FISH PASSAGE CENTER

847 NE 19th Ave., Suite 250, Portland, OR 97232
Phone: (503) 833-3900 Fax: (503) 232-1259
www.fpc.org/
e-mail us at fpcstaff@fpc.org

MEMORANDUM

TO: Rob Lothrop, CRITFC

FROM: Michele DeHart

DATE: March 24, 2014

RE: Opportunities to Improve Data and Fish Passage through the Upper Columbia River with Emphasis on Present Structure and Passage Issues

In response to your request, the Fish Passage Center staff reviewed the opportunities to improve data and fish passage through the Upper Columbia, in light of the present structural operational and fish passage problems in the Upper Columbia. We have listed specific opportunities to improve data and passage below.

Improving Data in the Upper Columbia

When estimating smolt-to-adult return rates (SARs) through the use of PIT tags, there are two important considerations when it comes to ensuring high data quality and confidence. The first is to use PIT-tag release groups that are large enough in numbers to allow for sufficient downstream detections as juveniles out-migrate and also allow for sufficient returning adults to be detected upon their return. Second, data quality for PIT-tag studies can be improved by increasing the number of opportunities that a PIT-tagged fish can be detected, particularly when detection probability of any given detection system is limited, like in a juvenile bypass system. With these two concerns in mind, we have determined that improving data quality in the Upper Columbia could be accomplished by a combination of increasing PIT-tag release groups and increasing PIT-tag detection capabilities throughout the Upper Columbia. Below, we outline the possibilities for accomplishing these two objectives.

Increasing PIT-Tag Release Groups

Increasing PIT-tagging release groups at dams in the Upper Columbia River will improve estimates of survival and smolt-to-adult return rates, allowing improved analyses of fish passage and survival. Currently the bypass surface collector and sampling facility at Rocky Reach Dam collects juvenile salmonids. Yearling Chinook, steelhead, and sockeye collected at that site could be marked. The operation of this facility would allow for the collection and PIT-tagging of both hatchery and wild yearling Chinook, steelhead, and sockeye that are out-migrating from tributaries and hatcheries above Rocky Reach Dam. Also PIT-tag marking could be increased at Rock Island Dam for yearling Chinook, subyearling Chinook, steelhead, and sockeye (Table 1).

Table 1. Additional PIT-tagging proposed. Note that some release groups within a basin are combined in this preliminary evaluation in order to improve efficiency of marking and to promote cost savings. When 15,000 tags are spread across more than one release group within a basin it is suggested that tagging numbers would be split proportional to each release group's number of smolts.

Species-Race	Release number in 2013	Stock	Release River	Proposed Increase
Marking at Hatcheries				
CH-SU	420,000	Okanogan R	Chief Joseph Hatchery (New 2014)	15,000
CH-SP	341,399	Methow R	Methow Hatchery	15,000
CH-SP	281,793	Chiwawa	Chiwawa Hatchery	15,000
ST	169,398	Wells	Ringold Springs Hatchery	15,000
ST	51,473	Twisp	Twisp Acclim. Pond	15,000
ST	26,350	Wells	Similkameen Acclim. Pond	15,000
ST	40,032	Wells	Okanogan River	
ST	24,000	Wenatchee R	Blackbird Island Acclim. Pond	15,000
ST	47,263	Wenatchee R	Chiwawa Hatchery	
ST	72,028	Wenatchee R	Nason Creek	
ST	104,189	Wenatchee R	Wenatchee River	
Increased Marking at Rock Island				
ST		Hatchery/wild	Aggregate from upstream	8,000
CH-sub		Hatchery/wild	Aggregate from upstream	8,000
CH-year		Hatchery/wild	Aggregate from upstream	8,000
SK		Hatchery/wild	Aggregate from upstream	8,000
Marking at Rocky Reach Dam				
CH-sub		Hatchery/wild	Aggregate from upstream	8,000
CH-year		Hatchery/wild	Aggregate from upstream	8,000
ST		Hatchery/wild	Aggregate from upstream	8,000
SK		Hatchery/wild	Aggregate from upstream	8,000
			TOTAL PIT TAGS =	169,000

