Preliminary Data Report

Evaluation of Adult Salmon Fallback and Steelhead Downstream Passage at the Sluiceway and Turbines at The Dalles Dam, Winter 2008 and Early Spring 2009

AFEP Study Code ADS-00-1

Prepared for USACE, Portland District

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Introduction

This report presents *preliminary* data for fisheries managers and engineers to use in decision-making for sluiceway operations at The Dalles Dam (TDA). The goal of this study was to characterize adult salmonid spatial and temporal distributions, passage rates, and movement in front of the sluiceways at TDA during November/December 2008 and March/April 2009. The objectives were to 1) estimate the number and distribution of adult salmon and kelt-sized acoustic targets passing into the sluiceway and turbines at TDA during the study periods, and 2) assess the behavior of these fish in front of sluiceway entrances.

For Objective 1, we conducted a full powerhouse hydroacoustic study where a transducer was randomly deployed in one of the three intakes of each turbine unit and paired transducers were deployed in each of the six operating sluice entrances (1-1, 1-2, 1-3, 5-2, 18-1, and 18-2). For Objective 2, an acoustic camera was deployed at the entrance to the sluiceway above Main Unit 1-1 and aimed across the entrances of 1-1 and 1-2. We collected data 24 hr/d, 7d/wk for the course of two study periods (85 days total); November 1 – December 15, 2008 for adult salmon fallback and March 1 – April 9, 2009 for steelhead kelt downstream passage. Observational data were obtained from a subset of the DIDSON data. Because of the large amount of data collected, we randomly selected four hours (one hour from each 6-hr block) for each day of the study and reviewed each hour in the subset for fish behavior.

This report contains separate sections for each study periods. We present data on fish behavior, passage rates, run timing, and horizontal distribution. The data are preliminary and subject to change.

Results for Fall/Winter 2008 – Adult Salmon Fallback

<u>Fish Behavior Observations at Sluice 1-1 and 1-2 (DIDSON acoustic camera).</u>

We observed the following fish behaviors:

- Adult salmonids in front of the sluice entrance were oriented into the flow in the sluice nearfield, milling just upstream of the sill, falling back into the sluiceway, or swimming upstream out into the forebay. They also moved along the face of the dam from SL1-2 to SL1-1 and vice versa.

- Juvenile shad were present from the beginning of the sampling period on November 1, 2008 until mid-November. Adult salmonid behavior did not change in the presence of thousands of juvenile shad.
- From late November to the end of the sampling period on December 15, schools of yearling-sized salmonids were observed. These fish were present in large schools at times and they used the sluiceway to pass downstream.

Adult Salmon Fallback Results (hydroacoustics).

The main findings included:

- A total of 1,790 ±250 (95% confidence interval) adult size salmon targets passed through the powerhouse intakes and operating sluiceways from November 1 – December 15, 2008. A daily average of 40 adult size salmon targets passed (fallback) the dam during the 45 day study period.
- Of the 1,790 total adult size targets, 1,704 passed through the sluiceways (95%) and 86 passed through the powerhouse intake units (5%).
- Run timing peaked in late November (Figure 1). Adult size salmon targets fallback occurred, but at relatively low rates (10-25 fish/d), during the first and last days of the study period
- Total fish passage was highest at Sluice 1 (1,453 targets). Sluice 18 had the second highest number of fish passing (211). A small number passed through Sluice 5 (40 fish) and powerhouse Main Units 7, 8 and 18 (23, 51, and 12 fish, respectively) (Figure 2).
- Fish passage peaked at 0900 h and was lowest at 1000 h and 2300 h. Passage was also high during mid afternooon hours and nighttime (2000 h and 2200 h), except for a dip at 2100 h, and low during the early mornng (0300 – 0500 h)and late afternoon hours (1600 – 1800 h) (Figure 3).

