



# 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 [fpcestaff@fpc.org](mailto:fpcestaff@fpc.org)

## MEMORANDUM

TO: FPAC

FROM: FPC Staff

DATE: July 19, 2006

RE: Estimated transportation proportion for yearling Chinook and steelhead in 2006

FPAC Request: An estimate of the proportion of the population of yearling Chinook and steelhead arriving Lower Granite Dam forebay that were transported in 2006 from Lower Granite, Little Goose, and Lower Monumental dams versus migrated inriver through the Federal hydrosystem.

### Methods:

FPC staff used the probabilistic model presented in appendices of the past eight Fish Passage Center annual reports (1998 to 2005) to estimate the proportion of yearling Chinook and steelhead arriving Lower Granite Dam (LGR) forebay “destined” to the transportation management strategy. In this model approach, transported fish from Little Goose (LGS) and Lower Monumental (LMN) dams are expanded to LGR-equivalents to account for inriver mortality occurring between LGR and these two downstream transportation sites.

New in 2006 was the delaying of the start of transportation to April 20 at LGR, April 24 at LGS, and April 28 at LMN. This delay was based on NOAA research results on temporal SARs for PIT-tagged spring/summer Chinook that suggested early transportation might be harmful to yearling Chinook. The staggered start of transportation at the downstream dams was an attempt to allow the population of fish arriving at LGR through April 19 to continue inriver at those downstream dams (the four-day lag was based on average inter-dam travel times of smolts in prior years). Because the 2006 season was partitioned into two periods, the first with no transport and second with transport, the estimation of overall transportation proportion in 2006 was done in two parts.

First, an estimate of the proportion of the total population of yearling Chinook and steelhead arriving LGR forebay before the April 20 start of transportation was obtained. A modified

passage index approach was used to estimate the distribution of relative daily passage at LGR. Research using radio tagged smolts has provided measures of spillway passage effectiveness with the operation of the raised spillway weir and training spill at LGR in recent years. FPC staff observed that the pattern of spill effectiveness from the radio-tag data was similar to pattern that an odds ratio of 4:1 spillway to powerhouse fish passage per unit flow through each route would produce. For example, a 4:1 odds ratio *{i.e.,  $(4 \bullet \text{spillpct}) / [4 \bullet \text{spillpct} + 1 \bullet (1 - \text{spillpct})]$ }* where spillpct is percentage of daily average flow spilled at LGR} shows a 20% spillway flow producing 50% fish passage through spill. Applying a 4:1 spill effectiveness odds ratio to daily spill proportions, FPC staff estimated that 10.5% of the yearling Chinook passage distribution occurred before transportation commenced and 9.7% of the steelhead passage distribution.

Second, estimates of dam-specific transport proportions over the days after transportation commenced at each dam and estimates of seasonal collection efficiencies were inputted to the probabilistic model to obtain the estimated proportion of fish “destined” to transportation once the transportation program began in the Snake River. As in past years, the seasonal collection efficiency estimates for yearling Chinook and steelhead at LGR were obtained using PIT-tagged fish released from the Smolt Monitoring Program’s traps on the Snake, Salmon, Imnaha, and Grande Ronde rivers. Estimated 2006 collection efficiencies for yearling Chinook were 0.29, 0.52, and 0.42 at LGR, LGS, and LMN, respectively. Likewise, estimated 2006 collection efficiencies for steelhead were 0.37, 0.61, and 0.54 at LGR, LGS, and LMN, respectively. After transportation commenced, the proportion of collected yearling Chinook transported was 0.906, 0.998, and 0.976 at LGR, LGS, and LMN, respectively. Likewise, after transportation commenced, the proportion of collected steelhead transported was 0.966, 0.999, and 0.955 at LGR, LGS, and LMN, respectively. The resulting model-based transportation estimates during the period of transportation were 0.789 for yearling Chinook and 0.880 for steelhead.

Lastly, FPC staff computed the overall transportation proportion for yearling Chinook arriving Lower Granite Dam forebay over the entire 2006 spring migration season as the product of  $(0.105 \text{ run}) \bullet (0 \text{ transport}) + (0.895 \text{ run}) \bullet (0.789 \text{ transport}) = 0.706$  yearling Chinook “destined” to the transportation management strategy. Likewise, steelhead had  $(0.097 \text{ run}) \bullet (0 \text{ transport}) + (0.903 \text{ run}) \bullet (0.880 \text{ transport}) = 0.795$  fish “destined” to the transportation management strategy.

#### Results:

With approximately 10% of the yearling Chinook and steelhead arriving Lower Granite Dam before the start of the 2006 transportation program, the FPC estimated an overall 2006 transportation program percentages of 70.6% for yearling Chinook and 79.5% transportation of steelhead.