FISH PASSAGE CENTER

1827 NE 44th Ave., Suite 240, Portland, OR 97213
Phone: (503) 230-4099 Fax: (503) 230-7559
http://www.fpc.org/
e-mail us at fpcstaff@fpc.org

MEMORANDUM

TO: Fish Passage Advisory Committee

FROM: Michele DeHart

DATE: December 14, 2011

RE: Clarification of December 9, 2011 memo regarding Little Goose spill operations and adult Chinook conversion rates and travel times

At the December 13, 2011 FPAC meeting, the FPC staff was asked to present the results from a recent analysis of the Little Goose Dam (LGS) spill operations in 2011 and impacts on adult Chinook conversion rates and travel times. These analyses were posted to the FPC website in a memo dated December 9, 2011 (http://www.fpc.org/documents/memos/177-11.pdf), which is attached to the end of this memo. During the presentation of this memo, several members of FPAC had questions regarding the graphic presentation of results, suggesting that perhaps the graphs could be clarified. This memorandum addresses the questions discussed at the December 13, FPAC meeting and the same data is presented in different graphics to clarify conclusions of the analysis. The data analyzed and the conclusions are the same as presented in the previous memorandum and discussed at the meeting of FPAC. The conclusions of the analysis are clarified and the graphics are redesigned as indicated in the FPAC meeting.

The FPC has not changed its conclusions from the original Dec. 9th memo, which is listed below:

- Spill levels greater than 30% at LGS (up to at least 40%) had no effect on the travel times or conversion rates of adult PIT-tagged Chinook in 2011. The results of this 2011 analyses indicate that spill to the gas cap at Little Goose is unlikely to affect adult passage, specifically conversion rate.
- At spill levels above 40%, travel times (IHR-LGR) increased slightly. However, when spill levels were above 40% in 2011, spill volumes were generally well above the estimated gas cap at LGS.

- Based on past operations, it appears that LGS spill patterns and TSW operations at low flows may have a more significant effect on adult Chinook passage, specifically conversion rate at LGS than LGS spill percent. Tests in 2008 revealed that uniform spill minimized eddies in the LGS tailrace and resulted in the fastest adult travel times. Special operations in 2009 (during high flows) and 2010 (during low flows) suggest that TSW operation in low flows may cause delay in adult Chinook. This is likely due to the fact that in low flows, operation of the TSW (prioritizing spillbay 1) results in a bulk spill pattern, which may increase the production of eddies in the LGS tailrace.

Clarification of Methods:

Adult PIT tag detection is only available at Ice Harbor and Lower Granite dams. In order to address the question regarding spill at Little Goose Dam, an assumption was necessary to determine when adults passed Little Goose Dam. The LGS arrival date of an individual PIT-tagged adult Chinook was based on its Ice Harbor Dam (IHR) to Lower Granite Dam (LGR) fish travel time ($FTT_{IHR\text{-}LGR}$) and the distance from IHR to LGS. For example, the IHR-LGR reach is approximately 157 km, whereas the IHR-LGS reach is approximately 97 km. Therefore, the IHR-LGS reach is approximately 61% of the IHR-LGR reach. An estimated IHR-LGS fish travel time ($FTT_{IHR\text{-}LGS}$) was estimated as:

$$FTT_{IHR\text{-}LGS} = FTT_{IHR\text{-}LGR} * 0.61 \quad (1)$$

This $FTT_{IHR\text{-}LGS}$ was then applied to the IHR detection date to estimate the LGS arrival date. LGS operations for each PIT-tagged adult Chinook were then based on this estimated LGS arrival date.

As mentioned in the original memo, PIT-tagged adult Chinook were then grouped based on their IHR detection dates. This resulted in a total of 97 groups for the analysis. The majority of the groups were for a single day at IHR. However, there were some dates where very few PIT-tagged adults were detected at IHR on a single day. If a day had fewer than 10 detected fish, the detections from that day were combined with the next day(s), until a minimum of 10 detected adults were encountered. This typically occurred early in the season (Apr. 3-May 2) and mid-July to mid-August. Grouping fish this way allowed for the estimation of an average $FTT_{IHR\text{-}LGR}$, average LGS spill percent, and conversion rate for each of the 97 groups.

The date(s) that correspond to each of the 97 groups, along with their adult counts (at IHR), average $Ln(FTT_{IHR\text{-}LGR})$, average LGS spill percent, and conversion rates can be found in Appendix A at the end of this memo.

Clarification of Conversion Rate Graphic:

FPAC expressed confusion regarding the interpretation of the original figure (Figure 2 in Dec. 9 memo). Some members assumed that there was 100% conversion rate for daily groups all throughout the time period when 30% spill was provided from early April to early May. This was not true, and FPC staff explained that during this time period adult numbers were low, and the first group of fish for which a conversion rate was estimated was comprised of 19 adults that passed over a 29 day period (Apr 4-May 2).

