



# FISH PASSAGE CENTER

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## MEMORANDUM

TO: Ed Bowles ODFW

FROM: Michele DeHart

DATE: September 29, 2009

RE: Reach Survival Estimates for Steelhead reported in 2009

In response to your request, the FPC staff reviewed the reach survival estimates reported by NOAA fisheries in their Preliminary Survival Estimates memo dated September 14, 2009. We developed preliminary steelhead survival estimates for 2009 for the Lower Granite Dam to Bonneville Dam reach. **NOAA's preliminary 2009 survival and travel time data are consistent with recent past years' data, which indicate that higher flow, higher spill and decreased transport proportion will result in increased survival of in-river migrating juvenile steelhead.** Our review conclusions follow:

- Spill proportions were high in 2009 similar to other recent years under the Court Ordered Spill Program, with spill averaging over 37% of flow for all projects from Little Goose to Bonneville dams. Average flow at Lower Granite during the spring migration in 2009 was 110.3 kcfs, exceeding the Biological Opinion flow target of 100 kcfs.
- Our preliminary survival estimate for hatchery and wild steelhead combined was 0.660 for that river reach. This is very similar to the NOAA estimate of 0.693. These estimates were reasonably close and compared to past years, both represent high survival for juvenile steelhead in the reach LGR to BON.
- FPC preliminary juvenile steelhead reach survival estimates in the Lower Granite to McNary reach in 2009 averaged 0.801 and were comparable to the NOAA estimate of 0.800 for that reach. These results are consistent with past years' estimates for that reach, with the implementation of the court ordered spill program. The average juvenile steelhead survival, in the Lower Granite to McNary reach, for the year's of court ordered spill operation in 2006, 2007, 2008, was 0.68 compared to previous years' average of 0.55. (FPC memo August 27, 2009).

- The higher survival of juvenile steelhead migrating in-river in 2009 is not surprising based on recent past years' data collected during the court ordered spill operation. In particular for 2007, in-river juvenile steelhead migrants averaged a survival of 0.65 for the Snake River reach even though river flow in that reach averaged 61.2 kcfs, significantly lower than the Biological Opinion target flow of 85 kcfs. The 2007 average spring flow was the lowest flow occurring since 2001. The higher average survival of steelhead in 2007, under low flow conditions, is due to the higher average spill proportion that occurred under the court ordered operations, which also decreased the proportion of steelhead transported.
- FPC staff estimated the proportion of the population destined for transport at the Snake River transport dams in 2009 was 41 to 42%, which is lower than any other recent year for "wild" steelhead (unmarked population) and near the lowest for hatchery steelhead.
- We concur with the NOAA statement that the decreased transport proportion in 2009 is due to early timing of steelhead arriving at Lower Granite Dam in 2009. Since transportation did not begin until May 1, the proportion of the population that arrived prior to that date would be returned to river. We estimated that approximately 46% of steelhead (both hatchery and wild) arrived at Lower Granite Dam prior to the start of transportation in 2009 compared to 30% in 2008 and 25% and 2007.
- NOAA analysis indicates that decreasing the proportion of steelhead transported increases the number of steelhead migrating in-river, resulting in "predator swamping", and effectively increasing in-river survival of juvenile steelhead.
- Steelhead travel time in 2009 was among the fastest we have measured in recent years, with 2006 the only other year with median travel times from Lower Granite Dam to Bonneville Dam averaging less than 11.5 days for juvenile migrants.
- Consistent with past years' data, based upon multi-year analysis the most important variables explaining variability in reach survival for steelhead were spill proportion and water transit time (i.e. flow). Higher spill proportions, particularly for Snake River, are likely the primary factors contributing to the higher juvenile survivals and faster juvenile travel times which occurred in 2007, 2008, and 2009.(FPC memo, August 27, 2009).
- These results are consistent with historical findings (Schaller et al., 2007) which concluded that water transit time (i.e. flow) and spill proportion were the most important variables in steelhead in-river juvenile survival and fish travel time.