of petition finding.

Species of concern are those species whose conservation status is of concern to FWS, but more information is needed.

NOAA Fisheries threatened and endangered species list:

Information for eastern Washington species can be found on the Upper Columbia Fish and Wildlife Office web page and for all listed species on the U.S. Fish and Wildlife Service Endangered Species Home Page.
LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN LEWIS COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised November 1, 2007)

LISTED

Bull trout (Salvelinus confluentus)

Canada lynx (Lynx canadensis)

Gray wolf (Canis lupus)

Grizzly bear (Ursus arctos = U. a. horribilis)

Marbled murrelet (Brachyramphus marmoratus)

Northern spotted owl (Strix occidentalis caurina)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

*Lupinus sulphureus* ssp. *kincaidi* (Kincaid’s lupine)

*Sidalcea nelsoniana* (Nelson's checker-mallow)
Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in project vicinity.
2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.
3. Changes in hydrology where taxon is found.

**DESIGNATED**

Critical habitat for the marbled murrelet

Critical habitat for the northern spotted owl

Critical habitat for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid’s lupine)

**PROPOSED**

None

**CANDIDATE**

None

**SPECIES OF CONCERN**

Bald eagle (*Haliaeetus leucocephalus*)
California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana catesbeiana*)
Coastal cutthroat trout (*Oncorhynchus clarki clarki*) [southwest Washington DPS]
Columbia torrent salamander (*Rhyacotriton kezeri*)
Larch Mountain salamander (*Plethodon larselli*)
Long-eared myotis (*Myotis evotis*)

Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northwestern pond turtle (*Emys (= Clemmys) marmorata marmorata*)
Olive-sided flycatcher (*Contopus cooperi*)
Oregon vesper sparrow (*Poecetes graminus affinis*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend’s big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresii*)
Tailed frog (*Ascaphus truei*)
Valley silverspot (*Speyeria zerene bremeri*)
Van Dyke’s salamander (*Plethodon vandykei*)
Western gray squirrel (*Sciurus griseus griseus*)
Western toad (*Bufo boreas*)
*Cimicifuga elata* (tall bugbane)
*Delphinium leucophaeum* (pale larkspur)
*Meconella oregana* (white meconella)
The Priority Habitats and Species (PHS) Program fulfills one of the most fundamental responsibilities of the Washington Department of Fish and Wildlife (WDFW) -- to provide comprehensive information on important fish, wildlife, and habitat resources in Washington. Initiated in 1989, the PHS Program was identified as the agency's highest priority. Today, the PHS Program serves as the backbone of WDFW's proactive approach to the conservation of fish and wildlife.

PHS is the principal means by which WDFW provides important fish, wildlife, and habitat information to local governments, state and federal agencies, private landowners and consultants, and tribal biologists for land use planning purposes. PHS is the agency's primary means of transferring fish and wildlife information from our resource experts to those who can protect habitat. PHS information is used:

- to screen 12,000 - 15,000 Forest Practice Applications, 10,000 - 18,000 Hydraulic Project Applications, and over 3,000 SEPA reviews annually;
- by a majority of cities and counties to meet the requirements of the Growth Management Act;
- for the development of Habitat Conservation Plans on state, federal, and private lands;
- by state, federal, and tribal governments for landscape-level planning and ecosystem management;
- for statewide oil spill prevention planning and response.

PHS provides the information necessary to incorporate the needs of fish and wildlife in land use planning. The PHS program addresses three central questions:

- Which species and habitat types are priorities for management and conservation?
- Where are these habitats and species located?
- What should be done to protect these resources when land use decisions are made?
To answer these essential questions, the PHS Program:

- identifies habitats and species determined to be priorities based on defensible criteria;
- maps the known locations of priority habitats and species using GIS technology;
- provides information on the conditions required to maintain healthy populations of priority species
- and viable, functioning priority habitats using best available science;
- provides consultation and guidance on land use issues affecting priority habitats and species;
- distributes this information and makes it easily accessible.

PHS also furnishes products which enable the agency to provide competent and efficient customer service. In this regard, PHS staff annually produce and distribute:

- Over 4,000 copies of the Priority Habitats and Species List. The PHS List identifies and defines which species and habitats are priorities, and it outlines criteria used for choosing them.
- Over 3,500 copies of Management Recommendations for Washington's Priority Habitats and Species. These detailed documents identify the needs of fish and wildlife based on the best available science. Guidelines for their incorporation in management decisions are provided.
- Nearly 2,000 state-of-the-art Geographic Information System (GIS) maps which display locations and extent of priority species and habitats on 29 million acres in Washington State.
  - Requesting PHS Maps and Digital Data
### FISH

For information on state listed or candidate species, see the [SOC List](#).

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<thead>
<tr>
<th>COMMON NAME</th>
<th>SPECIES CRITERIA</th>
<th>WASHINGTON STATUS</th>
<th>Priority Area</th>
<th>GEOGRAPHIC AREA</th>
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### Sand Lances (Ammodytidae)
- **Pacific sand lance**
  - Common Name: Ammodytes hexapterus
  - Scientific Name: *Ammodytes hexapterus*
  - Food fish: 2
  - Breeding areas; regular large concentrations: 3

### Right-eye flounders (Pleuronectidae)
- **English sole**
  - Common Name: Parophrys vetulus
  - Scientific Name: *Parophrys vetulus*
  - Food fish: 3
  - Breeding site: 4
- **Rock sole**
  - Common Name: Lepidopsetta bilineata
  - Scientific Name: *Lepidopsetta bilineata*
  - Food fish: 3
  - Breeding areas; regular large concentrations: 4

For information on state listed or candidate species, see the **SOC List**.

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SPECIES CRITERIA</th>
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<tr>
<td>Cormorants</td>
<td>Eastern Washington breeding</td>
<td></td>
<td></td>
<td>Breeding areas</td>
<td>1 2 3</td>
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<tr>
<td>Grebes</td>
<td>Eastern Washington breeding</td>
<td></td>
<td></td>
<td>Breeding areas</td>
<td>1 2 3 5</td>
<td></td>
</tr>
<tr>
<td>Terns</td>
<td>Eastern Washington breeding</td>
<td></td>
<td></td>
<td>Breeding areas</td>
<td></td>
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</tr>
<tr>
<td>Marbled murrelet</td>
<td></td>
<td></td>
<td></td>
<td>State Listed or Candidate Species</td>
<td>1 2</td>
<td>Any occurrence in suitable habitat during breeding season; regular and regular large concentrations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>State Listed or Candidate Species</td>
<td></td>
<td>Any occurrence</td>
</tr>
<tr>
<td>Tufted puffin</td>
<td></td>
<td>1 2 3</td>
<td>State Listed or Candidate Species</td>
<td>Regular concentrations; breeding areas</td>
<td>4 6</td>
<td></td>
</tr>
<tr>
<td>Western grebe</td>
<td></td>
<td>1 2</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>Alcids</td>
<td>Western Washington breeding</td>
<td></td>
<td></td>
<td>Breeding areas</td>
<td></td>
<td>4 6</td>
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<tr>
<td>Cormorants</td>
<td>Western Washington breeding</td>
<td></td>
<td></td>
<td>Breeding areas</td>
<td></td>
<td>4 6</td>
</tr>
<tr>
<td>Storm-petrels</td>
<td>Western Washington breeding</td>
<td></td>
<td></td>
<td>Breeding areas</td>
<td></td>
<td>4 6</td>
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<tr>
<td>Terns</td>
<td>Western Washington breeding</td>
<td></td>
<td></td>
<td>Breeding areas</td>
<td></td>
<td>4 6</td>
</tr>
<tr>
<td>Alcids</td>
<td>Western nonbreeding</td>
<td></td>
<td></td>
<td>Regular large concentrations</td>
<td></td>
<td>4 6</td>
</tr>
<tr>
<td>Cormorants</td>
<td>Western nonbreeding</td>
<td></td>
<td></td>
<td>Regular large concentrations</td>
<td></td>
<td>4 6</td>
</tr>
<tr>
<td>Western Washington nonbreeding concentrations of: Fulmar, Shearwaters</td>
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<td>Regular large concentrations</td>
<td>4 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Washington nonbreeding concentrations of: Grebes</td>
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<td>4 6</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Western Washington nonbreeding concentrations of: Loons</td>
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<td>4 6</td>
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<td></td>
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<tr>
<td>Western Washington nonbreeding concentrations of: Storm-petrels</td>
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<td>Regular large concentrations</td>
<td>4 6</td>
<td></td>
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<td></td>
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</tbody>
</table>

**Heron**s (Ciconiiformes)

| Black-crowned night heron | 2 | Breeding areas | 1 2 3 4 5 6 |
| Great blue heron | 2 | Breeding areas | 1 2 3 4 5 6 |

**Waterfowl** (Anseriformes)

| Aleutian Canada goose | 1 | State Listed or Candidate Species | Regular concentrations | 5 6 |
| Barrow’s goldeneye | 3 | Game | Breeding areas | 1 2 3 4 5 6 |
| Brant | 3 | Game | Regular large concentrations in foraging and resting areas, migratory stopovers | 4 6 |
| Bufflehead | 2 | Game | Breeding areas | 1 2 3 4 5 6 |
| Common goldeneye | 3 | Game | Breeding areas | 1 2 3 4 5 6 |
| Harlequin duck | 2 | Game | Breeding areas, regular and regular large concentrations in saltwater | 1 2 3 4 5 6 |
| Hooded merganser | 3 | Game | Breeding areas | 1 2 3 4 5 6 |
| Snow goose | 2 | Game | Regular large concentrations | 4 |
| Trumpeter swan | 3 | Game | Regular and regular large concentrations | 1 2 3 4 5 6 |
| Tundra swan | 3 | Game | Regular and regular large concentrations | 1 2 3 4 5 6 |
| Waterfowl concentrations | 2 | Game | Significant breeding areas and regular large concentrations in winter | 1 2 3 4 5 6 |
Western Washington nonbreeding concentrations of: Barrow's goldeneye  2 3  Game  Regular large concentrations  4 5  6
Western Washington nonbreeding concentrations of: Bufflehead  2 3  Game  Regular large concentrations  4 5  6
Western Washington nonbreeding concentrations of: Common goldeneye  2 3  Game  Regular large concentrations  4 5  6
Wood duck  3  Game  Breeding areas  1 2 3 4 5 6

**Hawks, Falcons, Eagles (Falconiformes)**

<table>
<thead>
<tr>
<th>Species</th>
<th>State Status</th>
<th>Breeding and Foraging Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bald eagle</td>
<td>State Listed</td>
<td>Breeding areas, communal roosts, regular and regular large concentrations, regularly-used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>perch trees in breeding areas</td>
</tr>
<tr>
<td>Ferruginous hawk</td>
<td>State Listed</td>
<td>Breeding areas, including alternate nest sites.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If breeding area is not known, approximate with a 7.0 km² (4.35 mi²) area around known</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nest sites, foraging areas</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>State Listed</td>
<td>Breeding and foraging areas</td>
</tr>
<tr>
<td>Merlin</td>
<td>State Listed</td>
<td>Breeding sites</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>State Listed</td>
<td>Breeding areas, including alternate nest sites, post-fledging foraging areas</td>
</tr>
<tr>
<td>Peregrine falcon</td>
<td>State Listed</td>
<td>Breeding areas, regular occurrences, hack sites</td>
</tr>
<tr>
<td>Prairie falcon</td>
<td></td>
<td>Breeding areas</td>
</tr>
</tbody>
</table>

**Upland Game Birds (Galliformes)**

<table>
<thead>
<tr>
<th>Species</th>
<th>State Status</th>
<th>Breeding and Foraging Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue grouse</td>
<td></td>
<td>Breeding areas, regular concentrations</td>
</tr>
<tr>
<td>Chukar</td>
<td></td>
<td>Regular and regular large concentrations in WDFW's Primary Management Zones for chukar</td>
</tr>
<tr>
<td>Wildlife Species</td>
<td>Federal/State Status</td>
<td>Behavioral Characteristics</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mountain quail</td>
<td>Game</td>
<td>Any occurrence, breeding areas, leks, regular and regular large concentrations</td>
</tr>
<tr>
<td>Ring-necked pheasant</td>
<td>Game</td>
<td>Self-sustaining birds observed in regular or regular large concentrations in WDFW's eastern Washington Primary Management Zone for pheasant</td>
</tr>
<tr>
<td>Sage grouse</td>
<td>Game</td>
<td>Breeding areas, leks, regular and regular large concentrations</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>State Listed or Candidate Species; Game</td>
<td>Breeding areas, leks, regular and regular large concentrations, critical wintering habitat (riparian zones)</td>
</tr>
<tr>
<td>Wild turkey</td>
<td>Game</td>
<td>Regular and regular large concentrations and roosts in WDFW's Primary Management Zones for wild turkeys</td>
</tr>
<tr>
<td><strong>Cranes</strong> (Gruiformes)</td>
<td></td>
<td></td>
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<tr>
<td>Sandhill crane</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas, regular large concentrations, migration staging areas</td>
</tr>
<tr>
<td><strong>Shorebirds</strong> (Charadriiformes)</td>
<td></td>
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</tr>
<tr>
<td>Eastern Washington breeding occurrences of: Phalaropes</td>
<td>2</td>
<td>Breeding areas</td>
</tr>
<tr>
<td>Eastern Washington breeding occurrences of: Stilts and avocets</td>
<td>2</td>
<td>Breeding areas</td>
</tr>
<tr>
<td>Snowy plover</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas</td>
</tr>
<tr>
<td>Upland sandpiper</td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
</tr>
<tr>
<td>Western nonbreeding concentrations of: Charadriidae</td>
<td>2</td>
<td>Regular large concentrations</td>
</tr>
<tr>
<td>Western nonbreeding concentrations of: Phalaropodidae</td>
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<td>Regular large concentrations</td>
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</table>
### Western Washington nonbreeding concentrations of Scolopacidae

#### Pigeons (Columbiformes)

<table>
<thead>
<tr>
<th>Species</th>
<th>Zone</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band-tailed pigeon</td>
<td>3</td>
<td>Game</td>
<td>Breeding areas, regular concentrations, occupied mineral springs</td>
</tr>
</tbody>
</table>

#### Cuckoos (Cuculiformes)

<table>
<thead>
<tr>
<th>Species</th>
<th>Zone</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow-billed cuckoo</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
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</tbody>
</table>

#### Owls (Strigiformes)

<table>
<thead>
<tr>
<th>Species</th>
<th>Zone</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burrowing owl</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas, foraging areas, regular concentrations</td>
</tr>
<tr>
<td>Flammulated owl</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Breeding sites, regular occurrences</td>
</tr>
<tr>
<td>Spotted owl</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
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</tbody>
</table>

#### Swifts (Apodiformes)

<table>
<thead>
<tr>
<th>Species</th>
<th>Zone</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaux's swift</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas, communal roosts</td>
</tr>
</tbody>
</table>

#### Woodpeckers (Piciformes)

<table>
<thead>
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<th>Species</th>
<th>Zone</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-backed woodpecker</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas and regular occurrences</td>
</tr>
<tr>
<td>Lewis' woodpecker</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas</td>
</tr>
<tr>
<td>Pileated woodpecker</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas</td>
</tr>
<tr>
<td>White-headed woodpecker</td>
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<td>State Listed or Candidate Species</td>
<td>Breeding sites, regular occurrences</td>
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#### Perching Birds (Passeriformes)

<table>
<thead>
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<th>Category</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Loggerhead shrike</td>
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<td>Regular occurrences in breeding areas, regular and regular large concentrations</td>
</tr>
<tr>
<td>COMMON NAME</td>
<td>SPECIES CRITERIA</td>
<td>WASHINGTON STATUS</td>
<td>Priority Area</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------</td>
<td>--------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Oregon vesper sparrow</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
</tr>
<tr>
<td>Purple martin</td>
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<td>State Listed or Candidate Species</td>
<td>Breeding areas, including used artificial nest features, feeding areas</td>
</tr>
<tr>
<td>Sage sparrow</td>
<td>1</td>
<td>State Listed or Candidate Species</td>
<td>Breeding areas, regular occurrences in suitable habitat during breeding season</td>
</tr>
<tr>
<td>Sage thrasher</td>
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<td>State Listed or Candidate Species</td>
<td>Breeding areas, regular occurrences in suitable habitat during breeding season</td>
</tr>
<tr>
<td>Slender-billed, white-breasted nuthatch</td>
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<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
</tr>
<tr>
<td>Streaked, horned lark</td>
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<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
</tr>
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</table>

**MAMMALS**

For information on state listed or candidate species, see the [SOC List](#).