We understand how this graphic may have led to the incorrect conclusion that was drawn. To address the misinterpretation we are presenting the same data using a new figure to illustrate the conversion rates of the 97 groups individually, along with their corresponding average LGS spill percent (Figure 1).

The new figure still shows that conversion rates remained in the 80-100% range at all levels of LGS spill percent observed in 2011. Even when the LGS spill percent was greater than 60%, conversion rates were in the 85-100% range. However, later in the season when LGS spill percent was closer to 30%, conversion rates were somewhat lower ranging from 80-100%

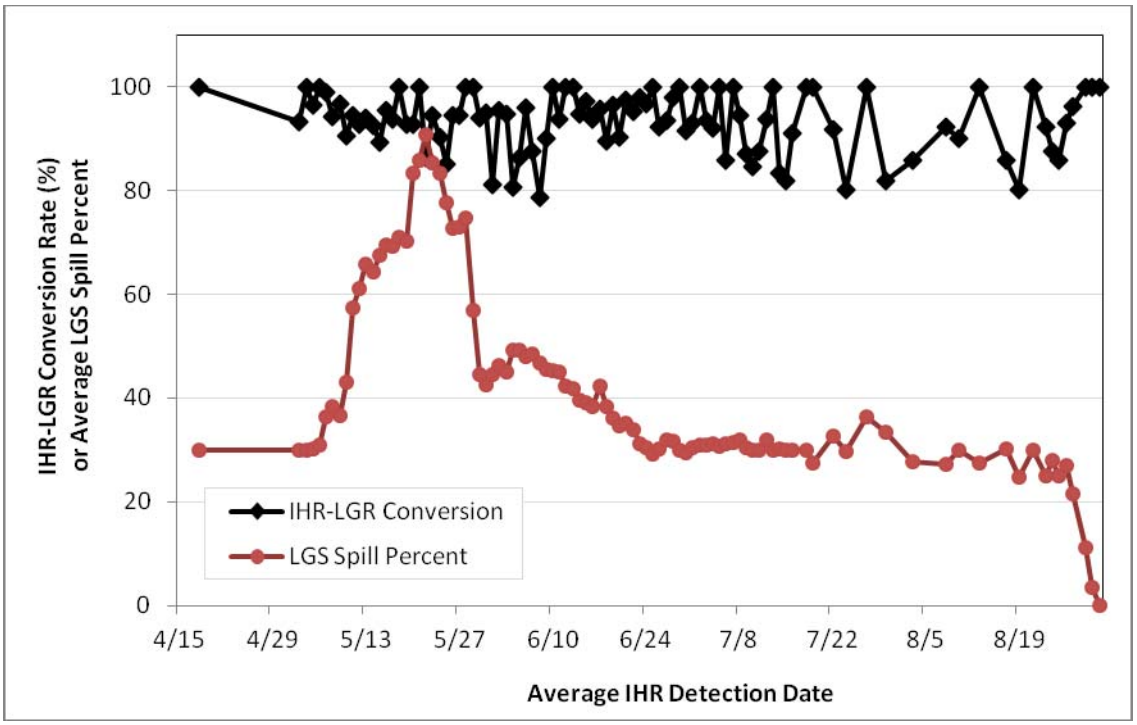

Figure 1. Conversion rates (IHR-LGR) and estimated average LGS spill percent for each of the 97 groups. Average IHR detection date was used for the x-axis, which allows for easier determination of which groups include more than one day at IHR. For more details on the date ranges and number of adults in each of these groups, see Appendix A.

Conclusions

In summary, we have clarified the graphics and discussion of this analysis based upon questions and discussion at FPAC on December 13. The conclusions drawn in the original memorandum are unchanged. We hope the new graph (and the data in Appendix A) clarifies that while the early group of fish did have 100% conversion, few fish were present during this time and only one data point was available. In addition 100% conversion was observed several times when LGS spill was well above 30%.

Appendix A

Table A.1. Each of 97 groups used in analyses of conversion rates (IHR-LGR) and fish travel time (IHR-LGR) of PIT-tagged adult Chinook in 2011.

