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To: Larry Basham, Fish Passage Center
From: Chris Peery, University of Idaho
Re: Temperatures and tagging protocols for AFF in 2002
Date: 25 January 2002
Cc: David Clugston, Mike Langeslay, USACE , Portland District

As requested at the January FPOM meeting, I estimated the effects to our data precision if tagging guidelines were imposed as described in the tagging protocols. Protocols would require tagging every other day when water temperatures in the Washington-shore ladder reached 70°F (21.1°C) and tagging limited to one per week when temperatures reached 72°F (22.2°C). Typically, the time period most likely to be affected by these temperatures would be August and early September, and would encompass a large portion of the adult steelhead and the first half of the fall chinook salmon runs.

As you know, our research is designed to evaluate passage conditions and factors that affect passage of adult salmon in the Columbia and Snake rivers. The accuracy of our results depends on our ability to sample fish (and passage conditions) from every segment of the fish runs, and in proportion to the run distribution as much as possible. When sampling restricted for periods of time, the portion of the run passing Bonneville Dam at the time is underrepresented in our analysis. Gaps in the number of radio-tagged fish migrating upstream also affect our ability to monitor a crucial river environment period (warm water conditions). At the time temperatures are warmest, fish groups most likely to be passing Bonneville Dam would be steelhead from Salmon, Imnaha, and mid-Columbia River stocks, summer chinook salmon from the Middle Fork Salmon and Mid-Columbia rivers, and upriver bright fall chinook salmon.

Numbers of fish affected by recommended temperature guidelines would vary with severity of the summer water temperatures. Based on the tag schedule from 2001, which should be similar to that used in 2002, and ladder water temperatures recorded by Corps personnel during 1997 and 1998, which represent the warmest years we have experienced recently, the following number of chinook salmon and steelhead would not have been tagged (Table 1 and Figure 1). Numbers or based on the assumption that tagging would be allowed every other day starting on the second day after temperatures reached 70°F, and on the fourth and then every seventh day after that when temperatures reached 72°F.

