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MEMORANDUM

TO: Jay Hesse (Nez Perce Tribe)

FROM: Michele DeHart

DATE: June 11, 2009

RE: Proportion of fall Chinook and steelhead adults passing LGR during evening non-counting hours

In response to your request, the FPC staff has reviewed PIT-tag detection data for adult fall Chinook and steelhead passing Lower Granite Dam (LGR). Specifically, the FPC staff reviewed five years of adult detection data (2004-2008) at LGR in order to determine what proportion of PIT-tagged adults pass LGR during times when counting occurs versus those times when counting does not occur (i.e., non-counting hours). Below is a brief summary of our findings, followed by a more detailed discussion.

- Overall, approximately 3.15% of PIT-tagged fall Chinook adults detected at LGR were detected during the non-counting times.
- The percent of fall Chinook adults passing LGR during the non-counting times seemed to increase as the season progressed.
- When adult fall Chinook counts were adjusted based on seasonal passage during non-counting hours, adult counts at LGR increased by 2-5%.
- Overall, approximately 3.21% of PIT-tagged steelhead adults detected at LGR were detected during the non-counting times.
- The percent of steelhead adults passing LGR during the non-counting times was highest for those adults passing LGR in the spring (March-April). However, for those steelhead adults passing LGR in the late summer and fall, the percent of adults passing during the non-counting times increased as the months progressed.
- When adult steelhead counts were adjusted based on seasonal passage during non-counting hours, adult counts at LGR increased by 5-8%.

Subsequent to your request, the FPC has received several additional data requests regarding counting discrepancies between projects. It is our intent to address each of these requests in a future memo. When this analysis is finished, we will forward it on to you as well.

Lower Granite Dam Adult Counts:

Each year, Lower Granite Dam (LGR) begins counting adult salmonids on March 1st and generally continues through December 15th. However, from March 1st to March 31st, these counts are based on video counts, which occur from 06:00 to 16:00. Direct counts of adult salmonids begin on April 1st and run through October 31st. During this time, counting takes place from 04:00 to 20:00. Finally, from November 1st to December 15th, counting goes back to video counts from 06:00 to 16:00. Therefore, depending on the period when adults are passing, adult counts at LGR are based on 10-hour (Mar. 1-Mar. 31 and Nov. 1 to Dec. 15) or 16-hour (Apr. 1 to Oct. 31) periods. This means that adults passing the counting station during non-counting times are being missed. It is thought that a negligible proportion of adult salmonids pass through the adult ladders during these non-counting times.

To estimate the proportion of fall Chinook and steelhead adults that pass through the adult ladder at LGR during non-counting times, FPC staff relied on PIT-tag data. Specifically, FPC staff reviewed five years of detection data (2004-2008) for PIT-tagged adult fall Chinook and steelhead passing LGR. Based on the criteria presented above, adults were categorized as having passed LGR during the counting period versus those that passed during the non-counting period. Passage time was based on the time of first detection, where the first detection site was either ISO East or ISO West. These two detection arrays are situated in the adult ladder, between the counting station and the adult trap.

Fall Chinook:

At LGR, Chinook adults passing the counting window in the adult ladder on or after August 18th are categorized as being fall Chinook. Based on this criterion, we only used PIT-tagged fall Chinook detected in the adult ladder on or after August 18th for each of the years analyzed (2004-2008). Jacks and mini-jacks were not excluded for this analysis.

Over the five years analyzed, about 3.15% of PIT-tagged adult fall Chinook detected in the LGR adult ladder were first detected during non-counting hours (Table 1). However, there was some variability between the years. Return year 2004 had the highest estimate of non-counting hour passage for adult fall Chinook (6.63%), whereas return year 2008 had the lowest estimate (2.15%) (Table 1).

