

31 May 2007

To: U.S. Army Corps of Engineers Walla Walla District

From: Matthew Keefer and Chris Peery (UI)

Re: Spring–summer Chinook passage between Lower Monumental and Little Goose, 2004-2005

There is concern that spill patterns at Little Goose Dam in recent years have caused passage delays for adult spring–summer Chinook salmon. Here, we present passage time data for radio-tagged Chinook salmon in 2004-2005. The 2004 sample was relatively large ($n = 198$), but there was little spill. The 2005 sample was smaller ($n = 50$), with spill starting in mid-June and ranging as high as 70% of total discharge. This pattern was unique over the last several years (see Figure 7). Both years were somewhat unlike 2007.

In 2005, 34-40 radio-tagged Chinook had good telemetry records at enough monitoring sites to calculate passage times. The median time for fish to pass from the top of Lower Monumental Dam to detection at a Little Goose fishway was 17.4 h ($n = 34$, Figure 1). Seven fish took > 24 h to pass, and all of these were during the period with spill at Little Goose Dam. The median time from the top of Lower Monumental Dam to the top of Little Goose Dam was 28.9 h ($n = 40$, Figure 2). Passage times were considerably longer during the period with spill, particularly for those fish that arrived on or near the date when spill shifted from zero to ~ 40 kcfs ($\sim 70\%$). Salmon took a median of 10.7 h ($n = 35$, Figure 3) to pass Little Goose Dam in 2005, not including time spent in the unmonitored tailrace prior to approaching a fishway. The pattern for this segment suggests that spill may have delayed passage for some fish.

Median passage times for all segments were shorter in 2004 than in 2005 despite many more fish passing in April and May 2004 when temperatures were cooler and passage is traditionally slower. Medians were: 15.2 h ($n = 181$, Figure 4) from the top of Lower Monumental to first fishway detection at Little Goose; 25.4 h ($n = 184$, Figure 5) from the top of Lower Monumental to the top of Little Goose; and 9.7 h ($n = 180$, Figure 6) from first detection at Little Goose to pass the dam. There was relatively little passage time variability in 2004 as compared to 2005 and little indication that the limited spill in 2004 strongly affected fish passage times.

Unfortunately, it is difficult to compare the river environment of either 2004 or 2005 to 2007 (Figure 7). The $\sim 30\%$ spill thus far in 2007 is unlike the 2004 pattern, when radio-tagged fish were passing throughout the spring and summer. The small sample in 2005 did not pass during the brief period of $\sim 30\%$ spill in May but was instead concentrated in the zero and $\sim 70\%$ spill periods in June.

We are hesitant to infer much from the available data. However, the patterns in 2005 clearly suggest that high %spill may slow adult passage at Little Goose Dam. It is not clear whether spill at lower levels (~30%) has a similar effect. It is possible that the hydraulic environments near the north ladder or north powerhouse entrances are unattractive under current spill criteria. Perhaps counts at individual ladders could provide information about entrance use though some shift in operations (i.e., shifting more spill to center spillbays) would probably be necessary to generate useful comparisons.

