

DRAFT
Rehabilitation Approach for
Lower Lake Creek

Presented to the
Aquatic Subcommittee
January 29-30, 2008

Lower Lake Creek Management Goals and
Objectives

- **Lake Creek Aquatic Goals**
 - Restore and enhance anadromous and resident salmonid habitat in Reach 1 of Lower Lake Creek (RM 0.0 – 1.00)

 - Fish species present or potentially present in this reach are:
 - Chinook Salmon
 - Coho Salmon
 - Steelhead Trout
 - Sea-run Cutthroat Trout
 - Resident Rainbow Trout

Lake Creek Aquatic Goals, cont'd

- Species most likely to utilize this reach of Lake Creek (steelhead trout and rainbow trout and coho salmon) are typically rearing limited. The primary objective would be to increase and restore rearing habitat for the species listed above.
- Spawning habitat is also very scarce in this reach of Lake Creek. Energy Northwest proposes to increase spawning habitat for anadromous and resident species through the recreation of pools and pool tailouts.

Lake Creek Aquatic Objectives

- Increase salmonid rearing habitat in Lake Creek from RM 0.0 – 1.0 by 15,300 ft². This will be accomplished by:
 - Increasing salmonid rearing habitat in the Reach from RM 0.0 – 0.3 by 2,700 ft²; and
 - Increasing salmonid rearing habitat in the Reach from RM 0.3 – 1.0 by 12,600 ft².

Lake Creek Aquatic Objectives, *cont'd*

- Increase salmonid spawning habitat in Lake Creek from RM 0.0 – 1.0 by 1700 ft². This will be accomplished by:
 - Increasing salmonid spawning habitat in the Reach from RM 0.0 – 0.3 by 300 ft²; and
 - Increasing salmonid spawning habitat in the Reach from RM 0.3 – 1.0 by 1,400 ft².

Design Criteria

- **LWD Placement**
 - Target areas for wood placements will be in existing pools or in glides/runs where pool habitat can be created by wood placement. In areas targeted for pool formation, large 'key' pieces of wood will be incorporated into the channel bed to create stable pool-forming bedforms (i.e. steps). Boulders will be used in combination with wood to form bedforms and to provide ballast for wood placements. In other areas, wood jams will be placed along channel margins and will extend into the active channel in order to provide habitat cover and complexity.

Design Criteria, *cont'd*

- **LWD Jams**
 - Wood jams will be constructed to obtain approximately 20 jams per mile. This jam frequency is based on jam frequency that occurs further upstream on Lake Creek. This equates to approximately 1 jam every 250 feet, or approximately 15 jams over the 0.7 mile reach of stream.

Design Criteria, *cont'd*

- **LWD Numbers**
 - Total numbers of wood will be increased to within 90-130 pieces per mile (assuming 12" diameter and 25 ft minimum to qualify as LWD). This is in keeping with wood quantities that have been observed in the upper reaches of Lake Creek, and it exceeds the federal standard for achieving 'properly functioning condition' (>80 pieces per mile, NMFS 1996) .
 - Most of this wood will be located in accumulations of 4 or more pieces, although smaller accumulations or individual placements may be appropriate in some areas.
 - This equates to roughly 60-105 pieces of wood, with 4-7 pieces per jam (assuming 15 jams). Smaller wood debris can be added to the jams to increase habitat value.

Design Criteria, *cont'd*

- **LWD Sources; Acquisition from:**
 - Cooperating Agencies
 - Tacoma Public Utilities salvage operations at mainstem Cowlitz River dams
 - Thinning from local timber stands
 - Purchasing Outright

Design Criteria, *cont'd*

- **Boulder Placement**
 - Boulders will be incorporated into large wood structures to increase complexity, help to develop step-pool channel units, and to provide ballast for large wood placements.
 - Boulders can also be placed in the lowest 0.3 miles of stream to create steps and complexity to enhance juvenile rearing habitat, especially for steelhead and rainbow trout.
 - Most boulders will be available on-site, but may be brought in from off-site if enough suitable boulders cannot be sourced from the existing channel.

