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MEMORANDUM

TO: Fish Passage Advisory Committee

Michele DeHart

FROM: Michele DeHart

DATE: March 2, 2018

SUBJECT: Review of supporting materials for discussion of early start to transportation in 2018

At the January 16, 2018, Fish Passage Advisory Committee (FPAC) meeting, Paul Wagner (NOAA) provided two PowerPoint presentations as supporting materials to inform a discussion of whether transportation in 2018 should begin earlier than the typical May 1 start date. These supporting materials included: 1) summary figures of transport vs. bypassed smolt-to-adult returns (SARs) and Transport:Bypass (T:B) ratios from NOAA analyses and 2) summary tables of select route specific SARs and Transport to In-River ratios (TIRs) from the 2017 Comparative Survival Study (CSS) Annual Report. FPAC members were asked to review the materials and provide comments for discussion at the March 6, 2018 FPAC face-to-face meeting. In response to this request, the Fish Passage Center (FPC) staff reviewed the supporting materials and offer the following comments for discussion.

- Based on the summary data of NOAA analyses, there is no conclusive evidence that an earlier start to transportation is beneficial for wild Chinook, hatchery Chinook, or wild steelhead.
- The fact that many of the TIRs for Chinook and steelhead groups have been >1.0 since 2006 supports the decision to delay the start of transportation, as the lower SARs from early transported fish are no longer bringing the TIRs down to 1.0 or below.

The decision to delay the initiation of transportation was based on past analyses showing that early transported fish had lower SARs than later transported fish. As a result of these analyses and discussions, the initiation of transportation was delayed to late April, beginning in 2006.

Since 2006, the initiation of transportation has generally occurred between April 21st (2006) and May 1st. However, for the last several years, NOAA has conducted research where a limited number of barges were loaded and departed from Lower Granite Dam (LGR) prior to the initiation of full transportation. This resulted in a few early barges in each of the years when the study was conducted. As was discussed at FPAC on January 16th, these earlier barges would have contained fish that were collected and tagged at LGR, which generally have lower SARs than fish collected at LGR but tagged above LGR. This is worth noting because there has been some question as to how representative fish tagged at LGR are to the run-at-large and whether these fish should be used to assess T:B ratios. However, these are the only data points that are available in more recent years to inform the discussion as to whether the initiation of transportation should begin prior to May 1st in 2018.

Review of NOAA Analyses

Wild Chinook

In all, the supporting materials of NOAA analyses contained nine years (2006-2014) of data for wild Chinook. In eight of these nine years, the confidence intervals for transported versus bypassed fish in the early transported groups (i.e., experimental barges that left LGR prior to the initiation of the full transportation program) were overlapping (Table 1, Figure 1). The one exception to this was in 2010 when the SAR for the transported group in the second experimental barge appears to be significantly higher (non-overlapping CI) than the bypassed group (Figure 1). Furthermore, the lower limit of the confidence intervals for the T:B ratios were all below 1.0 for the period prior to May 1st (Table 1, Figure 2). Based on this information, there appears to be no conclusive evidence that transportation prior to May 1st is beneficial to wild Chinook.

Table 1. Summary of NOAA supporting materials of transport and bypass SARs and Transport:Bypass ratios for wild Chinook.

Migration Year	Transport Start Date	SARs Tagged Above LGR	SARs Tagged At LGR	T:B Ratio for Fish Tagged at LGR
2006	April 21	Mixed; Overlapping CI	Mixed; Overlapping CI	Mean & lower CI below 1.0 through May 1
2007	May 1	N/A	Mixed; Overlapping CI	Mean below 1.0 through ~Apr. 20; Lower CI below 1 through May 1
2008	May 1	N/A	Trans Higher; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1 through May 1
2009	May 1	N/A	Trans Higher; Overlapping CI	Mean above 1.0 through May 1; Lower CI at or below 1.0 through May 1
2010	April 26	Overlapping CI	Trans Higher; 1 st overlapping CI; 2 nd Trans Higher	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2011	May 1	N/A	Same; Overlapping CI	Mean just above 1.0; Lower CI below 1.0 through May 1
2012	May 1	N/A	Same; Overlapping CI	Mean just at or below 1.0; Lower CI below 1.0 through May 1
2013	April 26*	Similar; Overlapping CI	Trans higher; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2014	May 1	N/A	Similar; Overlapping CI	Mean just above 1.0 through May 1; Lower CI below 1.0 through May 1

* Transportation occurred every-other-day from April 26th to until May 2nd.

