FISH PASSAGE CENTER

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MEMORANDUM

TO: FPAC

FROM: Michele DeHart

DATE: July 30, 2013

RE: Review of Adult Sockeye Passage Data and Ladder Temperatures at Lower Granite Dam.

In response to your request, the Fish Passage Center staff has reviewed adult sockeye PIT-tag detections between Ice Harbor Dam (IHR) and Lower Granite Dam (LGR) to determine PIT-tag conversion rates for return year 2013, compared to the most recent five years (2008–2012). In addition, FPC staff reviewed more recent LGR ladder temperature data to determine whether there is evidence of an impact of ladder temperatures on adult passage. Finally, FPC staff reviewed the daily timing of PIT-tag detections to determine whether there was a clear pattern in when PIT-tagged adult sockeye pass through the adult ladder at LGR. Below are a few conclusions based on these analyses, followed by a more detailed explanation.

- So far for 2013, the PIT-tag conversion rate for sockeye adults between IHR and LGR is approximately 0.65. Over the last five years, the IHR-LGR conversion rate for PIT-tagged sockeye adults has ranged from 0.91 to 1.0.
- As anticipated, there appears to be a relation between maximum ladder temperatures and adult sockeye passage, with sockeye passage decreasing at high ladder temperatures. This impact is evident when considering both adult counts and PIT-tag detections.
- Based on a review of PIT-tag detections in the adult ladder at LGR, it appears that peak passage occurs during daytime hours (05:00 to 20:00). However, there was no discernible pattern as to when this peak occurs, as peak passage has been seen throughout this daytime period over the past six years.
- During the week of July 22nd through July 29th, many different measures were taken in an attempt to address the adult passage problem at Lower Granite Dam. The combination of these measures makes it difficult to determine if it was one specific action, or the combination of several actions, that helped to facilitate the passage of adult sockeye past LGR. However, it appears that the lower maximum daily temperatures in the adult ladder on July 25th, 27th, and 28th coincided with the highest adult counts and highest number of PIT-tag detections.

Conversion Rates

To estimate conversion rates of PIT-tagged adult sockeye, PIT-tag detections for sockeye adults in the IHR and LGR adult fishways for return years 2008 through 2013 (detections through July 28, 2013) were used. PIT-tag conversion rates were then estimated as the number of detections at LGR divided by the number of detections at IHR. The conversion rate estimate for 2013 accounted for adult travel time between the two projects. Specifically, we estimated conversion rates for adults that were detected at IHR through July 23rd, based on the estimated median travel time of approximately 5 days. From this analysis, it is clear that the conversion rate for 2013 of 0.66 is lower than what had been observed over the previous five years (Table 1). It's important to note that this 2013 conversion rate is likely to increase as delayed sockeye adults continue to pass LGR, but to what level is unknown.

Table 1. PIT-tag conversion rates (IHR to LGR) of sockeye adults detected at Ice Harbor Dam.

Return Year	ICH_Obs	GRA_Obs	Conversion Rate
2008	15	14	0.93
2009	25	25	1.00
2010	33	30	0.91
2011	310	293	0.95
2012	67	61	0.91
2013*	111	73	0.66

* Conversion is for adults detected at IHR through July 23, 2013, to account for travel time between IHR and LGR.

Ladder Temperature and Adult Passage

To assess the impact of ladder temperature on passage of adult sockeye, FPC staff used both PIT-tag detections of sockeye adults and adult count data. Ladder temperature data for the period of July 19th through July 28th were downloaded from the TMT website (http://www.nwd-wc.usace.army.mil/tmt/agendas/2013/0729_LWG_temperature-hobo.xls). There appears to be a pattern between adult passage (based on both PIT-tags and adult counts) and the maximum daily ladder temperature (Figure 1). From July 19th through July 24th, the maximum daily temperature in the LGR ladder as above 75.4 °F (Figure 1). During this time, daily adult counts ranged from 1 to 6 fish while PIT-tag detections ranged from 0 to 1 per day. On the morning of July 25th, the COE started using auxiliary pump #2 that drew cooler water into the adult ladder, close to diffuser #14. Later that day, auxiliary pump #1 was started. This auxiliary pump drew cooler water to the adult ladder near the exit. As a result of running these pumps, the maximum daily temperature for July 25th was 74.4 °F (Figure 1). The daily adult sockeye count on July 25th was 26, with 3 PIT-tag detections (Figure 1). On July 26th, pump operations were manipulated to attempt operating the adult trap, causing more warm water to be drawn into diffuser #14. The maximum daily temperature in the adult ladder on July 26th was 75.8 °F (Figure 1). Adult counts on this day were -4 and there were no PIT-tag detections (Figure 1). Subsequent to this, trap operations were terminated and both auxiliary pumps have been running. Since this time, the maximum daily temperature in the adult ladder at LGR has been in the 70-74 °F range (Figure 1). Adult counts for this period have ranged from 30 to 41 per day, with 3 to 9 PIT-tag detections per day (Figure 1).