Table 1. Detections of PIT-tagged adult fall Chinook at LGR during counting and non-counting time periods and percent of adults passing LGR that passed during non-counting periods

| Year | Counting Hour Passage | Non-Counting Hour Passage | Percent Passing During Non-Counting Hours |
|--------------------|------------------------------|----------------------------------|--|
| 2004 | 503 | 36 | 6.63 |
| 2005 | 229 | 12 | 4.98 |
| 2006 | 287 | 7 | 2.38 |
| 2007 | 803 | 26 | 3.14 |
| 2008 | 2,046 | 45 | 2.15 |
| 2004 - 2008 | 3,868 | 126 | 3.15 |

In order to determine whether adult passage during non-counting times might change over the season, adult detections at LGR were broken into weekly time periods. Due to low numbers of detections during early and late periods, some weekly blocks were combined into a single time period. For example, all detections in the first three weeks (Aug. 18 through Sept. 7) were combined and all detections after October 13th were combined. There were no detections of PIT-tagged adults in December for any of the years we analyzed. Therefore, December was not included in any of the time periods. Based on this analysis, there appears to be a seasonal effect of the percent of adult fall Chinook that pass LGR during non-counting hours (Table 2). In general, this percentage of adults increases as the season progresses. On average, the percent of PIT-tagged adult fall Chinook detected at LGR that were detected during non-counting hours varied from 0.31% to 0.83% in the earlier periods (Aug. 18-Sept. 14) to nearly 13% in the later periods (>Oct. 13) (Figure 1). However, some of this seasonal effect could be explained by the fact that the non-counting time period is approximately 14 hours in the later portion of the season (after Nov. 1st), compared to a 8 hour non-counting period prior to Nov. 1st.

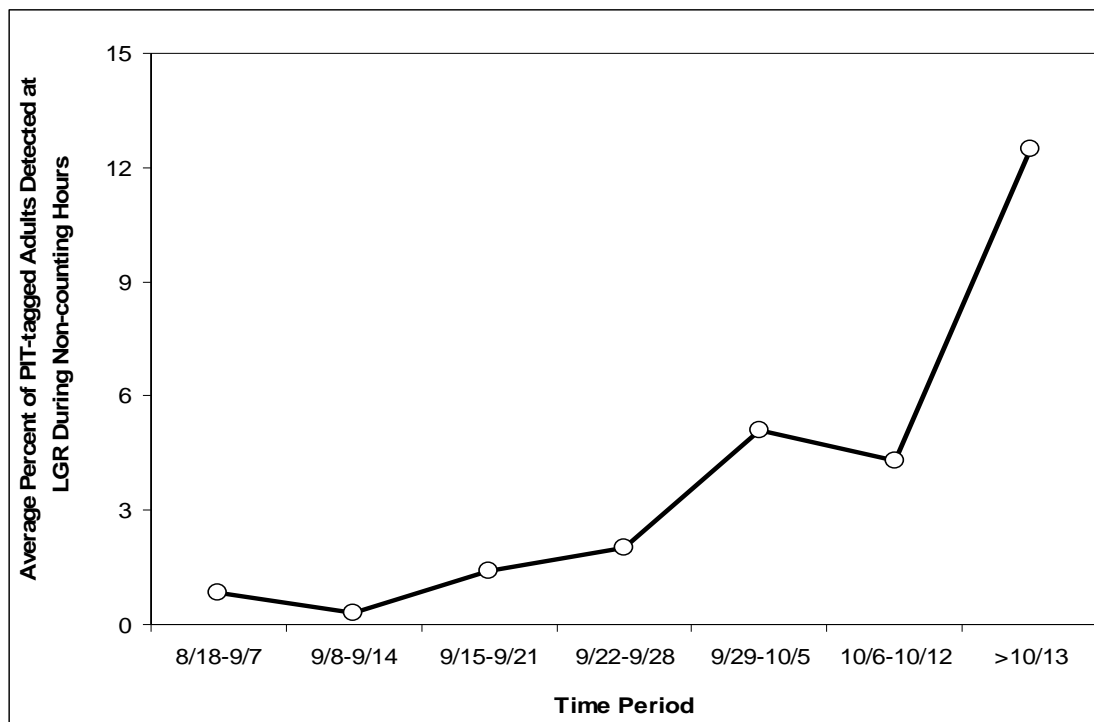


Figure 1. Average percent of PIT-tagged fall Chinook adults that were detected at LGR during non-counting hours. Averages were based on estimated from 2004 through 2008.

Finally, based on the seasonal estimates of the percent of adult fall Chinook passing LGR during non-counting hours, we estimated an adjusted adult count (Table 2). These adjusted adult counts represented a 2-5% increase over the actual adult counts for each of the years analyzed.