Group Number	Min IHR Date	Max IHR Date	Average LN($FTT_{IHR-LGR}$)	Average LGS Spill Percent	Number IHR Adults	Conversion Rate (%)
1	4-Apr	2-May	1.66	29.97	19	100
2	3-May	3-May	1.46	29.90	15	93.3
3	4-May	4-May	1.38	29.95	24	100.0
4	5-May	5-May	1.41	30.17	58	96.6
5	6-May	6-May	1.33	30.82	86	100.0
6	7-May	7-May	1.58	36.44	91	98.9
7	8-May	8-May	1.67	38.41	123	94.3
8	9-May	9-May	1.63	36.49	93	96.8
9	10-May	10-May	1.80	43.10	106	90.6
10	11-May	11-May	2.18	57.25	129	94.6
11	12-May	12-May	2.41	61.06	136	92.6
12	13-May	13-May	2.66	65.86	115	93.9
13	14-May	14-May	2.52	64.29	108	92.6
14	15-May	15-May	2.50	67.57	113	89.4
15	16-May	16-May	2.49	69.56	89	95.5
16	17-May	17-May	2.49	69.27	80	93.8
17	18-May	18-May	2.54	71.02	78	100.0
18	19-May	19-May	2.42	70.15	82	92.7
19	20-May	20-May	2.20	83.31	55	92.7
20	21-May	21-May	2.30	85.84	17	100.0
21	22-May	22-May	2.27	90.63	29	86.2
22	23-May	23-May	2.30	85.42	36	94.4
23	24-May	24-May	2.27	83.29	71	90.1
24	25-May	25-May	2.38	77.76	60	85.0
25	26-May	26-May	2.40	72.73	36	94.4
26	27-May	27-May	2.20	72.99	18	94.4
27	28-May	28-May	2.04	74.76	7	100.0
28	29-May	29-May	1.95	56.83	17	100.0
29	30-May	30-May	2.25	44.43	33	93.9
30	31-May	31-May	2.17	42.59	20	95.0
31	1-Jun	1-Jun	2.09	44.42	37	81.1
32	2-Jun	2-Jun	2.43	46.31	22	95.5

Group Number	Min IHR Date	Max IHR Date	Average LN($FTT_{IHR-LGR}$)	Average LGS Spill Percent	Number IHR Adults	Conversion Rate (%)
33	3-Jun	3-Jun	2.19	44.99	37	94.6
34	4-Jun	4-Jun	2.15	49.27	57	80.7
35	5-Jun	5-Jun	2.34	49.32	51	86.3
36	6-Jun	6-Jun	2.33	47.97	24	95.8
37	7-Jun	7-Jun	2.11	48.51	24	87.5
38	8-Jun	8-Jun	2.36	46.63	14	78.6
39	9-Jun	9-Jun	2.28	45.49	30	90.0
40	10-Jun	10-Jun	2.21	45.37	31	100.0
41	11-Jun	11-Jun	2.26	44.97	32	93.8
42	12-Jun	12-Jun	2.31	42.34	23	100.0
43	13-Jun	13-Jun	2.13	41.82	25	100.0
44	14-Jun	14-Jun	2.21	39.53	38	94.7
45	15-Jun	15-Jun	2.01	38.98	69	97.1
46	16-Jun	16-Jun	1.93	38.45	79	93.7
47	17-Jun	17-Jun	2.04	42.28	94	95.7
48	18-Jun	18-Jun	1.96	38.44	67	89.6
49	19-Jun	19-Jun	1.79	36.23	58	96.6
50	20-Jun	20-Jun	1.97	34.51	51	90.2
51	21-Jun	21-Jun	1.94	35.07	39	97.4
52	22-Jun	22-Jun	1.85	34.00	41	95.1
53	23-Jun	23-Jun	1.91	31.23	49	98.0
54	24-Jun	24-Jun	1.63	30.41	31	96.8
55	25-Jun	25-Jun	1.66	29.23	45	100.0
56	26-Jun	26-Jun	1.69	30.24	51	92.2
57	27-Jun	27-Jun	1.79	31.88	61	93.4
58	28-Jun	28-Jun	1.70	31.68	47	97.9
59	29-Jun	29-Jun	1.72	30.05	29	100.0
60	30-Jun	30-Jun	1.69	29.49	35	91.4
61	1-Jul	1-Jul	1.70	30.45	28	92.9
62	2-Jul	2-Jul	1.73	30.85	36	100.0
63	3-Jul	3-Jul	1.92	30.98	31	93.5
64	4-Jul	4-Jul	1.63	31.08	37	91.9
65	5-Jul	5-Jul	1.54	30.67	40	100.0
66	6-Jul	6-Jul	1.55	31.24	21	85.7
67	7-Jul	7-Jul	1.78	31.48	23	100.0
68	8-Jul	8-Jul	1.68	31.86	18	94.4
69	9-Jul	9-Jul	1.49	30.49	23	87.0
70	10-Jul	10-Jul	1.53	29.88	13	84.6
71	11-Jul	11-Jul	1.48	29.83	8	87.5