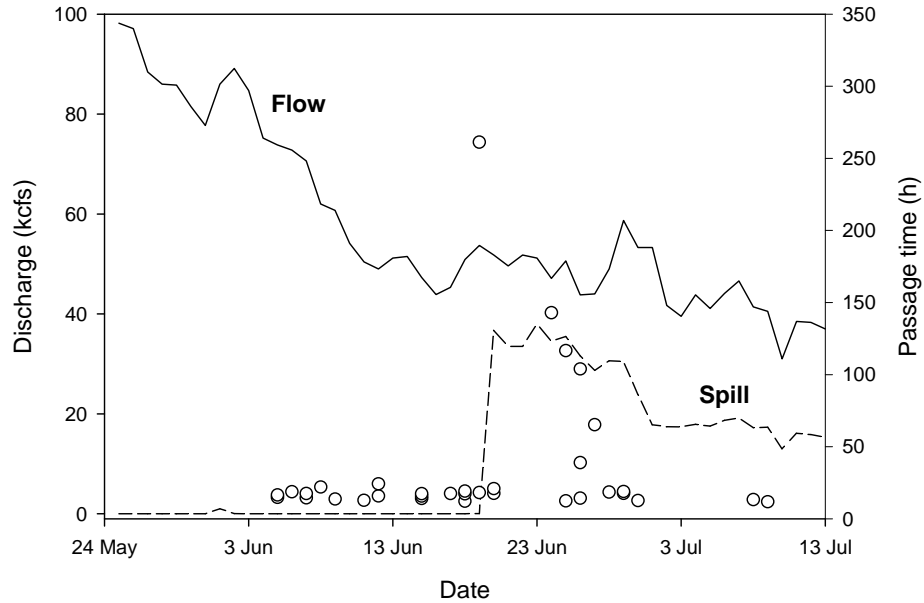


Figure 1. Time (h) radio-tagged Chinook salmon took to pass from the top of Lower Monumental Dam to their first detection at a Little Goose Dam fishway in 2005. Flow and spill are at Little Goose Dam. Passage time symbols are aligned with the date of Lower Monumental passage.

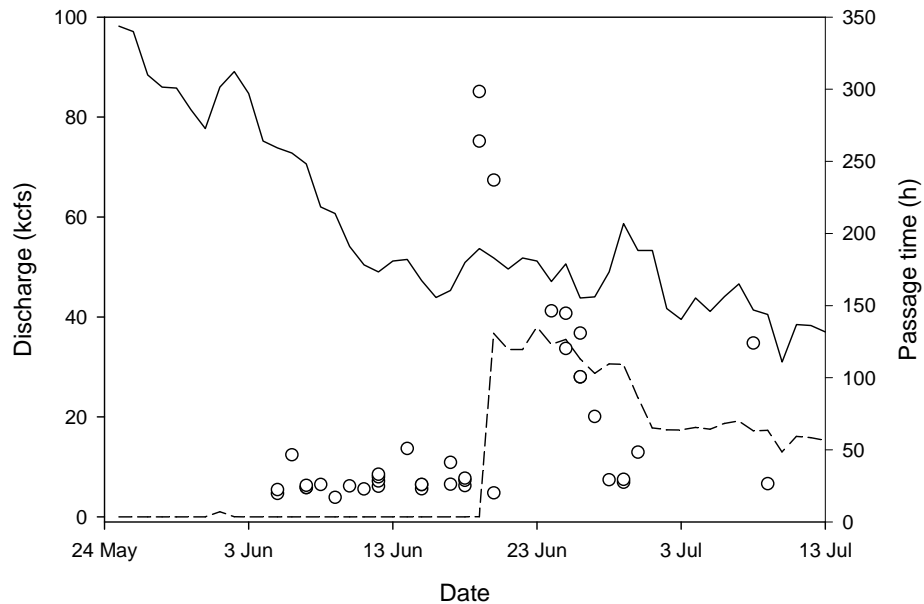


Figure 2. Time radio-tagged Chinook salmon took to pass (h) from the top of Lower Monumental Dam to the top of Little Goose Dam in 2005. Flow and spill are at Little Goose Dam. Passage time symbols are aligned with the date of Lower Monumental passage.