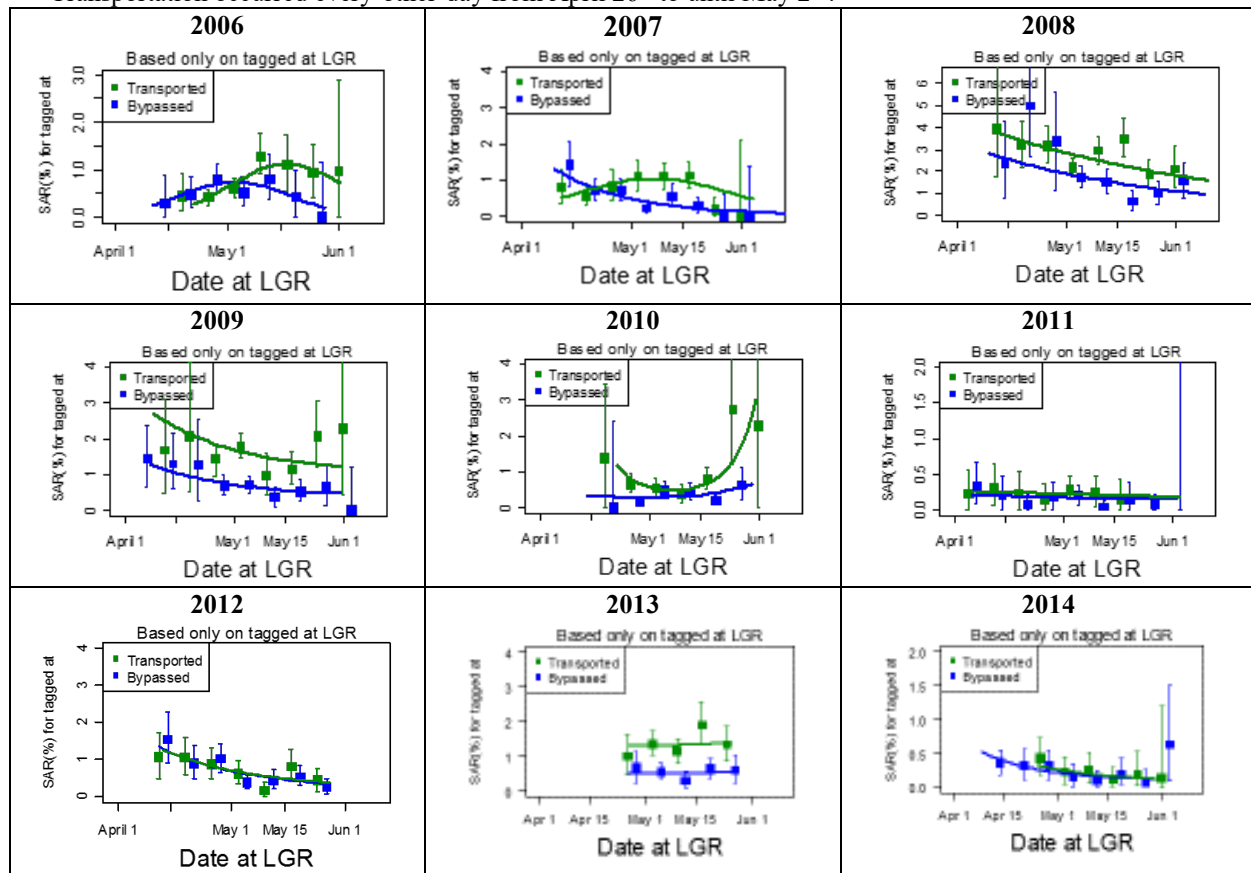


Figure 1. Summary figures of Transported and Bypassed SARs for wild Chinook tagged at LGR.