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SPECIES CRITERIA</th>
<th>WASHINGTON STATUS</th>
<th>Priority Area</th>
<th>GEOGRAPHIC AREA</th>
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<tbody>
<tr>
<td>Shrews (Insectivora)</td>
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<tr>
<td>Bats (Chiroptera)</td>
<td>1 2</td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
<td>6</td>
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<tr>
<td>Keen's myotis</td>
<td>1 2</td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>Roosting concentrations of: Big brown bat</td>
<td>1 2</td>
<td>Regular large concentrations in naturally occurring breeding areas and other communal roosts</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Roosting concentrations of: Myotis bats</td>
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<td>Regular large concentrations in naturally occurring breeding areas and other communal roosts</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Roosting concentrations of: Pallid bat</td>
<td>1 2</td>
<td>Regular large concentrations in naturally occurring breeding areas and other communal roosts</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Townsend's big-eared bat</td>
<td>1 2</td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
<td>1 2 3 4 5 6</td>
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</tbody>
</table>
## Rabbits (Lagomorpha)

<table>
<thead>
<tr>
<th>Species</th>
<th>F</th>
<th>C</th>
<th>H</th>
<th>Threat Status</th>
<th>Distribution</th>
<th>Possibilities</th>
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</thead>
<tbody>
<tr>
<td>Black-tailed jack rabbit</td>
<td>1</td>
<td>3</td>
<td></td>
<td>State Listed or Candidate Species; Game</td>
<td>Regular and regular large concentrations Any occurrence</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Pygmy rabbit</td>
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<td></td>
<td></td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
<td>1 2 3</td>
</tr>
<tr>
<td>White-tailed jack rabbit</td>
<td>1</td>
<td>3</td>
<td></td>
<td>State Listed or Candidate Species; Game</td>
<td>Regular and regular large concentrations Any occurrence</td>
<td>1 2 3</td>
</tr>
</tbody>
</table>

## Rodents (Rodentia)

<table>
<thead>
<tr>
<th>Species</th>
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<th>C</th>
<th>H</th>
<th>Threat Status</th>
<th>Distribution</th>
<th>Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brush Prairie pocket gopher</td>
<td>1</td>
<td></td>
<td></td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
<td>5</td>
</tr>
<tr>
<td>Gray-tailed vole</td>
<td>1</td>
<td>2</td>
<td></td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
<td>5</td>
</tr>
<tr>
<td>Townsend's ground squirrel</td>
<td>1</td>
<td></td>
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<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
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</tr>
<tr>
<td>Washington ground squirrel</td>
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<td></td>
<td>State Listed or Candidate Species</td>
<td>Regular and regular large concentrations</td>
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<tr>
<td>Western gray squirrel</td>
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<td>Any occurrence</td>
<td>2 3 5 6</td>
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<tr>
<td>Western pocket gopher</td>
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<td></td>
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<td>Any occurrence</td>
<td>5 6</td>
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</table>

## Terrestrial Carnivores (Carnivora)

<table>
<thead>
<tr>
<th>Species</th>
<th>F</th>
<th>C</th>
<th>H</th>
<th>Threat Status</th>
<th>Distribution</th>
<th>Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisher</td>
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<td></td>
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<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>Gray wolf</td>
<td>1</td>
<td></td>
<td></td>
<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Grizzly bear</td>
<td>1</td>
<td></td>
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<td>Any occurrence</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Lynx</td>
<td>1</td>
<td></td>
<td></td>
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<td>1 2 3 4</td>
</tr>
<tr>
<td>Marten</td>
<td>3</td>
<td></td>
<td></td>
<td>Game</td>
<td>Regular occurrences</td>
<td>1 2 3 4 5 6</td>
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<tr>
<td>Mink</td>
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<td></td>
<td></td>
<td>Game</td>
<td>Regular occurrences</td>
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</table>
### Marine Mammals (Cetacea and Carnivora)

<table>
<thead>
<tr>
<th>Species</th>
<th>List Type</th>
<th>Occurrence</th>
<th>Regular Concentrations</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wolverine</td>
<td></td>
<td></td>
<td></td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>Dall's porpoise</td>
<td></td>
<td></td>
<td>Regular concentrations in foraging areas and migration routes</td>
<td>4 6</td>
</tr>
<tr>
<td>Gray whale</td>
<td>State Listed or Candidate</td>
<td>Any occurrence, migration routes</td>
<td></td>
<td>4 6</td>
</tr>
<tr>
<td>Harbor seal</td>
<td></td>
<td></td>
<td>Haulout areas</td>
<td>4 5 6</td>
</tr>
<tr>
<td>Killer whale</td>
<td>State Listed or Candidate</td>
<td></td>
<td>Regular concentrations in feeding areas and migration routes</td>
<td>4 6</td>
</tr>
<tr>
<td>Pacific harbor porpoise</td>
<td>State Listed or Candidate</td>
<td>Regular concentrations in foraging areas and migration routes</td>
<td></td>
<td>4 6</td>
</tr>
<tr>
<td>Sea lion, California</td>
<td></td>
<td></td>
<td>Haulout areas</td>
<td>4 6</td>
</tr>
<tr>
<td>Sea lion, Steller (Northern)</td>
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<td></td>
<td>Haulout areas</td>
<td>4 6</td>
</tr>
<tr>
<td>Sea otter</td>
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<td>Regular concentrations</td>
<td></td>
<td>6</td>
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</table>

### Big Game Ungulates (Artiodactyla)

<table>
<thead>
<tr>
<th>Species</th>
<th>List Type</th>
<th>Occurrence</th>
<th>Regular Concentrations</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bighorn sheep</td>
<td></td>
<td>Breeding areas, regular and regular large concentrations</td>
<td></td>
<td>1 2 3</td>
</tr>
<tr>
<td>Columbian black-tailed deer</td>
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<td>Regular and regular large concentrations, migration corridors</td>
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<td>Regular and regular large concentrations</td>
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<td>State Listed or Candidate Species</td>
<td>Any occurrence</td>
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</table>
June 2, 2004

Bernice Rusko
Energy Northwest
MD 1030 - PO Box 968
Richland WA 99352

SUBJECT: Packwood Hydroelectric Relicensing Project
(T13N R09-10E)

We've searched the Natural Heritage Information System for information on significant natural features in your project area. Currently, we have no records for rare plants or high quality native ecosystems in the vicinity of your project.

The information provided by the Washington Natural Heritage Program is based solely on existing information in the database. In the absence of field inventories, we cannot state whether or not a given site contains high quality ecosystems or rare plant species; there may be significant natural features in your study area of which we are not aware.

The Washington Natural Heritage Program is responsible for information on the state's rare plants as well as high quality ecosystems. For information on animal species of concern, please contact Priority Habitats and Species, Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia WA 98501-1091, or by phone (360) 902-2543.

Please visit our internet website at http://www.dnr.wa.gov/nhp for more information. Lists of rare plants and their status, as well as rare plant fact sheets, are available for download from the site. Please feel free to call me at (360) 902-1667 if you have any questions, or by e-mail at sandra.moody@wadnr.gov.

Sincerely,

Sandra Swepe Moody
Environmental Review Coordinator
Washington Natural Heritage Program

Asset Management 
& Protection Division, PO Box 47014, Olympia WA 98504-7014
FAX 360-902-1789
1) Washington Natural Heritage Information System

2) List of Known Occurrences of Rare Plants in Washington

3) February 2007

(ii) Lewis County

A key to status fields appears below. If a scientific name is underlined you may click on it to go to a field guide page (html or pdf format) for that taxon.

<table>
<thead>
<tr>
<th>1) Scientific Name</th>
<th>2) Common Name</th>
<th>3) Stat</th>
<th>4) Fed</th>
<th>5) Hi</th>
<th>6) R</th>
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<td>S</td>
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<td>E</td>
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<td>Alice's Fleabane</td>
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<td>Branching Montia</td>
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<td>Pedicularis rainierensis</td>
<td>Mt. Rainbow Lousewort</td>
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<td>Poa laxiflora</td>
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</table>
Polemonium carneum  Great Polemonium  T
Potentilla drummondii ssp. breweri  Brewer's Cinquefoil  T  H
Sidalcea hirtipes  Hairy-stemmed Checker-mallow  E
Sidalcea nelsoniana  Nelson's Checker-mallow  E  LT
Trillium parviflorum  Small-flowered Trillium  S

7) Description of Codes
8) Historic Record:
a) H indicates most recent sighting in the county is before 1977.
9)
10) State Status
   a) State Status of plant species is determined by the Washington Natural Heritage Program. Factors considered include abundance, occurrence, vulnerability, threats, existing protection, and taxonomic distinctness.
      Values include:
      E = Endangered. In danger of becoming extinct or extirpated from Washington.
      T = Threatened. Likely to become Endangered in Washington.
      S = Sensitive. Vulnerable or declining and could become Endangered or Threatened in the state.
      X = Possibly extinct or Extirpated from Washington.
      R1 = Review group 1. Of potential concern but needs more field work to assign another rank.
      R2 = Review group 2. Of potential concern but with unresolved taxonomic questions.
11) Federal Status
   a) Federal Status under the U.S. Endangered Species Act(USESA) as published in the Federal Register:
      LE = Listed Endangered. In danger of extinction.
      LT = Listed Threatened. Likely to become endangered.
      PE = Proposed Endangered.
      PT = Proposed Threatened.
      C = Candidate species. Sufficient information exists to support listing as Endangered or Threatened.
      SC = Species of Concern. An unofficial status, the species appears to be in jeopardy, but insufficient information to support listing.

b) Washington Natural Heritage Program - www.dnr.wa.gov/nhp/
back  t

d) Washington Dept. of Natural Resources, PO Box 47014, Olympia, WA 98504-7014
APPENDIX BA-2

SPAWNING SURVEY DATA
FROM WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
### WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
### SPAWNING SURVEY DATA

**Spring Chinook**

<table>
<thead>
<tr>
<th>Date</th>
<th>Drainage</th>
<th>Area</th>
<th>Method</th>
<th>Redds</th>
<th>Alive</th>
<th>Carcasses</th>
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<tr>
<td>8/9/2005</td>
<td>Cowlitz River</td>
<td>Jodie’s Bridge to Clearfork</td>
<td>foot</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<tr>
<td>8/9/2005</td>
<td>Ohanapecosh</td>
<td>Mouth to blue hole</td>
<td>foot</td>
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<td>9/15/2005</td>
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<td>foot</td>
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<td>7</td>
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<td>33</td>
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<td>foot</td>
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<td>15</td>
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<tr>
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<td>Copper crk U.S 1mile</td>
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<td>0</td>
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<td>Skate crk Craig rd to 47 rd</td>
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<td>Cowlitz</td>
<td>Spud hill br to 12 mile</td>
<td>raft</td>
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<td>1</td>
</tr>
<tr>
<td>9/27/2006</td>
<td>Riffe</td>
<td>Rainy crk br upstream 1 mile</td>
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### Spring Chinook

<table>
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<td>25 rd to 300 br</td>
<td>raft</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9/28/2006</td>
<td>Cispus</td>
<td>300 br to Res.</td>
<td>raft</td>
<td>12</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>9/28/2006</td>
<td>Cispus</td>
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<tr>
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<td>&quot;Twin Cedars&quot; to 25 rd</td>
<td>raft</td>
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<td><strong>588</strong></td>
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### Steelhead

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<th>Redds</th>
<th>Alive</th>
<th>Carcasses</th>
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<tr>
<td>5/10/2005</td>
<td>Crystal Cr</td>
<td>300 bridge to mouth</td>
<td>foot</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<tr>
<td>5/10/2005</td>
<td>Crystal Cr</td>
<td>300 bridge to beaver ponds</td>
<td>foot</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>5/10/2005</td>
<td>Quartz Cr</td>
<td>300 bridge to canyon (~3 miles)</td>
<td>foot</td>
<td>9</td>
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<tr>
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<td>0</td>
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<tr>
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<td>28 rd br to barrier</td>
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<tr>
<td>4/25/2006</td>
<td>Cowlitz</td>
<td>Clear fork to mouth</td>
<td>helicopter</td>
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<tr>
<td>4/25/2006</td>
<td>Cowlitz</td>
<td>Confluence to Franklin br</td>
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<td>7</td>
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<td>4/25/2006</td>
<td>Cowlitz</td>
<td>Franklin br to Cora br</td>
<td>helicopter</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4/28/2006</td>
<td>Cispus</td>
<td>Quartz crk mouth to canyon</td>
<td>foot</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4/28/2006</td>
<td>Cispus</td>
<td>Crystal crk mouth to barrier</td>
<td>foot</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5/10/2006</td>
<td>Cowlitz</td>
<td>Silver crk mouth to silverbrook rd</td>
<td>foot</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>62</strong></td>
<td><strong>1</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
APPENDIX BA-3

ESSENTIAL FISH HABITAT ASSESSMENT

PACKWOOD LAKE HYDROELECTRIC PROJECT
FERC NO. 2244
PACKWOOD LAKE HYDROELECTRIC PROJECT
FERC NO. 2244

ESSENTIAL FISH HABITAT ASSESSMENT

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1.0 REGULATORY AUTHORITY

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), federal agencies are required to consult with NOAA Fisheries regarding activities that may adversely affect Essential Fish Habitat (EFH). The objectives of EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

Under Section 7(a)(2) of the Endangered Species Act (ESA), NOAA Fisheries is likewise responsible for administration of the ESA with respect to anadromous salmonids. The implementing regulations for the MSA allow for the integration of NEPA or ESA Section 7 reviews with the analysis of proposed Project effects on EFH. Therefore, the information contained in the BA (to which this EFH document is attached) has been drafted in accordance with the EFH consultation requirements defined by NOAA Fisheries.

