

Packwood Lake Hydroelectric Project

Issues of Concern

August 9, 2007



Potential Project Effects

- Decreased Lake Creek Flows Below Drop Structure
- Lack of Connectivity between Lake and Reach 5
- Tributary Stream Connectivity to Lake
- Water Quality (Temperature)
- Culvert Fish Passage
- Project shutdown impacts on tailrace slough

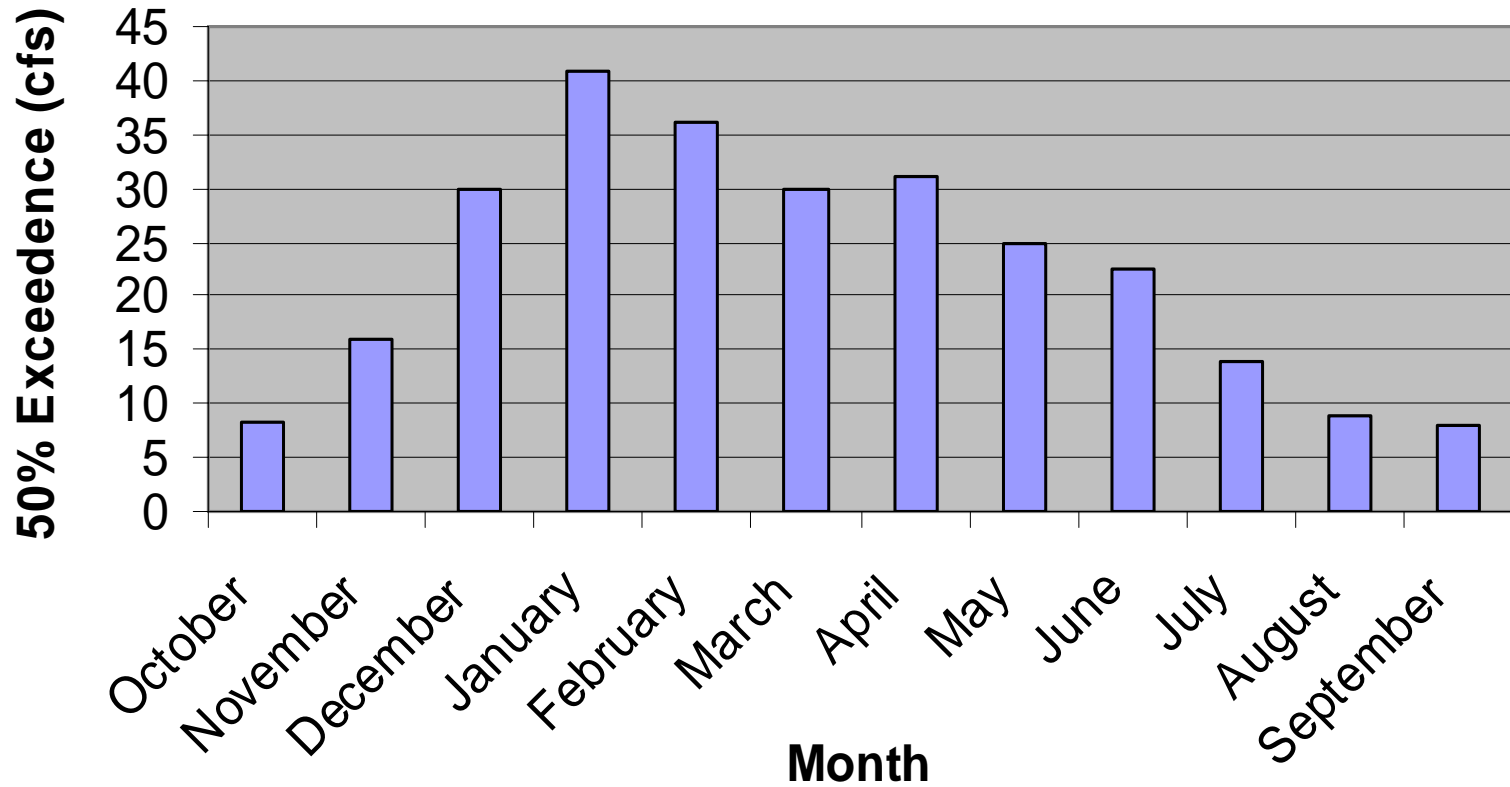
Decreased Lake Creek Flows Below Drop Structure