Table 2. Detections of PIT-tagged adult fall Chinook at LGR during counting and non-counting time periods and percent of adults passing LGR that passed during non-counting periods

| Year | Date Range | Counting Hour Passage | Non-Counting Hour Passage | Percent Passing During Non-Counting Hours | Adult Fall Chinook Counts ^A | Adjusted Adult Fall Chinook Counts |
|------|---------------------|-----------------------|---------------------------|---|--|------------------------------------|
| 2004 | 8/18 - 9/7 | 23 | 1 | 4.17 | 1,931 | 2,015 |
| | 9/8 - 9/14 | 90 | | 0.00 | 4,984 | 4,984 |
| | 9/15 - 9/21 | 125 | 2 | 1.57 | 5,878 | 5,972 |
| | 9/22 - 9/28 | 91 | 1 | 1.09 | 4,106 | 4,151 |
| | 9/29 - 10/5 | 63 | | 0.00 | 2,365 | 2,365 |
| | 10/6 - 10/12 | 38 | | 0.00 | 1,458 | 1,458 |
| | >10/13 | 73 | 32 | 30.48 | 1,838 | 2,644 |
| | Total Counts | | | | 22,560 | 22,589 |
| 2005 | 8/18 - 9/7 | 3 | | 0.00 | 1,131 | 1,131 |
| | 9/8 - 9/14 | 35 | | 0.00 | 2,953 | 2,953 |
| | 9/15 - 9/21 | 60 | 1 | 1.64 | 3,613 | 3,673 |
| | 9/22 - 9/28 | 58 | 1 | 1.69 | 3,155 | 3,209 |
| | 9/29 - 10/5 | 33 | 5 | 13.16 | 1,620 | 1,865 |
| | 10/6 - 10/12 | 30 | 3 | 9.09 | 1,057 | 1,163 |
| | >10/13 | 10 | 2 | 16.67 | 896 | 1,075 |
| | Total Counts | | | | 14,425 | 15,070 |
| 2006 | 8/18 - 9/7 | 10 | | 0.00 | 1,462 | 1,462 |
| | 9/8 - 9/14 | 32 | | 0.00 | 2,515 | 2,515 |
| | 9/15 - 9/21 | 51 | | 0.00 | 2,759 | 2,759 |
| | 9/22 - 9/28 | 45 | 1 | 2.17 | 1,933 | 1,976 |
| | 9/29 - 10/5 | 44 | 4 | 8.33 | 2,034 | 2,219 |
| | 10/6 - 10/12 | 67 | 1 | 1.47 | 2,278 | 2,312 |
| | >10/13 | 38 | 1 | 2.56 | 1,784 | 1,831 |
| | Total Counts | | | | 14,765 | 15,074 |
| 2007 | 8/18 - 9/7 | 24 | | 0.00 | 1,442 | 1,442 |
| | 9/8 - 9/14 | 64 | 1 | 1.54 | 2,361 | 2,398 |
| | 9/15 - 9/21 | 187 | 4 | 2.09 | 4,650 | 4,749 |
| | 9/22 - 9/28 | 175 | 5 | 2.78 | 3,750 | 3,857 |
| | 9/29 - 10/5 | 187 | 3 | 1.58 | 3,930 | 3,993 |
| | 10/6 - 10/12 | 81 | 6 | 6.90 | 1,905 | 2,046 |
| | >10/13 | 85 | 7 | 7.61 | 1,903 | 2,060 |
| | Total Counts | | | | 19,941 | 20,545 |
| 2008 | 8/18 - 9/7 | 224 | | 0.00 | 5,876 | 5,876 |
| | 9/8 - 9/14 | 269 | | 0.00 | 5,902 | 5,902 |
| | 9/15 - 9/21 | 299 | 5 | 1.64 | 4,968 | 5,051 |
| | 9/22 - 9/28 | 505 | 12 | 2.32 | 4,370 | 4,474 |
| | 9/29 - 10/5 | 333 | 8 | 2.35 | 2,007 | 2,055 |
| | 10/6 - 10/12 | 234 | 10 | 4.10 | 1,654 | 1,725 |
| | >10/13 | 182 | 10 | 5.21 | 2,077 | 2,191 |
| | Total Counts | | | | 26,854 | 27,274 |

^A Adult fall Chinook counts do not include any adults counted in December. Therefore, adjusted counts were only made for adults counted from March 1st to November 30th of each year

Steelhead:

Steelhead adults are counted at LGR during the entire period of adult counting (Mar. 1 to Dec. 15). Typically there are two periods of high steelhead adult passage. The first period is in the spring (March and April) when steelhead adults that held-up in the Lower Columbia River the previous winter make their way into the Snake River. There second period of high steelhead adult passage is in the late summer through early fall (September through November). Minimal passage of adult steelhead does occur from May to August. Given that adult steelhead pass the LGR adult ladder throughout this whole period, we used PIT-tagged adult steelhead detected in the adult ladder from March 1st to December 15th , for each of the years analyzed (2004-2008).