2.0 DESCRIPTION OF PROPOSED ACTION

The Proposed Action to be considered in this BA is the issuance of a new license for the Project. Energy Northwest is requesting a 50-year license term. Energy Northwest’s proposed Project operation and protection, mitigation and enhancement measures are described in this section.

2.1 Proposed Project Operation

The current Project license specifies a maximum water surface elevation of 2858.5 ft MSL and a minimum water surface elevation of 2849 ft MSL for Packwood Lake. Energy Northwest proposes that the current maximum water surface elevation of 2858.5 ft MSL be eliminated. The maximum water surface elevation allowed under the terms of the current Project license physically corresponds to the drop structure spillway crest. The drop structure spillway is uncontrolled (no spillway gates) and lake levels that exceed this elevation are self-regulating and cannot be directly controlled by the Project. Any spill over the drop structure currently exceeds the existing license elevation limit, causing a “non-compliance” with the license. Because water spilling over the drop structure is an expected condition and is projected to occur more frequently under the proposed terms of a new license, Energy Northwest proposes to eliminate this unnecessary upper lake elevation limit.

Energy Northwest proposes to continue to shut down the Project annually to perform scheduled equipment maintenance. The Project will begin shutting down for the annual
outage on August 15 of each operating year. The intent is to complete all major maintenance and inspections within the first three weeks of the outage and perform all testing and preparation for startup in the fourth week. Operations will resume by September 15, or earlier if all necessary work has been completed. If the Project experiences an unscheduled outage, emergency maintenance will be conducted as needed to restore the unit to operating status. Currently the lake is drawn down prior to the outage. Energy Northwest proposes that this pre-outage drawdown be eliminated.

Energy Northwest proposes to maintain a minimum lake elevation of 2856.5 ft MSL between May 1 and September 15. Between September 16 and April 30, the minimum lake elevation will be 2849 ft MSL. The minimum winter lake level will continue to be needed in order to provide sufficient water for increased bypass flows in Lake Creek, for Project generation that provides continuous flows through the tailrace to the tailrace slough following the maintenance outage, and to allow cleaning and maintenance of the permanent intake screens. Due to the elimination of the pre-outage drawdown, the lake level will stay higher before and during the annual outage, which will result in higher groundwater level than previously.

Instream flows to Lake Creek will be increased according to the schedule in Table EFH-1 below.

<table>
<thead>
<tr>
<th>Month</th>
<th>Instream Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>4</td>
</tr>
<tr>
<td>February</td>
<td>4</td>
</tr>
<tr>
<td>March</td>
<td>4</td>
</tr>
<tr>
<td>April</td>
<td>7</td>
</tr>
<tr>
<td>May</td>
<td>15</td>
</tr>
<tr>
<td>June</td>
<td>10</td>
</tr>
<tr>
<td>July</td>
<td>15</td>
</tr>
<tr>
<td>August 1 – 15</td>
<td>15</td>
</tr>
<tr>
<td>Aug 16 – Sept 15</td>
<td>20</td>
</tr>
<tr>
<td>September 16 – 30</td>
<td>15</td>
</tr>
<tr>
<td>October</td>
<td>10</td>
</tr>
<tr>
<td>November</td>
<td>7</td>
</tr>
<tr>
<td>December</td>
<td>4</td>
</tr>
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</table>

2.2 Proposed Resource Protection, Mitigation and Enhancement Measures

Energy Northwest proposes that the following resource protection, mitigation and enhancement (PM&E) measures be incorporated in the new license for the Project for the benefit of ESA-listed fish species. The measures are discussed below under the potential Project effects to which they relate.
• Increase the annual minimum bypass flow to Lake Creek as shown in Table EFH-1 above.

• Increase the frequency of gravel and wood movement in Lake Creek by providing a spill event of 285 cfs for as long as lake inflows can sustain that flow, or a maximum of 24 hours, every other water year or 3 out of every 6 water years.

• Increase the Lake Creek anadromous spawning and rearing habitat by installing wood and boulder stream structures to provide for additional pools, gravel retention, and other beneficial habitat features in Lake Creek (RM 0-1). Gravel will be added to these structures to immediately improve habitat.

• Monitor stream enhancement measures to verify improvements to habitat.

• Supplement stream structures with gravel recruitment stations to provide adequate movement of gravel into the anadromous reach.

• Move the annual maintenance outage to August 15 through September 15 in order to minimize impacts to spring Chinook salmon spawning and incubation by eliminating attraction flows in the tailrace slough and to avoid discharge of naturally-warmed Packwood Lake water to the tailrace during periods of peak summer temperatures.

• Maintain a minimum lake elevation of 2849.0 ft MSL from September 15 – April 30 of each year, to allow continued project operation to protect Chinook incubation in tailrace slough.

• Eliminate mandatory maximum elevation year round.

• Improve anadromous fish passage on Snyder Creek where it crosses the tailrace canal by rerouting the stream

3.0 EFH FOR APPROPRIATE FISH MANAGEMENT PLANS

3.1 Identification of Essential Fish Habitat

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally managed Pacific salmon: Chinook salmon (O. tshawytscha), coho salmon (O. kisutch), and Puget Sound pink salmon (O. gorbuscha) (PFMC 1999). The MSA, as amended by the Sustainable Fisheries Act of 1996 (PL 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSA, as amended, defines EFH as those waters and substrate necessary for fish use in spawning, breeding, feeding, or growth to maturity.

No pink salmon utilize any part of the Cowlitz River; therefore, EFH is designated only for Chinook and coho salmon. The major components of EFH for these species consist of (1) spawning and incubation, (2) juvenile rearing, and (3) adult migration corridors.

Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable manmade barriers (PFMC 1999), and longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). In this case, EFH extends above the
Cowlitz hydroelectric projects (Cowlitz River Hydroelectric Project [FERC No. 2016] and Cowlitz Falls Hydroelectric Project [FERC No. 2833]) and includes the Cowlitz River, Lake Creek, Snyder Creek and Hall Creek.

The primary EFH for the Project extends from Lake Creek at RM 1.03, the location of the natural barrier to Chinook and coho upstream migration, down to the confluence with the Cowlitz River. In addition, Hall and Snyder creeks and the Cowlitz River in the vicinity of the Tailrace Slough are also designated EFH and considered relevant to the Project. The general habitat characteristics for these reaches are described in the Lake Creek Instream Flow Study (EES Consulting 2007g).

3.2 On-site Studies to Evaluate the Habitat and Effects of the Project

Numerous studies for the relicensing of the Packwood Lake Hydroelectric Project have been developed with agency consultation, completed, and reports have been reviewed by agency representatives. These studies resulted in a comprehensive assessment of habitat quantity and quality and the potential effects of the Project on Chinook, coho and trout habitat. Habitat and fisheries reports for the Project are listed below.


4.0 EFFECTS ON EFH

Energy Northwest has conducted a series of studies within the Packwood Project boundaries to examine potential Project effects on EFH. The following summarizes the finding of these studies with respect to Project effects on EFH.

4.1 Lake Creek Fish Barrier

Survey results of the Lake Creek barrier at RM 1.03 show that the falls/chute complex is a complete barrier to Chinook and coho upstream migration at all flows (EES Consulting 2007f). Therefore, the Project has no EFH effects on migration, spawning or rearing upstream of RM 1.03.

4.2 Lake Creek Instream Flows

Energy Northwest currently releases a minimum of 3 cfs of Packwood Lake water into lower Lake Creek to protect fish and other aquatic species. Additional accretion from snowmelt and groundwater occurs along the 5.4 mile stretch between the Project drop structure and the confluence of Lake Creek with the Cowlitz River.

Results of the instream flow study (EES Consulting 2007c) indicated that spawning habitat, and sometimes rearing habitat, are limited due to habitat conditions and the current instream flow releases. Analysis of spawning habitat below RM 1.03 indicates: 1) gravel is scarce in the EFH in lower Lake Creek; 2) gravel which is present is often perched higher on the banks, and 3) is not covered with flow of appropriate depth and velocity to serve as effective spawning habitat under most flow conditions. Rearing habitat is also limited in the anadromous reach below the barrier at RM 1.03. EFH for both Chinook and coho salmon may be affected by the current instream flows.

4.3 Hall Creek Fish Passage

Energy Northwest surveyed the Project flume over Hall Creek in 2004. The survey showed that the wetted area under the flume was more than 100 ft², with water depths greater than 3 ft. It was determined that the flume did not impede fish passage at any flows and was not a barrier to upstream migration for any of the species listed under the ESA. Therefore, the flume over Hall Creek has no negative effect on EFH (Fish Passage Barriers Study Report for Energy Northwest’s Packwood Lake Hydroelectric Project, EES Consulting 2007f).

4.4 Snyder Creek Crossing at the Project Tailrace

Snyder Creek flows under the Project Tailrace through a 4-foot-diameter culvert. A Level A fish passage analysis indicated that a Level B analysis was warranted. The Level B analysis indicated that the crossing met WDFW fish passage criteria for depth and velocity and the Snyder Creek culvert is not a barrier. However, the WDFW stream simulation was also used to analyze fish passage. With this analysis, the culvert did not
meet fish passage criteria for width, and a Priority Habitat Index (PI) model was run to quantify the amount and quality of the habitat in Snyder Creek for coho salmon. This latter analysis indicated the Snyder Creek culvert crossing would be considered a partial barrier to upstream migration of adult coho salmon (see Figure 4.2 of the Barrier Report; EES Consulting 2007f). Coho fry have been found above the crossing, indicating that fish passage is possible. No Chinook salmon have been documented in Snyder Creek.

Due to the results of the WDFW stream simulation fish passage analysis and the presence of coho fry upstream of the tailrace, the Snyder Creek Crossing of the tailrace is likely a partial barrier and, therefore, has a potential negative effect on EFH.

4.5 Spawning and Rearing in the Tailrace Slough (Cowlitz River)

Currently, generation shutdown for required maintenance of the Project begins in late September and typically lasts until the third week in October. During this period, the water supplied via the Project tailrace to the Cowlitz River tailrace slough is stopped. The shutdown coincides with the late stages of spawning timing for Spring Chinook salmon as well as rearing for coho salmon and steelhead, rainbow and cutthroat trout.

The proportion of flow in the River’s tailrace slough that is derived from the Project tailrace is highly variable, due to both the dynamic channel migration and large flow fluctuations of the Cowlitz River. During certain years, water from the tailrace may be important in providing habitat for spawning and rearing anadromous salmonids, particularly for incubating eggs.

Fish use and associated habitat studies were conducted to assess water needs in the tailrace slough. The Tailrace Slough Use by Anadromous Salmonids report (EES Consulting 2007g) documented fish species presence in the tailrace slough at different times during the year and the Tailrace Slough Instream Flow Study documents the variable effect of flow on fish habitat in the tailrace slough (EES Consulting 2007d).

The tailrace discharges into the Tailrace Slough may have negative effect on EFH in the slough due to their timing and the potential to strand eggs and fry during outages when flows from the Project are shut off. It is likely that during some years tailrace discharges may enhance EFH in the slough.

5.0 CUMULATIVE EFFECTS

Cumulative effects are normally defined as "those effects of future State, tribal, local or private actions, not involving Federal activities that are reasonably certain to occur in the action area….”

Due to the extensive federal ownership and lack of substantial private, tribal and state holdings and development in the Upper Cowlitz River basin, it is unlikely that cumulative effects to EFH will occur within the Project vicinity.
6.0 ALTERNATIVES

Two alternatives were considered for operating the Project.

- No changes to Project operations from the current Project FERC license.
- Adopt proposed protection, mitigation, and enhancement measures to avoid impacts and enhance EFH in lower Lake Creek

7.0 PROPOSED PROTECTION, MITIGATION AND ENHANCEMENT MEASURES FOR CHINOOK AND COHO SALMON IN LAKE CREEK, THE TAILRACE SLough AND SNYDER CREEK.

Results of the studies examining presence/abundance of anadromous fish species in the waters potentially affected by the Project were correlated with flow and habitat data to assess potential Project effects on fish and fish habitat. Studies addressed agency concerns that the Project may affect fish resources and fish habitat in the Project area. Energy Northwest proposed the following measures to protect and enhance the fishery resources of lower Lake Creek, and the Tailrace Slough.

- Increase the frequency of gravel and wood movement in Lake Creek by providing an aquatic habitat forming flow in Lower Lake Creek greater than or equal to 285 cfs for as long as lake inflows can sustain that flow, or a maximum of 24 hours, every other water year or 3 out of 6 water years.
- Increase the bypass flows in Lake Creek to range between 4 and 20 cfs as specified in the agreement reached between Energy Northwest and the resource agencies (see Table EFH-1).
- Increase the Lake Creek anadromous rearing and spawning habitat by installing stream structures to provide for additional gravel retention in Lake Creek (RM 0-1) and created additional pool habitat and cover. Gravel will be added to these structures to immediately improve habitat.
- Monitor gravel movement and retention.
- Supplement stream structures with gravel recruitment stations.
- Shift the time of the annual maintenance outage to August 15 – September 15 in order to minimize impacts to spring Chinook salmon by eliminating attraction flows in the tailrace slough and to avoid discharge of naturally warmed Packwood Lake water to the Cowlitz River during periods of peak summer temperatures.
- From September 16 – April 30 of each year, maintain a minimum lake elevation of 2849.0 ft MSL with no mandatory maximum elevation year round. This will allow for flow continuity in the tailrace slough during the period from mid-September to late July when Project may have been previously shut down due to lack of water.
- Improve fish passage on Snyder Creek where it crosses the tailrace canal by re-routing Snyder Creek to join Hall Creek downstream of the Project flume.
7.1 Measures to Improve EFH Habitat in Lower Lake Creek

Lack of gravel and large wood in the anadromous zone of lower Lake Creek has been established as a primary reason for the lack of overall quality habitat in the lower 1.95 miles of Lake Creek. The Lake Creek Instream Flow Study concluded that spawning habitat for both anadromous and resident fish in Lake Creek is scarce and comprises on average less than 1% of the total habitat available. Spawner surveys conducted for the relicensing noted that all available gravels in Reach 1 were already fully utilized (EES Consulting 2007b). Field surveys of LWD in Lake Creek showed that Reach 1 (accessible to all anadromous fish) has very little LWD in the wetted channel. This lack of LWD results in spawning sized gravel being washed through the system or stored on the channel margins where it is rarely functional as spawning habitat for salmon or trout.