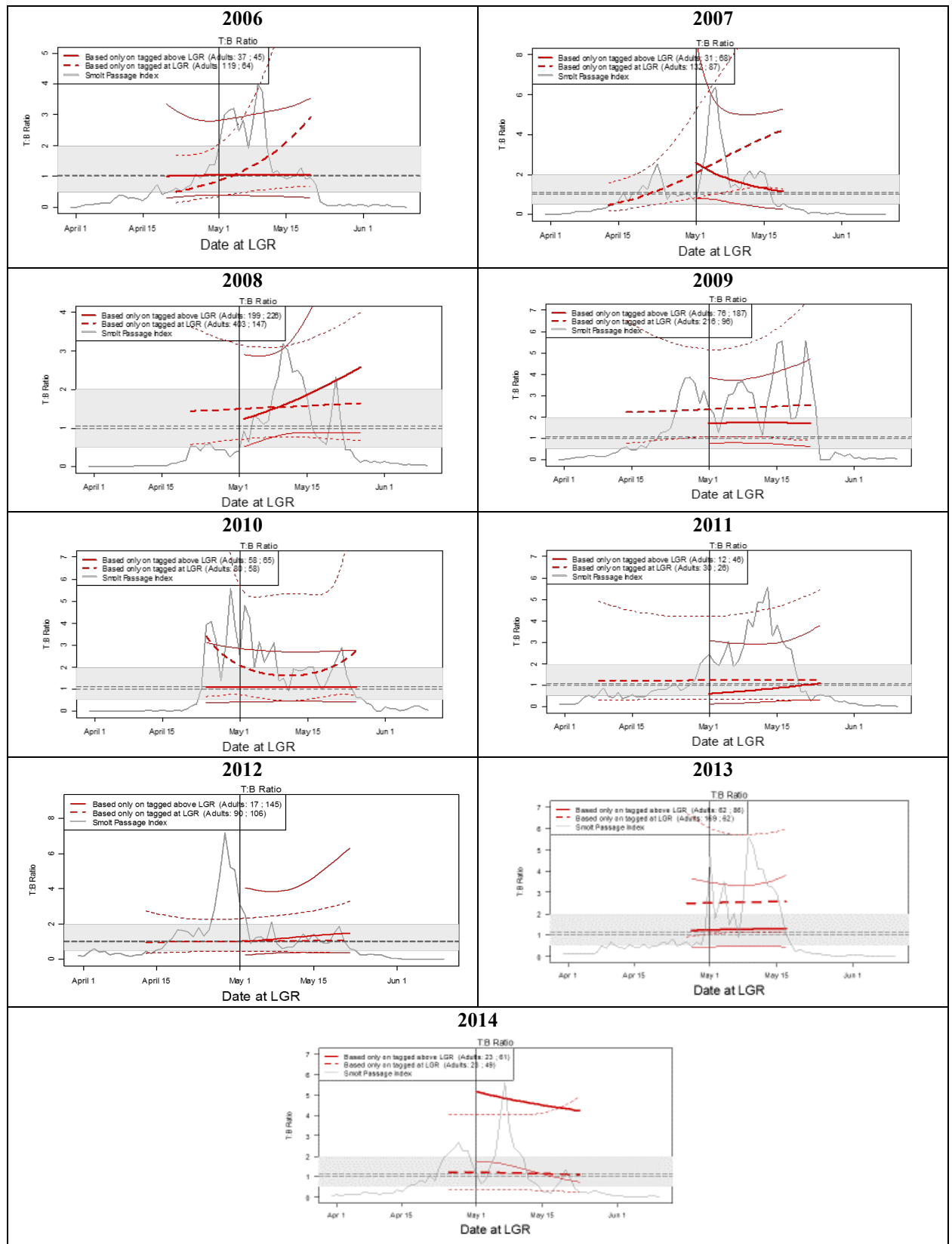


Figure 2. Summary figures of Transported:Bypass ratios for wild Chinook. Data to inform earlier start of transport are for fish tagged at LGR (dashed red lines).

Hatchery Chinook

In all, the supporting materials of NOAA analyses contained four years (2006, 2008-2010) of data for hatchery Chinook. In all four of these years, the confidence intervals between transported and bypassed fish in the early transported groups were overlapping (Table 2, Figure 3). Furthermore, the lower limit of the confidence intervals for the T:B ratios were all below 1.0 for the period prior to May 1st (Table 2, Figure 4). Based on this information, there appears to be no conclusive evidence that transportation prior to May 1st is beneficial to hatchery Chinook.