Group Number	Min IHR Date	Max IHR Date	Average LN($FTT_{IHR-LGR}$)	Average LGS Spill Percent	Number IHR Adults	Conversion Rate (%)
72	12-Jul	12-Jul	1.72	31.91	16	93.8
73	13-Jul	13-Jul	1.81	30.01	11	100.0
74	14-Jul	14-Jul	2.06	30.14	12	83.3
75	15-Jul	15-Jul	2.05	29.96	11	81.8
76	16-Jul	17-Jul	1.58	29.88	11	90.9
77	18-Jul	18-Jul	1.90	29.92	13	100.0
78	19-Jul	20-Jul	1.91	27.39	12	100.0
79	21-Jul	23-Jul	1.89	32.58	12	91.7
80	24-Jul	25-Jul	1.61	29.77	10	80.0
81	26-Jul	28-Jul	2.04	36.43	14	100.0
82	29-Jul	31-Jul	2.10	33.26	11	81.8
83	1-Aug	6-Aug	2.25	27.71	14	85.7
84	7-Aug	9-Aug	2.35	27.31	13	92.3
85	10-Aug	11-Aug	2.64	29.91	10	90.0
86	12-Aug	15-Aug	2.45	27.43	12	100.0
87	16-Aug	18-Aug	1.88	30.05	14	85.7
88	19-Aug	20-Aug	2.23	24.85	15	80.0
89	21-Aug	22-Aug	1.88	29.87	15	100.0
90	23-Aug	23-Aug	1.89	24.98	13	92.3
91	24-Aug	24-Aug	1.95	27.96	16	87.5
92	25-Aug	25-Aug	1.89	25.05	14	85.7
93	26-Aug	26-Aug	1.92	26.88	14	92.9
94	27-Aug	28-Aug	1.79	21.48	27	96.3
95	29-Aug	29-Aug	1.70	11.10	17	100.0
96	30-Aug	30-Aug	1.62	3.42	23	100.0
97	31-Aug	31-Aug	1.69	0.00	22	100.0

FISH PASSAGE CENTER

1827 NE 44th Ave., Suite 240, Portland, OR 97213
Phone: (503) 230-4099 Fax: (503) 230-7559
http://www.fpc.org/
e-mail us at fpcstaff@fpc.org

MEMORANDUM

TO: Charlie Morrill (WDFW)

FROM: Michele DeHart

DATE: December 9, 2011

RE: 2011 Little Goose Dam spill operations and adult travel times and conversion rates.

Observations made during the 2005 court-ordered summer spill period at Little Goose Dam (LGS) regarding the upstream passage of adult Chinook salmon at high spill rates lead to the restriction of spill to 30% of instantaneous flow at this project. The 30% spill level restriction often limits spill at LGS to below gas cap levels. It has been difficult to assess the efficacy of this limited operation, since in subsequent years spill has been limited to 30% most of the time. However, high flows in 2011 resulted in spill levels at Little Goose Dam that ranged from 30% to near 100%. You requested that the FPC staff review the available data to determine if the 30% spill is actually a documentable threshold, above which impacts can be observed on adult fish passage. In order to address your request we evaluated the conversion rate and travel time data for PIT-tagged Chinook adults passing between Ice Harbor (IHR) and Lower Granite (LGR) dams during the voluntary spill season (Apr. 3 – Aug. 31) in 2011. The Fish Passage Center addressed this concern in two previous memos (July 7, 2005 and November 6, 2009) where we concluded that there was no effect on travel time or conversion rates at LGS spill levels of greater than 30% of instantaneous flow. Below are our findings from the analysis of 2011 operations and adult returns, followed by a more detailed explanation of our analyses.

- The January-July run-off volume in the Lower Snake River (as measured at LGR) was the 9th highest in the historic record (1929-2011) This high run-off volume, along with maintenance issues at LGS, resulted in spill percentages at LGS that ranged from 30-97% for the period of April 3 to August 31.

- Spill levels of greater than 30% at LGS (up to at least 40%) had no effect on the travel times or conversion rates of adult Chinook in 2011.
- In 2011, at spill levels above 40%, travel times increased slightly. When spill was above 40%, spill volumes were generally well above the estimated gas cap at LGS.
- Based on past operations, it appears that LGS spill patterns and TSW operations at low flows may have a more significant effect on adult Chinook passage at LGS than LGS spill percent. Tests in 2008 revealed that uniform spill minimized eddies in the LGS tailrace and resulted in the fastest adult travel times. Special operations in 2009 (during high flows) and 2010 (during low flows) suggest that TSW operation in low flows may cause delay in adult Chinook. This is likely due to the fact that in low flows, operation of the TSW (prioritizing spillbay 1) results in a bulk spill pattern, which may increase the production of eddies in the LGS tailrace.

2011 Operations at Little Goose Dam:

At 41.6 MAF, the January-July runoff volume for the Lower Snake River (at Lower Granite Dam) was the 9th highest among the historic data (1929-2011). The high run-off volume in the Snake River in 2011 resulted in daily average flows at LGS that ranged from 32.7 to 200.8 Kcfs (Figure 1). Under the 2011 Fish Operations Plans (2011 FOP), voluntary spill at LGS in 2011 was to be 30% of instantaneous flow for the April 3 to August 31 period. Spill at LGS has been limited to 30% of instantaneous flow since 2005 when the summer spill program was first initiated. Daytime spill was limited to 30% of instantaneous flows due to a fish passage concern.