Energy Northwest proposes to increase the instream flow below the drop structure to between 4 cfs and 20 cfs (Table EFH-1) In addition, ENW proposes to increase spawning and rearing habitat in Reach 1 (RM 0.0 – 0.7) and the lower portion of Reach 2 (RM 0.7 – 1.0) by adding structure, cover and complexity and gravel to this lower one mile of Lake Creek. Gravel recruitment stations will also be installed.

Channel forming discharge events are also a critical factor in creating and maintaining diverse and beneficial habitat features. Flows of approximately 285 cfs in Lake Creek have been shown to move gravel and some wood and appear to be adequate flushing flows (see PLP, Section 3.3.1.2.7). Whether caused by natural runoff events or planned overtopping, the channel forming discharges in conjunction with LWD structures will provide the necessary conditions for beneficial changes in stream morphology and habitat in lower Lake Creek.

Energy Northwest will increase the frequency of gravel and wood movement in Lake Creek by providing an aquatic habitat forming flow in Lower Lake Creek greater than or equal to 285 cfs for as long as lake inflows can sustain that flow, or a maximum of 24 hours, every other water year or 3 out of 6 water years. Together these measures are intended to stabilize and retain spawning gravel in the main anadromous reach of Lake Creek and provide pools, cover, and habitat diversity for all fish species and life stages.

Success of the proposed protection, mitigation, and enhancement measures will require agreement on clear goals, thorough planning, careful execution, and adequate monitoring. Numeric targets will be set for a specific quantity of habitat and standards for measuring the habitat will be followed. Monitoring at specified intervals and areas will be carried out with consultation and input of the appropriate resource agencies.

Table EFH-2 shows the detailed effects of the proposed instream flows (including accretion) and habitat enhancement on rearing habitat within Reach 1. Details of the analysis can be found in the Lake Creek Instream Flow Report (EES Consulting 2007c). Table EFH-3 shows the effects of the proposed instream flows and habitat enhancement on salmonid spawning in Reach 1.
### Table EFH-2. Summary of Rearing WUA by Month for Reach 1, Lower Lake Creek (Pre-Project, Current Conditions and Proposed Flows with enhancement with the 50% exceedence level)

| Month  | Treatment       | Chinook Rearing | Coho Rearing | Steelhead Rearing | Cutthroat Rearing | Rainbow Rearing | Winter Rearing | Mean       | %age  
|-------|----------------|----------------|--------------|-------------------|-------------------|----------------|--------------|-----------|-------
|       | Pre-Project    | 4,785          | 3,018        | N/A               | N/A               | N/A            | 5,879        | 4,560     | 100.0%
|       | Current Conditions | 4,853        | 2,831        | N/A               | N/A               | N/A            | 6,259        | 4,648     | 101.9%
|       | Prop w/Enhance | 7,633          | 3,481        | N/A               | N/A               | N/A            | 6,230        | 5,781     | 126.8%
| January | Pre-Project    | 4,526          | 3,082        | N/A               | N/A               | N/A            | 6,108        | 4,572     | 100.0%
|       | Current Conditions | 4,862        | 2,923        | N/A               | N/A               | N/A            | 6,618        | 4,801     | 105.0%
|       | Prop w/Enhance | 7,801          | 3,546        | N/A               | N/A               | N/A            | 6,442        | 5,929     | 129.7%
| February | Pre-Project    | 4,432          | 3,097        | N/A               | N/A               | N/A            | 6,012        | 4,514     | 100.0%
|       | Current Conditions | 4,722        | 3,152        | N/A               | N/A               | N/A            | 7,125        | 4,999     | 110.8%
|       | Prop w/Enhance | 7,838          | 3,813        | N/A               | N/A               | N/A            | 6,956        | 6,202     | 137.4%
| March  | Pre-Project    | 4,797          | 3,024        | 5,502             | 3,969             | 3,782          | N/A          | 4,215     | 100.0%
|       | Current Conditions | 4,766        | 3,097        | 5,558             | 3,047             | 3,276          | N/A          | 3,549     | 84.2%
|       | Prop w/Enhance | 7,821          | 3,629        | 6,205             | 5,961             | 5,391          | N/A          | 5,801     | 137.7%
| April  | Pre-Project    | 5,077          | 2,050        | 6,377             | 4,634             | 4,421          | N/A          | 4,638     | 100.0%
|       | Current Conditions | 4,481        | 3,460        | 3,145             | 2,870             | 2,984          | N/A          | 3,388     | 73.0%
|       | Prop w/Enhance | 7,801          | 3,546        | 6,389             | 5,967             | 5,342          | N/A          | 5,809     | 125.3%
| May    | Pre-Project    | 5,968          | 2,045        | 6,532             | 4,924             | 4,458          | N/A          | 4,785     | 100.0%
|       | Current Conditions | 4,373        | 3,602        | 2,988             | 2,796             | 2,858          | N/A          | 3,323     | 69.5%
|       | Prop w/Enhance | 7,812          | 3,930        | 5,600             | 5,815             | 5,451          | N/A          | 5,721     | 119.6%
| June   | Pre-Project    | 5,575          | 2,234        | 6,342             | 4,562             | 4,486          | N/A          | 4,640     | 100.0%
|       | Current Conditions | 3,717        | 4,036        | 2,163             | 2,251             | 2,171          | N/A          | 2,868     | 61.8%
|       | Prop w/Enhance | 7,745          | 4,129        | 5,249             | 5,622             | 5,404          | N/A          | 5,630     | 121.3%
| July   | Pre-Project    | 4,448          | 3,092        | 4,777             | 3,371             | 3,640          | N/A          | 3,866     | 100.0%
|       | Current Conditions | 2,905        | 4,229        | 1,615             | 1,800             | 1,707          | N/A          | 2,451     | 63.4%
|       | Prop w/Enhance | 7,406          | 4,631        | 4,473             | 4,997             | 5,122          | N/A          | 5,326     | 137.8%
| August | Pre-Project    | 4,692          | 2,945        | 4,531             | 3,367             | 3,706          | N/A          | 3,848     | 100.0%
|       | Current Conditions | 2,711        | 4,278        | 1,499             | 1,698             | 1,607          | N/A          | 2,359     | 61.3%
|       | Prop w/Enhance | 7,703          | 4,210        | 5,117             | 5,522             | 5,367          | N/A          | 5,584     | 145.1%
| September | Pre-Project    | 4,717          | 2,928        | 4,480             | 3,354             | 3,708          | N/A          | 3,837     | 100.0%
|       | Current Conditions | 2,711        | 4,278        | 1,499             | 1,698             | 1,607          | N/A          | 2,359     | 61.5%
|       | Prop w/Enhance | 6,617          | 5,272        | 3,689             | 4,346             | 4,632          | N/A          | 4,911     | 128.0%
### Table EFH-2. Summary of Rearing WUA by Month for Reach 1, Lower Lake Creek (Pre-Project, Current Conditions and Proposed Flows with enhancement with the 50% exceedence level)

<table>
<thead>
<tr>
<th>Month</th>
<th>Treatment</th>
<th>Chinook Rearing</th>
<th>Coho Rearing</th>
<th>Steelhead Rearing</th>
<th>Cutthroat Rearing</th>
<th>Rainbow Rearing</th>
<th>Winter Rearing</th>
<th>Mean</th>
<th>%age 1/</th>
</tr>
</thead>
<tbody>
<tr>
<td>November</td>
<td>Pre-Project</td>
<td>4,439</td>
<td>3,096</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>5,992</td>
<td>4,509</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>3,948</td>
<td>3,992</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>8,385</td>
<td>5,442</td>
<td>120.7%</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>7,310</td>
<td>4,729</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>8,251</td>
<td>6,763</td>
<td>150.0%</td>
</tr>
<tr>
<td>December</td>
<td>Pre-Project</td>
<td>4,626</td>
<td>3,064</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>6,064</td>
<td>4,585</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>4,722</td>
<td>3,152</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>7,125</td>
<td>4,999</td>
<td>109.0%</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>7,838</td>
<td>3,813</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>6,956</td>
<td>6,202</td>
<td>135.3%</td>
</tr>
<tr>
<td>Mean</td>
<td>Pre-Project</td>
<td>4,893</td>
<td>3,586</td>
<td>5,506</td>
<td>4,026</td>
<td>4,029</td>
<td>6,011</td>
<td>4,545</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>4,064</td>
<td>2,352</td>
<td>2,309</td>
<td>2,316</td>
<td>7,102</td>
<td>3,622</td>
<td>79.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>7,610</td>
<td>4,061</td>
<td>5,246</td>
<td>5,461</td>
<td>5,244</td>
<td>6,967</td>
<td>5,765</td>
<td>126.8%</td>
</tr>
<tr>
<td>Mean %</td>
<td>Pre-Project</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>83.1%</td>
<td>127.8%</td>
<td>42.7%</td>
<td>57.3%</td>
<td>57.5%</td>
<td>118.2%</td>
<td>79.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>155.5%</td>
<td>144.7%</td>
<td>95.3%</td>
<td>135.7%</td>
<td>130.2%</td>
<td>115.9%</td>
<td>126.8%</td>
<td></td>
</tr>
</tbody>
</table>

1/ As Percent of Pre-Project Flow WUA

### Table EFH-3. Summary of Spawning WUA by Month for Reach 1, Lower Lake Creek (Pre-Project, Current Conditions and Proposed Flows with enhancement with the 50% exceedence level)

<table>
<thead>
<tr>
<th>Month</th>
<th>Treatment</th>
<th>Spawning WUA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Chinook</td>
</tr>
<tr>
<td>January</td>
<td>Pre-Project</td>
<td>342</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>737</td>
</tr>
<tr>
<td>February</td>
<td>Pre-Project</td>
<td>228</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>154</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>719</td>
</tr>
<tr>
<td>March</td>
<td>Pre-Project</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>187</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>448</td>
</tr>
<tr>
<td>April</td>
<td>Pre-Project</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>488</td>
</tr>
<tr>
<td>Month</td>
<td>Treatment</td>
<td>Spawning WUA</td>
</tr>
<tr>
<td>-------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chinook</td>
</tr>
<tr>
<td>May</td>
<td>Pre-Project</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>507</td>
</tr>
<tr>
<td>June</td>
<td>Pre-Project</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>427</td>
</tr>
<tr>
<td>July</td>
<td>Pre-Project</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>590</td>
</tr>
<tr>
<td>August</td>
<td>Pre-Project</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>491</td>
</tr>
<tr>
<td>September</td>
<td>Pre-Project</td>
<td>247</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>557</td>
</tr>
<tr>
<td>October</td>
<td>Pre-Project</td>
<td>139</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>501</td>
</tr>
<tr>
<td>November</td>
<td>Pre-Project</td>
<td>167</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>156</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>555</td>
</tr>
<tr>
<td>December</td>
<td>Pre-Project</td>
<td>273</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>674</td>
</tr>
<tr>
<td></td>
<td>Pre-Project</td>
<td>185</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>524</td>
</tr>
<tr>
<td>Mean</td>
<td>Pre-Project</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Current Conditions</td>
<td>2.9%</td>
</tr>
<tr>
<td></td>
<td>Prop w/Enhance</td>
<td>283.9%</td>
</tr>
</tbody>
</table>

\(^{1/}\) As Percent of Pre-Project Flow WUA
7.2 Measures to Address Effects to EFH in the Tailrace Slough

The tailrace slough is a highly dynamic side channel and is altered by high flow events in the Cowlitz River. Some years the tailrace slough is largely dependent upon the Cowlitz River during low flow months; however, in other years, a greater percentage of the flow in the tailrace slough comes from the Project than from the river.

Under the current operational regime, the Project’s annual outage for maintenance occurs during October. Spring Chinook periodicity indicates that spawning timing ranges from the middle of August through the end of September. Under the Project’s current operational regime, in certain years where flows in the side channel from the Cowlitz River are low compared to the Project’s outflow contribution, Spring Chinook could be attracted to spawn in the tailrace slough by Project flow, and incubating eggs in the tailrace could be dewatered when the Project shuts down for annual maintenance. Low Packwood Lake inflows during August and September have also forced the Project to shut down occasionally on weekends, since mandatory lake elevations could not otherwise be maintained. This situation also has the potential to subject incubating eggs and fry in the tailrace slough to the risks of dewatering or stranding during these periods.

Energy Northwest proposes to shift the timing of the annual outage in order to provide additional protection to spawning Chinook in the tailrace. Energy Northwest proposes to move the outage to August 15 – September 15. In order to avoid potential impacts to the Packwood Lake environment, Energy Northwest does not propose a pre-outage drawdown. The outage time period was chosen for a number of reasons:

- Spring Chinook salmon spawning begins in the upper Cowlitz River on approximately August 15. By starting the outage on August 15 rather than the current outage timing, the Project will avoid providing attraction water that would draw adult Chinook salmon into the tailrace slough to spawn.
- Performing the outage in August and September, when lake inflows are traditionally low, will help assure adequate water is available to provide bypass flows for Lake Creek that support spawning, incubation, and rearing of anadromous fish.
- Eliminating the pre-outage drawdown will ensure lake storage necessary for continuous operation of the Project from the end of the outage in mid-September through the end of October. Uninterrupted Project operation results in continuous discharge to the tailrace slough in years when the Project flows play a significant part in maintaining spawning and incubation in this area after mid-September.
- Eliminating a pre-outage drawdown minimizes the negative effects at Packwood Lake on:
  - Out migration of juvenile fish from lake tributaries
  - Lowering water levels in wetland areas
  - Amphibian impacts due to lower wetland water levels
  - Littoral fish habitat issues
  - Concerns on limiting uncontrolled shoreline access by recreationists.
• Changing the outage timing has helped minimize the dependence on the Cowlitz River to provide flows during critical October incubation periods in the tailrace slough.
• The shifting of the outage to this period also helps avoid the discharge of naturally warmed Packwood Lake water to the Cowlitz River, when summer temperatures are at their highest.

Several measures will be required during the outage to protect fish in the tailrace area:

• Prior to the annual Project shutdown Energy Northwest will inspect the Cowlitz River side channel that flows into the tailrace slough area. The purpose of this inspection is to verify that the river is providing flow through the side channel into the slough and document the results of the inspection in the station logs. If there is flow through the side channel, no fish rescue is required. If the side channel is dry, a fish rescue will be initiated within 12 hours of cessation of flows through the Project tailrace. If fish are stranded, then fish rescue protocols will be followed to capture them and move them into safe habitat in the Cowlitz River.

• In accordance with the established schedule developed to determine the efficiency of the tailrace fish barrier, the section of tailrace upstream of the fish barrier will be inspected and electrofished, as necessary, within 12 hours of the Project's annual maintenance outage. A block net will be installed where the tailrace exits the stilling basin prior commencing the tailrace fish rescue. The stilling basin will be seined within 72 hours of the shutdown. All captured fish will be recorded and the information provided to the aquatics resource panel in the annual report.