Over the five years analyzed, about 6.21% of PIT-tagged adult steelhead detected in the LGR adult ladder were first detected during non-counting hours (Table 3). However, there was some variability between the years. Return year 2004 had the highest estimate of non-counting hour passage for adult steelhead (7.82%), whereas return year 2008 had the lowest estimate (4.98%) (Table 3).

Table 3. Detections of PIT-tagged adult steelhead at LGR during counting and non-counting time periods and percent of adults passing LGR that passed during non-counting periods

| Year | Counting Hour Passage | Non-Counting Hour Passage | Percent Passing During Non-Counting Hours |
|--------------------|-----------------------|---------------------------|---|
| 2004 | 908 | 77 | 7.82 |
| 2005 | 568 | 45 | 7.34 |
| 2006 | 597 | 40 | 6.28 |
| 2007 | 1,408 | 94 | 6.26 |
| 2008 | 1,851 | 97 | 4.98 |
| 2004 - 2008 | 5,332 | 353 | 6.21 |

In order to determine whether adult passage during non-counting times might change over the season, adult detections at LGR were broken into monthly time periods. Due to low numbers of detections during early months, some monthly blocks were combined into a single time period. For example, all detections in March and April were combined and all detections from May through August were combined. There were no detections of PIT-tagged adults in December for any of the years we analyzed. Therefore, December was not included in any of the time periods. Based on this analysis, there appears to be a seasonal effect of the percent of adult steelhead that pass LGR during non-counting hours (Table 4). In general, the percentage of adult steelhead that pass LGR during non-counting hours starts out relatively high in the March-April period, begins to fall from May through September, and then begins to increase again as adults pass in October and November (Table 4, Figure 2). On average, the percent of PIT-tagged adult steelhead being detected during non-counting hours was 27% for the March-April period. This average percentage decreased to 7.12% for the May-August period and further decreased to 3.93% in the September period (Figure 2). As adults were detected in October and November, the average percentage being detected during non-counting hours increased to 5.98% and 13.27%, respectively (Figure 2).

As with the fall Chinook adults, some of this seasonal effect could be explained by the fact that the non-counting time period is approximately 14 hours in the later portion of the season (after Nov. 1st), compared to a 8 hour non-counting period prior to Nov. 1st.

Table 4. Detections of PIT-tagged adult fall Chinook at LGR during counting and non-counting time periods and percent of adults passing LGR that passed during non-counting periods

