

September 18, 2006  
PKWD-06-034

Ms. Magalie R. Salas  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, D.C. 20427

Dear Secretary Salas:

Subject:       **PACKWOOD LAKE HYDROELECTRIC PROJECT  
FERC DOCKET NO. 2244-012  
STUDY PROGRESS REPORT**

In accordance with 18 CFR 5.15, enclosed please find the Packwood Lake Hydroelectric Project's Study Progress Report. The report describes Energy Northwest's progress in conducting relicensing studies: Amphibian Survey, Anadromous Salmonid Habitat and Spawning Survey, Bald Eagle and Osprey Nest Survey, Cultural Resources, Engineering Needs for Access Routes, Engineering Study Related to Barrier Replacement on the Tailrace, Fish Distribution and Species Composition, Fish Passage Barriers, Fish Population Characterization Near the Drop Structure, Geomorphology and Habitat of the Tailrace Slough, Gravel Transport, Lake Creek Instream Flow and Habitat Assessment, Large Wood, Noxious Weed Survey, Packwood Lake Drawdown, Packwood Lake Entrainment, Rare Plant Survey, Recreation Resources, Stream Connectivity in Packwood Lake Tributaries, Tailrace Slough Instream Flow, Tailrace Slough Use by Anadromous Salmonids, Vegetation Cover Type Mapping, and Water Quality.

The first of two study progress report meetings has been scheduled for Tuesday, October 3, 2006 from noon until 5:00 p.m. at the Lacey Public Library. Studies under discussion at that meeting include: Cultural Resources, Engineering Studies Related to Barrier Replacement, Packwood Lake Drawdown, Water Quality, and Stream Connectivity in Packwood Lake Tributaries. A second study plan meeting will be held in December to discuss the remaining eighteen studies.

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**FERC DOCKET NO. 2244-012**  
**STUDY PROGRESS REPORT**

If you have any questions or require additional information regarding this matter, please contact Ms. Laura Schinnell at (360) 673-3350.

Respectfully,

A handwritten signature in black ink, appearing to read "J.W. Baker". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

J.W. Baker, Vice President  
Energy/Business Services

Enclosure: Packwood Lake Hydroelectric Project, Study Progress Report, September  
2006

## ENCLOSURE

### PACKWOOD HYDROELECTRIC LAKE PROJECT FERC Docket No. 2244-012

#### STUDY PROGRESS REPORT September 2006

#### Amphibian Survey

##### ***Study Requested By:***

This study was requested by the Washington Department of Fish and Wildlife (WDFW) and the USDA Forest Service.

##### ***Purpose of Study:***

The purpose of the study is to determine the occurrence and general distribution of amphibian species in and along lower Lake Creek, and in the portion of Upper Lake Creek upstream from Packwood Lake where there may be backwater effects. The study targeted species listed as Sensitive by the USDA Forest Service and/or listed as Candidates by the State of Washington. The results from this study will be used to assess and evaluate potential Project effects on amphibians.

##### ***Status of Study Investigation:***

All aspects of the amphibian field survey have been completed. These include searches in and along lower Lake Creek; a survey of Upper Lake Creek and wetlands at the fringe of Packwood Lake), and opportunistic searches associated with the vegetation cover type survey. Survey results are summarized below and in Table 1.

Searches targeting Van Dyke's salamander (*Plethodon vandykei*) were completed at the previously established survey sites, each of which was surveyed on three separate dates in spring 2006. These searches yielded seven species: coastal giant salamander, western red-backed salamander, rough-skinned newt, coastal tailed frog, Pacific treefrog, Cascades frog, and red-legged frog. No Van Dyke's or Cascade torrent salamanders (*Rhyacotriton cascadae*) were found.

Instream habitat searches of lower Lake Creek were conducted in July and August 2006. Two species were found in instream habitats: coastal giant salamander and coastal tailed frog. Over all, nearly 50 giant salamanders were examined for identification. Based on size, morphology, and color patterns, all of the examined individuals were clearly identifiable as coastal giant salamander and not Cope's giant salamander (*Dicamptodon copei*).

<b>Species</b>	<b>Location<sup>1</sup></b>	<b>Comments</b>
Coastal giant salamander ( <i>Dicamptodon tenebrosus</i> )	LLC	Common in creek where there is hiding cover and flows are not excessive.
Northwestern salamander ( <i>Ambystoma gracile</i> )	PLW, HCW	Small, first-year larvae found in wetland at the fringe of upper Packwood Lake. Both first-year and large, second-year larvae found in Hall Creek wetland.
Rough-skinned newt ( <i>Taricha granulosa</i> )	LLC	Two juveniles observed at talus slope site along creek in 2006.
Western red-backed salamander ( <i>Plethodon vehiculum</i> )	LLC	Found at several sites adjacent to the creek, particularly numerous in areas of accumulated cobbles and gravel.
Coastal tailed frog ( <i>Ascaphus truei</i> )	LLC	Most observations were adults, including active in the open during cool, rainy days and several pairs in amplexus.
Western toad ( <i>Anaxyrus boreas</i> ) <sup>2</sup>	LLC	One tiny juvenile found along creek in 2005.
Pacific treefrog ( <i>Pseudacris pacifica</i> ) <sup>2</sup>	LLC, PLW, HCW	Several adults found by creek. Larvae numerous in wetland at fringe of upper Packwood Lake and in Hall Creek wetland.
Cascade frog ( <i>Rana cascadae</i> )	LLC, ULC, PLW	Adults and juveniles common along lower Lake Creek. A few small larvae found in Upper Lake Creek (where water was relatively cold); much larger larvae were found in the wetland at the fringe of upper Packwood Lake. Species also found at Osprey Lake and at two other wetlands in the Vegetation Cover Type study area.
Red-legged frog ( <i>Rana aurora</i> )	LLC, HCW	One juvenile observed along creek in 2006. Large larvae found at Hall Creek wetland.

<sup>1</sup>LLC = lower Lake Creek; ULC = Upper Lake Creek; PLW = upper Packwood Lake wetland

<sup>2</sup>Terminology according to Frost et al. 2006.

The amphibian survey of the Upper Lake Creek area, including an emergent wetland on the fringe of upper Packwood Lake, was conducted on July 18, 2006. This area was also examined during the Packwood Lake seasonal drawdown on September 30, 2005. Because heavy rain on this date resulted in widespread standing water, it was not possible to determine whether pools are normally retained in the drawdown zone of the upper Packwood Lake wetland during the seasonal drawdown. During the amphibian survey only one species was found in Upper Lake Creek: a few small Cascades frog larvae in a shallow, muddy tributary. Larvae of Cascades frog were numerous in the emergent wetland on the southeast fringe of Packwood Lake between Upper Lake Creek and Muller Creek (see attached photographs), along with larvae of Pacific

treefrog and northwestern salamander. Cascades frog and Pacific treefrog larvae characteristically metamorphose by late summer, long before drawdown occurs. However, northwestern salamander larvae, which over-winter before metamorphosing in their second year, would be present during the drawdown.

Cascades frogs were also found at Osprey Creek and at other sites in the vegetation cover type mapping study area. At the Hall Creek wetland, larvae of three species were found: red-legged frog, Pacific treefrog, and northwestern salamander.

***Anticipated Completion of Field Study:***

Field investigations have been completed.

***Anticipated Draft Study Report Date:***

The draft study report has been issued.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

***References:***

Frost, D.R., T. Grant, J.N. Faivovich, R.H. Bain, A. Haas, C.F.B. Haddad, R.O. De Sá, A. Channing, M. Wilkinson, S.C. Donnellan, C.J. Raxworthy, J.A. Campbell, B.L. Blotto, P. Moler, R.C. Drewes, R.A. Nussbaum, J.D. Lynch, D.M. Green, and W.C. Wheeler. 2006. The Amphibian Tree of Life. *Bulletin of the American Museum of Natural History* 297:1-370.

Devine Tarbell and Associates, Inc. 2006. Draft, Amphibian Survey Report for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, Washington. September 2006. Available at: [http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Draft%20Packwood%20Lake%20Amphibian%20Study%20Report\\_0906.pdf](http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Draft%20Packwood%20Lake%20Amphibian%20Study%20Report_0906.pdf)

Appendix A, Amphibian Survey Photographs. Available at: [http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Appendix%20A%20Draft%20Packwood%20Lake%20Amphibian%20Study%20Report\\_0906.pdf](http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Appendix%20A%20Draft%20Packwood%20Lake%20Amphibian%20Study%20Report_0906.pdf)

## **Anadromous Salmonid Habitat and Spawning Survey**

### ***Study Requested By:***

This study was requested by WDFW, NOAA Fisheries and the USDA Forest Service.

### ***Purpose of Study:***

The goals of this study are to:

1. Identify spawning habitat and quantify the amount of spawning by anadromous salmonids in the streams affected by project operations.
2. Determine the presence and upstream limits of anadromous salmonid distribution in Lake Creek, Snyder Creek, and Hall Creek
3. Determine the presence and utilization of the Cowlitz River near shore left banks immediately downstream of Lake Creek and the tailrace slough.
4. Identify any project-related barriers to upstream migration.

### ***Status of Study Investigation:***

Anadromous spawner surveys for Lake, Snyder, and Hall creeks and the Cowlitz River areas and the tailrace slough were completed in July, 2006. Spawner surveys for the Project stilling basin continue on a monthly basis. Anadromous salmonids (adults or juveniles) were found in the following areas:

- lower Lake Creek below the barrier at RM 1.03;
- Snyder Creek above the tailrace to immediately below the main Forest Service road crossing and culvert that runs behind the Powerhouse [*Note: a natural barrier, a falls in excess of 60 feet, exists upstream of this road crossing*];
- Hall Creek above the Snyder Creek Road and below the falls several hundred meters above the Snyder Creek Road;
- tailrace slough;
- Cowlitz River adjacent to and downstream of the tailrace.