7.3 Measures to Improve Fish Passage at Snyder Creek Tailrace Crossing

Snyder Creek currently passes through a 70-ft-long culvert that crosses under the Project tailrace and joins Hall Creek downstream of the tailrace. This crossing creates a partial barrier to upstream migration of anadromous species currently listed as receiving EFH protection. This crossing is complex and completely backwatered, but does not allow for full passage of all species and life stages at all times. Past high-flow events have filled the culvert with sediment, further impeding upstream passage. Energy Northwest has nevertheless observed both coho salmon and cutthroat trout utilizing Snyder Creek above the tailrace crossing. In meetings with resource agencies, Energy Northwest considered the following options:

• Clean out the culvert to provide passage, if the culvert as configured is passable;
• Abandon the culvert and divert Snyder Creek back into Hall Creek upstream of the tailrace; or
• Replace the culvert with a new structure.

Energy Northwest proposes to re-route Snyder Creek to connect to the backwater channel of Hall Creek downstream (south) of the Project flume. A conceptual drawing of the re-routing of Snyder Creek is included as Figure E.5.3-79 in Section 5.3.1.3.6 of
this BA. Energy Northwest will retain stream restoration specialists and consult with the natural resource agencies and tribes in the re-routing of this creek.

Since the culvert currently does pass fish (although the percentage is not known) Energy Northwest proposes that this culvert be maintained and kept in operating condition until 2015. By this time, Energy Northwest proposes to have Snyder Creek rerouted into Hall Creek downstream of the Project tailrace so as to provide full passage to anadromous fish. Further details are provided in Section 5.3.1.6 of this BA.

8.0 CONCLUSIONS

Based on the results of the studies for the Project, the proposed action would likely have an overall beneficial effect on EFH. Beneficial effects on EFH would primarily occur in the lower 1.0 miles of Lake Creek. In this section of the creek, Chinook spawning and rearing habitat and coho spawning habitat would be increased due to increased flows, LWD structures, spawning gravel and channel maintenance flows. Accretion between the Project drop structure at RM 5.4 and the EFH adds substantial flow to Lake Creek.

Moving the Project’s annual maintenance outage would prevent the Project from having adverse effects on listed species and critical habitat in the Cowlitz River side channel that adjoins the tailrace.

In addition, re-routing Snyder Creek to connect with Hall Creek below the Project tailrace restores access to Snyder Creek for coho and Chinook salmon.
9.0 REFERENCES


APPENDIX E

NOXIOUS WEED MANAGEMENT PLAN
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th></th>
<th>PURPOSE AND SCOPE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2.0</td>
<td>REFERENCES</td>
<td>2</td>
</tr>
<tr>
<td>3.0</td>
<td>DEFINITIONS</td>
<td>2</td>
</tr>
<tr>
<td>4.0</td>
<td>RESPONSIBILITIES</td>
<td>3</td>
</tr>
<tr>
<td>5.0</td>
<td>PROCEDURE</td>
<td>3</td>
</tr>
<tr>
<td>6.0</td>
<td>ATTACHMENTS</td>
<td>5</td>
</tr>
</tbody>
</table>
1.0 PURPOSE AND SCOPE

This procedure establishes responsibilities and requirements for the control of noxious weeds at the Packwood Lake Hydroelectric Project.

2.0 REFERENCES

2.1 Packwood Lake Hydroelectric Project, Stormwater Pollution Prevention Plan

2.2 GIH-8.1.2, Noxious Weed Control Program

2.3 Lewis County Noxious Weed Control Board, 2006 Noxious Weed List, Lewis County, WA

2.4 USDA Forest Service, Region 6, Common Control Measures For Invasive Plants of the Pacific Northwest Region, March 31, 2006, Editor’s note added August 9, 2006


2.6 Washington State Noxious Weed Control Board (WSNWCB), weed list information available at: http://www.nwcb.wa.gov/weed_list/weed_list.htm

3.0 DEFINITIONS

3.1 Noxious weed - Legally, a noxious weed is any plant designated by a Federal, State or County government as injurious to public health, agriculture, recreation, wildlife or property. A noxious weed is also commonly defined as a plant that grows out of place and is competitive, persistent, and pernicious.

3.2 Class A noxious weed – Class A weeds are non-native species with a limited distribution in Washington. Preventing new infestations and eradicating existing infestations is the highest priority.

3.3 Class B noxious weed – Class B weeds are non-native species that are presently limited to portions of Washington. Class B species are designated for control in regions where they are not yet widespread. Preventing infestation in these areas is a high priority. In regions where a Class B species is already abundant, control is decided at the local level, with containment as the primary goal.

3.4 Class C weeds are other non-native weeds found in Washington. Many of these species are widespread in the state. Long-term programs of suppression and control are a local option, depending upon local threats and the feasibility of control in local areas.
3.5 Eradicate - To eliminate a noxious weed within an area of infestation.

3.6 Control - To prevent all seed production within a growing season.

3.7 Prevent the spread of noxious weeds - To contain noxious weeds.

3.8 Contain - To confine a noxious weed and its propagules to an identified area of infestation.

3.9 Dominance ratings - A measure of plant density of the target noxious weed. It is an estimate based on a 0 (zero) to 5 scale where:
   0 = not present
   1 = target species is present, but not obvious in the surrounding plant community.
   2 = target species is present, but not obvious. On a close examination multiple plants are present.
   3 = target species is present and obvious in the surrounding plant community. The target species is not an obvious dominant within the plant community.
   4 = target species is present and obvious in the surrounding plant community. The target species is a co-dominate in the plant community.
   5 = target species is present and dominates the surrounding plant community.

3.10 Action level - The threshold for the Lewis County Noxious Weed Control Board (LCNWCB) to take action as determined by the presence or dominance level of a noxious weed. When the action level is met for a Class A, Class B designate, Class B select or C select weed, the LCNWCB staff will contact the landowner and begin the process of gaining compliance with the noxious weed law.

4.0 RESPONSIBILITIES

4.1 The Packwood Project Manager shall have the overall responsibility for ensuring that Packwood has a noxious weed control program and complies with local, state, and federal regulations for control of noxious weeds.

4.2 The Packwood Station Leader shall have the primary responsibility for ensuring day-to-day project operations are in compliance with local, state, and federal regulations for control of noxious weeds.

5.0 PROCEDURE

5.1 Each year, Packwood staff will obtain the latest listing of noxious weeds in Lewis County and revise the procedure to include the latest list. The 2007 list appears in Attachment 6.1. The LCNWCB may be contacted at (360) 740-1215 or weeds@co.lewis.wa.us, or the list may be obtained on the Lewis County website.
5.2 Packwood staff will identify, with the assistance as needed from LCNWCB staff and/or consultants, noxious weeds within the Project boundary.

5.3 Packwood staff will take appropriate control measures for noxious weeds within the Project boundary, as dictated by the LCNWCB. Action levels and treatment findings are included in Attachment 6.1. Project staff may contact the LCNWCB coordinator for assistance in determining appropriate control measures.

5.4 Packwood staff will review USDA Forest Service requirements for treatment of invasive plant species, and working with the Forest Service initiate appropriate control measures for noxious weeds on USDA Forest Service property within the Project boundary. Common control measures recommended by the USDA Forest Service are given in Reference 2.4 and are summarized in Attachment 6.2. Specific plant species requiring control are discussed in Section 5.7.

5.5 Where practical, manual and/or mechanical methods of noxious weed removal will be used. For noxious weeds in which prevention of seed production is required, plants removed by manual and/or mechanical methods will be taken to the County landfill. If seed production is not an issue, weeds will be disposed of away from waterways and storm drainage systems.

5.6 If pesticides are used, they shall be applied in accordance with label instructions. Registered pesticides may only be applied by employees or contractors licensed by the State of Washington. All pesticide applications shall comply with Chapter 16-228 of the Washington Administrative Code (WAC). Prior to pesticide use, the Packwood Station Leader will review to ensure that the pesticide selected is appropriate; application method proposed is in accordance with label; and pesticides will be stored and disposed safely and in accordance with environmental regulations. Pesticides will not be mixed, nor equipment cleaned in an area where accidental spills can enter surface or ground waters or contaminate the soil. Pesticides will not be sprayed within 100 feet of open waters, including wetlands, ponds, streams, Packwood Lake, the tailrace, and any drainage ditch or channel that leads to open water except when approved by the Washington State Department of Ecology and/or Lewis County. Where pesticide is needed to control vegetation along the tailrace, a cut treatment will be used. The Packwood Station Leader will maintain a record of pesticide applications in the plant log.

5.7 Noxious Weeds within the Project Boundary

5.7.1 Energy Northwest will work with the USDA Forest Service and LCNWCB in controlling reed canary grass and Canada thistle at Packwood Lake within the Project boundary. Control of these species will be deferred until such time as the USDA Forest Service is ready to control these species on their adjacent property.
5.7.2 Energy Northwest will work with the USDA Forest Service and LCNWCB on the meadow knapweed population where it occurs in the Project boundary. Known populations are located along Forest Service Road 1260 (Snyder Road) and along Forest Service Road 1262 (Latch Road). There have been on-going control efforts by the USDA Forest Service. In the past, the population has been treated by hand pulling. Other options include herbicides and biocontrol.

5.7.3 There is a small diffuse knapweed population along the tailrace west of Highway 12. Most of the larger population that probably serves as a seed source is outside the Project boundary on Lewis County property. The LCNWCB has been treating plants at the County site on an on-going basis. Energy Northwest will control any diffuse knapweed within the Project boundary by hand pulling and/or application of herbicides.

5.7.4 Several butterfly bush plants (2 to 3 individuals) were located near where the tailrace enters the Cowlitz River. Energy Northwest will control any butterfly bush plants that occur within the Project boundary by hand pulling. Flower spikes will be deadheaded to prevent the spread of seeds.

5.7.5 Although control for scotch broom is not currently required within the Project boundary, Energy Northwest will use a combination of manual, mechanical and chemical control to reduce the scotch broom population.

5.7.6 Other noxious weeds that occur within the Project boundary will be treated when required by the LCNWCB.

6.0 ATTACHMENTS

6.1 2006 Noxious Weed List, Lewis County, WA
6.2 Description and Summary of Common Control Measures for Invasive Plants of the USDA Forest Service Pacific Northwest Region
6.3 Description and Summary of Control Measures for Other Noxious Weeds Occurring within the Project Boundary
Noxious weeds are non-native plants that have been introduced to Washington through human actions. Due to aggressive growth and lack of natural enemies in the state, these species can be highly destructive, competitive or difficult to control.

To help protect the state's resources, the Washington State Noxious Weed Control Board adopts a State Noxious Weed List each year. The list categorizes weeds into three major classes: A, B, and C according to the extent of their infestation in the state.

The Lewis County Noxious Weed List is made up of all Class A weeds, Class B designer and any selections made by the County Board from the Class B or Class C weed list.

All underlined weeds receive the highest priority for education, survey and enforcement activities by the Lewis County Noxious Weed Control Board.

Class A Weeds

Class A weeds are non-native species with a limited distribution in Washington. Preventing new infestations and eradicating existing infestations is the highest priority. Control of these species is required by law.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bighead knapweed</td>
<td>Centaurea macrocephala</td>
</tr>
<tr>
<td>Buffalo bur</td>
<td>Solanum rostratum</td>
</tr>
<tr>
<td>Gary sage</td>
<td>Salvia scabra</td>
</tr>
<tr>
<td>Common crassula</td>
<td>Crassula vulgaris</td>
</tr>
<tr>
<td>Dense flower coreopsis</td>
<td>Spartina densiflora</td>
</tr>
<tr>
<td>Dyer's weed</td>
<td>Iris tectorum</td>
</tr>
<tr>
<td>Egghead spurge</td>
<td>Euphorbia oblongata</td>
</tr>
<tr>
<td>Flooding prairie-willow</td>
<td>Ludwigia peploides</td>
</tr>
<tr>
<td>Garlic mustard</td>
<td>Alliaria petiolata</td>
</tr>
<tr>
<td>Grant hawthorn</td>
<td>Hippophae rhamnoides</td>
</tr>
<tr>
<td>Goat's rue</td>
<td>Galega officinalis</td>
</tr>
<tr>
<td>Hydrilla</td>
<td>Hydrilla verticillata</td>
</tr>
<tr>
<td>Italian thistle</td>
<td>Carduus pyreoschistus</td>
</tr>
<tr>
<td>Jehovah grass</td>
<td>Sorghum halpense</td>
</tr>
<tr>
<td>Kudzu</td>
<td>Pueraria montana var. lobata</td>
</tr>
<tr>
<td>Leatherleaf</td>
<td>Salvia sericea</td>
</tr>
<tr>
<td>Meadow clover</td>
<td>Salvia perforata</td>
</tr>
<tr>
<td>Mediterranean sage</td>
<td>Salvia azetopis</td>
</tr>
<tr>
<td>Milk thistle</td>
<td>Silybum marianum</td>
</tr>
<tr>
<td>Purple starthistle</td>
<td>Centaurea calcitrigia</td>
</tr>
<tr>
<td>Reed sweetgrass</td>
<td>Glycinea indica</td>
</tr>
<tr>
<td>Salt meadow coreopsis</td>
<td>Spartina paeans</td>
</tr>
<tr>
<td>Silverleaf nightshade</td>
<td>Solarum elaeagnifolium</td>
</tr>
<tr>
<td>Silverflower thistle</td>
<td>Carduus tenuiflorus</td>
</tr>
<tr>
<td>Spanish broom</td>
<td>Spartina junceum</td>
</tr>
<tr>
<td>Sausage fox</td>
<td>Thymus capitatus</td>
</tr>
<tr>
<td>Syrian bear-caper</td>
<td>Zygophyllum fagopyrum</td>
</tr>
<tr>
<td>Texas blurweed</td>
<td>Helianthus ciliatus</td>
</tr>
<tr>
<td>Velvetleaf</td>
<td>Abutilon theophrasti</td>
</tr>
<tr>
<td>Vochysia knapweed</td>
<td>Centaurea nigraescens</td>
</tr>
<tr>
<td>Wild lacebark</td>
<td>Mirabilis nyctaginea</td>
</tr>
<tr>
<td>Yellow devil hawkweed</td>
<td>Hieracium floribundum</td>
</tr>
</tbody>
</table>
**ATTACHMENT 6.1 (Page 2 of 9)**

**Class B Weeds**

Class B weeds are non-native species that are presently limited to portions of the state. Class B species are designated for control in regions where they are not yet widespread. Preventing infestation in these areas is a high priority. In regions where a Class B species is already abundant, control is decided at the local level, with containment as the primary goal.