The combination of the high flows at LGS and project outages for maintenance on transmission lines resulted in daily average spill operations at LGS that ranged from 30% to as much as 97% of instantaneous flows (Figure 1). In fact, spill of 30% was only possible for the periods of approximately April 3 to May 9 and July 1 to August 31 (Figure 1). However, there was a brief period in August (August 1 and 2) where project maintenance resulted in spill operations of approximately 60% (Figure 1). Flows during this August operation were in the 45 to 55 Kcfs range.

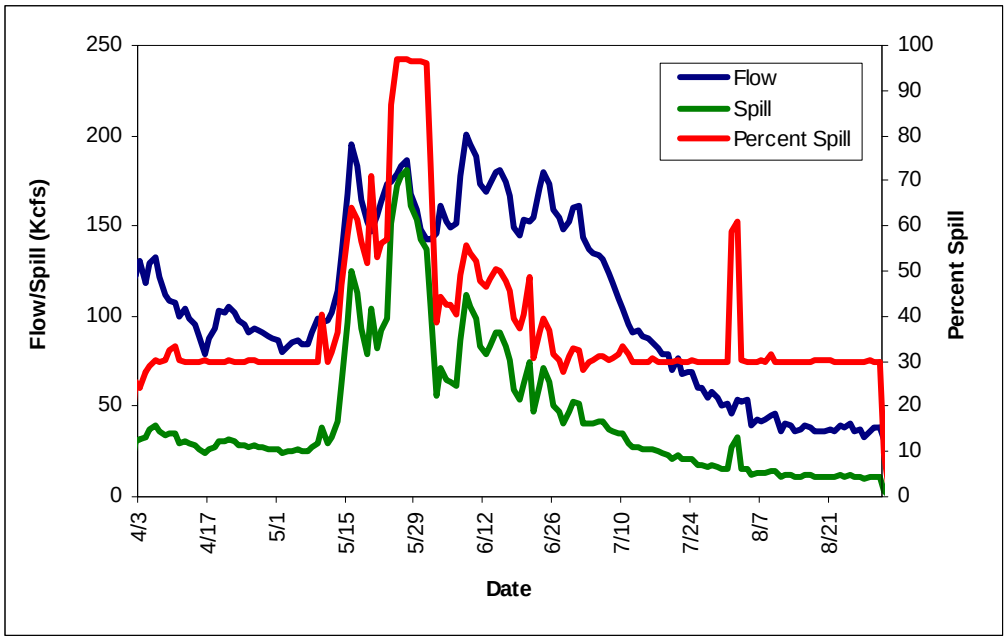

Figure 1. Flow and spill operations at Little Goose Dam in 2011 (Apr. 3 – Aug. 31)

Return year 2011 was the third year with the Temporary Spillway Weir (TSW) in operation at LGS. The percentage of total spill that runs through the TSW is dependent on the total volume of spill. At lower flows (<85 Kcfs), the 2011 Fish Passage Plan (2011 FPP) called for the TSW at LGS to be in the high-crest position, which corresponds to 7 – 8 Kcfs spill through the TSW. Depending on total flows the percentage of total spill that passes through the TSW may range from 100% (at very low flows) to 31.4% (at 85 Kcfs). However, at flows of > 85 kcfs, the 2011 FPP called for the TSW at LGS to be in the low-crest position, which corresponds to 10 – 11 Kcfs spill through the TSW. At 85 Kcfs, this corresponds to 43.1% of total spill passing through the TSW. However, as flows increase, the percentage of total spill that passes through the TSW is reduced and spill approaches a more uniform pattern.

Methods:

To determine travel times and conversion rates of Snake River Chinook during the 2011 voluntary spill season (Apr. 3 – Aug. 31), FPC staff relied on PIT-tagged Chinook adults detected at IHR between April 3rd and August 31st. Only PIT-tagged adults that were released as juveniles above LGR were included in these analyses. Furthermore, 0-ocean adults (i.e., mini-jacks) were not included in this analysis. Steelhead adults were not included in this analysis because most PIT-tagged steelhead adult detections at IHR in 2011 occurred after July 1st, when spill operations at LGS were no longer above 30%.

Fish travel times (IHR-LGR) (FTT) were estimated for all PIT-tagged adults that were detected at both IHR and LGR. Due to the lack of a PIT-tag detection system in the adult ladder at LGS, it is not possible to know exactly when a PIT-tagged adult reached LGS. Therefore, for these analyses, LGS arrival date was estimated based on the estimates of IHR-LGR fish travel time and the distance between IHR and LGS. Based on the estimated LGS arrival date, each individual adult was assigned an LGS spill operation (as percent spill) that they would be expected to experience upon passing LGS.