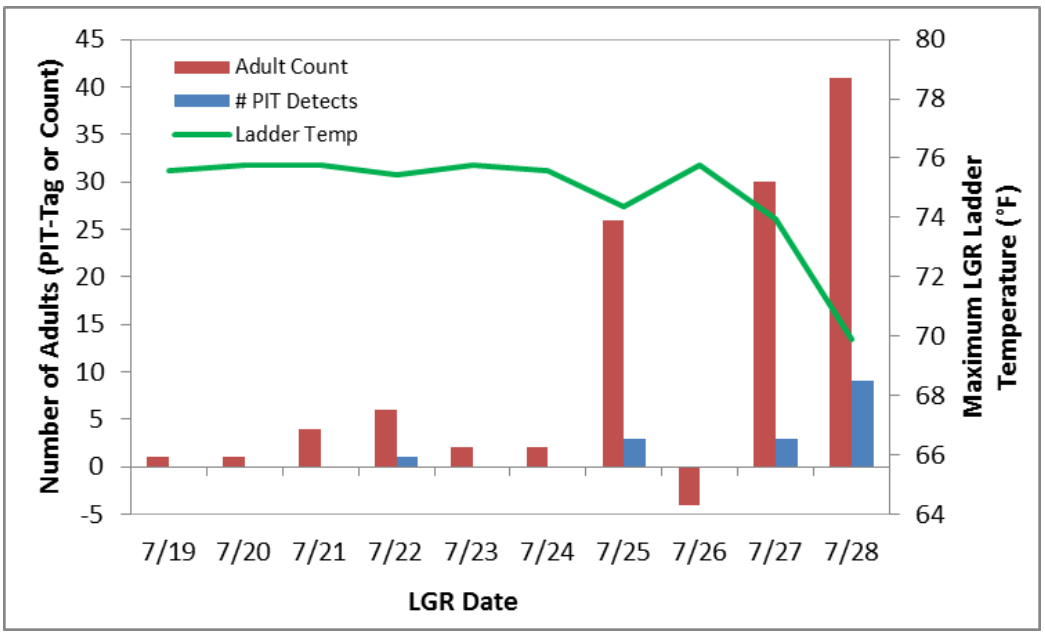

Figure 1. Daily adult counts and PIT-tag detects with corresponding daily max LGR ladder temperatures.

Distribution of Passage Times

Adult PIT-tag detections in the ladder were considered to determine if they could be used to describe a daily distribution pattern. The hour of first detection for each fish that was detected in the LGR adult fishway was determined and frequency histograms for each hour of the day were constructed. Separate histograms were constructed for each return year (2008-2013), as well as one for all six years combined (Figure 2). Based on this analysis, there does not appear to be a discernible pattern as to when peak daily passage of adult sockeye occurs (Figure 2). However, a few observations are worth pointing out. First, while relatively low, there is evidence that adult sockeye do pass through the ladder at night. In fact, among the years analyzed, approximately 7 to 15% of all PIT-tagged adult sockeye were first detected in the adult ladder during evening hours (between 21:00 and 04:00) (Figure 2). Second, it appears that peak passage occurs throughout the daytime hours (05:00 to 20:00). However, there was no discernible pattern as to when this peak occurs, as peak passage has been seen throughout this daytime period over the past six years (Figure 2).