Anadromous salmonids were not observed below the confluence of Lake Creek on the left bank.

Habitat surveys were conducted in all study stream reaches below the first natural barriers. Snorkeling of anadromous areas was conducted during the study; electrofishing of anadromous areas was also completed after securing the required state and federal permits.

### ***Anticipated Completion of Field Study:***

Field efforts were completed in July 2006.

***Anticipated Draft Study Report Date:***

The draft study report will be issued no later than November 15, 2006.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

The study plan stated that Hall Creek would be surveyed from 200 meters downstream of the Project flume crossing to 200 meters above the project flume crossing and an index area upstream of the Snyder Creek Road. The depth of the marshy slough area in the vicinity of the Project flume crossing precluded effective sampling. Spawning, however, was concentrated in 2005-2006 in Hall Creek above the Snyder Creek Road and this area was intensively sampled, both during spawner surveys and in the Fish Distribution and Species Composition surveys.

As a result of commitments made for fish rescue in the tailrace pending installation of a permanent barrier, spawning surveys were added to the stilling basin. Energy Northwest agreed to have the stilling basin snorkeled a minimum of one time per month until the permanent barrier is constructed.

No additional modifications or new studies are being proposed by Energy Northwest.

**Bald Eagle and Osprey Nest Survey**

***Study Requested By:***

This study was requested by WDFW and the USDA Forest Service.

***Purpose of Study:***

The purpose of the study is to document the number, status, and location of bald eagle and osprey nests in the proximity of Packwood Lake and to record incidental observations of both species during the survey effort.

***Status of Study Investigation:***

The field study has been completed. The initial helicopter survey was conducted on April 18, 2006, timed to be consistent with the early nesting period of both of the target species. On this date, four osprey nests were observed adjacent to the southwest side of Packwood Lake; two of these nests were previously known and recorded in the WDFW Wildlife Resource Database System. Three of the nests were determined to be active and occupied (one or both adults present); the fourth nest was inactive (Table 2). The locations of nests were determined by GPS, marked on a map, and the nests were photographed. No bald eagle nests were found and there were no incidental observations of bald eagles during the survey. Because occupied osprey nests were observed during the initial survey, a second, follow-up survey was conducted on

June 21. On this date, a fourth occupied nest, discovered during a May 12 amphibian field survey on lower Lake Creek, was also examined. The results of the follow-up survey are presented in Table 2. No bald eagles were observed during the follow-up survey.

<b>Table 2. Summary of Bald Eagle and Osprey Nest Survey.</b>			
<b>Nest Number</b>	<b>Location</b>	<b>April 18 Results</b>	<b>June 21 Results</b>
1	Packwood Lake	Active, Occupied (2 adults)	1 adult incubating 3 eggs
2 <sup>1</sup>	Packwood Lake	Active, Occupied (2 adult)	2 adults with two nestlings
3 <sup>2</sup>	Packwood Lake	Active, Occupied (1 adult)	No ospreys observed
4	Packwood Lake	Inactive	Inactive
5	Lake Creek	NA <sup>3</sup>	1 adult, no eggs or young

<sup>1</sup> Nest PAHA 14-1 in WRDS

<sup>2</sup> Nest PAHA 14-2 in WRDS

<sup>3</sup> Nest subsequently discovered (May 12, 2006); 1 osprey observed at the nest.

***Anticipated Completion of Field Study:***

The field investigation has been completed.

***Anticipated Draft Study Report Date:***

The draft study report has been issued.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

***References:***

Devine Tarbell and Associates, Inc. 2006. Draft, Bald Eagle and Osprey Nest Report for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, Washington. September 2006. Available at: [http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Bald%20Eagle%20and%20Osprey%20Nest%20Survey\\_Draft%20Report0906.pdf](http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Bald%20Eagle%20and%20Osprey%20Nest%20Survey_Draft%20Report0906.pdf)

## Cultural Resources

### ***Study Requested By:***

This study is needed for compliance with Section 106 of the National Historic Preservation Act.

### ***Purpose of Study:***

The purpose of the study is to inventory cultural resources, determine which are eligible for listing in the National Register of Historic Places (“historic properties”), evaluate Project effects, and prepare a Historic Properties Management Plan to mitigate adverse effects and manage the properties during the period of the new license.

### ***Status of Study Investigation:***

Cultural resource specialists completed background research and field surveys. The draft confidential inventory report was issued in January 2006 to members of the Cultural Resources Committee for review and comment. A final inventory report was prepared in May; however, because of questions related to the USGS gaging station located within the Project boundary, additional research was conducted. The final inventory report was issued on September 11, 2006.

The research and fieldwork investigated a number of sites and two buildings, as listed in Table 3. Only one site, the prehistoric sites 45LE285 that the GPNF has previously studied, is both inside the APE and eligible for listing in the National Register of Historic Places. While the 1930 USGS gaging station is located in the APE, the building is not recommended as individually eligible for listing in the National Register and investigation of eligibility as part of a regional multiple property submission is beyond the scope of Project relicensing. The Project is anticipated to have no effects on the gaging station. The HPMP will address management of the properties.

<b><i>FS Number</i></b>	<b><i>Name</i></b>	<b><i>Inside/Outside APE</i></b>	<b><i>NHRP Significance</i></b>
13102115	Prehistoric Archaeological Site 45LE285	Inside	Eligible
13102103	Big Sleep Peeled Cedar	Outside	Eligible
13092303	Valley Development Company telephone line	Inside but not encountered	Not Applicable
13092304	Valley Development Company tramway hoist house	Just outside	Not Applicable
13092305	Valley Development Company road and flume bed	Outside	Not Applicable

**Table 3. Cultural resources in on near the Packwood Lake Hydroelectric Project Area of Potential Effects.**

<i><b>FS Number</b></i>	<i><b>Name</b></i>	<i><b>Inside/Outside APE</b></i>	<i><b>NHRP Significance</b></i>
13092401	Valley Development Company road/flume bridge	Inside but not encountered	Not Applicable
	Valley Development Company Trail	Inside but not encountered	Not Applicable
13102803	Site 45LE296	Inside but not encountered	Recommended Not Eligible
13102101	Packwood Lake Guard Cabin (Valley Development Company cabin remains)	Just outside	Eligible
	USGS Gaging Station and Cableway	Inside	Recommended Not Individually Eligible; Could be Eligible as Part of a Multiple Property Submission
	Packwood Lake Trail (currently maintained as the Pipeline Bench Road and the Pipeline to Packwood Lake Motorized Trail)	Inside	Recommended Not Eligible
13102102	Packwood Lake Resort Site	Only boat dock was inside; was removed & not encountered	Not eligible
13102804	Packwood Lake prehistoric isolated artifact	Inside but not encountered	Not Applicable
	Lily Basin Trail (Hager Creek Trail [Trail #86]); fragments in lower elevations below maintained portion	Inside but not encountered	Not Applicable
	Unknown trail fragment, reported by Wyman Ross, possible part of Trail #86	Outside	Not Applicable
13102801	Bear Creek Fishtrap	Outside	Not Applicable
13102802	Game Department Cabin Site	Outside	Not Applicable
13103301	Upper Lake Creek Fishtrap	Outside	Not Applicable

***Anticipated Completion of Field Study:***

The field investigation has been completed.

***Anticipated Draft Study Report Date:***

The draft and final inventory reports have been issued, and were mailed to members of the Cultural Resources Committee. The draft Historic Properties Management Plan is expected to be issued to members of the Cultural Resources Committee in mid-October, 2006 for review and comment. The plan will be finalized in early December, 2006.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

Because of the additional research required for the USGS gaging station, the Historic Properties Management Plan was not issued in summer 2006 as anticipated by the Revised Cultural Resources Study Plan.

No other modifications or additional studies are proposed by Energy Northwest.

**Engineering Needs for Access Routes**

***Study Requested By:***

This study was requested by the USDA Forest Service.

***Purpose of Study:***

The goal of this study is to determine the condition, use, and maintenance of Project access roads so that appropriate actions can be identified for the protection of natural resources while providing safe access to the project area. The goal of this study is to also develop sufficient information to provide a technical basis for developing a maintenance plan for managing access roads and trails that is consistent with applicable state and federal regulatory requirements and plans. The objectives for this study include:

- Document current maintenance of access roads and trails; and
- Identify maintenance and reconstruction needs to make the access roads hydrologically stable and in compliance with maintenance levels and safety standards.

***Status of Study Investigation:***

USDA Forest Service and Energy Northwest staff inspected the wet areas on September 29 and October 17. Three locations were inspected: the Tunnel 1 French drain, the small creek crossing Latch Road, and a culvert on the trail that passes water over the pipeline. Stream flows for Lake Creek near the mouth were provided to the USDA Forest Service staff to provide a comparison for their observations and measurements. The USDA Forest Service staff will provide a summary of their findings

to Energy Northwest and the Federal Energy Regulatory Commission. Energy Northwest believes that the measurements indicate that the wet spots are not a result of pipeline leakage.

Traffic counters, part of the recreation study, were installed in April and May 2006.

***Anticipated Completion of Field Study:***

The road inventory will be completed in October 2006 as scheduled by the Revised Engineering Needs for Access Routes Study Plan. The inventory will include an assessment of road stability and hydrologic connectivity.

***Anticipated Draft Study Report Date:***

The draft study report will be issued by January 19, 2007, consistent with the Revised Engineering Needs for Access Routes Study Plan. An oral report summarizing results will be provided in December 2006 as part of the study plan report meeting.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

**Engineering Study Related to Barrier Replacement on the Project Tailrace**

***Study Requested By:***

This study was requested by the United States Fish and Wildlife Service (USFWS) and NOAA Fisheries.

***Purpose of Study:***

The study will provide a design for a fish barrier that will replace the barrier that had been installed as part of the original Project features at the downstream end of the tailrace and was subsequently washed away by the Cowlitz River in the 1970s.