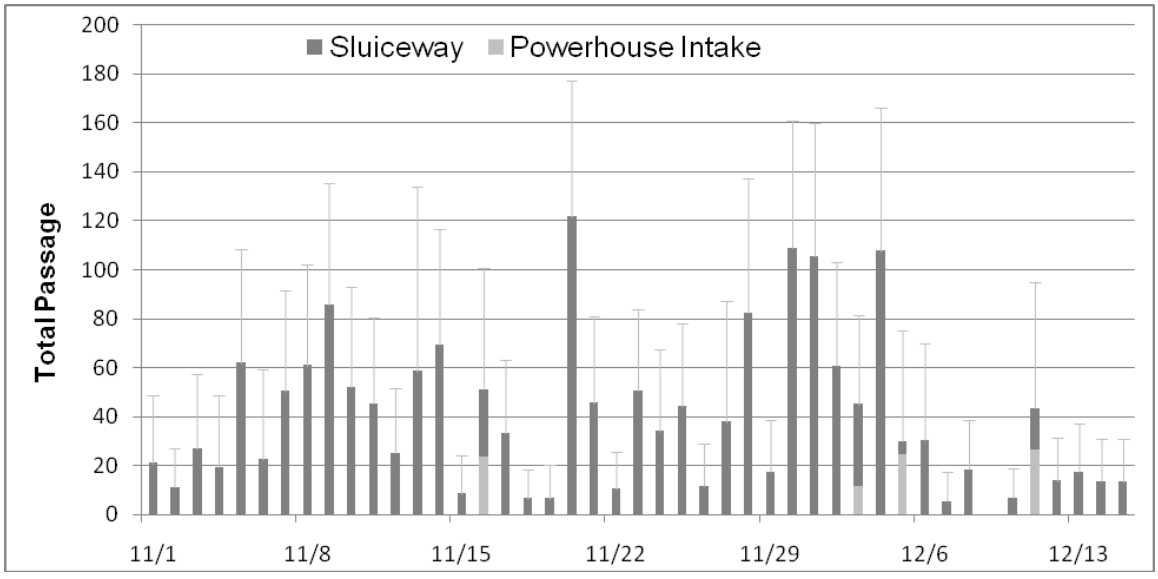

Figure 1. Total number of adult size salmon targets passing daily at each route of the powerhouse and sluiceway from November 1 – December 15, 2008 (95% CI).