- Effects
 - Reduced frequency and magnitude of bankfull flows
 - Less than optimum flows for habitat in anadromous reach
- Potential solution = Ensure Bankfull Flows
 - Bankfull flows are dependent on natural lake inflows to create overtopping (spill) events
 - Target flows would be 285 cfs, which equates to a lake level of 2859.64 ft MSL
 - Duration of overtopping event is 12-24 hours
 - If an overtopping event does not occur naturally, the project will take steps to create one
 - Periodicity would be once every 2-3 years

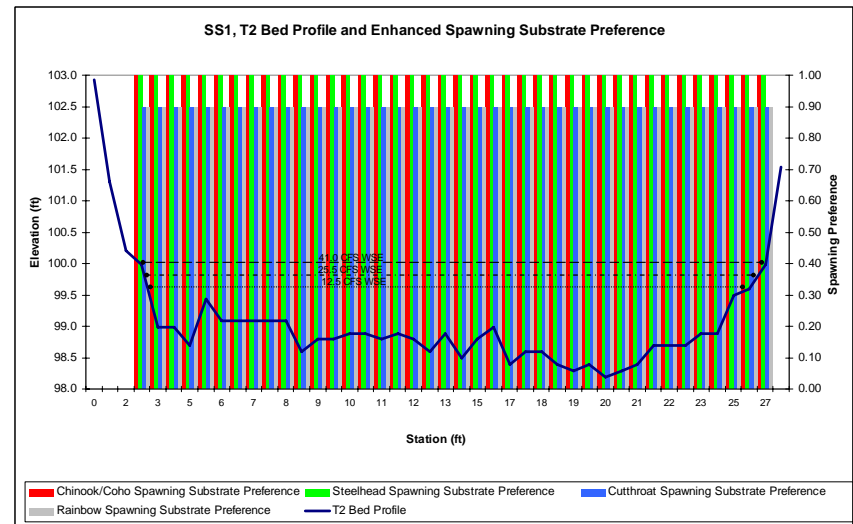
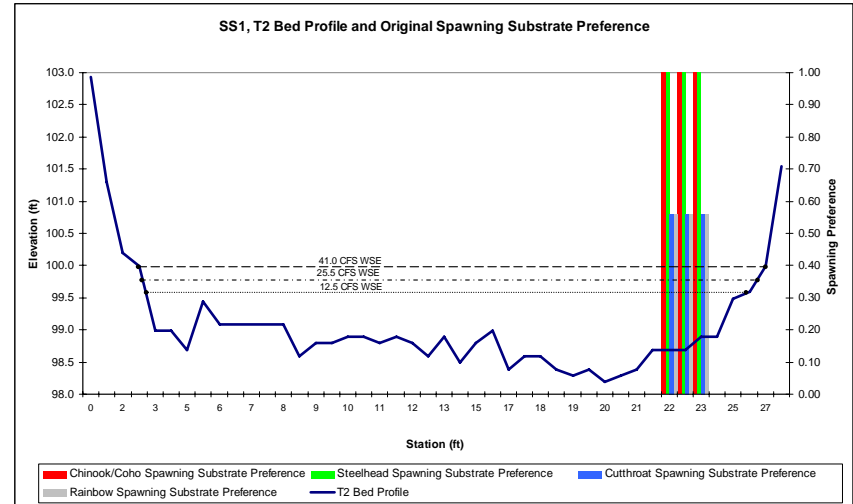
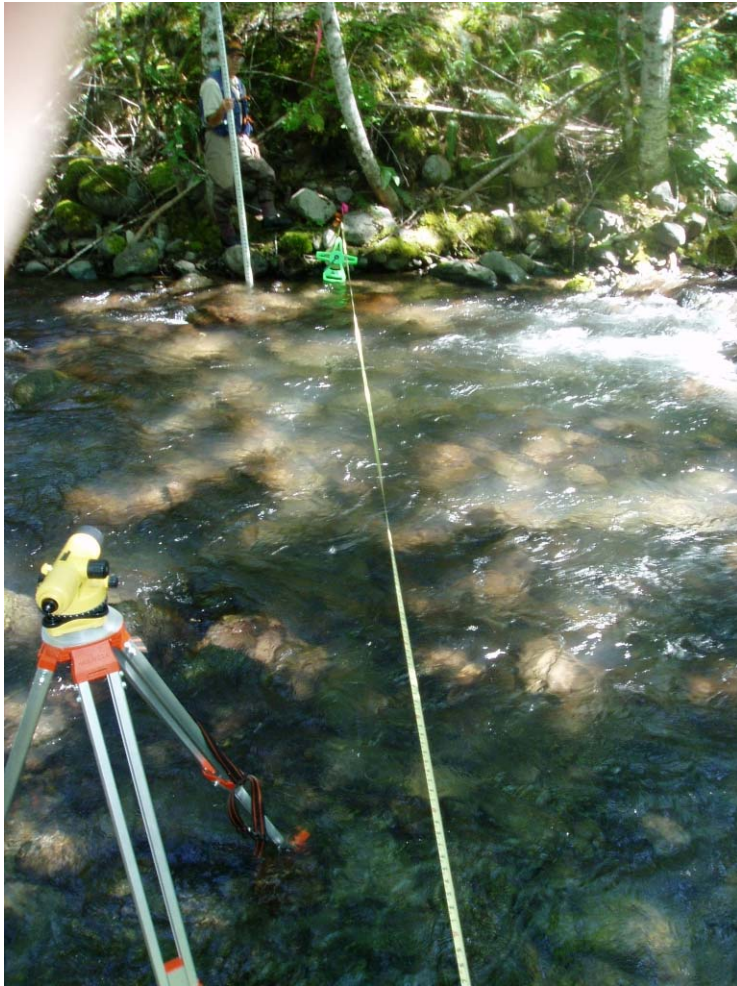
Decreased Lake Creek flows Below Drop Structure Potential Solutions cont.