Our review of unmarked hatchery releases of yearling Chinook and steelhead from 2013 identified additional hatchery releases that could be marked with PIT tags if additional PIT tags and funding were available. Table 1 identifies potential mark groups for hatchery PIT-tagging. All the hatcheries identified for marking were WDFW hatcheries. The USFWS has implemented increased PIT-tagging in recent years at their hatcheries in the Upper Columbia. There may be a potential to aggregate releases within a basin to represent a broader geographic group (Table 1).

A sample size of 15,000 smolts marked at an individual hatchery location should provide a relatively precise estimate of smolt-to-adult return rate. Leavenworth NFH has marked 15,000 smolts every year since 2005 and the resulting estimates of McNary to Bonneville SARs have an average coefficient of variation of 18% across those years (Figure 1). In general, the SARs produced in the CSS for Upper Columbia River groups (CSS 2013 annual report) show increased precision with increasing sample sizes. With a smolt release of about 15,000 smolts, the coefficient of variation is typically about 20% (Figure 1).

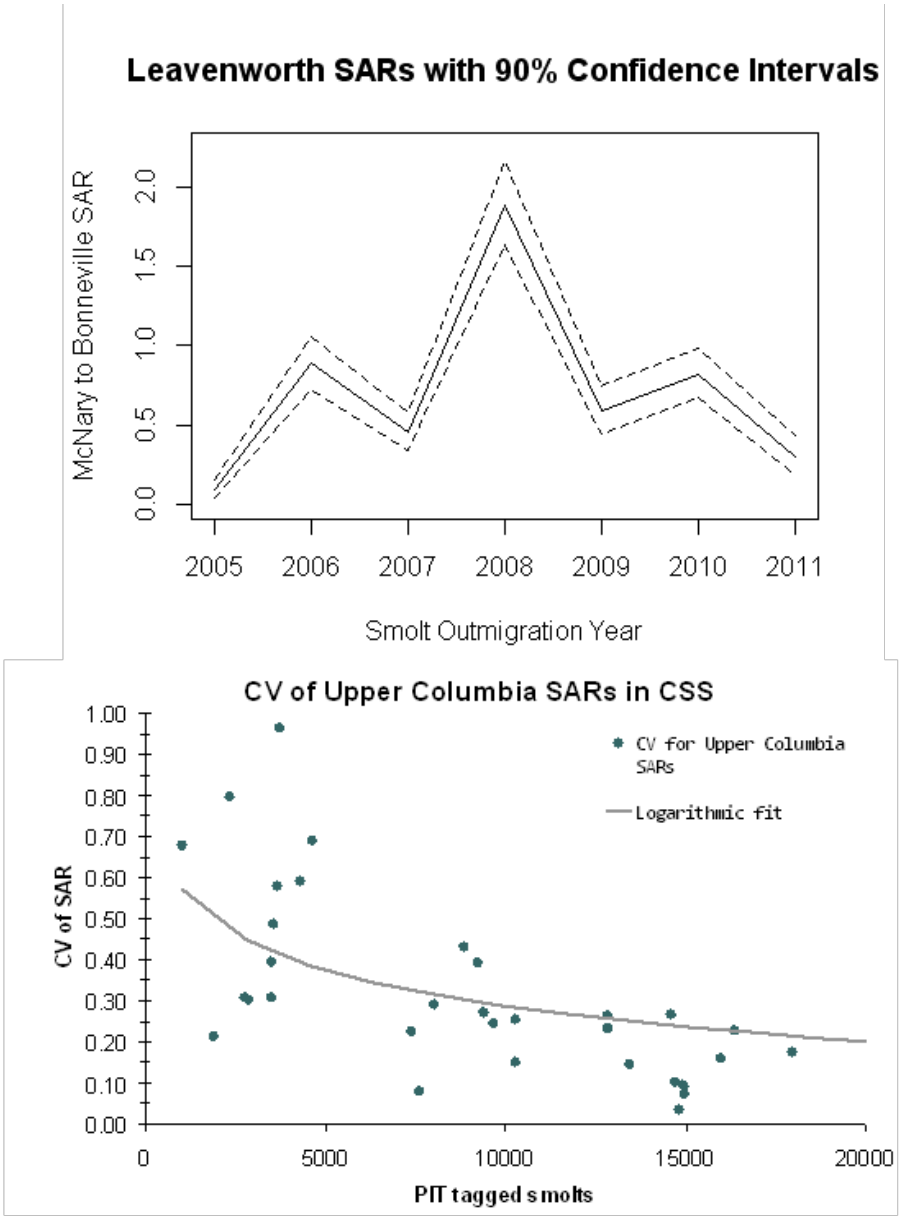

Figure 1. The top panel shows McNary to Bonneville SARs for Leavenworth Hatchery with 90% confidence intervals. The bottom panel shows the coefficient of variation for SARs of various hatchery and wild groups in the Upper Columbia River. All data is from the 2013 CSS report. The solid line in the bottom panel is a logarithmic fit to the CV data.

Table 1 above shows how an ideal sample size of 15,000 smolts could be applied to improve monitoring of current stocks for the Upper Columbia River basin and involves three components. The first is to begin marking at hatcheries that are currently releasing smolts but are not PIT tagging those releases. The second is to augment the current marking program at Rock Island Dam. The last is to begin a marking program at Rocky Reach dam in a similar manner as the PIT-tagging at Rock Island Dam. The total number of PIT tags proposed for these marking programs/augmentations is 169,000.

Increasing PIT-Tag Detection Capabilities