***Status of Study Investigation:***

Energy Northwest completed a feasibility study on installing a temporary barrier that was submitted to the Federal Energy Regulatory Commission in October 2005. The feasibility study indicated that it was not viable to put in a temporary barrier, because cost-effective designs did not meet requested criteria for fish barriers as provided by NOAA Fisheries or the costs were what were expected for a permanent barrier. As a result, Energy Northwest modified the schedule for initiating the design for a permanent barrier to 2006.

A fish rescue plan has been developed in consultation with the agencies and tribes, and fish rescues have been conducted since September 2005. The fish rescue plan was finalized in September 2006. Fish rescues will be conducted until the permanent barrier is constructed.

***Anticipated Completion:***

Energy Northwest will provide agencies and tribes with preliminary design concepts in September 2006, and expects to submit a permanent design for FERC approval in January 2007. A monitoring plan will be developed based upon the permanent design in consultation with the agencies and tribes. Providing all required approvals are obtained, Energy Northwest expects to install the permanent barrier in October 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

As indicated above, Energy Northwest will submit a permanent design one year earlier than anticipated by the Revised Engineering Study Related to Barrier Replacement on the Project Tailrace. Energy Northwest is scheduling installation of the permanent barrier for October 2007, provided all required approvals are obtained. This is a modification from the Revised Study Plan, which stated that the new barrier would be installed within three years of obtaining the new license. After the permanent design has been completed, and prior to beginning installation, a monitoring plan will be developed to determine the effectiveness of the barrier.

***References:***

Letter dated October 28, 2005, J.W. Baker to Magalie R. Salas, "Interim Tailrace Barrier Feasibility Study."

Letter dated April 20, 2006, J. W. Baker to Magalie R. Salas, "Status Report for Fish Rescue Plan and Tailrace Barrier."

Energy Northwest and EES Consulting. "Fish Rescue Plan, Project Tailrace and Stilling Basin, Revision 0, September 2006."

**Fish Distribution and Species Composition**

***Study Requested By:***

This study was requested in whole or in part by the USDA Forest Service, WDFW, NOAA Fisheries, and USFWS.

### ***Purpose of Study:***

Recent fisheries population data for the Project-affected area are not available. Resident trout spawner surveys are taken at the peak of the run by WDFW, but do not reflect spawner population size or duration of spawning. Timing of emigration from these lake tributaries to Packwood Lake is unknown; these data could be important relative to the timing of the lake drawdown in late September and October.

### ***Status of Study Investigation:***

A literature review of existing information was conducted and the results synthesized.

Snorkeling and electrofishing surveys have been completed on Hall and Snyder creeks and all tributaries to Packwood Lake with the exception of upper Lake Creek above Beaver Bill Creek. However, Beaver Bill Creek, a tributary to upper Lake Creek, was surveyed for habitat and fish. Flows in Upper Lake Creek were extremely turbid, and very few fish were observed. Surveys in this area will be completed in the fall when temperatures decrease, flows drop, and Upper Lake Creek becomes clearer (e.g., glacial till is not present).

Anadromous spawner surveys on lower Lake Creek are complete through RM 2.0. Electrofishing and snorkeling surveys were completed in September for lower Lake Creek from its confluence with the Cowlitz River up to the drop structure. Coho juveniles, rainbow and sculpin have been observed below the chute at RM 1.03. Rainbow and sculpin have been observed/collected between RM 1.03 and RM 2.0.

Surveys using fyke nets in Packwood Lake tributaries were conducted for resident fish (e.g., juvenile and young of the year) in May, prior to the commencement of spawning in the tributaries. The study plans stated that these nets were to be deployed in fall, 2005; however, large freshets followed by snowy conditions and lack of access precluded setting these nets until late the following spring. These juvenile fyke nets were redeployed in late July. To date, the only fish captured by these nets has been a spawned out rainbow carcass collected in Crawford Creek.

Four spawner surveys of Packwood Lake tributaries were proposed for 2006. Higher than normal water, with poor visibility, precluded these surveys from being effective. Energy Northwest proposes to resurvey the lake for spawning rainbow trout in 2007.

Four gillnets (two horizontal and two vertical) were suspended in Packwood Lake prior to the spawning period. Snow and ice on the lake, coupled with lack of access to Packwood Lake, precluded setting the nets until late spring. Very short night sets resulted in capture of rainbow trout only. This effort was suspended due to a mortality rate of 50%. Two Oneida traps were deployed in lieu of gillnets, with a 14 day set during the last two weeks of July. There were no captures in the traps; however, there were 6 mortalities due to entanglement in the wings leading to the traps. The traps are currently pulled from the lake.

Packwood Lake was snowed and frozen over until mid-April. Higher than normal snowfall and conditions as a result of snow melt prevented necessary equipment from being taken to the lake until late April – early May. At that point, higher than normal flows prevented deployment of the nets in Packwood Lake tributaries until mid-July. Those same flows precluded effective snorkeling or electroshocking as well. Data collection has taken place in late July and August and will continue throughout September. Fish surveys and mapping of Upper Lake Creek above Beaver Bill Creek will be completed in October when temperatures decrease, flows become lower and visibility increases.

***Anticipated Completion of Field Study:***

Energy Northwest expects to complete the field study by June 30, 2007.

***Anticipated Draft Study Report Date:***

Energy Northwest expects to issue the draft study report by July 31, 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

Energy Northwest is proposing to continue this study through June 2007, in order to collect data for the spawning period, corresponding to the period in which field conditions did not allow data collection in 2006. The Oneida traps will be redeployed in Packwood Lake and the fyke nets will be reset in the tributaries in February 2007 or when conditions allow. Per the study plan modification approved by FERC, genetic analysis was not conducted on any fish in Lake Creek, Packwood Lake, or its tributaries.

**Fish Passage Barriers**

***Study Requested By:***

The USDA Forest Service, USFWS, and WDFW requested this study.

***Purpose of Study:***

The goal of this study is to identify barriers to fish passage from Project facilities such as roads, trails, pipelines and the tailrace. Analysis of the drop structure is covered in a separate study.

Objectives of the Packwood Lake Hydroelectric Project Fish Passage Barriers study include:

1. Determine impacts to fish migration and connectivity from project facilities and operations.
2. Include in this evaluation all species present and life stages that are appropriate at the particular barrier.
3. Scope of this study is to evaluate Project-related barriers including, but not limited to roads, trails, pipelines and tailrace.

***Status of Study Investigation:***

Barriers on Lake Creek at RM 1.03 and 2.0 have been analyzed at release flows of approximately 5, 16, and 34 cfs from the drop structure. The barriers were also evaluated during the spill event in spring, 2006. Culverts on Snyder Creek, along the Snyder Creek Road and along the Pipeline Bench Road (FS Road 1260-066) were also evaluated per the methods prescribed in the study plan. These culverts included those to Art Lake Creek and other road crossings. The culvert evaluated on Snyder Creek was upstream of the project boundary.

***Anticipated Completion of Field Study:***

Field work has been completed.

***Anticipated Draft Study Report Date:***

The draft Fish Passage Barriers study report will be completed and distributed to the resource agencies and tribes by the end of September 2006.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

**Fish Population Characterization Near the Drop Structure**

***Study Requested By:***

The USDA Forest Service and USFWS requested the Fish Population Characterization Near the Drop Structure study.

***Purpose of Study:***

This study will characterize the abundance, distribution, movement, and structure of the fish communities and available habitat that are potentially impacted by the Packwood Lake Hydroelectric Project drop structure.

The objective of this study is to provide the stakeholders with information to assess potential drop structure impacts on fish populations in Project affected waters and make informed decisions on the management of the fish communities.

Specific study goals included the following:

1. Determine the location of the first fish passage barrier waterfall downstream of the drop structure, thereby delineating the isolated reach of Lake Creek. The isolated reach is defined here as the reach from the drop structure downstream to the first barrier waterfall.
2. Determine the amount of suitable spawning and rearing habitat available for rainbow and cutthroat trout and other fish species within the isolated reach.
3. Determine the fish species present within the isolated reach.
4. Determine the population size and age/size structure of all fish species within the isolated reach.
5. Determine upstream migration timing (spawning, foraging, and other movement) of rainbow and cutthroat trout and other fish species within the isolated reach.

#### ***Status of Study Investigation:***

Due to higher than normal snow and conditions as a result of snow melt, commencement of this study was delayed because gear could not be secured at the drop structure. Once equipment access had been established, higher than normal flows and the planned spill event to accommodate the instream flow, large wood, gravel transport, and barrier analysis studies precluded setting nets in the drop structure until after the spill had ceased.

Per the study plan, a seine net was employed in June to capture fish in the apron below the drop structure; both seines and gillnets proved ineffective for capture of fish in this area. A fyke net for use below the drop structure was built and deployed for the month of July and August; however, even this net has had limited success. Visual counts of rainbow trout in the apron have been made on each trip to provide additional information on fish present below the drop structure. The fyke net has been fished continuously since August and is still employed below the drop structure.

The amount of spawning gravel has been quantified for the area above the highest barrier as part of the gravel transport study. Habitat assessments, including rearing and spawning area were completed in August. A fish population assessment survey was completed in August, and will be repeated in October. Fish surveys indicate the presence of rainbow trout only in this portion of Lake Creek, with many congregating on the apron below the drop structure. Due to the large size of these fish (not found in Lake Creek during other investigations) at the drop structure, it is thought that these trout originated from the lake and were swept over the drop structure during the planned

spill event for the instream flow, barrier analysis, gravel transport, and large woody debris investigations.

The uppermost barrier to fish migration, a 12 foot waterfall, was identified and analyzed. This barrier is approximately 1400 feet below the drop structure.

A literature review is being conducted to determine affects of fish being transported over the drop structure.