| Year | Month | Counting Hour Passage | Non-Counting Hour Passage | Percent Passing During Non-Counting Hours | Adult Steelhead Counts ^B | Adjusted Adult Steelhead Counts |
|------|---------------------|-----------------------|---------------------------|---|-------------------------------------|---------------------------------|
| 2004 | Mar.-Apr. | 46 | 23 | 33.33 | 7,464 | 11,196 |
| | May-Aug. | 62 | 1 | 1.59 | 6,294 | 6,396 |
| | September | 500 | 34 | 6.37 | 78,020 | 83,325 |
| | October | 267 | 15 | 5.32 | 55,626 | 58,751 |
| | November | 33 | 4 | 10.81 | 6,480 | 7,265 |
| | Total Counts | | | | | 153,884 |
| 2005 | Mar.-Apr. | 22 | 9 | 29.03 | 4,683 | 6,599 |
| | May-Aug. | 16 | | 0.00 | 6,084 | 6,084 |
| | September | 211 | 9 | 4.09 | 57,231 | 59,672 |
| | October | 300 | 23 | 7.12 | 79,926 | 86,054 |
| | November | 19 | 4 | 17.39 | 6,882 | 8,331 |
| | Total Counts | | | | 154,806 | 166,739 |
| 2006 | Mar.-Apr. | 19 | 9 | 32.14 | 7,391 | 10,892 |
| | May-Aug. | 3 | 1 | 25.00 | 3,041 | 4,055 |
| | September | 253 | 5 | 1.94 | 50,958 | 51,965 |
| | October | 260 | 16 | 5.80 | 68,063 | 72,251 |
| | November | 62 | 9 | 12.68 | 14,958 | 17,129 |
| | Total Counts | | | | 144,411 | 156,293 |
| 2007 | Mar.-Apr. | 15 | 5 | 25.00 | 10,371 | 13,828 |
| | May-Aug. | 30 | 2 | 6.25 | 5,778 | 6,163 |
| | September | 629 | 22 | 3.38 | 58,983 | 61,046 |
| | October | 658 | 39 | 5.60 | 71,535 | 75,775 |
| | November | 76 | 26 | 25.49 | 8,269 | 11,098 |
| | Total Counts | | | | 154,936 | 167,910 |
| 2008 | Mar.-Apr. | 75 | 14 | 15.73 | 7,224 | 8,572 |
| | May-Aug. | 214 | 6 | 2.73 | 18,551 | 19,071 |
| | September | 989 | 40 | 3.89 | 83,413 | 86,787 |
| | October | 572 | 37 | 6.08 | 56,851 | 60,528 |
| | November | 1 | | 0.00 | 8,322 | 8,322 |
| | Total Counts | | | | 174,361 | 183,281 |

^B Adult steelhead counts do not include any adults counted in December. Therefore, adjusted counts were only made for adults counted from March 1st to November 30th of each year

Finally, based on the seasonal estimates of the percent of adult steelhead passing LGR during non-counting hours, we estimated an adjusted adult count for each of the years analyzed (Table 4). These adjusted adult counts represented a 5-8% increase over the actual adult counts for each of the years analyzed.

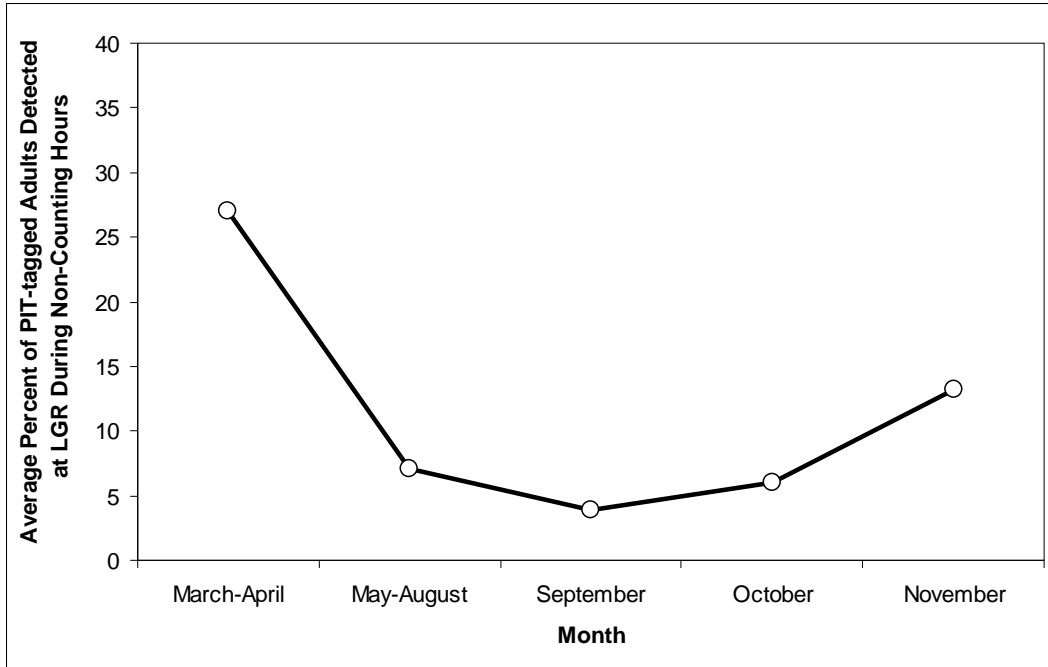


Figure2. Average percent of PIT-tagged steelhead adults that were detected at LGR during non-counting hours. Averages were based on estimated from 2004 through 2008.