



# FISH PASSAGE CENTER

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## MEMORANDUM

TO: Jeff Fryer, CRITFC  
Skyeler Folks, ONA

FROM: Michele DeHart

DATE: February 5, 2014

RE: Preliminary results from 2013 pilot study to explore feasibility of long monitoring group for Okanogan River sockeye

In 2013, the CSS Oversight Committee was approached with a request to explore the feasibility of adding a long-term monitoring group for sockeye trapped and released at Osoyoos Lake on the Okanogan River. Upon the request from the Okanogan Nation Alliance (ONA) and CRITFC, 3,000 PIT tags were transferred to the ONA for PIT-tagging at Osoyoos Lake in the spring of 2013. Below are preliminary results from this exploratory effort, followed by more specific details.

- In 2013, a total of 2,840 sockeye juveniles were PIT-tagged and released by ONA at Osoyoos Lake from April 17<sup>th</sup> to May 7<sup>th</sup>.
- With these tags, we were able to estimate survival from release to Rocky Reach Dam. Survival from release to Rocky Reach Dam was 0.50 (s.e. 0.04).
- Estimates of survival beyond Rocky Reach dam were questionable. This was partially due to the low survival from release to Rocky Reach Dam which contributed to a low number of detections of PIT-tagged fish below McNary Dam.
- Preliminary analyses indicate that it may be possible to get more reliable estimates of survival from release to McNary Dam with increased tagging at this or other sites on the Okanogan River, or with higher survivals from release to Rocky Reach Dam.
- At this time, it is too early to tell if estimation of smolt-to-adult ratios is possible from this exploratory effort.

## Methods

### *Timing and Travel Time*

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

### *Survival*

We attempted to estimate smolt survival estimates and their associated variance estimates for these juvenile sockeye from their release at OSOYOS to BON. PIT-tagged smolts can be detected at RRH, 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 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 (e.g., Release to MCN combines two reaches: Release to RRH and RRH to MCN), and variance estimates for the overall reach (Release to MCN) were generated using the delta method (Burnham et al. 1987).

