



DATE: May 1, 2009

TO: Boundary Project Relicensing Participants (RPs)

FROM: Seattle City Light (SCL)

SUBJECT: The purpose of this memorandum is to describe Project effects on whitefish spawning conditions at the mouth of Sullivan Creek.

During the Integrated Resource Analysis (IRA) Meeting on March 25th, 2009, participants discussed information that had been collected by SCL to improve site specific information on the spawning periodicity of mountain whitefish in the Boundary Project area. Fieldwork was conducted from October 28, 2008 to January 30, 2009 to better define mountain whitefish spawning periodicity for use in habitat modeling analyses. Three sites had been sampled (adult observation/capture and egg mat deployment) during this study effort: the mainstem river below the Box Canyon Dam tailrace, the Boundary Dam tailrace and the mouth of Sullivan Creek. These were the three areas identified during sampling in the winter of 2007/08 where whitefish in spawning condition were observed or captured. Results of the 2008/09 mountain whitefish periodicity study were presented in the Fish Distribution, Timing and Abundance addendum which has been posted to the Boundary Relicensing website.

During the IRA meeting on March 25th, participants noted that whitefish in spawning conditions and whitefish eggs had been observed or collected in mainstem habitats below the Box Canyon tailrace. However, information discussed during the meeting focused on the location of gravid female and milt-flowing male whitefish observed or collected at the mouth of Sullivan Creek and mountain whitefish eggs that had been collected on egg mats placed in the Sullivan Creek delta area in 2008/09.

At the Sullivan Creek delta, small concentrations (five to six fish per survey) of gravid females and milt-flowing males were captured or observed on the delta from late October to early December. Egg mats deployed in the Sullivan Creek channel portion of the delta captured 30 whitefish eggs. This information confirmed that mountain whitefish utilize the middle portion of the Sullivan Creek delta for spawning during the late fall/early winter time period where the substrate, depth and velocity appeared conducive to spawning.

Potential effects of Project operations on mainstem mountain whitefish spawning habitat below the Box Canyon Dam tailrace were evaluated as part of the mainstem effective spawning analysis. However SCL noted that quantitative, PHABSIM-type transect data are not available for the middle portion of the Sullivan Creek delta where whitefish spawning was observed.

In response to interest in better understanding potential project effects on mountain whitefish spawning in the Sullivan Creek delta area, SCL modelers identified an approach that would track the frequency of reservoir water surface elevations inundating the various portions of the delta. A key assumption of the approach would be that reservoir pool levels that inundated the middle reach of the delta might allow whitefish to broadcast eggs outside of the primary stream channel. Eggs that adhered to surficial substrates outside of the primary stream channel would be at increased risk of dewatering mortality when the reservoir pool level dropped. Low reservoir water surface elevations would increase the risk of exposing eggs outside of the primary stream channel that were deposited at higher reservoir water surface elevations. The analysis would not be as quantitative as the effective spawning analysis being conducted for mainstem reservoir habitats, but the analysis would provide an indication of the potential effect of reservoir water surface fluctuations on whitefish spawning at the Sullivan Creek delta.

The group discussed the merits of using this less detailed model to assess Project impacts on spawning mountain whitefish in the Sullivan Creek delta as part of the IRA process. SCL acknowledged that Project operations that caused reservoir water surface elevations to fluctuate over a broad range were likely to have some effect on mountain whitefish spawning habitat in the Sullivan Creek delta. The group decided that rather than having SCL develop a Sullivan Creek delta model to assess impacts of Project operations on whitefish spawning, SCL would draft for RP review a description about the potential Project effects on spawning mountain whitefish at the Sullivan Creek delta. That description follows below.

Current Boundary Project load following operations occur during the time period when mountain whitefish would be spawning in the Sullivan Creek delta area. These load following operations result in fluctuations in water surface elevations over the Sullivan Creek delta and modify conditions (depth and velocity) which may cause whitefish to change the location of spawning. Eggs attaching to areas above or below an optimal location could be subjected to decreased survival. If whitefish spawn during periods of delta inundation, eggs that adhered to substrates outside of the Sullivan Creek channel would be dewatered if reservoir water surface elevations subsequently dropped.

Mountain whitefish spawning is assumed to occur from October 15 through January 15 and incubation extends from October 15 through April 15. During October through December, Sullivan Lake is drawn down resulting in augmented flows in the lower Sullivan Creek

channel during peak mountain whitefish spawning. The effects of increased flow in the Sullivan Creek channel associated with Sullivan Lake drawdown complicate any attempt to isolate the effects of fluctuations in reservoir water surface elevations on whitefish spawning conditions at the Sullivan Creek delta. Regardless of the effect of augmented flows in the lower Sullivan Creek channel, it seems clear that fluctuations in reservoir water surface elevations impact mountain whitefish spawning habitats.

During the whitefish spawning and incubation period October 15, 2002 through April 15, 2003, a period representing average hydrologic conditions, SCL operations caused the reservoir water surface elevation to drop to elevation 1985.12 feet (NAVD 88), measured at the USGS Gage 12396500 located 1.4 miles downstream of the Box Canyon Dam. During this same period, the maximum water surface elevation measured at the USGS gage was 1996.59 feet. Although the maximum water surface elevation was affected by inflow, the minimum water surface elevation was affected by SCL operations at the Boundary Project. This range of reservoir water surface elevations would have exposed portions of the Sullivan Creek delta outside of the Sullivan Creek wetted channel.