***Anticipated Completion of Field Study:***

The study plan schedule provides for seining to occur one day per month for one year, with seining occurring twice in May and June. The plan noted that it may not be feasible to net the area below the drop structure during the winter due to snow cover. Energy Northwest will complete this effort in June 2007.

The fish population assessment survey will be completed in October 2006.

***Anticipated Draft Study Report Date:***

The first year draft will be completed and distributed to resource agencies and tribes by November 15, 2006. A final report, following the completion of the seining, will be distributed to the agencies and tribes that incorporates comments received on the draft, as well as data from the seining effort.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

As noted above, Energy Northwest is proposing to continue this study until June 2007. No additional modifications to ongoing studies or new studies are being proposed by Energy Northwest.

**Geomorphology and Habitat of the Tailrace Slough**

***Study Requested By:***

This study was requested by NOAA Fisheries and the USFWS.

***Purpose of Study:***

The goals and objectives of this study are to obtain a physical description of the physical habitat present in the tailrace slough; the geomorphology of the point bar at the end of the tailrace, and the likely changes in the point bar and tailrace slough over the duration of the new license, including:

- Likely physical changes to the tailrace slough over the course of the license (natural processes);
- Potential for development (residential or industrial) of the area surrounding the tailrace slough; and
- Potential for Energy Northwest to undertake activities to stabilize (i.e., rip rap, grading) or otherwise modify the tailrace and its entrance into the slough over the course of the new license.

### ***Status of Study Investigation:***

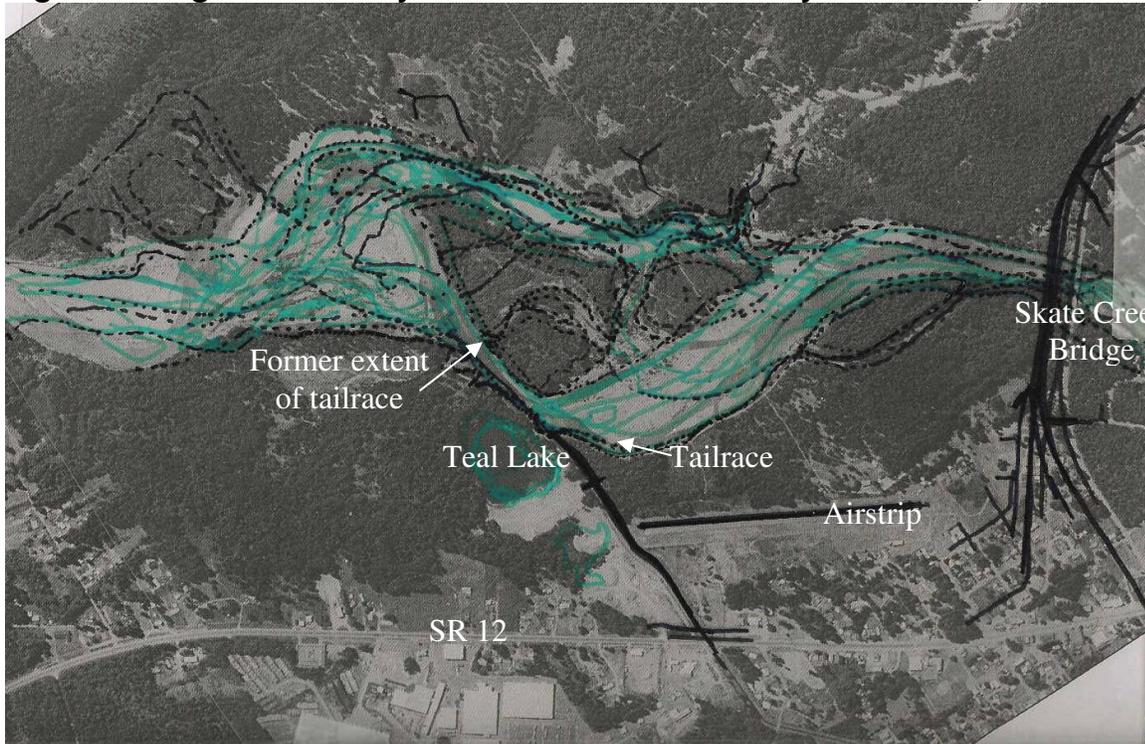
Cross sections in the lower tailrace and slough were surveyed during April-May 2006 using a TOPCON laser level, tape, and 25' survey rod. Cross sections extended from the berm around Teal Lake on the west through the tailrace, and eastward across the former floodplain to the Cowlitz River. Cross sections were taken along the tailrace from the small bridge over the tailrace (north of the airstrip) to the approximate end of the former tailrace section that was washed out. Cross sections were spaced 50 feet apart from the bridge to the location where the unlined tailrace intersects the Cowlitz River side channel, and 100 feet apart between the intersection and the end of the former washed-out tailrace.

Existing substrate and habitat were also mapped on recent aerial photographs. Channel features were mapped on a series of historic aerial photographs for use as part of the geomorphic study. A draft summary of this information follows.

The Cowlitz River is an active, braided, glacially-influenced channel. The main Cowlitz channel has changed position significantly in the vicinity of the tailrace outflow several times since the Project was constructed in the 1960's, and has eroded and removed approximately the lower 1,600 feet of the lined tailrace during high flows in the late 1970's.

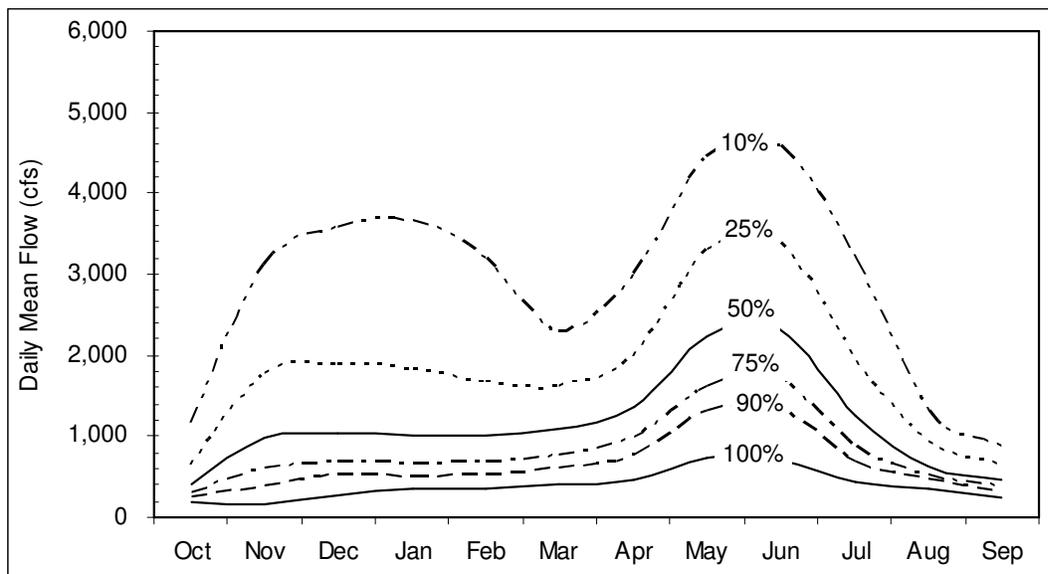
Figure 1 shows the varying locations of the Cowlitz water surface (blue lines) and the edge of the active channel (black lines) from 1966 through 2003. The river is pinned on the East at the Skate Creek road bridge, and has avulsed (shifted suddenly) in the vicinity of the tailrace from the northern channel to the southern channel in the 1970's. During this shift, the lower approximately 1,600 feet of the lined tailrace was eroded and removed by the river. The channel migrated progressively southward, toward the tailrace and the airstrip through the mid 1990's, then the main flow shifted back to the northern channel. A rip-rap lined levee was constructed to protect the tailrace and airstrip along the southern portion of the southern channel. This halted the southern migration of the channel. At present, the main flow is in the northern channel, with a smaller amount of flow in the southern channel near the tailrace. It is very likely that the channel will shift again in the future, with minor annual shifts and major shifts during peak flows. There have been at least five peak flows since the 1960's.

**Figure 1. Migration history of Cowlitz River in vicinity of tailrace, 1966-2003.**



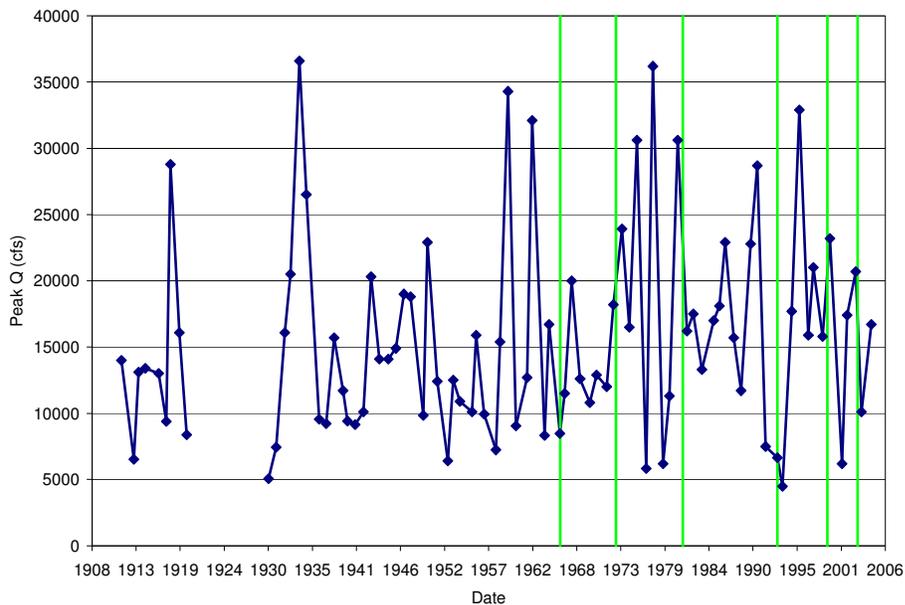
Average daily flows in the Cowlitz River are highest during snowmelt runoff (May-June), are lowest in September and October, and moderately high during the winter in response to rainfall at lower elevations (see Figure 2).