- Enhance habitat in anadromous reach of lower Lake Creek
 - Design and install stream structures to retain gravel
 - Provide gravel for recruitment if necessary
- Lake Creek Flow Augmentation
 - Increase bypass flows to Lake Creek in August and September for spring Chinook spawning
 - Flow augmentation will be coordinated with natural resource agencies and tribes

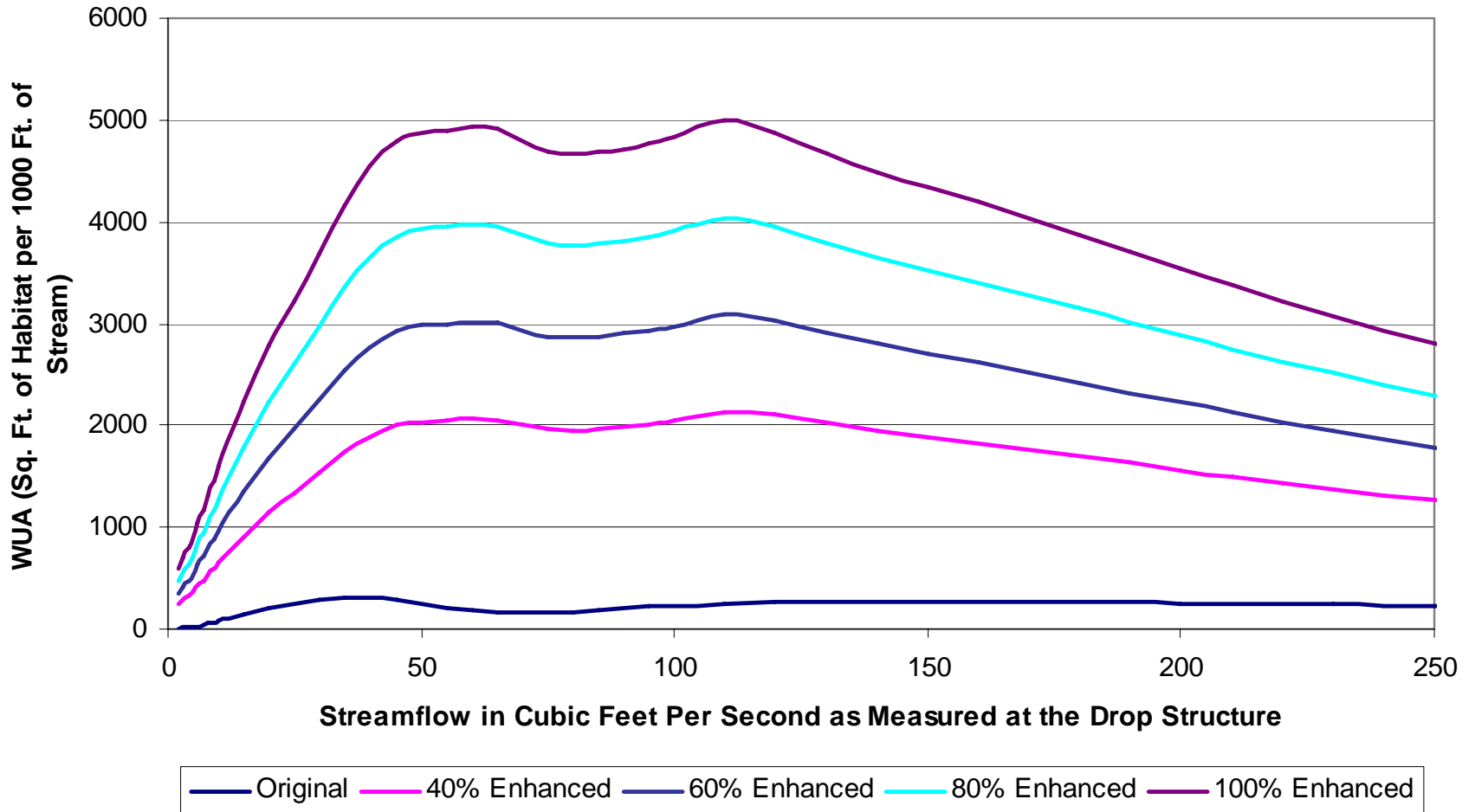
Lake Creek Accretion



Pre/Post Enhancement – Study Site 1, Transect 2



Lake Creek IFIM August: Chinook Spawning Habitat (WUA) vs. Flow



Lack of Connectivity between Lake and Reach 5

- Effects
 - No connectivity between Packwood Lake and Lake Creek
 - Only downstream fish movement due to natural barrier at 1464 feet below drop structure
 - Isolated reach has limited habitat for spawning and rearing fish
- Potential solutions
 - Capture Packwood Lake trout and transport them downstream around the drop structure
 - Enhances the resident trout population in Lake Creek

Tributary Stream Connectivity to Lake

- Effects
 - Not affected, provided sufficient lake level is maintained to provide spawning / fry emigration
- Potential Solution = Lake Elevation
 - Keep Lake at or above elevation 2856.5 ft MSL
 - May 1 – July 15
 - Seven days after outage begins
 - Outage will begin the last week of July or first week of August. Historical data indicate that natural inflows will raise the lake level approximately 2 inches per day

Water Quality (Temperature)

- Effects
 - Increased instream flow in Lake Creek diminishes cooling effect of groundwater but Lake Creek temperatures are still cooler than natural flows
 - 7DADMax for tailrace is slightly warmer than 7DADMax for natural condition in Lake Creek at mouth
- Potential solution = Moving Outage Timing
 - August outage eliminates tailrace flow at warmest time of year
 - Increased flow for Lake Creek does not violate standards

Culvert Fish Passage

- **Effects**
 - No passage issues with project pipeline crossings or Hall Creek flume
 - Snyder Creek tailrace culvert needs routine maintenance
- **Potential Solution = Snyder Creek culvert fix**
 - Complete review of culvert for adequate passage
 - Perform annual inspection and routine maintenance as required on existing culvert
 - Replace crossing or reroute Snyder Creek if existing culvert poses passage issue
 - Long term fix within the first ten years of new operating license if necessary