Table 2. Summary of NOAA supporting materials of transport and bypass SARs and Transport:Bypass ratios for hatchery Chinook.

Migration Year	Transport Start Date	SARs Tagged Above LGR	SARs Tagged At LGR	T:B Ratio for Fish Tagged at LGR
2006	Apr 21	Same; Overlapping CI	Same; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2008	May 1	N/A	Similar; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2009	May 1	N/A	Large CI; In-River Higher; Overlapping CI	Mean above 1.0 through April ~28, above 1.0 April ~28-May 1; Lower CI below 1.0 through May 1
2010	April 26	Mixed; Overlapping CI	Large CI; Overlapping CI	Mean above 1.0 through May 1, decreasing; Lower CI below 1.0 through May 1, at zero for most of period.

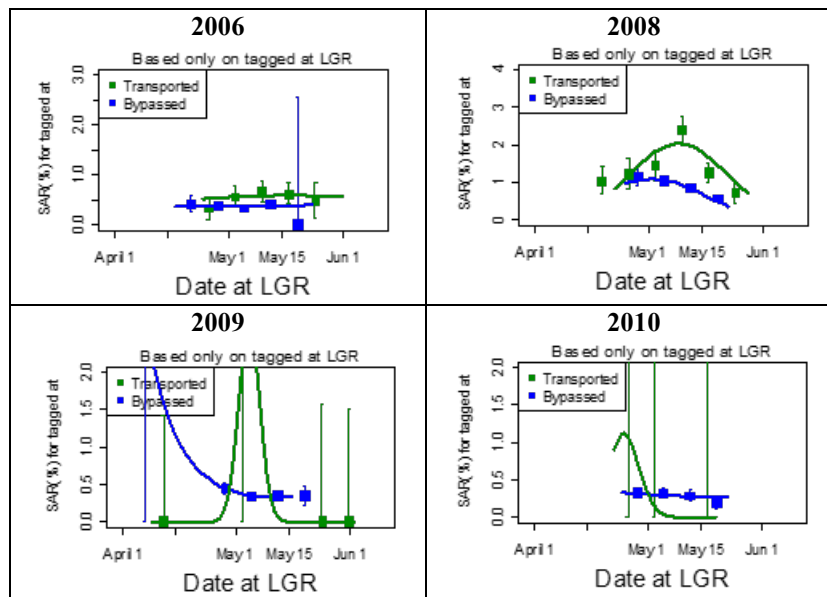


Figure 3. Summary figures of Transported and Bypassed SARs for hatchery Chinook tagged at LGR.