**Class B Designates, Region 8, Lewis County:**

<table>
<thead>
<tr>
<th>Annual bugloss</th>
<th>Anchusa arvensis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austrian fieldgross</td>
<td>Portulaca oleracea</td>
</tr>
<tr>
<td>Black knapweed</td>
<td>Centaurea nigra</td>
</tr>
<tr>
<td>Blackgrass</td>
<td>Atriplex patula</td>
</tr>
<tr>
<td>Blueweed</td>
<td>Echium vulgare</td>
</tr>
<tr>
<td>Brazilian elodea</td>
<td>Elodea canadensis</td>
</tr>
<tr>
<td>Brown knapweed</td>
<td>Centaurea lycosa</td>
</tr>
<tr>
<td>Camelthorn</td>
<td>Alhagi maurorum</td>
</tr>
<tr>
<td>Common bugloss</td>
<td>Anchusa officinalis</td>
</tr>
<tr>
<td>Common cordgrass</td>
<td>Sporobolus anglicus</td>
</tr>
<tr>
<td>Common foxtail</td>
<td>Foxtail setaria (excl var. arizonica)</td>
</tr>
<tr>
<td>Dalmatian foxtail</td>
<td>Linum usitatissimum var. usitatissimum</td>
</tr>
<tr>
<td>Diffuse knapweed</td>
<td>Centaurea diffusa</td>
</tr>
<tr>
<td>Eurasian watermilfoil</td>
<td>Myriophyllum sibiricum</td>
</tr>
<tr>
<td>Field pennycress</td>
<td>Cardamine pratensis</td>
</tr>
<tr>
<td>Garden foxtail</td>
<td>Avena fatua</td>
</tr>
<tr>
<td>Glass leaved arrowhead</td>
<td>Sagittaria graminea</td>
</tr>
<tr>
<td>Hawkweed ox tongue</td>
<td>Picris hieracifolia</td>
</tr>
<tr>
<td>Horseweed</td>
<td>Conyza arvensis</td>
</tr>
<tr>
<td>Himalayan knapweed</td>
<td>Polygonum polystachyum</td>
</tr>
<tr>
<td>Hoary alison</td>
<td>Bertolonia incana</td>
</tr>
<tr>
<td>Indigobush</td>
<td>Amorpha fruticosa</td>
</tr>
<tr>
<td>Kochia</td>
<td>Kochia scoparia</td>
</tr>
<tr>
<td>Least apricot</td>
<td>Euphorbia esula</td>
</tr>
<tr>
<td>Longspine sandbur</td>
<td>Lepidium virginicum var. virginicum</td>
</tr>
<tr>
<td>Meadow knapweed</td>
<td>Centaurea jacea x nigra</td>
</tr>
<tr>
<td>Mouseear hawkweed</td>
<td>Hieracium umbellatum</td>
</tr>
<tr>
<td>Musk thistle</td>
<td>Carduus nutans</td>
</tr>
<tr>
<td>Orange hawkweed</td>
<td>Hieracium aurantacium</td>
</tr>
<tr>
<td>Parrotfeather</td>
<td>Myriophyllum aquaticum</td>
</tr>
<tr>
<td>Perennial pepperweed</td>
<td>Lepidium latifolium</td>
</tr>
<tr>
<td>Perennial sowthistle</td>
<td>Sonchus arvensis ssp. arvensis</td>
</tr>
<tr>
<td>Phalaris canariensis</td>
<td>Carduus subsp. canariensis</td>
</tr>
<tr>
<td>Poka hawkweed</td>
<td>Hieracium atratum</td>
</tr>
<tr>
<td>Polka's hawkweed</td>
<td>Impatiens glandulifera</td>
</tr>
<tr>
<td>Purple loosestrife</td>
<td>Lythrum salicaria</td>
</tr>
<tr>
<td>Queen devil hawkweed</td>
<td>Hieracium glomeratum</td>
</tr>
<tr>
<td>Rush skeletonweed</td>
<td>Chondrilla juncea</td>
</tr>
<tr>
<td>Russian knapweed</td>
<td>Acroptilon repens</td>
</tr>
<tr>
<td>Saltcedar</td>
<td>Tamarix ramosissima</td>
</tr>
<tr>
<td>Scottish thistle</td>
<td>Onopordum acanthium</td>
</tr>
<tr>
<td>Smooth cordgrass</td>
<td>Spartina alterniflora</td>
</tr>
<tr>
<td>Smooth hawkweed</td>
<td>Hieracium laevigatum</td>
</tr>
<tr>
<td>Spotted knapweed</td>
<td>Centaurea stoechas</td>
</tr>
<tr>
<td>Sow thistle</td>
<td>Cirsium arvense</td>
</tr>
<tr>
<td>Sowthistle</td>
<td>Cirsium arvense</td>
</tr>
<tr>
<td>Swansone</td>
<td>Sphaerocephalus salsola</td>
</tr>
<tr>
<td>Wart lettuce</td>
<td>Lactuca virosa</td>
</tr>
<tr>
<td>Watercress</td>
<td>Lactuca serotina</td>
</tr>
<tr>
<td>White bryony</td>
<td>Bryonia laciniosa</td>
</tr>
<tr>
<td>Wild cherry</td>
<td>Arctomeicus sylvestris</td>
</tr>
<tr>
<td>Yellow hawkweed</td>
<td>Hieracium umbellatum</td>
</tr>
<tr>
<td>Yellow foxtail</td>
<td>Cynodon dactylon var. dactylon</td>
</tr>
<tr>
<td>Yellow nussedge</td>
<td>Cyperus esculentus</td>
</tr>
<tr>
<td>Yellow starthistle</td>
<td>Centaurea solstitialis</td>
</tr>
</tbody>
</table>
ATTACHMENT 6.1 (Page 3 of 9)

Class B Select*, Lewis County:
Local Selections:
- Bohemian knotweed  
- Giant knotweed  
- Japanese knotweed  
- Scotch broom  
- Tansy ragwort

* Mandatory control in selected areas of Lewis County.

Class B
- Common cress  
- Hovea  
- Hydrangea  
- Myrtle Spurge  
- Oxeye daisy  
- Puncturevine  
- Sulfur cinquefoil  
- Wild carrot

Class C Weeds

Class C weeds are other non-native weeds found in Washington. Many of these species are widespread in the state. Long-term programs of suppression and control are a local option, depending upon local threats and the feasibility of control in local areas.

Class C Select*, Lewis County:
Local Selections:
- Butterfly bush  
- Canadian thistle  
- Hairy willowherb  
- Poison hemlock  
- Reeve canarygrass

* Mandatory control in selected areas of Lewis County.

- Absinth wormwood  
- Babystreak  
- Black hembane  
- Bull thistle  
- Cereal rye  
- Common groundsel  
- Common reed  
- Common St. Johnswort  
- Common tansy  
- Curly leaf pondweed  
- English ivy (4 cultivars only)  
- Fragrant water lily  
- Field bindweed  
- Hairy whitetop  
- Hawkweed  
- Heavy teasel  
- Jointed goatgrass  
- Old man's beard  
- Smoothseed alfalfa dodder  
- Spikey cockbur  
- Sphyny cockbur  
- White goode  
- Yellow archangel  
- Yellow flag iris  
- Yellow toadflax

* Non-native genotypes

**Additional information is available on the listed hawkweed species.
**Washington State Noxious Weed List**

(Ch. 16-750 WAC)

The Washington State Noxious Weed List is updated annually. Everyone is encouraged to participate in the process.

For additional information, contact:

Washington State Noxious Weed Control Board
PO Box 42560 — 1111 Washington Street
Olympia, WA 98504-2560  (360) 902-2093
Web site: www.nwcw.wa.gov

The Lewis County Noxious Weed Control Board is a resource for you.

For more information about weed identification and vegetation management, contact:

**Lewis County Noxious Weed Control Board**
Lewis County Historic Courthouse
351 NW North Street MS:AES02
Chehalis, WA
(360) 740-1215
(360) 740-1218
Fax: (360) 740-2792
E-mail: weeds@co.lewis.wa.us
www.co.lewis.wa.us  see “weed control”

**What You Can Do To Protect**
Lewis County’s Resources From
**Noxious Weeds**

- Be an informed gardener; do not plant invasive plants in your gardens and landscapes
- Become familiar with local noxious weeds and inform others
- Volunteer to control weeds in your city, county or national parks
- Report weed sites
- Remove clinging aquatic weeds from your watercraft and trailer
- Control weeds on your property
- Follow best management practices for pastures and open spaces
- Keep vehicles and ATVs out of weed patches, drive on established roads
- Keep your pack animals and pets out of weed patches to minimize movement of weed seeds in their fur
- Re-plant bare ground with appropriate species to prevent weeds from becoming established
- Never dump aquatic plants into a lake, pond or stream

**What are noxious weeds?**

**Why should you care?**

**NOXIOUS WEEDS:**
- Destroy fish & wildlife habitat
- Displace native vegetation
- Frustrate gardeners endlessly
- Decrease biological diversity
- Lower land values
- Reduce crop yields
- Change the functioning of natural ecosystems
- Poison humans and livestock
- Render rivers, lakes and ponds impassable to basses and useless to anglers
APPENDIX ONE

Lewis County
Noxious Weed List & Action levels

-- See Attached Lewis County Noxious Weed List --

Lewis County Noxious Weed List 2007

The Lewis County Noxious Weed List includes the following:

- CLASS A NOXIOUS WEEDS
  and any other, Class A noxious weeds identified by the Washington State Noxious Weed
  Control Board.
- CLASS B DESIGNATES, REGION B, LEWIS COUNTY,
  and any other, Class B designate noxious weeds identified by the Washington State Noxious
  Weed Control Board.
- CLASS B SELECT, LEWIS COUNTY.
- CLASS C SELECT, LEWIS COUNTY.

-See Attached Lewis County Noxious Weed List -

Written Findings
Written findings are developed by the Washington State Noxious Weed Control Board and
provide the biology, impacts and management of listed weeds. The Written Findings are
posted on the Web- www.nwcb.wa.gov and updated periodically by the WSNWCB.

Action levels or treatment thresholds

The Action levels for the following classes - Class A, Class B designates, County Select Class
B, County Select Class C, Class B and Class C weeds on the Lewis County Noxious Weed list
are as follows:
Definitions:
"Eradicate" means to eliminate a noxious weed within an area of infestation.
"Control" means to prevent all seed production within a growing season.
"Prevent the spread of noxious weeds," means to contain noxious weeds.
"Contain" means to confine a noxious weed and its propagules to an identified area of
infestation.
“Dominance ratings” is a measure of plant density of the target noxious weed. It is an estimate based on a 0 (zero) to 5 scale where:
0 = not present
1 = target species is present, but not obvious in the surrounding plant community.
2 = target species is present, but not obvious. On a close examination multiple plants are present.
3 = target species is present and obvious in the surrounding plant community. The target species is not an obvious dominant within the plant community.
4 = target species is present and obvious in the surrounding plant community. The target species is a co-dominant in the plant community.
5 = target species is present and dominates the surrounding plant community.

“Action level” is the threshold for the Weed Board taking action as determined by the presence or dominance level of a noxious weed. When the action level is met for a Class A, Class B designate, Class B select or C select weed, the Weed Board staff will contact the landowner and begin the process of gaining compliance with the noxious weed law.

**NOXIOUS WEED CLASSIFIED as "Class A"**

Control all infestations with a goal of eradication.
Prevention of seed production required statewide.
**Action level requiring landowner eradication:** Identification and dominance at any level.
Maintain a process of surveying for noxious weeds by recording location information, assigning dominance ratings and mapping infestation areas.
Specify control strategies appropriate to each site.
Monitor plant re-growth and propagate production following control actions.

**NOXIOUS WEEDS CLASSIFIED as "CLASS B designate"**

Control all infestations.
Prevention of seed production required in designated regions of state.
**Action level requiring landowner control:** Identification and dominance at any level.
Maintain a process of surveying for noxious weeds by recording location information, assigning dominance ratings and mapping infestation areas.
Specify control strategies appropriate to each infestation site.
Monitor plant re-growth and propagate production following control actions.

**NOXIOUS WEED CLASSIFIED as "B-select" or "C-select"**

Control all infestations.
**Action level requiring landowner control:** Determined by the Weed Control Board for each weed species selected.
Maintain a process of surveying for noxious weeds by recording location information, assigning dominance ratings and mapping infestation areas.
**Tansy ragwort, Senecio jacobaea:**

1. Action level requiring landowner control: Identification and dominance level of 4 and 5 for the parcel or any subset area (10,000 sq. ft.) within the parcel.

2. Public right of way corridors: Action level requiring landowner control: Identification and dominance at any level along described public right of way corridors:
   - Lewis County Roads, St. Highways and City maintained roads.

3. Other considerations: Livestock present, neighboring livestock and forage production operations, landowners complaints.

4. The presence of biological agents on a property does not relieve a landowner of control responsibilities.

**Scotch broom, Cytisus scoparius:**

1. Action level requiring landowner control: Identification and dominance at any level along described public right of way corridors:
   - Public right of way corridors: St. Hwy. 123 from the intersection of Hwy. 123 and St. Hwy. 12 (T14N, Rge 10E, Sec 20) extending north along Hwy. 123 to the Pierce County line.
   - Public right of way corridors: St. Hwy. 12 from the intersection of Hwy. 12 and St. Hwy. 123 (T14N, Rge 10E, Sec 20) extending east along St. Hwy. 12 to the Yakima County Line and extending west along Hwy. 12 to the entrance to La Wiss Forest Service Campground.
   - Public right of way corridor: St. Hwy. 131 from the intersection with Hwy. 12 (Randle) extending southwest along Hwy. 131 to the USFS boundary (T12N, Rge 7E, Sec 17, 20).
   - Public right of way corridor: Cispus Rd, from the intersection with Hwy. 131 extending southeast along Cispus Rd. to the USFS boundary (T12N, Rge 7E, Sec 20, 21, 22, 27).
   - Public right of way corridor: Spears Rd, from the intersection with Hwy. 131 extending southeast along Spears Rd. to the Cispus Rd. (T12N, Rge 7E, Sec 21).
   - Public right of way corridor: Skate Creek Rd South & North from the intersection with Hwy. 12 extending northwest along Skate Creek Rd., USFS 52 Rd. & Skate Creek Rd. North to the Intersection with Pierce Co. line.

2. Action level requiring landowner control: Identification and dominance at any level along described public right of way corridors and adjoining parcels to the right of way:
   - Lincoln Creek Road: Starting at intersection of Galvin Rd & Lincoln Creek Rd., north west to the end of Lincoln Creek Rd. (T15N, Rge 3W Sec 35, 34, 27, 28, 29, 30) (T12N, Rge 4W, Sec 30, 25, 26, 35, 34, 33, 32, 31, 6, 7).
   - Manners Road & Independence Road: Starting at intersection of Lincoln Creek Road, north east to the intersection with Independence Road and east along independence to the Thurston County line. (T15N, Rge 4W Sec 32, 29, 20, 21, 15).
   - Big Hanford Road from the intersection with St. Hwy. 507, east to the end of Big Hanford Road (Sec 5, T16, Rge 1 W).
   - Starting at Mossyrock city limits. Mossyrock Road East, Swafford, Green Mountain, Perkins, Longbell, Salmon Creek, Winston Creek &
all the secondary roads from these primary roads. (T12N, Rge 2E, Sec 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32) and (T12N, Rge 3E, Sec 16, 21, 27, 26, 35, 36) and (T11N, Rge 2E, Sec 2, 3, 4, 9, 10).

