FISH PASSAGE CENTER

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MEMORANDUM

To: Michele DeHart

From: Brandon R. Chockley

Date: December 18, 2014

Re: Results from WDFW sockeye PIT-tagging on the Wenatchee River in 2014

In 2014, staff from Washington Department of Fish and Wildlife (WDFW) in Wenatchee, Washington, trapped and PIT-tagged approximately 4,800 juvenile sockeye from the Wenatchee River. These PIT tags were provided through funding from Chelan PUD. In the summer of 2014, WDFW staff approached the FPC about the possibility of the CSS providing PIT tags for future trapping and tagging of Wenatchee River sockeye. In August of 2014, the CSS Oversight Committee agreed to allow WDFW staff to use up to 6,000 of their surplus PIT tags from Wenatchee River Chinook and steelhead marking towards the marking of Wenatchee River sockeye in the spring of 2015. The purpose of this memo is to provide information on what data I was able to obtain from the 2014 PIT-tagging efforts and, therefore, provide insight into what the CSS may obtain from future sockeye PIT-tagging efforts.

- In 2014, a total of 4,820 sockeye juveniles were PIT-tagged and released by WDFW into the Wenatchee River from two release sites between March 20th and April 24th.
- Survival from release to McNary Dam was 0.43 (95% CI: 0.33–0.53).
- Estimates of survival beyond McNary Dam were unreliable. This was due to the relatively low survival from release to MCN and the low number of detections of PIT-tagged fish below McNary Dam.
- Results from 2014 indicate that estimating survival from release to McNary Dam is possible with approximately 4,800 tags, but estimating survival beyond McNary Dam may require additional tags and/or higher survival in the release to MCN reach.
- At this time, it is too early to tell if estimation of smolt-to-adult ratios is possible, as complete adult returns will not be available until 2016.

Methods

Timing and Travel Time

Timing and fish travel times were estimated for 2014 out-migrants based on PIT-tag detections at various dams within the Rock Island to Bonneville reach. I estimated cumulative passage timing based on PIT-tag detections at McNary (MCN), John Day (JDA), and Bonneville (BON) dams. Daily PIT-tag detections at each of these projects were summed and adjusted based on the average proportion of flows that passed through the powerhouse. Minimum, median, and maximum fish travel times were estimated from release to detection at each dam in the reach with PIT-tag detection capabilities.

Survival

I attempted to estimate smolt survival and their associated variance estimates for PIT-tagged juvenile sockeye from their release to BON. PIT-tagged smolts can be detected at MCN, JDA, and BON dams, as well as downstream of Bonneville Dam using specialized trawl equipment for PIT-tag detection. Using recapture data from fish detected at these sites, single-release mark-recapture survival estimates were generated using the Cormack-Jolly-Seber (CJS) methodology as described by Burnham et al. (1987) with the Mark program (software available free from Colorado State University) (White and Burnham 1999). If possible, survivals from multiple reaches were combined to estimate survival over the entire reach (release to BON) using the delta method (Burnham et al. 1987).

Results

Travel Time and Timing

A total of 4,820 juvenile sockeye were tagged and released by WDFW from two release sites on the Wenatchee River in 2014 (WENA4T and DRYTAL). Sockeye tagging in 2014 began on March 30th and ended on April 24th. Overall, these PIT-tagged sockeye juveniles passed through the Upper and Lower Columbia River from late April through early June (Table 1, Figure 1).

Table 1. Migration timing of PIT-tagged juvenile sockeye from the Wenatchee River detected at MCN, JDA, and BON dams in 2014.

	Estimated Passage Date		
Project	**10%**	**50%**	**90%**
MCN	22-Apr	5-May	23-May
JDA	7-May	23-May	3-June
BON	1-May	21-May	29-May