**Figure 2. Flow exceedence for Cowlitz River at Packwood, 1968-present.**



The highest peak discharges occur during rain-on-snow events, generally between December and February. The flow of record occurred in December, 1933 (36,600 cfs); other high peaks occurred in 1959, 1962, 1975, 1977, 1980, and 1996 (Figure 3).

**Figure 3. Annual Peak Discharge, Cowlitz River at Packwood.**



*Note: green bars show dates of available aerial photographs.*

***Anticipated Completion of Field Study:***

Pebble counts in the tailrace slough will be made in September 2006 during low water.

Information on property ownership, zoning, and development plans will be obtained from Lewis County during September 2006, so that reasonably up-to-date information may be used in the assessment. Energy Northwest has decided, in consultation with resources agencies and tribes, to construct a permanent barrier to fish passage, that will need to be factored into the assessment. The fish barrier will be constructed at the end of the existing tailrace, to preclude potential stalling of anadromous fish.

***Anticipated Draft Study Report Date:***

The draft study report will be completed and distributed to resource agencies and tribes in mid-November, 2006.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

## Gravel Transport

### ***Study Requested By:***

The USDA Forest Service requested this study.

### ***Purpose of Study:***

The gravel transport study will assess how operation of the Packwood Lake Hydroelectric Project affects the transport of gravel in the size range suitable for use by spawning fish in Lake Creek downstream of the drop structure. Study objectives include:

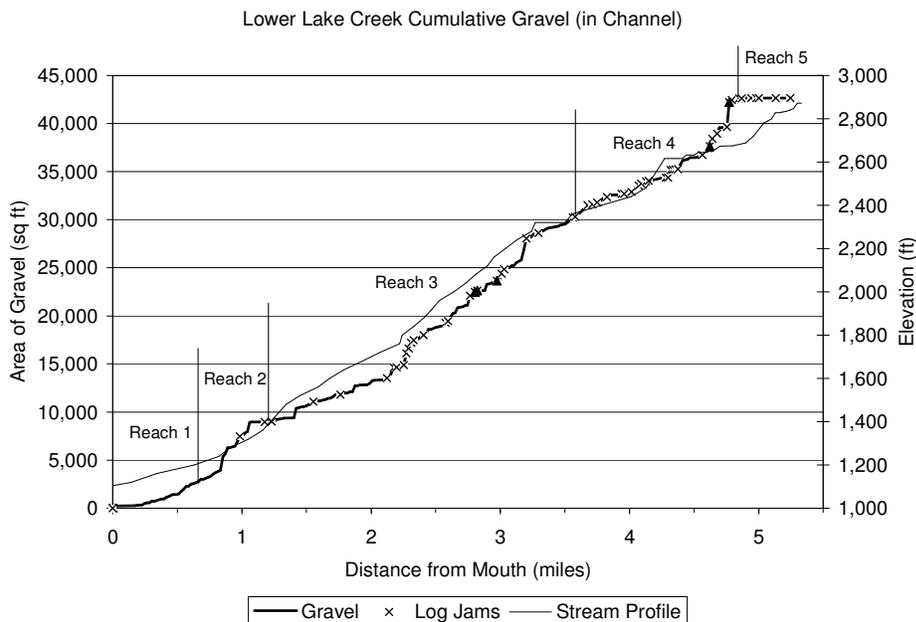
- Document the relative amount of spawning gravel and its longitudinal distribution in Lake Creek downstream of the drop structure.
- Determine the flows that are necessary to transport spawning-sized gravel down Lake Creek from the drop structure to the mouth of Lake Creek at its confluence with the Cowlitz River.
- Determine if flows that transport spawning-sized gravel from the reaches of Lake Creek upstream of RM 1.0 will maintain spawning gravel pockets in the lowest one mile of Lake Creek (the anadromous reach).
- Evaluate the project-induced change in magnitude and frequency of peak flows that are capable of transporting gravel in lower Lake Creek.

### ***Status of Study Investigation:***

The gravel inventory in lower Lake Creek was completed in September, 2005. Gravel samples were also taken, and painted rocks were placed at seven study sites for monitoring. Flows of approximately 16, 35, and 300 cfs were released into the bypass reach during the fall of 2005 and May 2006. Gravel was checked following each flow event.

Draft study results show that there were approximately 42,660 sq. ft of spawning-sized gravel within the wetted channel during the 2005 inventory. An additional 20,550 sq. ft. of gravel was stored on bars within the bankfull channel. The majority of gravel was located between River Mile 0.8 and River Mile 4.7, and often associated with log jams (Figure 4).

**Figure 4. Cumulative Gravel in lower Lake Creek**



There was little movement of painted gravel following the 16 cfs flow release, movement of a few of the smaller (0.5 to 1 inch size) gravel following the 35 cfs release, and movement of most of the painted gravel following the 300 cfs release. The study report will evaluate the effect of flow releases on movement of gravel from upstream reaches into the lower (anadromous) reach.

***Anticipated Completion of Field Study:***

All field work has been completed.

***Anticipated Draft Study Report Date:***

The draft study report will be completed and distributed to resource agencies and tribes by September 22, 2006

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

**Lake Creek Instream Flow and Habitat Assessment**

***Study Requested By:***

Washington Department of Ecology (Ecology), USDA Forest Service, and USFWS requested this study.

***Purpose of Study:***

The goal of this study is to assess the relationship between flow and aquatic habitat in lower Lake Creek. The Project can divert up to 260 cfs and modify the hydrology of lower Lake Creek.

***Status of Study Investigation:***

Energy Northwest conducted a habitat assessment of Lake Creek in 2004, and selected transects based on that assessment. Also in 2004, calibration data were taken at 34 transects located on four study sites throughout Lake Creek at flows less than 32-34 cfs. At the request of the natural resource agencies, a planned spill event was conducted in May 2006 in order to collect water surface elevation (WSE) data at each of the transects. The planned spill for this study required a flow of at least 100 cfs, in order to extend the model to a release flow of 260 cfs. The data were collected at a spill of approximately 170 cfs.

Data reduction and hydraulic modeling will be completed during the winter and spring. Hydraulic modeling consists of model calibration (with approval from WDFW and the other resource agencies), and transect weighting, habitat suitability indices (HSI), and inflow estimate approval. HSI curves have already been approved by the agencies. After these components have been approved, the hydraulic model will be run, which generates Weighted Usable Area (WUA) for the target species and life stages. This information will be included in a calibration and WUA report.

***Anticipated Completion of Field Study:***

Field measurements are now complete.

***Anticipated Draft Study Report Date:***

The habitat assessment report was issued in 2004. The draft report with modeling results will be completed by mid-May 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

***Reference:***

EES Consulting. 2005. Final Lake Creek Physical Habitat Assessment Survey. July 2005. Available at: [http://www.energy-northwest.com/generation/packwood/relicensing/aquatic\\_studies.php](http://www.energy-northwest.com/generation/packwood/relicensing/aquatic_studies.php).

## Large Wood

### ***Study Requested By:***

This study was requested by the USDA Forest Service.

### ***Purpose of Study:***

The large wood study will assess how operation of the Packwood Lake Hydroelectric Project affects the supply and transport of large woody debris in Packwood Lake and in Lake Creek downstream of the drop structure. A wood management plan will be developed. Study objectives include:

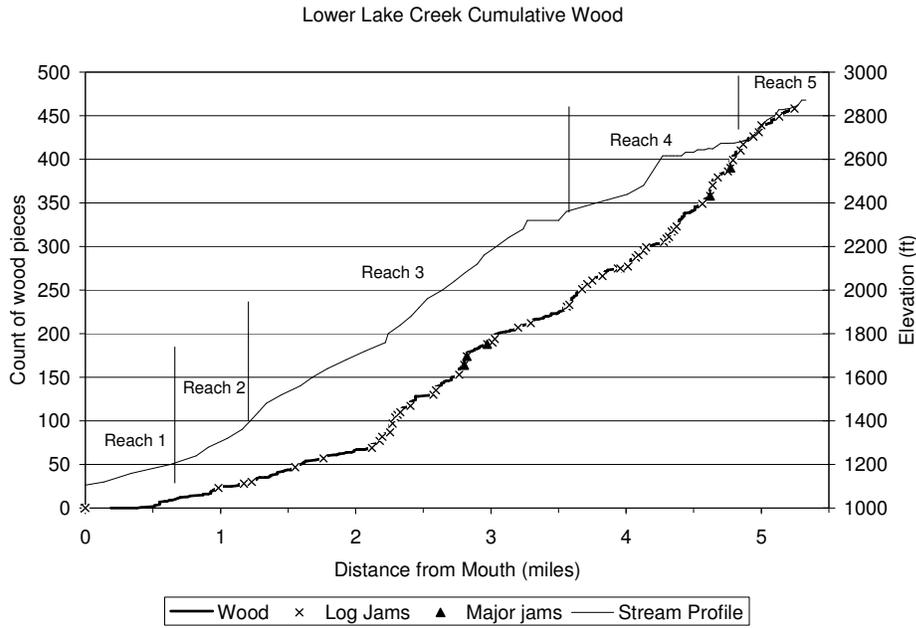
- Inventory large wood in Lake Creek downstream of the drop structure.
- Assess large woody debris that collects behind the log boom.
- Assess wood recruitment and transport processes in Lake Creek downstream of the drop structure.