- North Fork Road from the intersection with Jackson Hwy., northeast to the end of North Fork Road (T14N, Rge 1 E, Sec 20).
- St. Hwy. 507 from the intersection with Interstate Five (Mellen St.), north to the Thurston County line.

3. Isolated populations associated with public roads and the adjoining parcels. Considerations: population location within the watershed, distance to adjacent populations, probability of spread by water movement, equipment or vehicles, adjacent landowner complaint.

4. The presence of biological agents on a property does not relieve a landowner of control responsibilities.

**Giant knotweed, Polygonum sachalinense**

**Bohemian knotweed, Polygonum bohemicum**

**Japanese knotweed, Polygonum cuspidatum**

1. Action level requiring landowner control: Identification and dominance at any level.

2. Priority for control actions given to:
   River riparian corridor and adjacent parcels where knotweed populations are a source for spread due to flooding.
   1) Cowlitz River from the confluence of Clear Fork of the Cowlitz River and the Muddy Fork of the Cowlitz River (approx. river mile 132) downstream to the confluence with the Cowlitz Falls Dam (approx. river mile 96 88).
   2) Newaukum River, (headwaters T 13 N, R 2 E, Sec 6), downstream to the Chehalis River & including the North Fork (headwaters T 14 N, R 1 E, Sec 20) and the Middle Fork.

   Populations associated with public roads and or streams and the adjoining parcels.

   Considerations: population location within the watershed, distance to adjacent populations, probability of spread by water movement, equipment or vehicles, adjacent landowner complaint.

**"C-select"**

**Poison hemlock, Conium maculatum**

1. Action level requiring landowner control: Identification and dominance at any level within the parcel.

2. Public right of way corridors. Action level requiring landowner control: Identification and dominance at any level along described public right of way corridors. Lewis County Roads, St. Highways and City maintained roads.

3. Other considerations: Landowner complaints, public safety & maintenance of vegetation to prevent this plant from being a human health hazard.

4. The presence of biological agents on a property does not relieve a landowner of control responsibilities.
**ATTACHMENT 6.1 (Page 8 of 9)**

**Hairy willow-herb, Epilobium hirsutum**
1. Action level requiring landowner control: Identification and dominance at any level within the parcel.

**Butterfly bush, Buddleja davidii**
1. Action level requiring landowner control:
2. Identification and dominance at any level of seedling plants, escaped, colonized, naturalized and/or non-cultivated populations.
3. Prevention of seed production required.
4. On going efforts to educate landowners about the invasive characters of buddleja davidii and recommend alternative plants that are less invasive.

**Canada thistle, Cirsium arvense**
**Reed canarygrass, Phalaris arundinacea**

1. Action level requiring control: Identification and dominance at any level.
a. At wilderness area portals (USFS wilderness trailheads, parking lots, campgrounds, & areas within 1/4 mi of wilderness access points).
On going efforts to educate wilderness users about the invasive character of noxious weeds and how to prevent their spread.

**NOXIOUS WEED CLASSIFIED as “Class B” or “Class C”**
Contain infestations
Maintain a process of surveying for noxious weeds within these classes to evaluate their classification and status on the county weed list.
Weeds identified in this category may be widely distributed in the region and within areas of Lewis County making prevention of all seed production within a single season difficult and not always practical. Nonetheless the weed species in this group are noxious and landowners are encouraged to contain them.
Containment of weed populations to prevent spread to areas where listed as Class B Designate. Class B or C select is the goal.

**AQUATIC NOXIOUS WEEDS**
In the aquatic / riparian environment it is not always clear where land ownership starts or ends. The Weed Board will seek the cooperation of landowners and agencies in managing aquatic noxious weeds. Ownership, site conditions and control tactics may limit control actions.

**FOR ALL LISTED WEEDS, OTHER NOXIOUS, TOXIC AND PROBLEM WEEDS**
Provide weed species identification and educational information.
Offer control strategies and tactics appropriate to the infestation site.
Encourage containment and control measures where practical to protect the safety and health of man, domestic animals, wildlife and the environment.
Evaluate weed species for introduction of biological control agents.

Habrolampsey2007\Weed List\APPENDIX ONE 2007 approved.doc
DESCRIPTION AND SUMMARY OF COMMON CONTROL MEASURES FOR INVASIVE PLANTS OF THE USDA FOREST SERVICE PACIFIC NORTHWEST REGION

The following summarizes information on noxious weeds from the Washington State Noxious Weed Control Board’s list of weeds (Reference 2.6) and options considered by Energy Northwest based on control measures listed in the USDA Forest Service’s “Common Control Measures for Invasive Plants of the Pacific Northwest Region” (Reference 2.4) for those species found within the Packwood Lake Hydroelectric Project boundary that require treatment, and those species that may require treatment in the future. Please refer to the USDA Forest Service’s document for details on control measures; the document can be found at: http://www.fs.fed.us/r6/invasiveplant-eis/FEIS/appendicies-pdf/App-N-Com-Cont-Meas-fnl-update-063005-0405-FEIS-nowatermark.pdf

Centaurea diffusa – Diffuse Knapweed

Diffuse knapweed is an 8 to 40 inch tall, biennial or short-lived perennial species, with a long tap root. The single, upright stem produces several spreading branches. The basal leaves are short-stalked and divided into lobes on both sides of the center vein. The stem leaves are stalkless, becoming smaller and less divided near the top of the stem. The flowers, which are generally white (sometimes pink or lavender), occur in urn-shaped heads that grow in clusters at the ends of the branches. The bracts of the flower heads are leathery, with obvious veins. The lower and middle bracts are yellowish-green with a buff or brown margin; they are edged with a fringe of spines plus a longer, spreading spine at the tip. Diffuse knapweed may regenerate from the crown, but reproduces primarily by seed and is a prolific seed producer. A single flower stalk can produce 1,200 seeds. The seeds are dispersed when the plant breaks off at the base and behaves as a tumbleweed. The plants must reach a critical size in order to flower. Under favorable conditions a plant will bolt in May of its second growing season and flowers in July/August. Seeds mature by mid to late August. Seeds germinate in both early spring and fall.

Manual Control: Hand pulling before seed set is effective if done three times per year. Methods include: dig rosettes in the spring; pull mature and immature plants in early summer before seeds form; and pull and bag (to remove seed from area) remaining plants in mid to late summer. All of the infestation must be pulled, and all of the taproot must be removed.

Cultural Control: Deep plowing may be effective where feasible because knapweed seeds will not germinate below 3 cm.

Chemical Control: The following pesticides may be used: clopyralid (Transline), picloram (Tordon), and glyphosate (RoundUp, Rodeo). If used, treat using a backpack or wick to minimize drift. For clopyralid, apply up to the bud stage; for picloram, apply late spring prior to flower stem elongation; for glyphosate, apply when the plant is actively growing in bud stage. Clopyralid is less persistent than picloram, but is more selective. Clopyralid is potentially mobile in water. One application of picloram may be effective for 2 or more years. Picloram is persistent in the soil, and can move offsite through surface or subsurface water. Glyphosate only
provides control during the year of application. It is not mobile in the environment. Glyphosate will not kill seeds or inhibit germination. Rain within 6 hours reduces effectiveness.

Centaurea pratensis – Meadow Knapweed

Meadow knapweed is a perennial growing from a woody root crown, with 20-40 inch tall upright stems. Its basal leaves can be up to 6 inches long and 1.25 inches wide, tapering at both ends. The stem leaves are lance-shaped, stalkless, and sometimes shallowly lobed, while the uppermost leaves are smaller and not lobed. The rose-purple to occasionally white flowers occur in solitary, oval, or almost globe-shaped flower heads at the ends of branches. Meadow knapweed flowers from July to September, producing ivory-white to light brown seeds that may or may not have a barely noticeable plume. Occasional flowers can be found west of the Cascades into November/December. However, because it is a hybrid, meadow knapweed traits are highly variable.

Chemical Control: The following pesticides may be used: clopyralid (Transline), picloram (Tordon), and glyphosate (RoundUp, Rodeo). If used, treat using a backpack or wick to minimize drift. For clopyralid, apply up to the bud stage with two applications per season, one in spring and one in fall; for picloram, apply late spring prior to flower stem elongation; for glyphosate, apply when the plant is actively growing in bud stage. Clopyralid is less persistent than picloram, but is more selective. Clopyralid is potentially mobile in water. One application of picloram may be effective for 2 or more years. Picloram is persistent in the soil, and can move offsite through surface or subsurface water. Glyphosate only provides control during the year of application. It is not mobile in the environment. Glyphosate will not kill seeds or inhibit germination. Rain within 6 hours reduces effectiveness.

Cirsium arvense – Canada Thistle

Canada thistle is a perennial herb with a deep-seated complex system of roots spreading horizontally which give rise to aerial shoots. The 1-4 foot tall stems are slender, green, and freely branched. The leaves are alternate, sessile, and deeply lobed. The leaf margins have stiff yellowish spines. The heads are many and relatively small. The flowers are purple. The fruits are about 1/8 inch long, somewhat flattened, and brownish with an apical circle of long hairs. Canada thistle spreads primarily by vegetative reproduction, which is aided by a fibrous taproot capable of sending out lateral roots as deep as three feet below ground, and from which shoots sprout up at frequent intervals. It also readily regenerates from root fragments less than an inch in length. Canada thistle produces an abundance of seeds that are easily dispersed by the wind. Most seeds germinate within a year; but may remain viable for twenty years or more.

Manual Control: Hand cutting of flower heads can be used; however, this technique will only suppress seed production. Cut high enough to leave > 9 leaves per stem, or > 20 centimeters of bare stem tissue, as mature Canada thistle leaves and stems independently inhibit development of shoots and rootbuds.
Mechanical Control: Smothering Canada thistle with boards, sheet metal, or tar paper can kill plants.

Chemical Control: The following pesticides may be used: clopyralid (Transline), picloram (Tordon), glyphosate (RoundUp, Rodeo), and chlorsulfuron (Telar, Glean). If used, treat using a backpack or wick to minimize drift. For clopyralid and picloram, apply at basal rosette stage after most leaves have emerged. Fall applications will reduce spring regrowth. For glyphosate, apply at basal rosette stage after most leaves have emerged; fall is the best season since translocation to root is highest. Chlorosulfuron could be applied at bud-bloom stage or to fall rosettes. Clopyralid is less persistent than picloram and is potentially mobile in water. Picloram is persistent in the soil, and can move offsite through surface or subsurface water. Glyphosate only provides control during the year of application. It is not mobile in the environment. Glyphosate will not kill seeds or inhibit germination. Rain within 6 hours reduces effectiveness. Chlorosulfuron primarily suppresses regrowth and secondarily reduces the number of root buds. It is extremely potent. There may be damage to non-target terrestrial and some aquatic plants.

Cytisus scoparius – Scotch Broom

Scotch broom is a shrub, 1-2 meters high, with leaves 6 to 12 mm long, flowers and flat pods. Golden yellow flowers bloom between April and June, and resemble flowers of a pea. Scotch broom can reproduce vegetatively or by seed. Bushes can produce up to 60 seed pods per bush by their second year. Seed can remain viable for up to 80 years, and will germinate when shad is removed and ground is disturbed. Soil disturbance while treating will encourage sprouting.

Manual Control: Hand pulling may be used to destroy seedlings or plants up to 1.5 meters tall. It is most easily accomplished after a rain when the soil is loose when the root system can be removed in its entirety. Hand digging or hoeing can be effective, but care must be taken to remove all roots. Use of a weed wrench is effective on mid-size plants.

Mechanical Control: Cutting using various tools or mowers is most effective when done as plants are flowering, but before seed set. Clipping low to the ground is best. Brooms will most likely still resprout with this method, so repeated treatments will be needed. Return visits in the fall and winter will be necessary.

Chemical Control: The following pesticides may be used: triclopyr (Garlon), picloram (Tordon), and glyphosate (RoundUp, Rodeo). For triclopyr, treatment should be in late spring during active growth; paint cut stumps or incised stem within 5-20 minutes of cutting. Offsite movement by water is possible. For picloram, apply to young plants during active spring growth using a backpack or wick to minimize drift. Picloram can move offsite through surface or subsurface water, and is persistent in the soil. Glyphosate is most effective when applied from flowering through first hard frost; apply using a backpack or wick to minimize drift. Glyphosate provides some control; however, repeated applications may be necessary. Rain within 6 hours reduces effectiveness.
Geranium robertianum – Herb Robert

Herb Robert is a shade tolerant, low growing geranium. A distinguishing characteristic of the species is the pungent odor of the crushed leaves; another common name for this plant is “stinky Bob.” The light green leaves are deeply dissected. In late fall the foliage turns red. The stems fork and are brittle at the joints. They are pubescent and under high light conditions are red and up to 25 cm long. The roots are shallow. The pink flowers are perfect with five petals that are 7-10 mm. The receptacle is elongated into a structure called a "torus." The fruit is a capsule. Herb Robert spreads entirely by seeds, which are brown and about 2 mm long. Each flower produces five seeds capable of being ejected 15-20 feet. With adequate moisture, seeds begin germinating soon after dispersal. New seedlings appear several times throughout the growing season, which is from early spring to late fall and even into early winter. It has the ability to overwinter as seeds or as a rosette.

Manual Control: Hand pulling is quick and easy, due to the shallow roots, but stems are brittle, so care must be taken to get the entire plant. Use caution to ensure that desirable vegetation is not pulled.

Chemical Control: Glyphosate (RoundUp, Rodeo) may be used; however care must be taken as non-targets could also be killed. If used, treat at low rates early in the season, using a backpack or wick to minimize drift. Complete control may require re-treatment. Rain within 6 hours reduces effectiveness.

Hypericum perforatum – St. Johnswort

St. Johnswort is an erect, opposite-leaved perennial herb, ranging from 2-4 feet tall arising from a taproot. The plant can have single or multiple stems. The reddish stems are smooth, somewhat two-edged, woody at the base, and branching out toward the top of the plant. The narrow, lance shaped leaves are about one inch long; stalkless with pointed tips. Each leaf is spotted with tiny translucent dots. Each flower has five yellow petals and many yellow stamens. The black dots often visible along the petal margins are glands containing hypericin. This red pigment is also visible in glands on leaf margins giving the leaf a perforated look. The inflorescence is a flat topped cluster of many flowers found at branch ends. St. Johnswort reproduces by seeds and short runners. The taproot may reach depths of 4-5 feet. Lateral roots grow 2-3 inches beneath the soil surface but may reach depths of 3 feet. Flowering begins in May and continues through September. Developing capsules become very sticky and contain 400 to 500 seeds. Seeds may remain viable in soil for up to 10 years.