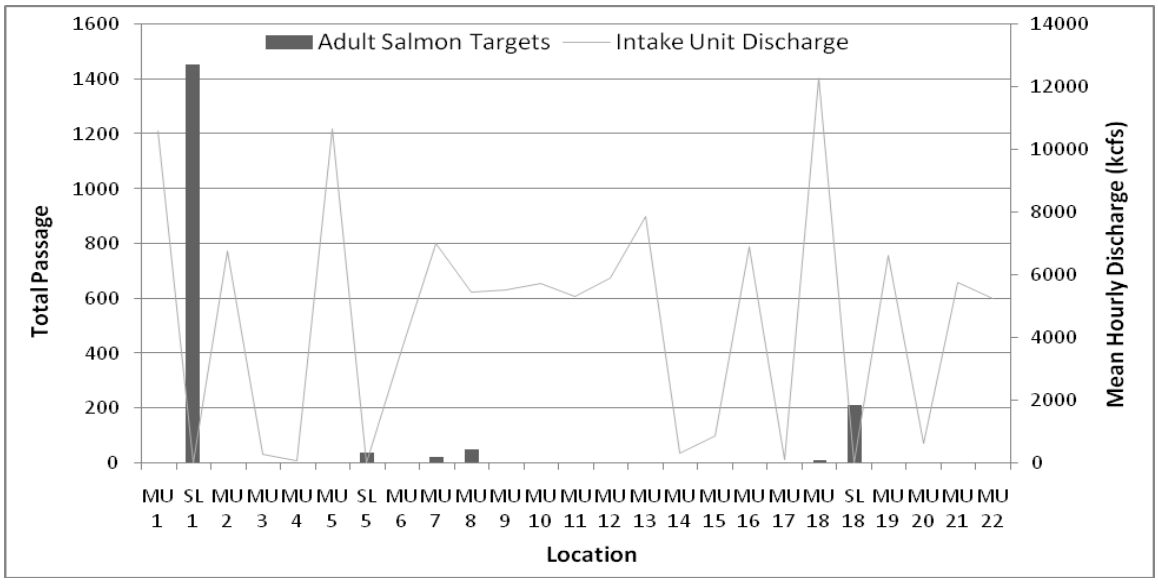

Figure 2. Horizontal distribution of total adult size salmon targets passage at each route of the powerhouse and sluiceway, with corresponding powerhouse intake unit discharge, from November 1 – December 15, 2008.

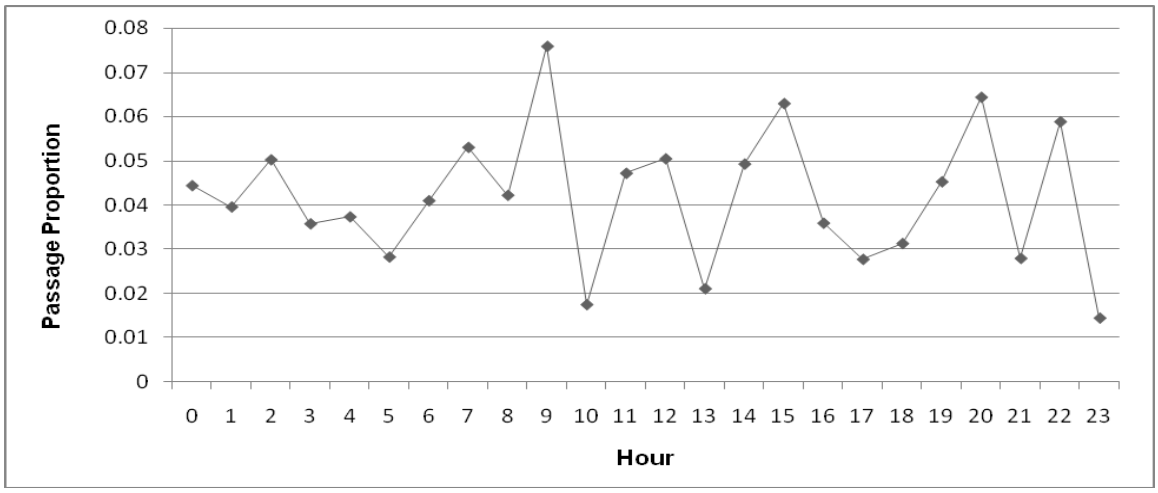

Figure 3. Diel distribution of adult size salmon from November 1 – December 15, 2008. Data are the hourly proportions of total passage.

Results for Spring 2009 – Steelhead Kelt Passage

Fish Behavior Observations at Sluice 1-1 and 1-2 (DIDSON acoustic camera).

We observed the following fish behaviors:

- Steelhead kelt behavior was typical for salmonids in front of a sluiceway entrance – tail-first orientation downstream, milling, traversing along the face of the dam, moving over the sill and into the sluiceway.

- Interestingly, some kelt approached SL 1-1 from the west moving around the large pier between SL1-1 and Fish Unit 2-2 and into the sluiceway, or they would make an abrupt U-turn and swim upstream into the forebay or over to SL 1-2.

Fish Fallback Results (hydroacoustics).