### ***Status of Study Investigation:***

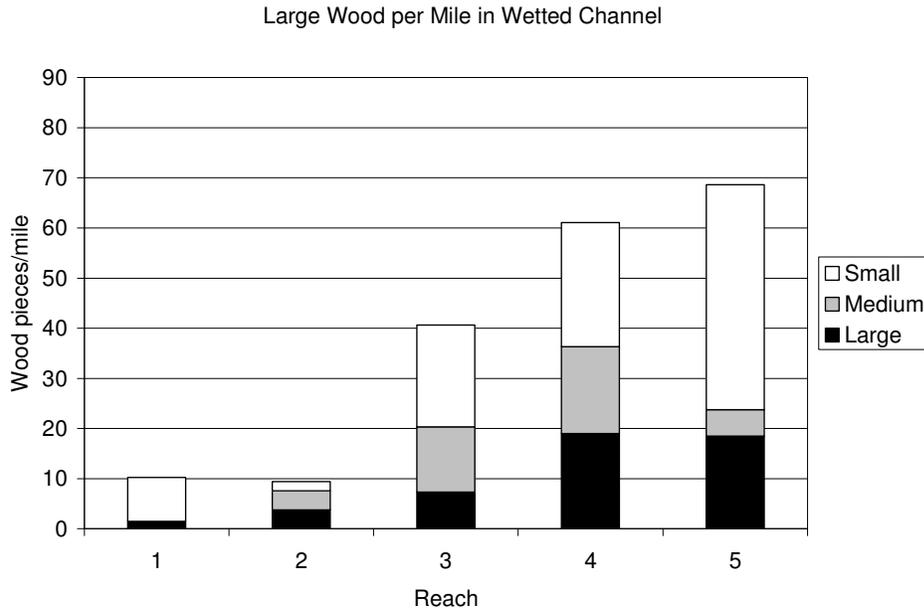
The large wood inventory in lower Lake Creek was completed in September, 2005. Wood was also tagged at five study sites for monitoring. Flows of approximately 16, 35, and 300 cfs were released into the bypass reach during the fall of 2005 and May 2006. Wood was checked following each flow event. Operators have been tagging and recording wood that reaches the drop structure.

The majority of wood in lower Lake Creek is found in reaches 3, 4, and 5; upstream of River Mile 2.1 (Figures 5 and 6). Most of the wood in the stream came from local sources such as mortality/tree throw, mass wasting and bank erosion (Figure 7). None of the wood in the large size class showed evidence of being transported by the stream, and about 10% of the wood in the medium and small size classes showed evidence of stream transport.

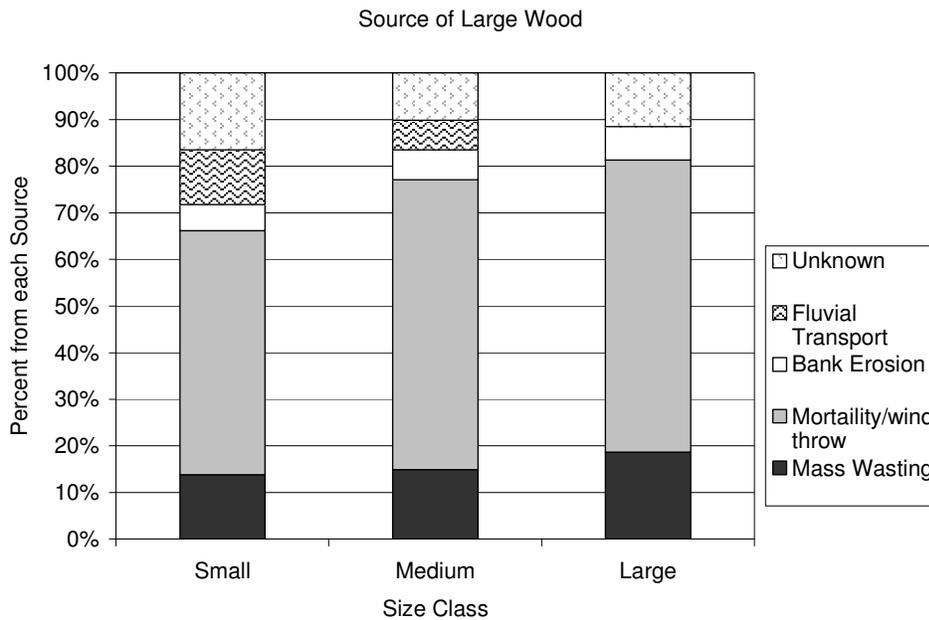
**Figure 5 – Cumulative large wood in lower Lake Creek (in channel).**



**Figure 6 – Large wood in wetted channel.**



**Figure 7 – Source of wood in channel.**



A total of 11 pieces of countable wood (over 12 inches in diameter and 25 feet long) reached the log boom in Packwood Lake between 9/8/05 and 8/29/05. Two pieces arrived in February, 2005 and floated away in mid-March. Nine more pieces floated up to the boom in late May, 2006.

***Anticipated Completion of Field Study:***

Field work in lower Lake Creek has been completed. Wood at the log boom will continue to be tracked through August 2007.

***Anticipated Draft Study Report Date:***

The initial draft study report will be completed and distributed to resource agencies and tribes by the end of October. A report incorporating comments and information on wood at the log boom will be issued in 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

The date for issuance of the draft report has been modified from mid-September to end of October.

## **Noxious Weed Survey**

### ***Study Requested By:***

This study was requested by the USDA Forest Service, WDFW and the Federal Energy Regulatory Commission (FERC).

### ***Purpose of Study:***

The purpose is to determine the location, distribution and abundance of noxious weed infestations in the Project area and infestations spreading from the Project to adjacent lands; assess their affects on native plant diversity and habitat quality; and provide a baseline of information.

### ***Status of Study Investigation:***

Fieldwork is complete. No variances to the study plan were made. The following summarizes draft results. No populations of Class A noxious weeds were located in the Project area. Populations of a number of species of Class B noxious weeds were located. Populations of the Class B noxious weeds meadow knapweed and Japanese knotweed are currently being tracked and treated by the Lewis County Noxious Weed Control Board. Other Class B noxious weed species in the Project area have not been selected or designated for control in the Packwood area. A small population of the Class C select noxious weed butterfly bush was located.

### ***Anticipated Completion of Field Study:***

Fieldwork is complete.

### ***Anticipated Draft Study Report Date:***

The draft study report has been issued.

### ***Any modifications to ongoing studies or new studies proposed by the applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

### ***Reference:***

Beck Botanical Services. 2006. Draft, Noxious Weed Survey Draft Report for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, Washington. September 2006. Available at: <http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Draft%20Noxious%20Weed%20Report9-06.pdf>

## **Packwood Lake Drawdown**

### ***Study Requested By:***

This study was requested by WDFW and USDA Forest Service.

### ***Purpose of Study:***

The purpose of the drawdown study is to identify impacts to fish, wildlife, shorelines, and associated wetlands, due to Project-related drawdown and associated fluctuating reservoir levels. Objectives include:

- Determine acres of drawdown zone exposed at various seasonal pool levels and evaluate impacts to fish and wildlife.
- Determine if the wetland is hydrologically connected to the lake level.
- Determine if Project operations are impacting the wetland complex near Upper Lake Creek.
- Investigate shoreline erosion associated with Project operations.
- Evaluate the rate in which the reservoir is drawn down and if resources are being impacted.

Assess direct and indirect effects of Project drawdown on fish and wildlife.

### ***Status of Study Investigation:***

The first year of monitoring water levels in wetlands has been completed. A draft interim report was issued in May 2006 and the results presented to the agencies and tribes at a meeting held in June 2006. Energy Northwest in consultation with the agencies and tribes determined that a second season of monitoring wetland piezometers, through the end of the drawdown and recovery period, was merited. One piezometer in the wetland adjacent to Osprey Creek was removed as results showed little or no connectivity to lake level. An additional piezometer was installed in wetlands near upper Lake Creek in order to monitor shallow groundwater levels that may be perched. Monitoring of the piezometers is scheduled to continue at least through October 31 2006. The intent is to leave piezometers in place until lake level recovers from the fall drawdown but remove equipment prior to winter access limitations. Bathymetric mapping of littoral habitats has been completed. An erosion assessment related to Project regulation of lake level has also been completed. An interim report with results from these two study components was distributed in August 2006. Functional assessment of the wetlands has been completed and data analysis of that component is in progress. Historical lake level data are being converted to a digital format so that exceedence curves can be generated that show the proportion of time that the lake surface is at or above various elevations.

***Anticipated Completion of Field Study:***

It is anticipated that the field work will be completed by early to mid November 2006.

***Anticipated Draft Study Report Date:***

A draft report with results for all facets of the study, including results from the second drawdown season, will be distributed to resource agencies and tribes in February 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

As noted above, the monitoring duration of wetland piezometers was extended, with one piezometer removed, and an additional piezometer installed. Because Energy Northwest believes that data collection will be completed in November 2006, we have modified the date for the final report from August 31, 2007 to February 2007.

***References:***

EES Consulting. 2006. Draft, Packwood Lake Drawdown Study, Wetland Hydrology Interim Report: 1<sup>st</sup> Year Study Results for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, WA. May 26, 2006. Available on-line at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

EES Consulting. 2006. Draft, Packwood Lake Drawdown Study, Draft Report (90% Completion) for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, WA. August 2006. Available on-line at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

**Packwood Lake Entrainment**

***Study Requested By:***

WDFW and USFWS requested this study.

***Purpose of Study:***

The goal of this study is to identify relative abundance, age/sex, timing and species composition of fishes entrained, impinged or otherwise affected by the Packwood Lake Hydroelectric Project intake structure. This information will improve the knowledge base and develop an understanding of the options for natural resource protection, mitigation and enhancement.