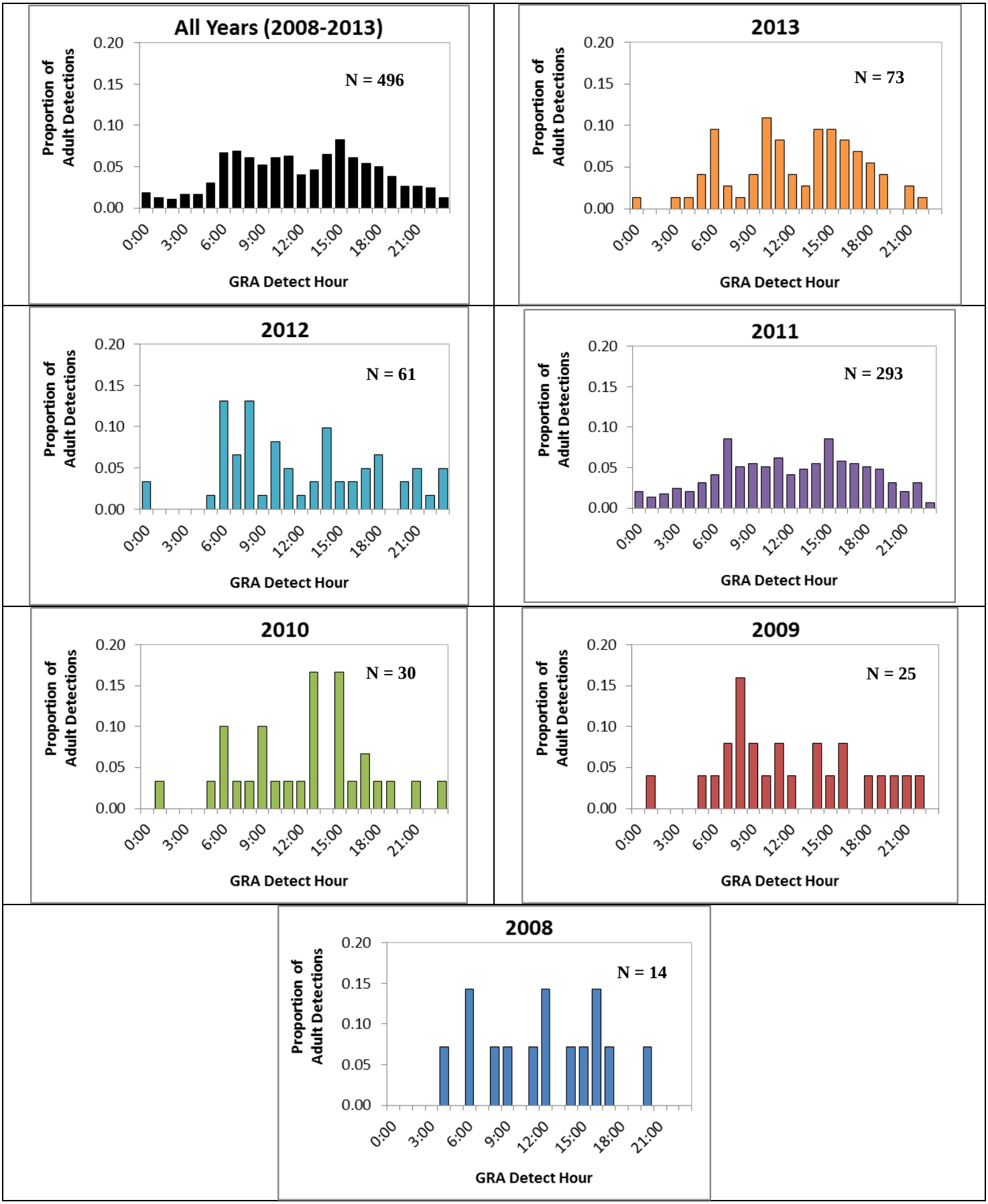

Figure 2. Frequency histograms of detection hour (i.e., ladder entry) for PIT-tagged adult sockeye detected in the adult fishway.

Conclusions

During the week of July 22nd through July 29th, several different measures were taken in an attempt to address the adult passage problem at Lower Granite Dam. Among these measures were: (1) switching between FOP and Unit 1 priority/RSW only spill approximately every 12-hours, (2) switching between Unit 1 priority/RSW only spill and Station Service/Gas Cap Spill approximately every 12 hours, (3) the operation of auxiliary pumps #1 and/or #2, and (4) a combination of both or part of these measures. At the same time, meteorological changes were occurring. The impact of each of these measures individually is difficult to assess. To date, it appears that the lower the maximum daily temperatures in the adult ladder on July 25th, 27th, and 28th coincided with the highest adult counts and highest number of PIT-tag detections.