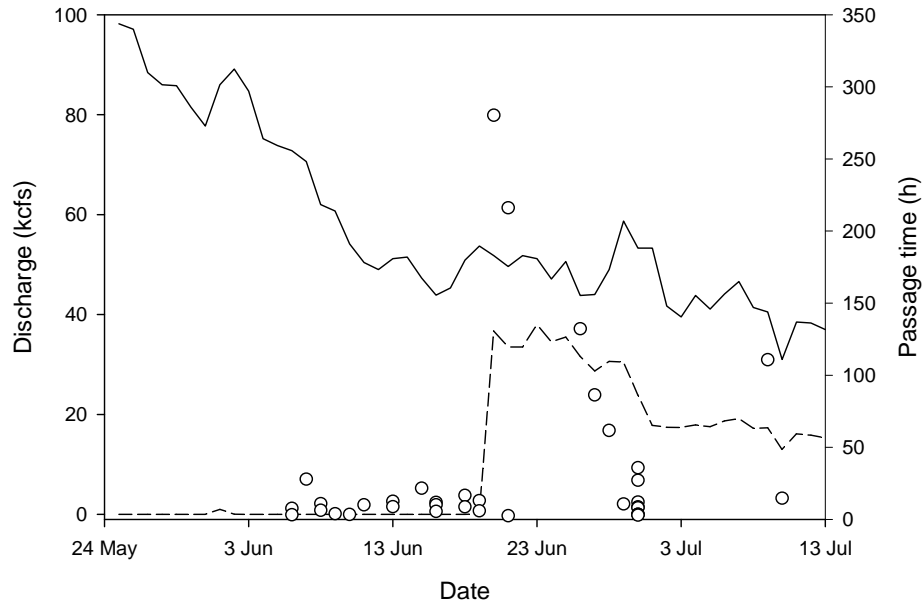


Figure 3. Time (h) radio-tagged Chinook salmon took to pass from their first detection at a Little Goose Dam fishway to the top of Little Goose Dam in 2005. Flow and spill are at Little Goose Dam. Passage time symbols are aligned with the date of first fishway detection.

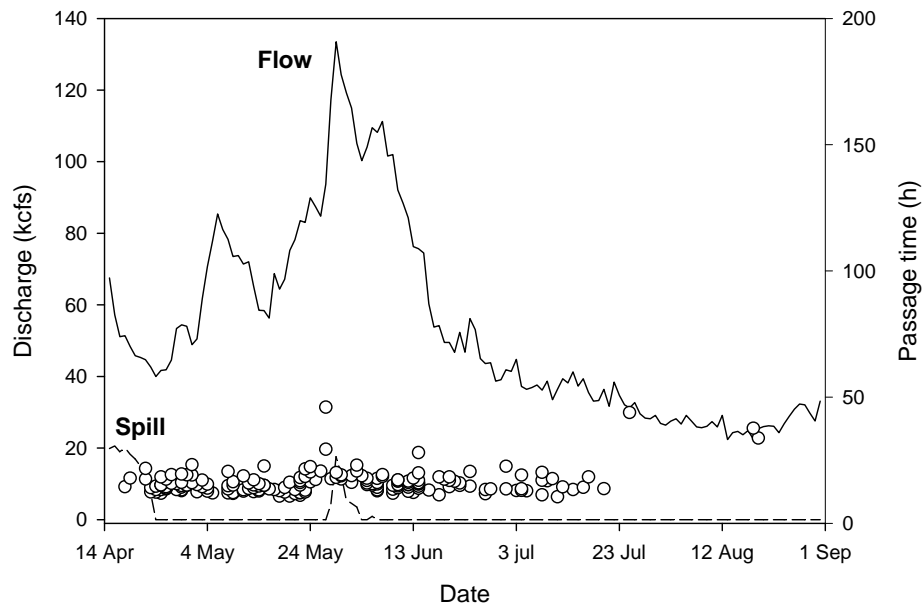


Figure 4. Time (h) radio-tagged Chinook salmon took to pass from the top of Lower Monumental Dam to their first detection at a Little Goose Dam fishway in 2004. Flow and spill are at Little Goose Dam. Passage time symbols are aligned with the date of Lower Monumental passage.

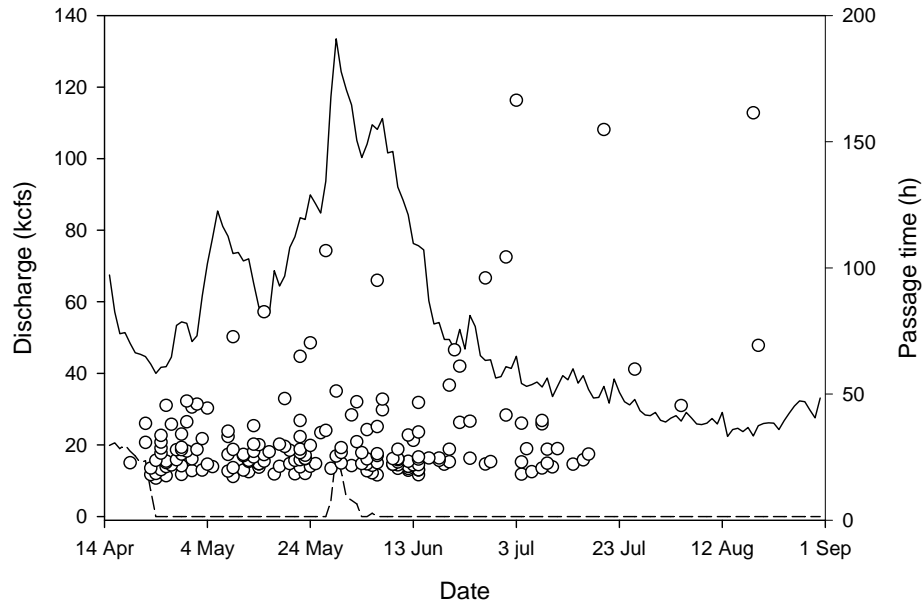


Figure 5. Time radio-tagged Chinook salmon took to pass (h) from the top of Lower Monumental Dam to the top of Little Goose Dam in 2004. Flow and spill are at Little Goose Dam. Passage time symbols are aligned with the date of Lower Monumental passage.