Design Criteria, *cont'd*

- **Bed Deformability**
 - Step-pool channels obtain most of their stability from large step-forming elements including boulders and logs.
 - Log structures used for this effort will be made to be stable up to at least the 50-year recurrence interval event, in order to reduce potential impacts to downstream infrastructure or property.
 - Beds and banks composed of large cobbles or boulders will have a stability that is similar to the existing channel conditions, although the addition of stable wood elements will increase their stability in wood placement locations.

Design Criteria, *cont'd*

- **Profile**
 - Average reach slope will not be altered, but profile will be modified from a plane-bed/step-pool profile into a wood-forced step-pool profile.
 - Residual pool depths and vertical variation in slope will be increased.

Design Criteria, *cont'd*

- **Cross-Section Form**
 - Width-to-depth ratios will be decreased through wood additions and mechanical adjustments to channel boundaries at select areas.
 - Increased pool depth will benefit juvenile summer rearing and will reduce temperature extremes.
 - Width-to-depth ratios will be reduced to at least below 15:1, and possibly below 10:1, based on surveys of reference channel conditions.

Design Criteria, *cont'd*

- **Habitat Units**
 - The percentage of channel in runs and glides will be reduced in favor of additional pool habitat.
 - Current percentage pool habitat is less than 15%, whereas runs and glides make up over 50% of the habitat.
 - Glide and run habitat will be reduced to below 40% and pools will be increased to above 25%.
 - These values may be modified based on more detailed site investigations.

Design Criteria, *cont'd*

- **Substrate**
 - Gravels will be placed upstream of bed control elements (i.e. riffles, steps) to enhance spawning capacity and quality.
 - Specific size and distribution of bed material will be determined through hydraulic analysis, reference conditions, and species requirements for spawning.
 - Where possible, bed material will be sourced from local areas; alternative sources will be identified if local sources are not available.
 - Reaches 2 – 4 will provide targets for gravel quantities, which are on the order of 10,000 ft² per mile. This corresponds to approximately 7,000 ft² for the target reach.

Design Criteria, *cont'd*

- **Flood Risk**
 - Adequate anchoring will be provided for installed log complexes in order to reduce the potential for logs creating damage to downstream infrastructure (e.g. bridges) or private property.
 - Anchoring will occur through log burial, anchoring to existing trees, or through boulder ballast.

Design Criteria, *cont'd*

- **Riparian Vegetation**
 - Riparian areas are mostly composed of deciduous or mixed deciduous / conifer stands. These forests are expected to move towards climax coniferous forest species over time.
 - There are currently few cases of invasive species that would be expected to interfere with natural succession to climax forest types.
 - A vegetation monitoring and management program will be put in place to ensure invasive species do not colonize the site.
 - Impacts to existing riparian vegetation will be minimized during construction activities.
 - Revegetation will be conducted in disturbed areas using native and site-appropriate species.

Design Criteria, *cont'd*

- **Amount of Habitat Created**
 - Rearing and spawning habitat will be created through installation of structures, alteration of channel unit composition, increased pool depth, and installation of spawning gravels.
 - One of the greatest benefits to fish will be the conversion of existing uniform glide/run habitat into pool habitat with high quality rearing in deep pools with overhanging and complex LWD.

Design Criteria, *cont'd*

- High quality spawning conditions will be created at tailouts with imported gravels.
- The objective is to convert at least 10% of the available habitat from glides to pools between RM 0.3-1 using large wood and boulder structures.
- Assuming an average wetted width of 38 ft (derived from values reported in EES 2007 that were collected in April/May 2004), this equates to the creation of approximately 14,000ft² of pool habitat. Assuming 10% of pools are comprised of tailout habitat, a total of approximately 12,600ft² of high quality rearing habitat will be created.

Design Criteria, *cont'd*

- This amounts to 840ft² of habitat per structure (assuming 15 structures).
- Spawning habitat at tailouts will amount to a total of 1,400ft², or 93ft² per structure.
- Between RM 0 and 0.3, approximately 5% of the glide habitat could reasonably be converted to pool habitat using boulders.
- This equates to the creation of approximately 2,700 ft² of high quality pool habitat for rearing and 300 ft² of spawning habitat.

Monitoring

- Energy Northwest will develop a monitoring plan in consultation with the natural resource agencies as part of the new license. This monitoring plan will include:
 - Reiteration of Metrics and Goals
 - Criteria for measuring achievement of metrics and goals
 - Steps to be taken if target goals are not achieved