Fish were then grouped based on their IHR detection dates. The majority of the groups used in these analyses were for a single day at IHR. However, there were some dates where very few PIT-tagged adults were detected at IHR on a single day. If a day had fewer than 10 detected fish, that IHR day was grouped by the next day(s), until the group had a minimum of 10 total PIT-tagged adults. This typically occurred in the beginning of the spill season (April 3 to early May) and mid-July to mid-August. In general, grouping this way resulted in groups of less than five sequential IHR detection dates. In all, grouping resulted in a total of 97 groups. Grouping PIT-tagged adults allowed for the estimation of an average (FTT) (IGR-LGR), average LGS spill percent, and conversion rate for each group. Conversion rates were the number of PIT-tagged adults detected at LGR divided by the number of PIT-tagged adults detected at IHR.

Because estimates of FTT are not normally distributed, estimates of average FTT were log-transformed (Ln(FTT)). We also estimated a variance for average Ln(FTT) estimate for each of the 97 groups. To investigate the effects of LGS spill percent on Ln(FTT), we grouped these data by the estimated average LGS spill percent. Grouping by LGS spill percent was done in increments of 10 (e.g., 0-10% spill, 10-20% spill, etc.). A weighted average Ln(FTT) was estimated for each LGS spill percent group, along with an estimate of 95% confidence interval. The weighting for the estimate was based on the inverse variance for Ln(FTT) for each individual group. If LGS spill levels above 30% are responsible for causing delays in adult Chinook passage below LGS, we would expect to see a significant increase in average Ln(FTT) as spill levels at LGS exceed 30%. This assumes that changes in operations at Lower Monumental Dam (LMN) operations do not affect adult Chinook travel times (IHR-LGR) and any changes would be due to delay below Little Goose caused by spill.

Results:

Analyses of Conversion Rates (IHR-LGR)

The overall average conversion rate for PIT-tagged adult Chinook in this analysis was 93.3% (range: 78.6% to 100%). Conversion rates remained high even during the periods when estimated average LGS spill percent was at its highest (Figure 2).

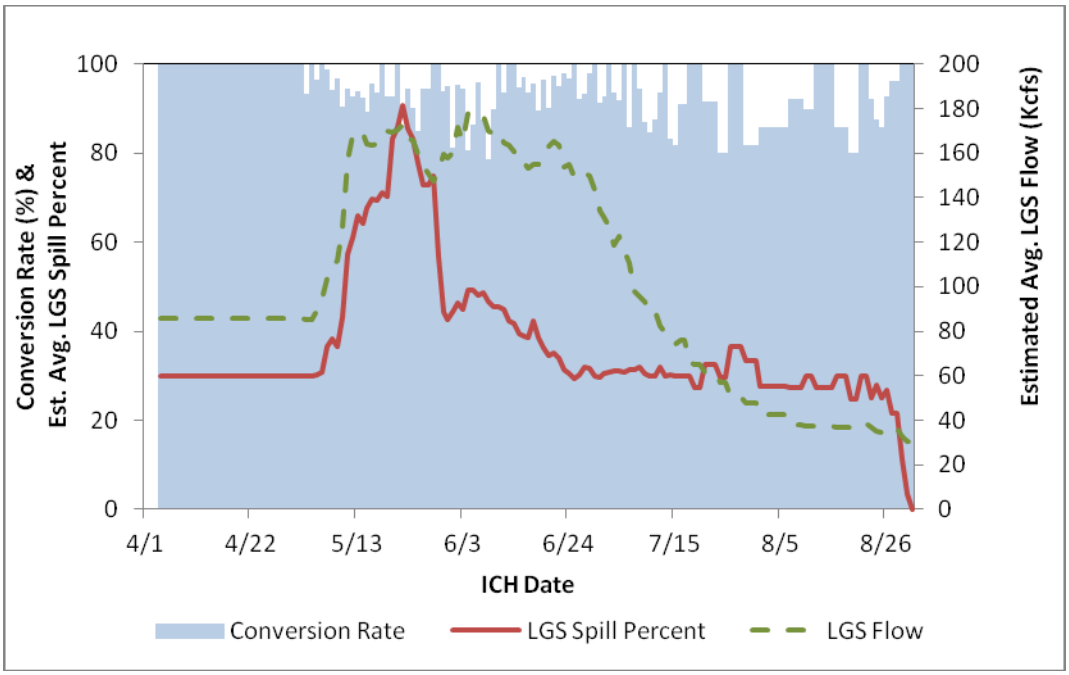

Figure 2. Conversion rates, estimated average LGS spill percent, and estimated average LGS flow (Kcfs) for each of the 97 groups (grouped by IHR detection date). Point estimates for the groups that include more than one day at IHR are displayed for the entire range of dates found in that group.