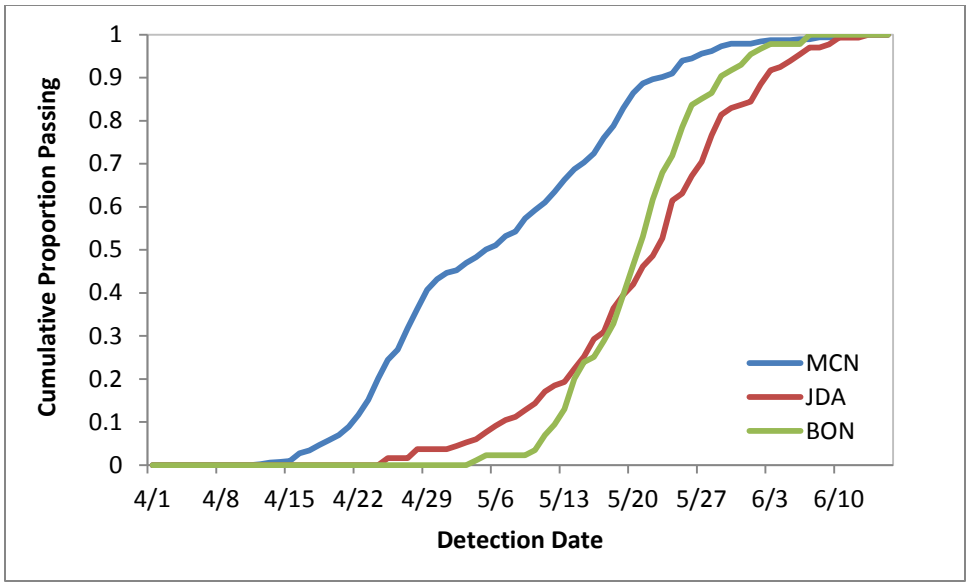

Figure 1. Cumulative passage timing at MCN, JDA, and BON dams of juvenile sockeye PIT-tagged and released into the Wenatchee River by WDFW in 2014.

Estimates of minimum, median, and maximum travel times from release to MCN, JDA, and BON dams are provided below (Table 2). Also provided are estimates of the 95% confidence limits around the estimated median travel time.

Table 2. Travel times of juvenile sockeye PIT-tagged and released into the Wenatchee River in 2013.

	Release to Project Travel Time (days)			95% Confidence Limits	
Project	**Min**	**Med**	**Max**	**Lower**	**Upper**
MCN	5.2	23.4	54.2	22.4	24.6
JDA	9.9	37.9	59.6	35.2	39.2
BON	14.1	38.6	52.0	36.9	41.1

Survival

With the 4,820 PIT-tagged sockeye from 2014, we were able to estimate survival from release to MCN, which was 0.43 (95% CI: 0.33–0.53). However, sample sizes and/or downstream detections were insufficient to obtain reliable estimates of survival below MCN. This is partially due to the relatively few PIT-tag detections below MCN. For example, of the 440 PIT-tagged sockeye smolts that were detected at MCN, only 50 were subsequently detected downstream of MCN. This low number of downstream detections led to an unreliable estimate of survival from MCN to JDA of 1.72 (95% CI: 0.04–3.39). Given the unreliable estimate of survival from MCN to JDA, it was not possible to estimate survival beyond MCN.

To put into context the out-migration conditions that the PIT-tagged sockeye juveniles may have experienced while migrating through the Upper Columbia, Table 3 provides the average spring flow volume (April 15–June 30) for the Upper Columbia River (as measured at Priest Rapids Dam), along with the average spring spill proportions at each of Rock Island, Wanapum, and Priest Rapids dams in 2014.

Table 3. Average spring (April 15–June 30) flow at Priest Rapids Dam (PRD) and average spill proportion at Wanapum (WAN), Priest Rapids (PRD), and Rock Island (RIS) dams in 2014.

PRD Flow Volume (Kcfs)	WAN Spill Prop.	PRD Spill Prop.	RIS Spill Prop.
189.4	0.31	0.35	0.21

Conclusions

Based on these preliminary analyses, a long-term monitoring group for Wenatchee River sockeye would be valuable to the Comparative Survival Study if enough PIT-tagged individuals could be released annually. Results from this single year indicate that a group of 4,820 PIT-tagged individuals is sufficient to obtain reliable estimates of juvenile survival from release to MCN. However, reliable survival estimates beyond MCN may require additional tags and/or increased survival from release to MCN. Increased survivals from release to MCN would mean that more individuals would be available to be detected downstream of MCN, which is one factor that likely led to unreliable estimates of survival below MCN. It is our understanding that the WDFW has a goal of tagging 5,000–6,000 sockeye smolts from the Wenatchee River annually. This tagging goal may be sufficient to produce more reliable estimates of juvenile survival beyond MCN. At this time, it is too early to tell if estimates of SARs are possible with the 4,820 tags that were released in 2014, as no adults have returned yet.

References

Burnham, K. P., D. R. Anderson, G. C. White, C. Brownie, and K. H. Pollock. 1987. Design and analysis methods for fish survival experiments based on release-recapture. American Fisheries Society Monograph 5. Bethesda, MD. 437 pp.

White, G.C. and K. P. Burnham. 1999. Program MARK: Survival estimation from populations of marked animals. Bird Study 46 Supplement, 120–138.