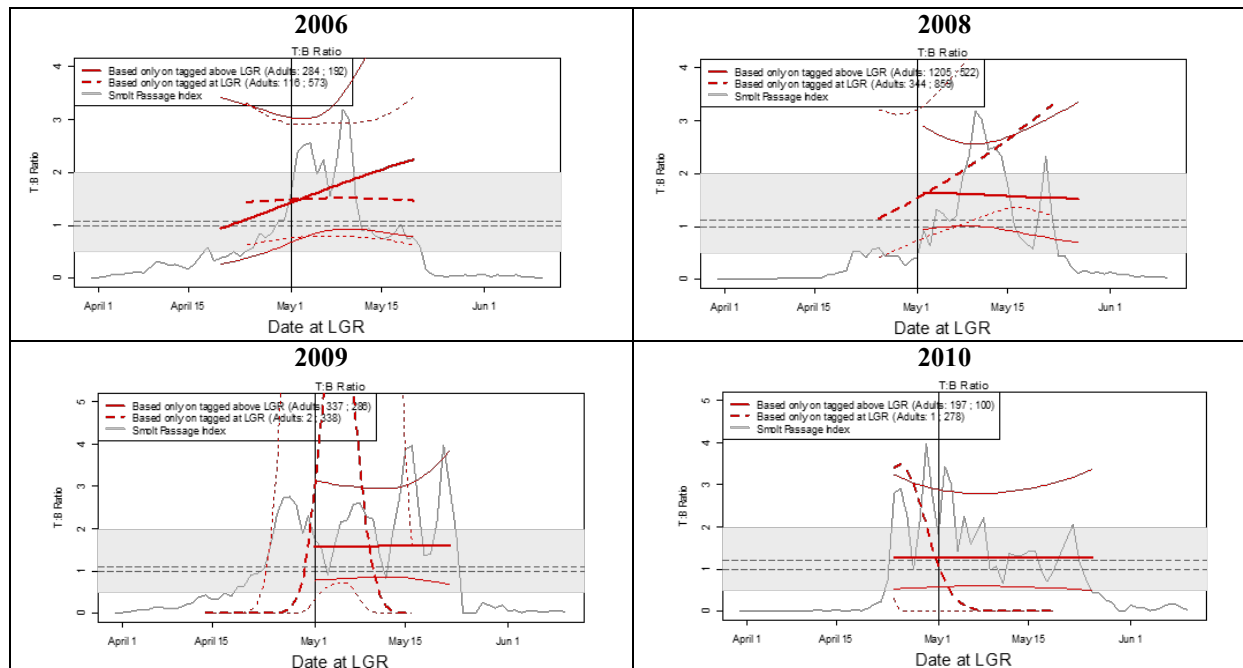


Figure 4. Summary figures of Transported:Bypass ratios for hatchery Chinook. Data to inform earlier start of transport are for fish tagged at LGR (dashed lines).

Wild Steelhead

In all, the supporting materials of NOAA analyses contained nine years (2006-2014) of data for wild steelhead. In six of these nine years (2006-2007, 2009, and 2012-2014), the confidence intervals between transported and bypassed fish were overlapping (Table 3, Figure 5). In the remaining three years (2008 and 2010-2011), there was one data point in each year where the confidence intervals between transported and bypassed fish did not overlap (Table 3, Figure 5). In each of these cases, the point estimate for the transported group were higher than the bypassed groups (Figure 5). Furthermore, in all nine years, the lower limit of the confidence intervals for the T:B ratios were all at or below 1.0 for the period prior to May 1st (Table 3, Figure 6). Based on this information, there appears to be no conclusive evidence that transportation prior to May 1st is beneficial to wild steelhead.

Table 3. Summary of NOAA supporting materials of transport and bypass SARs and Transport:Bypass ratios for wild steelhead.

Migration Year	Transport Start Date	SARs Tagged Above LGR	SARs Tagged At LGR	T:B Ratio for Fish Tagged at LGR
2006	April 21	Mixed; Overlapping CI	Trans Higher; Overlapping CI	Mean above 1.0 through May 1; Lower CI at 1.0 through May 1
2007	May 1	N/A	Trans Higher; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through ~Apr. 28, at 1.0 from ~Apr. 28-May 1
2008	May 1	N/A	Mixed; 1 st point overlapping CI, 2 nd point non- overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2009	May 1	N/A	Mixed; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through ~Apr. 27, at 1.0 from ~Apr 27-May 1
2010	April 26	Trans Higher; Overlapping CI	Trans Higher; 1 st point overlapping CI, 2 nd point non- overlapping CI	Mean ~2.0 through May 1; Lower CI below 1.0 through May 1
2011	May 1	N/A	Mixed; All CI overlapping except ~Apr 10	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2012	May 1	N/A	Mixed; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2013	April 26*	Trans Higher; Trans large CI, overlapping	Trans higher; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1
2014	May 1	N/A	Similar; Overlapping CI	Mean above 1.0 through May 1; Lower CI below 1.0 through May 1

* Transportation occurred every-other-day from April 26th to until May 2nd.