Analyses of Adult Fish Travel Time (IHR-LGR)

A total of 3,642 PIT-tagged adult Chinook were detected at IHR and at LGR, and were used in the analyses of effects of LGS spill percent on Ln(FTT). Among these, the median IHR-LGR fish travel time was 6.3 days (95% CI: 6.1-6.7 days). Pair-wise comparisons tests showed that average adult Chinook travel time (IHR-LGR) did not increase until LGS spill percent levels exceeded 40%. The back-calculated average IHR-LGR fish travel times for adult Chinook that passed LGS when spill was 40% or less ranged from 5.2 to 5.5 days. There only seemed to be an increase in average fish travel time (IHR-LGR) when average LGS spill levels were above 40% (Figure 3). The back-calculated average IHR-LGR fish travel times for those fish experiencing >40% spill at LGS ranged from 7.6 to 12.3 days. It is important to note that, when LGS spill percent was above 40% in 2011, flow was high and LGS spill volumes were generally well above the current LGS spill cap of approximately 32 Kcfs (Figure 1).

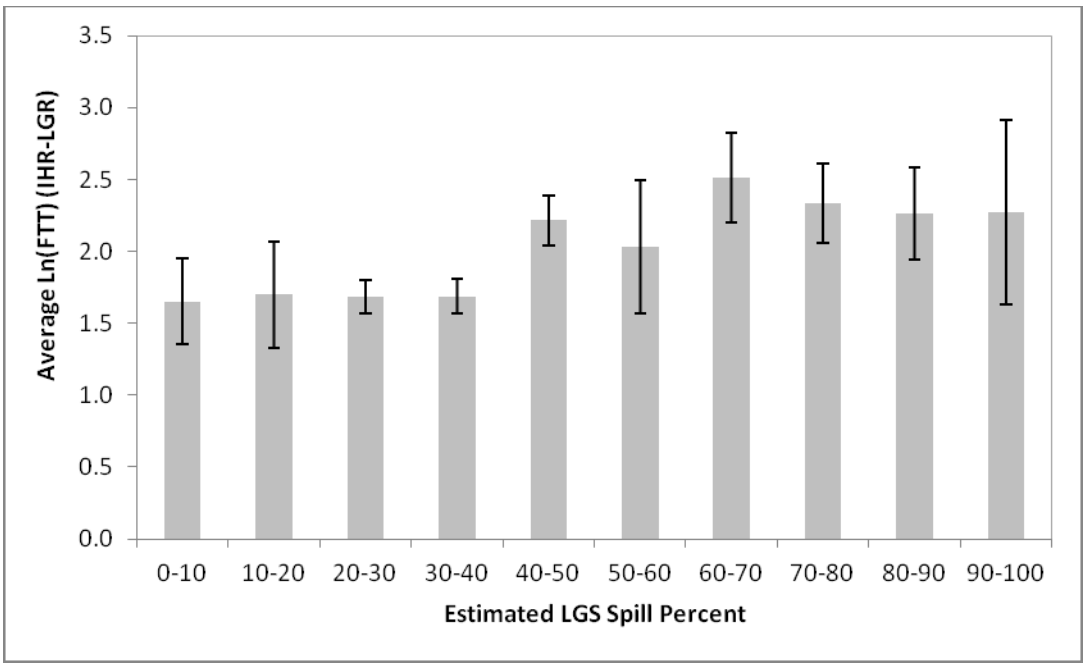

Figure 3. Estimated average Ln(FTT) (IHR-LGR) (±95% CI) for PIT-tagged Chinook adults detected at IHR, grouped by estimated average LGS spill percent.

Operational Considerations

The perception that spill at LGS should be capped at 30% is partially due to a delay in adult Chinook passage that occurred when summer spill began in 2005. To remedy this delay, spill at LGS was reduced to 30%. Spill operations at LGS have been capped at 30% ever since. Since this time, impact of spill operations at LGS has been an ongoing issue. However, since the initial problem in 2005, more data have been collected that indicate that adult Chinook delays below LGS are not affected by spill percent so much as LGS spill patterns and operation of the TSW at low flows.

In 2008, drogues were released in the LGS tailrace to investigate tailrace conditions under uniform versus bulk spill. These drogue tests showed that a bulk spill pattern resulted in the formation of eddies in the LGS tailrace and that a uniform pattern minimized the production of these eddies. Furthermore, adult radio-tag studies showed that adult spring/summer Chinook (released at IHR) passed more quickly through the LGS project under uniform spill than under bulk spill.

A Temporary Spillway Weir (TSW) was installed in spillbay 1 at LGS for operation during the 2009 out-migration season. With the TSW in operation, the spill pattern at LGS is more similar to a bulk pattern, as spill is prioritized through the TSW spillbay. In early June 2009, there was a large count differential between LMN and LGS. It was suspected that this count differential was evidence that adult Chinook were holding below LGS due to problems in LGS spill operations. On June 3, 2009, the fisheries managers conducted a special operation at LGS to see if this perceived holding behavior would be remedied and, thus, adult counts at LGS would increase. This operation involved shutting the TSW down, switching to a uniform spill pattern, and reducing spill to approximately 20.4% of total outflow (at flows of ~140 Kcfs). There were no apparent changes in adult Chinook counts at LGS as a result of this operation (Table 1).