The main findings were as follows:

- A total of 1,766 ±277 steelhead kelt size targets passed through the powerhouse intakes and operating sluiceways from March 1 – April 9, 2009. A daily average of 44 kelt size targets passed The Dalles dam during the 40 day study period.
- Run timing peaked in late March (Figure 4). However, very large numbers of kelt size targets passed the dam on March 2nd and March 6th.
- 1,673 kelt size targets passed into the sluiceway (95%) and 93 passed through the powerhouse intake units (5%).
- Total fish passage was highest at Sluice 1 (1,091 targets). Sluice 18 had the second highest number of fish passing (454). At Sluice 5, 128 targets passed. A small number of kelt size targets passed through the powerhouse Main Units 8, 21 and 22 (24, 23, and 46 fish, respectively) (Figure 5).
- Fish passage peaked at 2100 h and was lowest at 0500 h, 0700 h and 1100 h. Passage was also high during mid morning hours and late afternoon/nighttime, except for a dip at 2200 h (Figure 6).

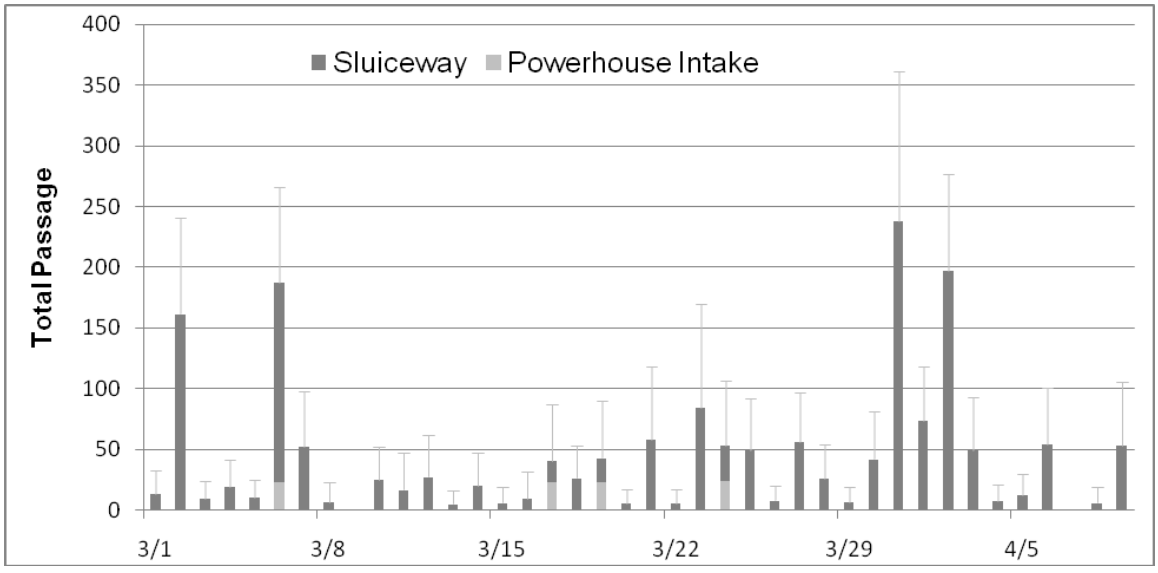

Figure 4. Total number of Steelhead kelt size targets passing daily at each route of the powerhouse and sluiceway from March 1 – April 9, 2009 (95% CI).