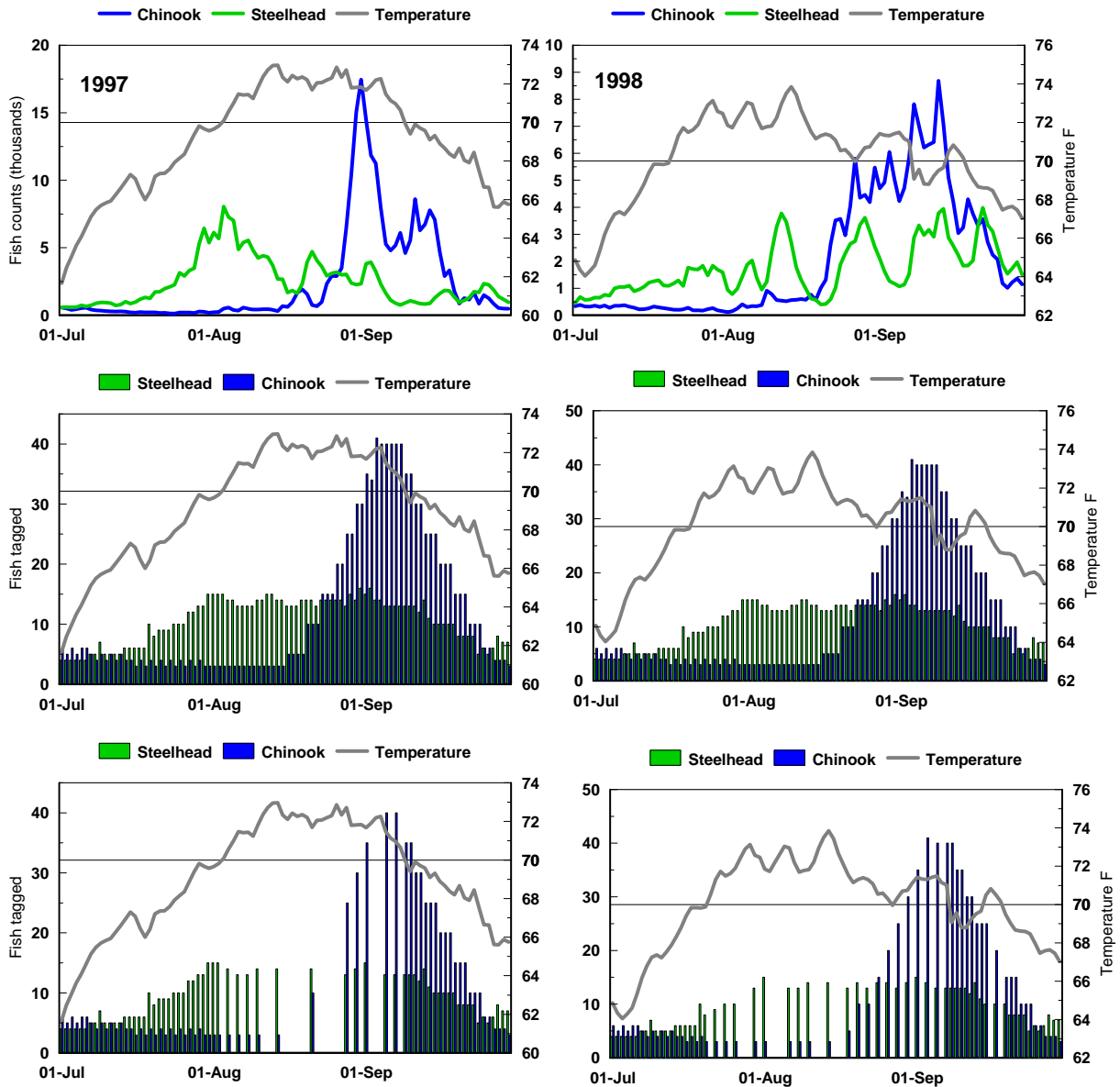


Figure 1. Fishway water temperatures and fish counts of chinook salmon and steelhead at Bonneville Dam during 1997 and 1998 (top), fishway water temperatures in 1997 and 1998 in relation to schedule used to radio-tag chinook salmon and steelhead adults at Bonneville Dam during 2001 without (middle) and with (bottom) temperature restrictions.

Table 1. Based the above stated recommendations, tagging would have been restricted for the following number of days with the corresponding numbers of fish not tagged during periods of water temperature between 70 and 71.9°F and between 72 and 73.9°F.

	70 to 71.9°F		72 to 73.9°F		
	Days	Chinook	Steelhead	Chinook	Steelhead
1997	25	215	321	120	48
1998	31	210	292	136	36

Values in Table 1 represent an undersampling of about 33 and 30% for steelhead and 33-35% for chinook salmon of the approximate 1,000 each steelhead and fall chinook salmon to be tagged in a standard sample year. Precision in our analyses from smaller sample sizes is relative to the tests being performed. In general terms, eliminating one third of the fish tagged would reduce precision in data relative to past years by about the same proportion, although some groups (those noted above) would be affected more than others.

In some of our regression analysis in which passage performance is related to environmental conditions by subdividing tagged fish into groups (sample units) of 25 fish, reducing the number of fish tagged as described above would eliminate about 11-13 sample units each from the chinook salmon and steelhead analysis at Bonneville Dam. With a sample size of about 34 (850 fish ÷ 25 fish per sample unit) power of regression analysis is about 85%. With a sample size of 21, the power of analysis declines to about 63%.

In the spill test proposed for 2002, fallback for salmon and steelhead are to be compared between high and low spill treatment levels. A replicate for this test consists of a period of time during which at least ten radio-tagged fish have exited the fishway ladders during each spill treatment (at least 20 fish per replicate). We have found that a sample size of about 30 is needed in order to differentiate a 5% difference in fallback rates between two spill treatments. Tagging at the level described above would have eliminated an estimated 6 replicates from analysis, increasing minimal detectable difference to about 10% in fallback rates.

Reducing the number of fish tagged Bonneville Dam would also adversely affect study objectives for upstream locations. Tagging 1,000 chinook salmon results in 200-300 fish passing Lower Granite Dam during a typical year, one third of which would be eliminated under the sampling scenario described above. Fewer fish at Lower Granite dam would affect the results from numerous objectives, including the homing and energy use studies and evaluations of the RSW and transition pool weir modifications.

In summary, I feel the proposed regulations would impair our ability to collect representative passage information on fall chinook salmon and steelhead during all but the coolest years and could significantly reduce our ability to evaluate results with respect to proposed study objectives.

To avoid significant disruptions to data collection for the Adult Passage Project, I propose that tagging operations at the AFF not be restricted when fishway water temperatures are between 70 and 71.9°F, with the normal precautions taken to reduce animal stress (tag only during mornings, change anesthetic and recovery water frequently, etc.) as in past years. At temperatures 72 to 73.9°F, tagging can be restricted to every other day with the same precautions being taken to reduce stress to animals. Provisions could be

made to raise one or more picket leads in the main fishway so fish can ascend Bonneville Dam without being diverted into the AFF trap while still allowing some level of trapping effort.