Manual Control: Hand pulling or digging of young plants in small, isolated infestations may be effective. Repeated treatments may be necessary because lateral roots can give rise to new plants. Pulled or dug plants must be removed from the area.
Chemical Control: The following pesticides may be used: metsulfuron (Escort), picloram (Tordon), and glyphosate (RoundUp, Rodeo). Apply using a backpack or wick to minimize drift. Apply metsulfuron after plants have fully emerged and are in active growth. Metsulfuron is potentially mobile in water through wind erosion. Damage to some aquatic plants is possible. Apply picloram in early growth stage before bloom. One application may be effective for two or more years. Pichloram is persistent in the soil, and can move through surface or subsurface water. Glyphosate should be applied in spring/summer when plants are growing rapidly. Aquatic formulation can be used near water. Rain within 6 hours of application may reduce effectiveness, and complete control may require retreatment.

Phalaris arundinacea – Reed Canarygrass

Reed canarygrass is a robust, cool season, sod-forming perennial that produces culms through creeping rhizomes. It is very tolerant of freezing temperatures and begins to grow early in spring; therefore it can out-compete many other species. Reed canarygrass can reach 3-6 feet in height. The sturdy, often hollow stems can be up to 1/2 inch in diameter, with some reddish coloration near the top. Leaf blades are flat and hairless, 1/4 to 3/4 of an inch wide. Flowers are in branched clusters on culms high above the leaves. The species flowers in June and July. Reed canary grass is rarely fully eradicated and requires yearly, if not monthly attention.

Manual Control: Removal by hand pulling is only practical for small stands. It can be effective if done over the entire population two to three times per year for five years. Covering populations with black plastic may work as long as shoots are not allowed to grow beyond the plastic.

Mechanical Control: Cutting can be effective, but must be done multiple times in one year.

Chemical Control: Glyphosate (Rodeo or Accord) and sulfometuron methyl (Oust) may be used. Apply with a backpack with adjustable spray nozzle. Glyphosate should be applied in early spring when plants are just sprouting and before other wetland species germinate. Rain within six hours reduces effectiveness. Some formulations may be used over water. Complete control may require re-treatment. Sulfometuron methyl should be applied to pre-emergent or early post-emergent plants. Sulfometuron methyl is highly mobile by water or by wind erosion. Damage to some aquatic plants is possible.

Polygonum cuspidatum – Japanese Knotweed

Japanese knotweed is a perennial species with spreading rhizomes and numerous reddish-brown, freely branched stems. The plant can reach 4-8 feet in height and is often shrubby. The leaves are 4-6 inches long and generally ovate with an abrupt point. The whitish flowers are borne in open, drooping panicles. The approximately 1/8 inch long fruits are brown, shiny, and triangular. The primary mode of reproduction is through extensive rhizomes that can reach 15-20 meters in length. Dispersal can occur when rhizome fragments are washed downstream.
Rhizomes can regenerate even if buried up to one meter deep and have been observed growing through two inches of asphalt. Shoots generally begin to emerge in April and growth rates exceeding eight centimeters per day have been recorded.

Mechanical Control: Covering, in conjunction with cutting, may be useful in smaller stands. Several layers of black plastic or shade cloth weighted down by blocks, mulch or stones may work. This should be done after cutting or when plants are fully grown. No reports of successful long term control using covering have been found.

Integrated approach: Cutting or pulling in combination with herbicide is most effective.

Chemical Control: Glyphosate (Rodeo) or triclopyr (Garlon) can be used. Triclopyr is most effective in fall when leaves are translocating to rhizomes. Application could follow a prior cut in late spring or early summer. Application by cut and paint stems: cut between first and second internode and then deliver triclopyr into “well” created by cut. Amine formulations may be used near or over water. Offsite movement by water is possible. Glyphosate application by cutting and injection is most effective in the fall when leaves are translocating to rhizomes. Application by cut and paint stems: cut between first and second internode and then deliver glyphosate into “well” created by cut. Foliar spray by backpack with adjustable nozzle can be used when plants are 1-2 meters tall, and is best if following a prior cut in the spring. Rain within six hours reduces effectiveness. Formulations approved for use over water must be used. Low concentrations (less than 5 percent) may be most effective.

**Potentilla recta – Sulfur Cinquefoil**

Sulfur cinquefoil is a long-lived, taprooted perennial herb that typically flowers from late May to mid July. It produces several erect stems which can reach 1-3 feet in height. The stout, leafy, hairy stems are unbranched up to the inflorescence. The leaves, which are also rough-hairy, have five-to-seven-toothed leaflets that are 2-4 inches long by 1/2-1 inch wide. The flat-topped inflorescences are 3-6 inches across, and each flower has five light yellow petals surrounding a dark yellow center. The fruits are dark brown, with lighter, prominent, branched ridges, and narrow, winged margins. It reproduces primarily through seed; a single plant can produce thousands of seeds annually; and it can be spread by roots if they are moved by tillage or on soil-moving equipment. Seeds are dispersed primarily by wind from late summer through fall. Seeds may remain viable for more than four years. Sulfur cinquefoil can dominate a site within two to three years. New shoots can develop annually from the outer portion of the main root.

Manual Control: Hand-digging may effectively control small infestations if the root crowns are completely removed.

Chemical Control: Repeated applications are needed for long term control. Backpack or wick to minimize drift. Broadcast spray may be necessary for large infestations. Picloram (Tordon) and metsulfuron (Escort) can be used. Apply picloram in the fall or spring prior to late bud stage. On dry sites, picloram is preferred because its residual activity will inhibit new plants.
from establishing from the seed bank. Apply metsulfuron after plants have fully emerged and are in active growth.

**Senecio jacobaea – Tansy Ragwort**

Tansy ragwort is classified as a biennial herb. It can complete its life cycle as a winter annual and occasionally as a perennial, depending on environmental conditions. Tansy ragwort has stalked dark green, basal leaves. The leaf underside is somewhat hairy, and appears whitish. The overall rosette has a ruffled appearance, due to deeply indented and blunt toothed lobes of the leaves. The basal leaves are often deciduous. The size of the rosette may indicate the potential for flowering, with larger rosettes producing more flowers. During the second year, one or several flowering stems bolt, with the overall plant being 1-4 feet high. The leaves found on the flowering stem are alternate, and sessile. The flower heads are in flat topped clusters. Each flower head is composed of yellow, daisy-like flowers. Each flower head is a composite of many disc flowers surrounded usually by 13 ray flowers. A distinguishing characteristic is the 13 'petals,' which are ray flowers. Tansy ragwort has a taproot, and often a large woody rootstock. Dispersal of seed is usually up to 9 meters. Seeds can remain viable in the soil for several years, and as deep as 25 centimeters. The species can also regenerate vegetatively.

**Manual Control:** Hand pulling is effective if done when soils are moist and the hole left behind is mulched. Plants must be mature enough to bloom, so the stems will not be easily broken. Tug firmly from one side, and if the plant does not come out, move to the opposite side; this is because the primary root grows toward one side.

**Mechanical Control:** Mowing is the most commonly used technique. It is most effective if done prior to flowering when the plant has exhausted its reserves, but before seeds have started to develop.

**Chemical Control:** Metsulfuron (Escort) plus a surfactant and picloram can be applied using a backpack or wick to minimize drift. Metsulfuron should be applied to actively growing plants. It is potentially mobile in water or through wind erosion. Picloram can be applied up through the flowering stage. Fall application after rains have initiated seed germination have also proven effective. Picloram is persistent in the soil and can move offsite through surface or subsurface water.
DESCRIPTION AND SUMMARY OF CONTROL MEASURES FOR OTHER NOXIOUS WEEDS OCCURRING WITHIN THE PROJECT BOUNDARY

The following summarizes information on noxious weeds from the Washington State Noxious Weed Control Board’s list of weeds (Reference 2.6) and control options considered by Energy Northwest.

Buddleja davidii – Butterfly bush

Butterfly bush is a deciduous shrub with arching branches that can reach a height of 15 feet. The showy flower spikes are often purple, and the leaves and stems are typically hairy. The leaves can be either lance-shaped or egg-shaped, and are either finely toothed or coarsely toothed, usually between 4-10 inches long and 1-3 inches wide. The leaves are often green or blue-gray above and whitish on the underside, due to the fuzzy hairs. Flowers are four-parted and bell-shaped, commonly purple with an orange center. Cultivars can be pink, magenta, red, blue, orange, yellow, and white. Flower spikes are erect or nodding, reaching a length of between 4-10 inches. The flowers are fragrant; blooming begins in mid-summer. Young stems are green; mature stems develop scraggly, gray-brown bark that peels off.

Manual control: Seedlings can be hand-picked and adult plants can be dug up. However, butterfly bush thrives in recently disturbed areas, so be aware that these methods of removing plants may actually promote the growth of new seedlings. Deadhead flowerspikes before they produce seed to prevent further spread.

Cirsium vulgare – Bull thistle

Bull thistle is an annual or biennial herbaceous plant. In the juvenile phase, individual bull thistle plants form a single rosette with a taproot up to 28 inches long. Rosettes may be up to 3.3 feet in diameter. The taproot does not spread, but may develop several smaller lateral roots. The tall, spiny, winged stems (up to 7 feet tall) have many spreading stems. Leaves are 3-12 inches long, lance-shaped, and very hairy. The purple flower heads are 1.5-2 inches in diameter and 1-2 inches long with narrow spine-tipped bracts.

Mechanical Control: Mow to prevent seeding.

Chemical Control: Bull thistle can be effectively controlled using glyphosate (RoundUp, Rodeo), triclopyr (Garlon), picloram (Tordon), clopyralid (Transline), metsulfuron methyl (Escort), and dicamba (Banvel).

Daucus carota – Wild carrot

Wild carrot is an erect, taprooted herb, 1 to 4 feet tall. Although it can occur as an annual or short-lived perennial, the species is typically a biennial that bears a rosette of leaves its first season. The plant, which is covered with coarse, stiff hairs, has fern-like leaves that are divided
several times into small, toothed leaflets; the ultimate segments are linear or lance-shaped. Leaves are basal or alternate. Basal leaves have a long petiole. Stem leaves are sessile with sheathing bases. The small, white flowers are borne in compound, flat-topped umbels. Umbels are 2-4 inches in diameter and may have one to several purple or pinkish flowers at the center. Umbels, which are surrounded by a circle of finely divided bracts, become concave as the fruits mature. A single plant may produce up to 100 umbels during the flowering season. The oblong, grayish-brown fruits are 1/16-1/8 inches long and flat on one side. The other side of the fruit has rows of bristles on the curved surface. Although plants are self-fertile, wild carrot flowers are typically cross-pollinated by a wide range of insects. Estimates of seed production vary, from 1,000 to 40,000 seeds per plant. Seeds of the terminal umbel ripen first; these umbels are heaviest and have more viable seed. The seeds are released from mid-summer through mid-winter and may be carried by wind or on animal fur.

Manual/Mechanical Control: Hand-pulling or mowing during the first year when the plants are 7 to 10 inches tall can be effective.

Cultural Control: Establishing and maintaining healthy stands of native/desirable vegetation can reduce wild carrot infestations.

Chemical Control: Pesticides are most effective when applied to seedlings. Older plants may not respond to herbicides. Annual applications may be required to control seedlings. Picloram (Tordon) and metsulfuron methyl (Escort) can be used.

Hypochaeris radicata – Common catsear

Common catsear is a perennial plant with basal rosettes of leaves. The leaves are rough-hairy and lobed, or wavy-margined. The hollow, sparsely branched flowering stems contain a white, milky juice, and are 0.75-2 feet tall. The yellow flowers occur in heads that are 1-1.5 inches in diameter. The fruits are long-beaked and tipped by a circle of plume-like bristles.

Manual/Cultural Control: Scattered plants can be spaded out below the crown in early spring as soon as the leaves appear. Badly infested fields should be cultivated one to two years before reseeding with native vegetation.

Leucanthemum vulgare – Oxeye daisy

Oxeye daisy is a perennial herb, 1 to 3 feet tall, with shallow, branched rhizomes and adventitious roots. The stems, which arise from upturned rhizomes or buds on the root crown, range from hairless to slightly hairy. The prostrate, basal stems can root, while the other stems are erect and simple to slightly branched. Cotyledons open above ground and wither soon after the first leaves form. The toothed, spatula-shaped to round basal leaves occur on long stalks. The stem leaves are alternate and lack stalks; they are lance-shaped to ligulate, with coarse teeth and often have a few lobes at the base. Flowers are showy and daisy-like, with 20 to 30 white ray flowers and numerous, bright yellow disk flowers. Flower heads are usually solitary and solitary.
grow on long, terminal stems; heads average 1-2.2 inches in diameter. Involucral bracts are narrow with a dark brown, scarious margin. The entire plant has a disagreeable odor when crushed. Oxeye daisy can spread both vegetatively and by seed.

Mechanical Control: Because of its shallow root system, oxeye daisy is easily killed by intensive cultivation.

Chemical Control: Metsulfuron methyl (Escort) can be used on oxeye daisy.

**Senecio vulgaris – Common groundsel**

Groundsel is a downy winter or summer annual or biennial. Leaves are elongate, with a blunt, rounded tip. The first true leaves have shallow teeth; the third and fourth leaves are more deeply lobed. The stems are succulent, hollow, slightly angled, and much branched, with many leaves on top. Leaves are alternate on the stem and deeply indented. Upper leaves are attached directly to the stem, but lower leaves have a short petiole. The green bracts surrounding the flower cluster have conspicuous black tips that distinguish groundsel from other weeds in the thistle family. Plants have simple or branched upright growth, 6-18 inches tall. The foliage is generally smooth but may have light pubescence. Flowers are yellow. Seeds germinate in early spring to late fall and three to four generations may develop in one season. The cotyledons and young leaves on seedlings are purple on the underside. Young plants appear as rosettes. Common groundsel flowers in April to October. This weed prefers cool and wet environments with nutrient rich soil. Common groundsel reproduces by seed. Seed dormancy may vary among populations. Seeds typically germinate early spring through late fall (year-round in some areas). Fluctuating temperatures, light, cold stratification, leaching with water, or scarification stimulate germination.

Mechanical Control: The key time to control common groundsel by mechanical methods is just prior to seed set. Shallow tillage in fall and early spring will control winter and some spring annuals.

Chemical Control: Several pesticides control groundsel, including metsulfuron methyl (Escort) and clopyralid (Transline).

**Tanacetum vulgare – Common tansy**

Common tansy is an aromatic and oily perennial that grows from 1 to 6 feet tall. Common tansy is often confused with tansy ragwort due only to its common name. They are easily distinguished since tansy ragwort is non-aromatic. The stems of common tansy grow in a cluster, causing the plant to have a bush appearance. Small, golden flower heads form many flat-topped clusters (flower heads are button shaped). Leaves are 2-10 inches long and divided into narrow, toothed segments.

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Manual Control: Pull the plant and place in a plastic bag to remove plant from the area if flowers or seeds are present.
Chemical Control: The most effective herbicide for common tansy control is metsulfuron (Escort); however, metsulfuron should not be used to control weedy infestations near water as metsulfuron is persistent in soil and has the potential to leach into groundwater. Glyphosate (Rodeo) is an alternative for use near water, but is not very effective for controlling common tansy.