Currently, there are very few opportunities for detecting PIT-tagged juvenile salmonids in the main-stem Upper Columbia River between Chief Joseph Dam and McNary Dam. The only large-scale PIT-tag interrogation site for detections of juvenile in this area is the Rocky Reach Dam Juvenile (RRJ) detection site. There is potential to increase detection opportunities by installing new PIT-tag detection systems at other projects throughout the main-stem Upper Columbia River. Specifically those include: (1) the spillway at the Wells Dam, (2) the future unit bypass at Wanapum Dam, and (3) the new surface passage structure at Priest Rapids Dam (when it is completed).

Operations to Improve Juvenile Passage

The present structural problems at Wanapum Dam and the constraints on pool elevations at other projects due to the present situation raise serious issues regarding juvenile and adult passage through the Upper Columbia. Juvenile mortality could increase through the powerhouses because lower pool elevations could result in turbine operating outside of the normal operating range resulting in even higher juvenile mortality. Lower flows through surface bypass could result in more fish passing through turbine units. Lower pool elevations could also affect the efficiency of surface passage structures, forcing more fish into powerhouse routes. Because the present situation affects the coordinated operations throughout the Upper Columbia a voluntary spill program could be implemented at all of the Upper Columbia projects to mitigate for the degraded juvenile passage conditions. Spring and summer voluntary spill programs could be implemented to the Total Dissolved Gas (TDG) caps.

Under normal conditions the Wanapum Future Unit Bypass typically discharges 20 Kcfs. Under the current operational constraints at Wanapum Dam, it is estimated that the Wanapum Bypass will discharge 5–6 Kcfs. It is our understanding that the powerhouse capacity at Wanapum is currently 107 Kcfs. In addition we have been advised that the Rock Island Powerhouse 2 capacity (with 3 units out) is currently 75–85 Kcfs depending on head. The Rock Island Powerhouse 1 capacity (with 2 units out) is currently 55–68 Kcfs depending on head. Total current powerhouse capacity at RIS is 133–153 Kcfs.