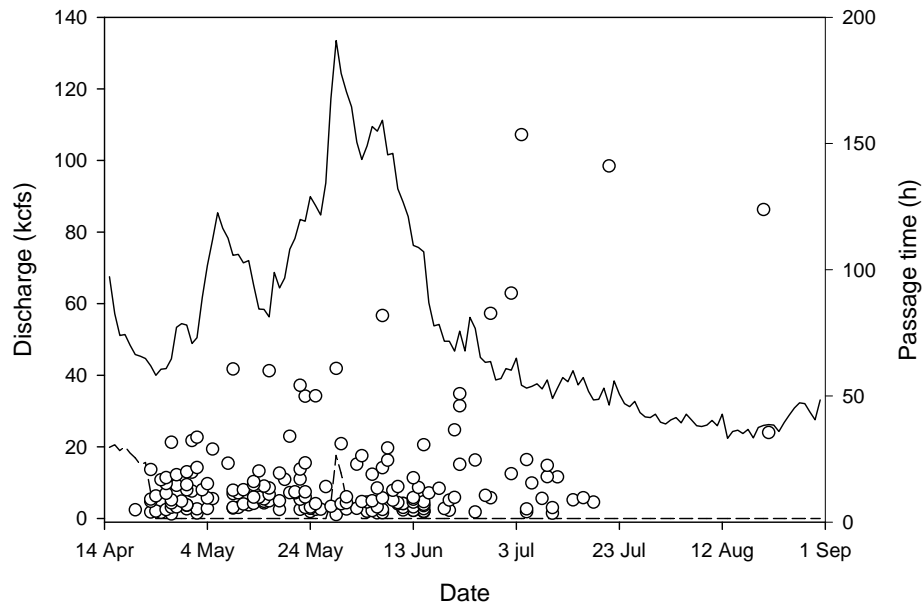


Figure 6. Time (h) radio-tagged Chinook salmon took to pass from their first detection at a Little Goose Dam fishway to the top of Little Goose Dam in 2004. Flow and spill are at Little Goose Dam. Passage time symbols are aligned with the date of first fishway detection.

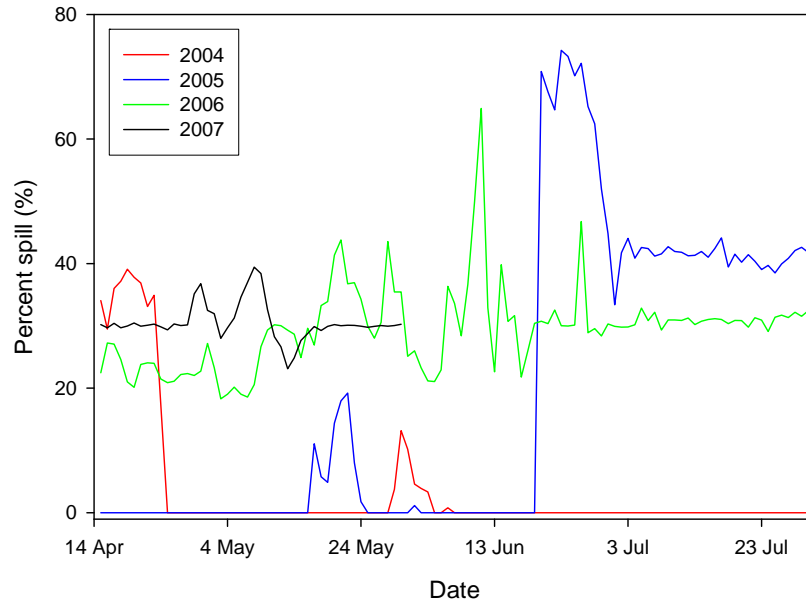


Figure 7. Percent spill at Little Goose Dam, 2004-2007.