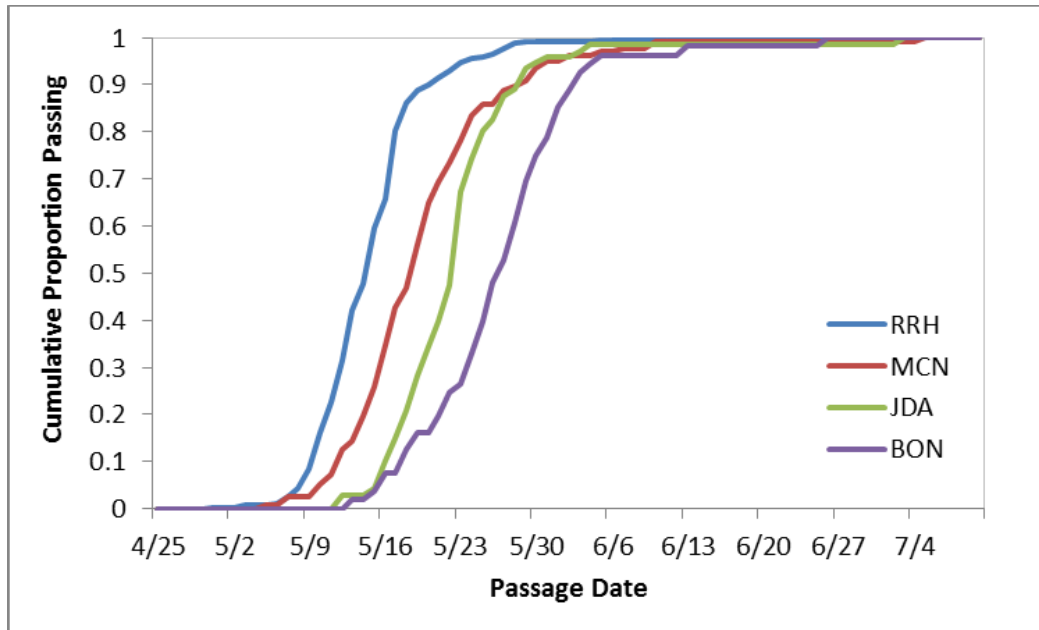
## Results

### *Timing and Travel Time*

In 2013, a total of 2,840 juvenile sockeye were tagged and released from OSOYOL by the ONA. Sockeye tagging began on April 17<sup>th</sup> and ended on May 7<sup>th</sup>. Overall, these PIT-tagged sockeye juveniles passed through the Upper Columbia River from mid-May to early June. In fact, the estimated 90% passage date at BON was of June 3<sup>rd</sup> (Table 1). Figure 1 (below) is provided to illustrate the passage timing of these PIT-tagged juvenile sockeye as they were detected at RRH, MCN, JDA, and BON.

**Table 1.** Migration timing of PIT-tagged juvenile sockeye from Lake Osoyoos detected at RRH, MCN, JDA, and BON dams in 2013.

Project	Estimated Passage Date		
	10%	50%	90%
RRH	10-May	15-May	20-May
MCN	12-May	19-May	29-May
JDA	16-May	23-May	29-May
BON	18-May	27-May	3-Jun



**Figure 1.** Cumulative passage timing at RRH, MCN, JDA, and BON dams of juvenile sockeye PIT-tagged and released from OSOYOL in 2013.

Estimates of minimum, median, and maximum travel times from release to RRH, 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 from OSOYOL in 2013.

Project	Release to Project Travel Time (days)			95% Confidence Limits	
	Min	Med	Max	Lower	Upper
RRH	5.6	18.7	56.3	18.3	19.7
MCN	10.0	23.6	63.7	21.9	24.9
JDA	12.0	25.4	62.3	23.1	27.6
BON	16.3	26.4	57.3	25.5	28.7

### *Survival*

With the 2,840 PIT-tagged sockeye from 2013, we were able to estimate survival from release to RRH, which was relatively low (0.50, s.e. 0.04). However, sample sizes were too low to get reliable estimates of survival below RRH. This is largely due to low numbers of subsequent downstream detections. For example, of the 122 PIT-tagged sockeye smolts that were detected at MCN, only 13 were subsequently detected downstream of MCN. This low number of downstream detections led to an estimated survival from RRH to MCN of 1.06 (s.e. 0.28).

To put into context the out-migration conditions that these sockeye juveniles may have experienced, 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 Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams in 2013.

**Table 3.** Average spring (Apr. 15–June 30) flow at Priest Rapids Dam (PRD) and average spill proportion at Wanapum (WAN), Priest Rapids (PRD), Rock Island (RIS), Rocky Reach (RRH), and Wells (WEL) dams in 2013.

<b>PRD Flow Volume (Kcfs)</b>	<b>WAN Spill Prop.</b>	<b>PRD Spill Prop.</b>	<b>RIS Spill Prop.</b>	<b>RRH Spill Prop.</b>	<b>WELL Spill Prop.</b>
28.5	0.26	0.29	0.15	0.10	0.11

## Conclusions

Based on these preliminary analyses, we feel a long-term monitoring group for Okanogan River sockeye trapped and released at Osoyoos Lake (or some other site) would be valuable to the Comparative Survival Study, if enough PIT-tagged individuals could be released annually. Results from this single year indicate that 2,840 PIT-tagged individuals may not be enough to obtain reliable estimates of juvenile survival from release to MCN. However, it appears that reliable estimates may be possible if either more PIT-tagged individuals were to be released or if survivals in the release to RRH reach were to increase. Increased survivals in this reach would mean that more individuals would be available to be detected downstream of RRH, which is one factor that led to unreliable estimates of survival below RRH in 2013. It is our understanding that the ONA has a goal of tagging up to 5,000 sockeye smolts. This tagging goal may be sufficient to produce more reliable estimates of juvenile survival from release to MCN. At this time, it is too early to tell if estimates of SARs are possible with the 2,840 tags that were released in 2013, as no adults have returned yet.

## Literature Cited

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.