Table 1. Adult Chinook counts at LGS before and after special operation to address count differential between LMN and LGS in 2009. Yellow highlighted area indicates date of special operation.

Date	Chinook Adults	Chinook Jacks	Total Chinook (Adults + Jacks)
6/1/2009	742	526	1,268
6/2/2009	1,372	668	2,040
6/3/2009	1,301	598	1,899
6/4/2009	912	422	1,334
6/5/2009	1,372	468	1,840
6/6/2009	1,152	391	1,543
6/7/2009	974	334	1,308

In May of 2010, there were two instances of large count differentials between LMN and LGS. Similar to 2009, fisheries managers conducted two days of special operations at LGS to see if adult counts at LGS would increase. These special operations occurred on May 13th (at flows of ~50 Kcfs) and May 18th (at flows of ~76 Kcfs). These 2010 special operations only involved shutting the TSW down and switching to a more uniform spill pattern at LGS. Spill percent at LGS was NOT reduced under these spill operations and remained at 30%. Unlike in 2009, the special operations in 2010 resulted in substantial increases in adult Chinook passage at LGS. In fact, both special operations resulted in a 5 to 6-fold increases in adult Chinook counts when compared to the counts from the day before (Table 2).

Table 2. Adult Chinook counts at LGS before and after special operationa to address count differential between LMN and LGS in 2010. Yellow highlighted area indicates dates of special operations.

Date	Chinook Adults	Chinook Jacks	Total Chinook (Adults + Jacks)
5/1/2010	4058	200	4258
5/2/2010	916	7	923
5/3/2010	3272	96	3368
5/4/2010	2202	30	2232
5/5/2010	984	20	1004
5/6/2010	635	10	645
5/7/2010	797	19	816
5/8/2010	1164	37	1201
5/9/2010	1330	55	1385
5/10/2010	754	32	786
5/11/2010	2406	61	2467
5/12/2010	1622	30	1652
5/13/2010	9572	107	9679
5/14/2010	1285	61	1346
5/15/2010	664	88	752
5/16/2010	1546	78	1624
5/17/2010	1831	188	2019
5/18/2010	9863	390	10253
5/19/2010	5090	251	5341
5/20/2010	2490	227	2717
5/1/2010	4058	200	4258

Based on the special operations in 2009 and 2010, it appears that the operation of the TSW at low flows, which results in more of a bulk spill pattern, may have a larger impact on adult Chinook passage than LGS spill percent. Shutting the TSW down, switching to a more uniform spill pattern, and reducing spill did not have an effect on adult counts at LGS in 2009. However, this was done at a time when flows were high (~140 Kcfs) and spill with the TSW was already more uniform, due to these higher flows. However, in 2010, at relatively low flows (~50-76 Kcfs), shutting the TSW down and switching to a more uniform spill pattern (while NOT reducing spill) have a substantial impact on adult passage.

As mentioned above, flows in the Snake River in 2011 were among the highest in the FPC record. At no point in 2011 were there significant enough count differential between LMN and LGS to warrant a special operation at LGS, not even when flows exceeded 200 Kcfs or when spill percent at LGS approached 90%.

Conclusions

In summary, we looked at conversion rates of PIT-tagged adult Chinook passing between IHR and LGR in 2011 and found no evidence of impacts on conversion rates, with regards to LGS spill operations. Conversion rates for PIT-tagged adult Chinook remained high throughout the entire voluntary spill season (Apr. 3 to Aug. 31), even when LGS spill percent was high. Furthermore, we looked at fish travel times of PIT-tagged adult Chinook in this same reach and did not see an increase in fish travel times (IHR-LGR) until LGS spill percent was above 40%. At these levels of LGS spill percent, spill volumes at LGS in 2011 were already well above the gas cap.

FISH PASSAGE CENTER
1827 NE 44th Ave, Suite 240, Portland, OR 97213
Phone: (503) 230-4099 Fax: (503) 230-7559
http://www.fpc.org
e-mail us at fpcstaff@fpc.org

DATA REQUEST FORM

Request Taken By: Brandon Chockley **Date:** 19-July-2011

Data Requested By:
Name: Charlie Morrill **Phone:** _____
Address: _____ **Fax:** _____
_____ **Email:** _____
_____

Data Requested:
Impact of spill percent & LGS on adult Chinook passage time & Snake River.

Data Format: **Hardcopy** ☐ **Text** ☐ **Excel** ☐

Delivery: **Mail** ☐ **Email** ☐ **Fax** ☐ **Phone** ☐

Comments:

Data Compiled By: _____ **Date:** 9-Dec-2011

Request # 87