



# FISH PASSAGE CENTER

1827 NE 44<sup>th</sup> 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](mailto:fpcstaff@fpc.org)

## MEMORANDUM

TO: Ron Boyce, ODFW

FROM: Michele DeHart, Manager FPC

DATE: January 25, 2006

RE: Data Request

Ron, this analysis is based on a previous analysis FPC did for ODFW last year. As such, many of the methods and assumptions are a repeat from that previous memo. You asked for the estimated proportion of Snake River yearling migrants that would be transported in 2006 based on available information regarding operations. The response to your question is estimated based on annual collection efficiency estimates generated from the PIT tag information. These estimates are routinely developed and included in the FPC annual reports. We have tried to calibrate the assumptions based on past years' collection efficiencies, but be advised that when using this information or considering implementation of management scenarios, it is important to keep in mind the limitations associated with the assumptions made for estimation purposes.

Estimates of the proportion of yearling and subyearling Chinook and steelhead arriving Lower Granite Dam (LGR) "destined" to the transportation strategy (*i.e.*, fish transported from all sites expressed in LGR equivalents) are computed with a probabilistic model and presented in the FPC Annual Reports from 2000 to 2003 (see Appendices G in 2000, and I in 2001-2003).

**Table 1. Assumed spill percentages (based on a projected average Snake River Spring flow of 100 kcfs) used for estimating proportion of salmonids arriving Lower Granite Dam "destined" to the transportation strategy.**

	Lower Granite	Little Goose	Lower Monumental
Spill Percent	0.19	0.30	0.40

In order to make the projections to future years under the Remand Operations, we have made the following set of assumptions:

- Transportation in springtime occurs at Lower Granite (LGR), Little Goose (LGS), and Lower Monumental (LMN) dams, but not at McNary Dam (MCN).

- The formula for estimating the proportion of fish “destined” for transportation is:  $P(\text{transport}) = P_1 + (1-P_1) \cdot P_2 + (1-P_1) \cdot (1-P_2) \cdot P_3$  where  $P_j$  is the probability of being alive in the forebay of the  $j^{\text{th}}$  dam and transported ( $j = 1$  for LGR, 2 for LGS, and 3 for LMN) and  $P_j = [1-P(\text{fish in spill})] \cdot P(\text{FGE}) \cdot P(\text{transported given collected})$ .
- Assumes 100% of collected fish are transported.
- Collection efficiency estimates (CE) obtained with yearling Chinook PIT-tag data from 2002 to 2004 is partitioned into components using  $CE = [1-P(\text{fish in spill})] \cdot P(\text{FGE})$ .
- FGEs of 65% LGR, 65% LGS, and 41% LMN and  $P(\text{fish in spill})$  computed with spill effectiveness (SPE) odds of 3:1 SP:PH at LGS and 4:1 SP:PH at LMN most closely match the PIT-tag CE estimates (these values were used in high spe scenario in shown in table 2).
- Spill effectiveness odds of 1:1 SP:PH at LGS and LMN do not calibrate well with the PIT-tag collection efficiency estimates, but results using those SPE are shown for comparison purposes as per your request.
- The proportion of fish passing through spill at LGR is based on recent RSW studies in 2003 that showed the RSW with 7 kcfs and training spill with 12 kcfs passed 66% of the yearling Chinook. This spill passage efficiency was applied to the 100 kcfs flow scenario and a prorated 56% passage ( $85/100 \text{ ratio times } 0.66$ ) was applied to the higher 100 kcfs flow scenario.
- The effects of test operations of the redesigned BGS at LGR are not known so were not estimated.

Based on the above assumptions and conditions, the estimated proportions of yearling Chinook “destined” for transportation are shown in Table 2. The quantity  $1-P(\text{transport})$  is an estimate of the proportion of yearling Chinook arriving LGR “destined” to in-river migration through the combination of spill and turbine passage. Since mortality will occur as fish migrate from LGR to LGS and LMN, the actual number of survivors transported or remaining in-river below LMN will be less than those “destined” to start from LGR on that particular route of passage.

**Table 2. Estimated proportion of yearling Chinook “destined” for transportation under the 2000 BIOP Remand spill operations for flows averaging 100 kcfs under two spill efficiency scenarios.**

Conditions	Flow	Dam	FGE	Pj --low spe	Pj --high spe
BIOP Spill	100 kcfs	LGR	0.65	0.285	0.285
		LGS	0.65	0.455	0.286
		LMN	0.41	0.246	0.111
			P(transport)	0.706	0.546

The range of possible estimates is relatively broad (between 0.54 and 0.706) and reflects different assumptions in spill efficiency. It is likely that spill efficiency will be greater than 1 to 1 and therefore the proportion destined for transport would likely be closer to the low estimate of 0.546 which assumes spill efficiencies between 3:1 and 4:1 for LGS and LMN respectively.

Caution must be exercised when looking at the magnitude of the modeled  $P(\text{transport})$  estimates due to the numerous assumptions that went into this modeling approach. The trends in the modeled  $P(\text{transport})$  estimates should be viewed as the primary outcome of this data analysis for use in future management decisions.