Objectives of the study include:

- Determine species relative abundance, age/size, timing and composition at the intake structure.
- Evaluate the effectiveness of the Project's screens in terms of protecting fish.
- Assess the potential entrainment or impingement impacts from the lake elevation and Project flow fluctuations.
- Develop a rule curve for lake level elevation and diversion rate, since approach velocities may exceed the state criteria of 0.33 fps at some operating scenarios.

***Status of Study Investigation:***

Because of higher than normal snow and conditions as a result of snow melt, commencement of the Doppler measurements and gillnetting for this study was delayed because equipment could not be taken to the lake as planned. Once equipment access had been established, higher than normal flows and the planned spill event to accommodate the instream flow, large wood, gravel transport, and barrier analysis studies prevented both gillnet (debris and clogging) and Doppler measurements at the intake structure until late June. Doppler measurements will continue through lake drawdown and will continue as feasible through the late fall. Additional monitoring will commence in March 2006, if conditions allow. Gillnetting in the vicinity of the Project intake to-date has indicated the presence of rainbow trout only.

Plant operators have been checking the screens weekly, starting in March 2006. The traveling screens were set to the "Off" mode. Operators monitored the screens during rotation; any fish impinged on the screen were collected so that fisheries biologists could determine and record the species, length, and condition. Plant operators also operated the trash racks on a monthly basis for inspection to determine if any fish were impinged. Results indicate that after the spawning period commenced, spent or dead adult rainbow trout drifted down lake and were found on the intake screens. Few fish were observed at any other time.

***Anticipated Completion of Field Study:***

Doppler field measurements will continue through Fall 2006, resume in March 2007, and continue through May 2007. Data collection was scheduled to be conducted from March through September 2006. Plant operators will complete monitoring of the rotating screens and trash racks in September. Because gillnetting could not begin until June 2006, we expect the study to continue to May 2007.

***Anticipated Draft Study Report Date:***

The draft report for the 2006 field season will be completed by November 15, 2006. A final draft report, incorporating comments from the draft, will be provided to the agencies and tribes after data collection has been completed in May 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

Because gillnetting could not begin as early as scheduled in the study plan, Energy Northwest proposes to continue this portion of the study through May 2007. However, if winter conditions do not allow gillnetting November through April, no measurements or gillnetting will take place. Measurements of velocity in front of the screens will continue through May, 2007. No other modifications are proposed to the study.

**Rare Plant Survey**

***Study Requested By:***

This study was requested by the USDA Forest Service, WDFW, and FERC.

***Purpose of Study:***

To determine the location and distribution of rare plants within the Project boundary, assess potential relicensing effects on them and provide a baseline of information for future studies.

***Status of Study Investigation:***

Fieldwork is complete. No variances to the study plan were made. One rare plant was located in the Project area: Oregon goldenaster (*Heterotheca oregona*). About 250 plants were found within the Project boundary as the tailrace enters the Cowlitz River side channel. Four plants were also found growing in cobbles along Lake Creek just before it flows into the Cowlitz. The gravel bar island in the Cowlitz near the tailrace was also surveyed and many thousands of plants – probably well over 10,000 were found. There were also thousands of plants growing on gravel bar areas near the Lake Creek confluence.

***Anticipated Completion of Field Study:***

Fieldwork is complete.

***Anticipated Draft Study Report Date:***

The draft study report has been issued.

***Any modifications to ongoing studies or new studies proposed by the applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

**Reference:**

Beck Botanical Services. 2006. Draft, Rare Plant Survey Draft Report for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, Washington. September 2006. Available at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

**Recreation Resources Study Status Report****Study Requested By:**

This study was requested by the USDA Forest Service.

**Purpose of Study:**

The goals of the study are to obtain additional information regarding recreational facilities, utilization, including activity types and location around Packwood Lake, as well as utilization of the parking lot that services both trails #74 and #78, and vehicle utilization on Trail #74. Information will also be obtained to determine recreational use (i.e. fishing) at Lake Creek.

Information gathered will be used to estimate average weekday, weekend day and holiday recreational use along the shoreline of Packwood Lake during the off-seasons (late April/May fishing and September/November hunting and fishing seasons) and during the peak-season (Memorial Day Weekend to Labor Day). Information will also be obtained to learn more about visitor's attitudes and desires around Packwood Lake. Observations made at Lake Creek will be used to estimate average weekday, weekend day and holiday recreational use (i.e. fishing on Lake Creek) during the fishing season (June 1 through October 31).

**Status of Study Investigation:**

USDA Forest Service volunteers conducted surveys at the guard station (log house) in the summer of 1995. The completed survey forms were obtained from the Forest Service, a database was developed, and information from the survey forms was input into the database. Forest Service Wilderness permit data has also been obtained for the last two years and will be obtained for 2006 once it becomes available.

Inventory and mapping data of wilderness area camp/day-use sites was obtained from the Forest Service in early 2006. In late April 2006, an inventory was conducted, including mapping of dispersed camp/day-use sites in the non-wilderness area along Packwood Lake, using GPS, on-site measurements, and documenting site characteristics in conformance with standards used by the Forest Service for the Wilderness area sites.

Recreation surveys at Packwood Lake parking lot began in late April 2006 and will continue until the end of November. A database has been developed and information from the completed survey forms is input into the database as forms are obtained from the local surveyors.

Observations at Lake Creek started the beginning of June 2006 (when fishing season opened) and will continue until the end of October. Data from observations is input into the database as data sheets are obtained from the surveyors.

Traffic counters were purchased and one traffic counter was installed on FS Road 1260 near the Forest Service boundary and two traffic counters were installed 200 feet apart between the trail coming off the end of Latch Road (FS Road 1262) and below the concrete sidewalk near the foot of the Packwood Lake diversion. The traffic counter on FS Road 1260 was installed in late April, but was stolen, so another traffic counter was obtained and installed on May 2, 2006. Traffic counters near the Packwood Lake diversion were installed as soon as snow melted enough to allow access to the area (installed May 9, 2006). Energy Northwest personnel have been documenting counts from the traffic counters during their routine visits to the intake structures at Packwood Lake. Energy Northwest personnel have also been documenting visitors and vehicles at Packwood Lake, near the intake structure, since late April 2006. Traffic counts and visitor/vehicle counts will continue until the end of November 2006.

Contractors conducting field studies at Packwood Lake were given forms in mid-April to document visitor/vehicle use during their visits to Packwood Lake. These counts will continue until the end of November 2006.

Preliminary review of the data indicates that the months of April and May have relatively few visitors at Packwood Lake, except for Memorial Day weekend, which showed relatively higher numbers of visitors than the rest of April and May. The number of visitors at Packwood Lake increased in June and July. No people were observed at Lake Creek during June and July observations.

***Anticipated Completion of Field Study:***

Field studies are expected to be completed in November 2006, as scheduled in the study plan.

***Anticipated Draft Study Report Date:***

The draft study report will be completed and distributed to resource agencies and tribes by February 1, 2007. A preliminary oral report will be provided to resource agencies and tribes in December. After the study report has been finalized, a Recreation Needs Analysis will be prepared and completed by June 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

The study plan was modified to include analysis of additional data provided by the Forest Service and issuance of the draft report by February 1, 2007. No other modifications and no new studies are being proposed by Energy Northwest.

**Stream Connectivity in Packwood Lake Tributaries**

***Study Requested By:***

This study was requested by the USDA Forest Service.

***Purpose of Study:***

The goal of the stream connectivity study is to evaluate the connectivity of Packwood Lake tributaries considering the seasonal drawdown and fluctuating water level of the reservoir and the erosive potential of the stream tributaries and reservoir shorelines. The objective is to determine if the periodic drawdown of the reservoir water surface modifies aquatic connectivity and transport potential of the tributaries. The study will evaluate the capacity of the channel to pass fish, transport sediment, and provide functional habitat for aquatic organisms.

***Status of Study Investigation:***

Packwood Lake tributaries were surveyed in the drawdown zone and upstream areas during the Fall of 2005 (drawdown zone) and Summer of 2006 (upstream). This data was used to plot longitudinal profiles and assess channel erosion. In addition, an assessment of potential fish passage was completed. Following is a draft summary of the results. A full discussion appears in the draft report that was issued on September 1, 2006.

Fish passage to Packwood Lake tributaries during the summer and the drawdown period is impeded by low inflows and associated minimum depths in the tributary of SE Trap, Trap, Crawford, and Osprey creeks that do not meet criteria standards for similar conditions (e.g., WDFW culvert criteria). These low flows and associated minimum depths are not related to Project operations. A barrier to upstream passage exists in the drawdown zone on the tributary of SE Trap Creek due to the high gradient of the stream entrance; however, passage would be impeded even without the drawdown due to the low natural flows that exist during this time of the year.

These small streams are located in alluvial-fan type environments resulting from a rapid decrease in gradient as the streams flow off the steep valley walls into the lower gradient valley. Evidence of past alternate channels on these fans was noticed in the field; it is likely that these streams will switch channel locations at some time in the future (the timing of channel switching could be on the order of centuries). Permanent

grade control features such as falls or large boulder cascades are located at the point where each of the small tributaries enters the confined, higher-gradient steep valley wall.

Upper Lake and Mueller creeks are located in a broad, low-gradient valley. Field evidence and the stream survey suggest these two creeks are incised approximately 400-500 feet upstream from full pool. This incision is likely the result of drawdown of Packwood Lake during the fall and winter. Incision upstream of the drawdown zone results in deep pools during full pool. There do not appear to be any changes to riparian vegetation or disconnection from the floodplain in Upper Lake or Mueller creeks because backwater from the lake at full pool fills these channels during the growing season, and during very large flow events Packwood Lake fills with water, bringing water levels up in the floodplain. Abundant large woody debris in Upper Lake and Mueller creeks has resulted in numerous log jams that act as grade control features and also trap gravel coming from upstream. Lake Creek carries the majority of the water and sediment from the upper valley, and has numerous gravel aggradation zones resulting from the large sediment sources upstream. Mueller Creek only extends about one mile up the valley and carries comparatively little water or sediment.