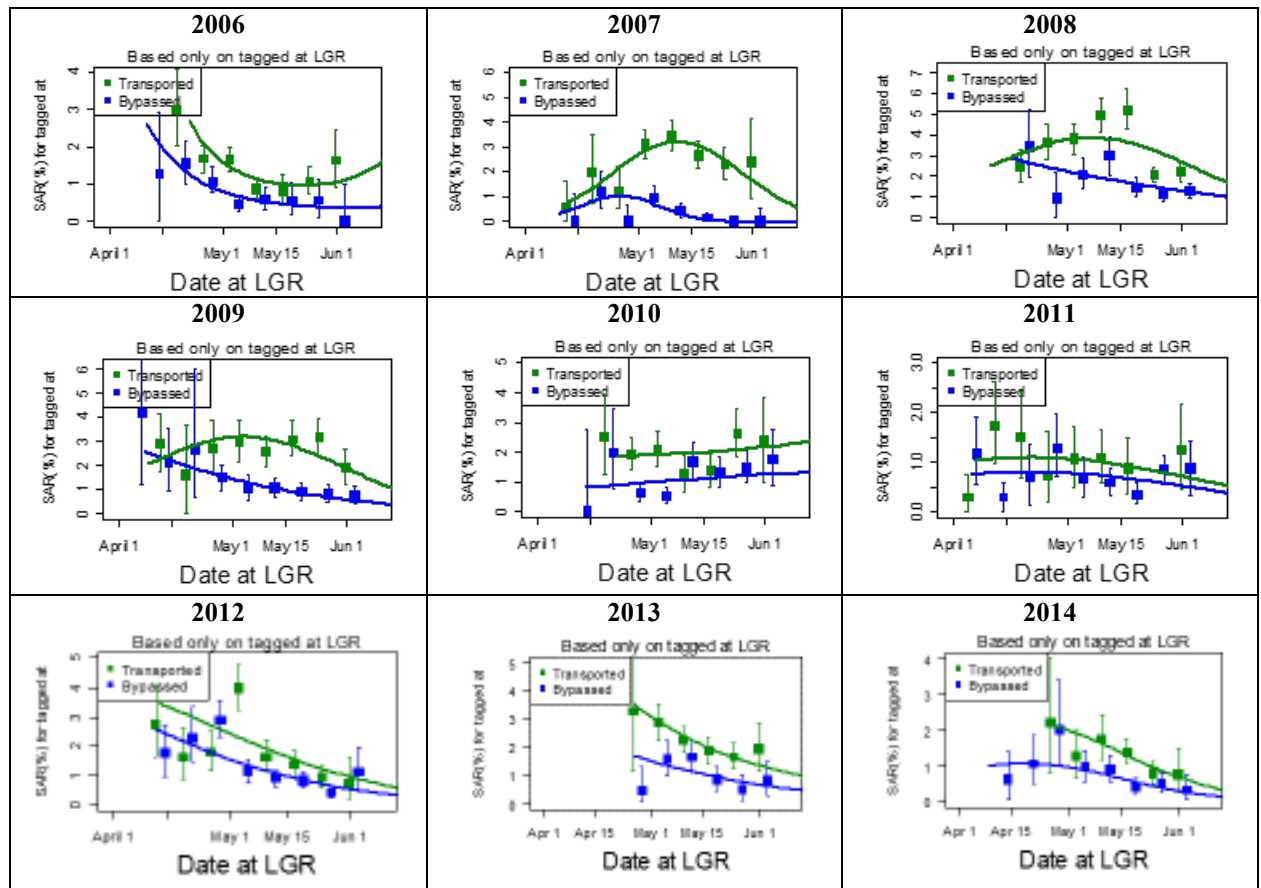


Figure 5. Summary figures of Transported and Bypassed SARs for wild steelhead at LGR for wild steelhead.