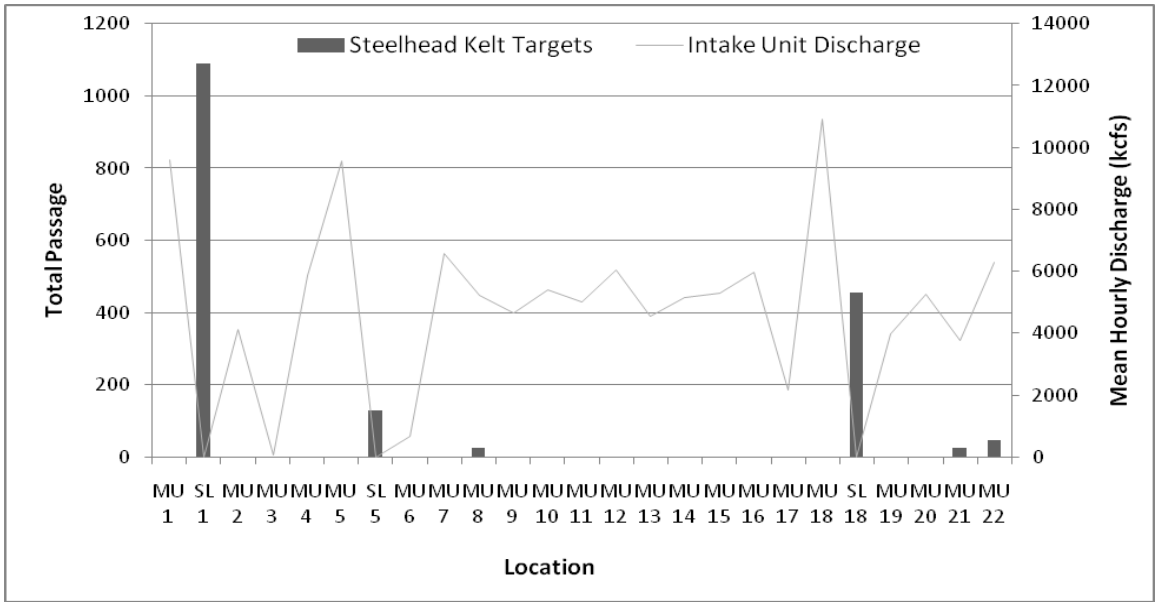

Figure 5. Horizontal distribution of total Steelhead kelt size targets passage at each route of the powerhouse and sluiceway, with corresponding powerhouse intake unit discharge, from March 1 – April 9, 2009.

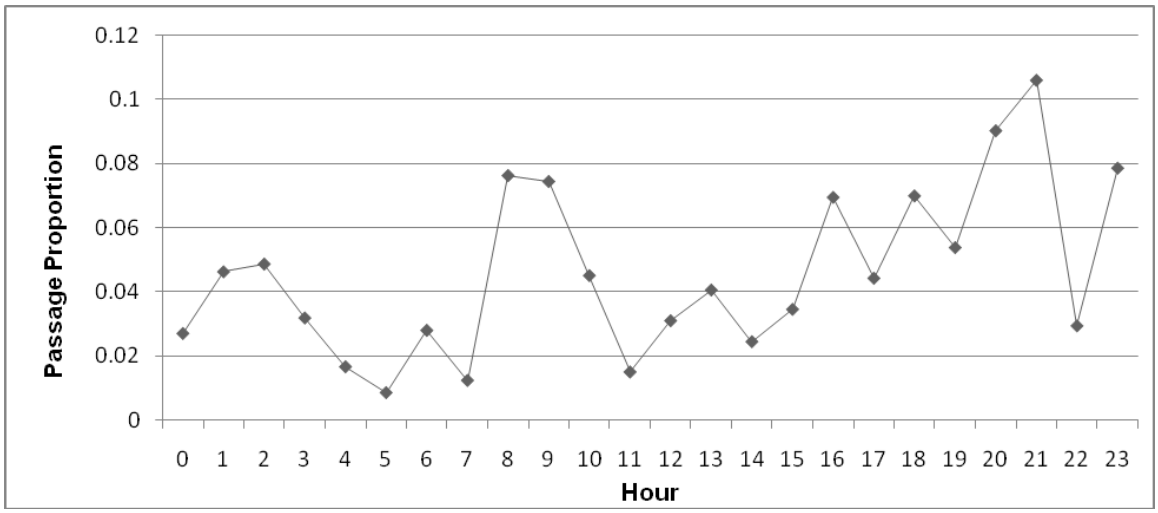

Figure 6. Diel distribution of Steelhead kelt size targets from March 1 – April 9, 2009. Data are the hourly proportions of total passage.

Next Step

- Prepare draft final report for submittal on July 31, 2009.