***Anticipated Completion of Field Study:***

Field studies have been completed.

***Anticipated Draft Study Report Date:***

The draft report has been issued.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

An assessment of the geomorphology of the Lake/Mueller Creek valley from historical and recent aerial photographs was added to the study based on the field observations of multiple old, large aggradation zones (across the entire flood plain) in the valley. No additional modifications to ongoing studies or new studies are being proposed by Energy Northwest.

***Reference:***

Watershed Geodynamics and EES Consulting. 2006. Draft, Stream Connectivity in Packwood Lake Tributaries, Study Report for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, WA. September 1, 2006. Available on-line at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

## **Tailrace Slough Instream Flow**

### ***Study Requested By:***

This study was requested in whole or in part by the USDA Forest Service, WDFW, NOAA Fisheries, and USFWS.

### ***Purpose of Study:***

The purpose of this study is to conduct an Instream Flow Incremental Methodology (IFIM) study of the tailrace slough; integrating the information gained from spawning surveys, habitat use surveys, and the physical habitat survey to estimate the effects of Project operations on fish and redds within the tailrace slough; and develop alternative operation scenarios to minimize negative effects on fish and redds in the tailrace slough.

### ***Status of Study Investigation:***

Initial habitat investigations, transect selection and approval were conducted in June 2006. Eight transects were approved and deemed to appropriately encompass all of the pertinent habitat needed to adequately evaluate anadromous salmonid spawning in the tailrace slough.

Set-up and high flow measurements were conducted on June 27<sup>th</sup>. An estimated 472 cfs was coming down the mainstem side channel with 252 cfs coming from the Cowlitz and another 220 cfs coming from generation at the Packwood powerhouse. Middle flow measurements were done on July 13<sup>th</sup>. An estimated 251 cfs was coming down the mainstem side channel with 60 cfs coming from the Cowlitz and another 190 cfs coming from generation at the Packwood powerhouse.

The low flow calibration measurement of approximately 100 cfs will be taken in mid-September, 2006. Data analysis and model calibration will follow during the fall and winter 2006 – 2007. Hydraulic modeling consists of model calibration (with approval from WDFW and the natural resource agencies), and habitat suitability indices (HSI) approval. HSI curves have already been approved by the agencies. After the model calibration has been approved, the hydraulic model will be run, which will generate wetted area used for protection of incubating salmonid eggs for the target species. This information will be included in a calibration and draft report.

### ***Anticipated Completion of Field Study:***

Field studies are scheduled to be completed in mid-September, 2006.

### ***Anticipated Draft Study Report Date:***

The draft study report will be issued in April, 2007.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

**Tailrace Slough Use by Anadromous Salmonids**

***Study Requested By:***

This study was requested in whole or in part by the USDA Forest Service, WDFW, NOAA Fisheries, and USFWS.

***Purpose of Study:***

The goal of this study is to identify what anadromous salmonids use the tailrace slough by life stage, timing, and type of use. The objectives are to identify habitat use of the tailrace slough by juvenile salmonids; identify habitat use of the tailrace slough by migrating adult salmonids; and identify spawning habitat in the tailrace slough.

***Status of Study Investigation:***

Spawning surveys were conducted twice monthly for the past year and a half and were completed on July 15<sup>th</sup>. The data collected are currently being analyzed and will be integrated with IFIM data upon completion of that study to gain a more complete picture of species information and timing related to anadromous salmonid spawning. Over the course of the study, both coho and Chinook redds were observed.

Five reaches were snorkeled in August as part of our seasonal anadromous salmonid analysis. Juvenile coho were observed at all sites along with other non-anadromous species such as: rainbow, whitefish and sculpin. Because of high water, electroshocking was not conducted in the tailrace slough, but rather snorkeling surveys were completed. During the fall when flows will be lower, electrofishing will be attempted as well as snorkeling. If water visibility during this winter allows, surveys will be conducted for spawners. A survey will be conducted spring of 2007 to complete the surveys for each season over the one-year period provided in the study plan.

***Anticipated Completion of Field Study***

Electrofishing is expected to be completed in the spring of 2007, no later than by the end of May.

***Anticipated Draft Study Report Date:***

The draft report will be distributed to resource agencies and the tribes by June 30, 2007.

### **Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant**

Because the electrofishing permit was received allowing start of that portion of the study in Summer 2006, the one year time period will end in Spring 2007. Therefore, Energy Northwest is modifying the date we expect to issue the draft report from September 2007 (as provided in the FERC Study Plan Determination) to June 30, 2007. No additional study modifications or new studies are being proposed.

### **Vegetation Cover Type Mapping Study**

#### ***Study Requested By:***

This study was requested by the WDFW, FERC, and the USDA Forest Service.

#### ***Purpose of Study:***

The objectives of the Vegetation Cover Type Mapping study are: 1) to identify and classify the vegetation cover types in the Project area; 2) collect additional information on the species composition and structural attributes of each cover type and 3) create a detailed GIS cover type map of the Project area showing the locations of these cover types, their distribution and total extent (acreage), and the locations of habitats that are of special concern. The study will provide the baseline map for recording occurrences of rare plants, noxious weeds, and wildlife, including amphibians and will also provide descriptions of existing habitat conditions in the Project area and in riparian areas along Lake Creek.

#### ***Status of Study Investigation:***

A field study to ground-truth cover types has been completed, and cover types have been delineated on orthophotos. The major cover types were sampled with an emphasis on specialized habitats such as riparian areas along Lake Creek, wetlands in the Upper Lake Creek area, the Packwood Lake drawdown area, and the Hall Creek wetland. Sample point locations were designed to be representative of each cover type. Major vegetative and structural characteristics were documented using a plotless, rapid vegetation assessment technique.

Map revisions will be digitized and final GIS vegetation coverage will be prepared, with all sampling information included in the metadata associated with the GIS layer. The total acreage of each cover type will then be calculated.

#### ***Anticipated Completion of Field Study:***

The field investigations have been completed.

***Anticipated Draft Study Report Date:***

The draft study report will be completed and distributed to resource agencies and tribes by November 15, 2006.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

No modifications to ongoing studies or new studies are being proposed by Energy Northwest.

**Water Quality**

***Study Requested By:***

This study was requested Ecology and the USDA Forest Service.

***Purpose of Study:***

The purpose of this study is to develop information to support the water quality certification that will be issued by Ecology, pursuant to Section 401 of the Clean Water Act, for the operation of the Project under a new FERC license. This study will document the existing water quality conditions in Packwood Lake, Lake Creek and other waters affected by the Project. Energy Northwest will work with Ecology to identify water quality modeling needs and modeling approaches to further define, as needed, existing water quality conditions relative to natural background conditions; i.e., water quality in absence of the Project. At a minimum, modeling water temperature in Lake Creek downstream of Packwood Lake to its mouth is needed to compare temperatures with and without the Project as well as any proposed modifications to instream flows.

***Status of Study Investigation:***

Data collection has been completed. A report on the findings of the first year of the study was distributed and finalized in April 2006. A draft report on the second year results was provided to interested stakeholders via Energy Northwest's web site in September 2006. The investigation of macroinvertebrates has also been completed and the draft report was provided to interested stakeholders via Energy Northwest's web site in September 2006. The Phase I Environmental Site Assessment was completed and provided to interested stakeholders via Energy Northwest's web site in June 2006. References for these documents are provided below.

Modeling will be conducted in the fall and winter of 2006.

***Anticipated Completion of Field Study:***

Field investigations were completed March 31, 2006.

***Anticipated Draft Study Report Date:***

Draft study reports have been issued.

***Any Modifications to Ongoing Studies or New Studies Proposed by the Applicant:***

A modification was made to the macroinvertebrate study because of dry conditions in the tailrace slough area during the fall of 2005. Normally sampling during the fall season provides the best information. Because the tailrace slough frequently changes in this area, and based on the results for the sampling that was conducted, it was determined that it would be unlikely that useful data would be obtained for the tailrace slough. No other modifications to ongoing studies or new studies are being proposed by Energy Northwest.

An alternate approach to modeling water temperature in Lake Creek downstream of Packwood Lake was discussed at the April 28, 2006 Water Quality and Aquatic Resources Committee meeting; however, no modification has been confirmed. The current study plan identifies CE-QUALW2 as the default model, but Ecology suggested there may be other options.

***References:***

EES Consulting. 2006. Macroinvertebrate Study Results, Energy Northwest, Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, WA. August 2006. Available on-line at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

EES Consulting. 2006. Water Quality Interim Report: 1<sup>st</sup> Year Study Results for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, WA. April 2006. Available on-line at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

EES Consulting. 2006. Water Quality Report: 2<sup>nd</sup> Year Study Results for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, WA. August 2006. Available on-line at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

EES Consulting. 2006. Draft Water Temperature Report for 2005 for Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, Lewis County, WA. August 2006. Available on-line at: <http://www.energy-northwest.com/downloads/gen/packwood/relicensing/Temperature%20report%202nd%20year%20results%20draft.pdf>

Energy Northwest. 2006. Packwood Lake Hydroelectric Project, Phase I Environmental Site Assessment, 179 Powerhouse Road, Packwood, WA. June 2006. Available on-line at: [http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic\\_studyplan\\_reports.php](http://www.energy-northwest.com/generation/packwood/relicensing/Aquatic_studyplan_reports.php)

Energy Northwest. 2006. Packwood Lake Hydroelectric Project. Water Quality and Aquatic Resources Committee, April 28, 2006, Meeting Summary. Available on-line at: [http://www.energy-northwest.com/downloads/gen/packwood/relicensing/MeetingMinutesAquatic\\_April\\_2006.pdf](http://www.energy-northwest.com/downloads/gen/packwood/relicensing/MeetingMinutesAquatic_April_2006.pdf)