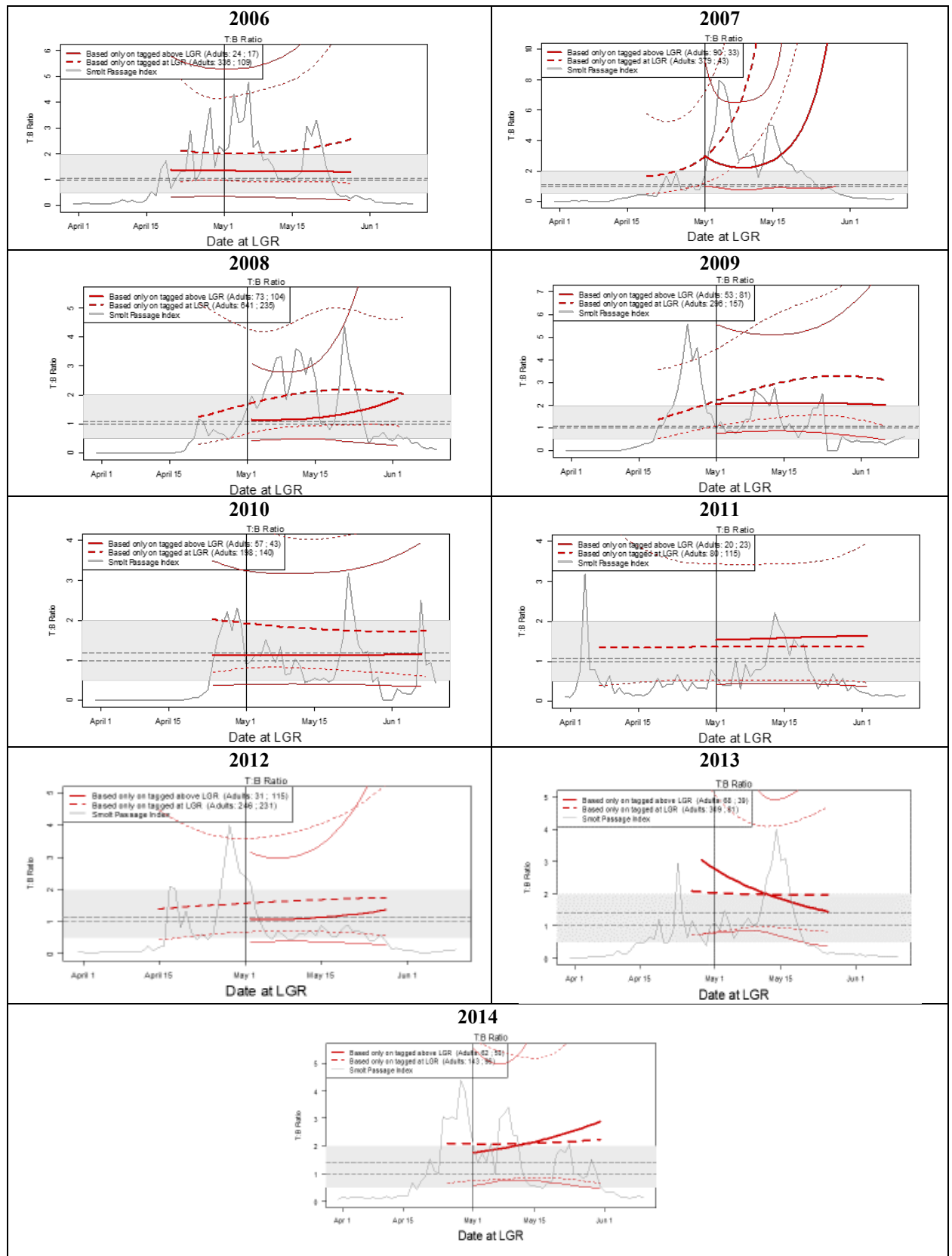


Figure 6. Summary figures of Transported:Bypass ratios for wild steelhead. Data to inform earlier start of transport are for fish tagged at LGR (dashed lines).

Review of CSS Route Specific SARs and TIRs

As mentioned above, NOAA also circulated select tables from Appendix A of the 2017 CSS Annual Report (McCann et al. 2017). These tables contained estimates of route specific SARs and TIRs for wild Chinook, hatchery Chinook from Rapid River Hatchery, wild steelhead, and hatchery steelhead aggregate. During discussions of these tables, it was noted that TIRs in recent years are above 1.0.

As noted above, the decision to delay the initiation of transportation was based on past analyses indicating that fish that were transported in early to mid-April had lower SARs than fish that were transported later in April or May. Lower SARs among early transported fish would result in lower overall SARs for the transported group, which would then translate to lower TIRs. One goal of delaying the start of transport in recent years was to effectively eliminate the influence of the lower SARs from early transported fish and, therefore, increase seasonal TIRs. The fact that many of the TIRs for Chinook and steelhead groups have been >1.0 since 2006 supports the decision to delay the start of transportation.

References:

McCann JM, B Chockley, E Cooper, B. Hsu, H. Schaller, S. Haeseker, R. Lessard, C. Petrosky, T. Copeland, E. Tinus, E. Van Dyke, A. Storch, and D. Rawding. 2017. Comparative Survival Study of PIT-tagged Spring/Summer/Fall Chinook, Summer Steelhead, and Sockeye, 2017 Annual Report. BPA Project #19960200