Figure 1 shows the general orientation of Sullivan Creek to the mainstem Pend Oreille River during the 2008/09 whitefish spawning season. Figure 1 identifies the area where observations of whitefish spawning activity were concentrated. Figure 1 also shows the 10th percentile, 50th percentile and 90th percentile of mainstem reservoir water surface elevations during an average water year during and after the period of storage releases from Sullivan Lake. During an average water year water surface elevations at the 10th percentile and 90th percentile may not allow whitefish to spawn under preferred spawning conditions, or may allow whitefish to spawn outside of the Sullivan Creek channel where a subsequent drop in reservoir water surface elevation may dewater eggs and reduce survival.

SCL acknowledges that current Project operations may affect the location where whitefish spawn at the mouth of Sullivan Creek and could decrease the survival of eggs due to the location they are laid. During the IRA process, SCL and other RPs will continue to examine the effects of Boundary Project operations on aquatic resources. In addition to considering the effects of operations, SCL is investigating opportunities to enhance mountain whitefish spawning conditions, such as placing spawning-sized gravels in Upper Reservoir mainstem habitats.

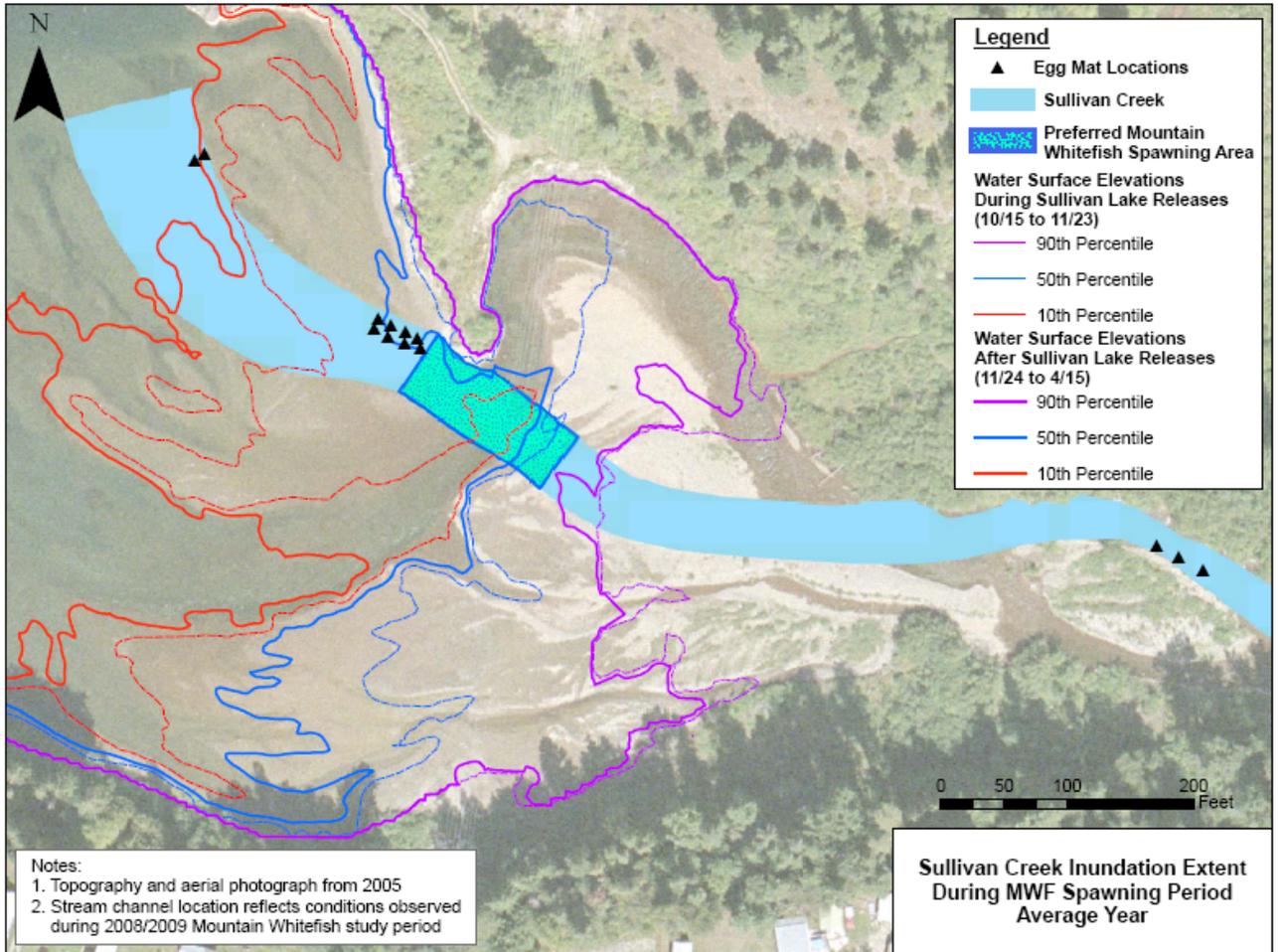


Figure 1. Sullivan Creek inundation extent during the mountain whitefish spawning period, preferred whitefish spawning area and the location of egg mats placed in the winter of 2008/09.