

Operation of the Lower Granite Dam Adult Trap, 2009

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Report of research by

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U.S. Department of Energy
P.O. Box 3621
Portland, Oregon 97208-3621
Contract 44314
Project 200500200

August 2010

EXECUTIVE SUMMARY

During 2009, we operated the adult salmonid trap at Lower Granite Dam from 3 March through 15 November. Trap operation was continuous, except during a short period when a mechanical failure occurred and when water temperatures were too high to handle fish safely. We collected and handled a total of 31,073 steelhead *Oncorhynchus mykiss*, and of these fish, we PIT tagged 3,795 wild steelhead. We took scales samples from 6,811 spring/summer Chinook salmon *O. tshawytscha* for age and genetic analysis. We collected 12 Lemhi River origin PIT-tagged adult spring Chinook salmon using separation-by-code and radio-tagged them for IDFG. We collected and handled a total of 8,894 fall Chinook salmon. Of those fish, 1,716 adults and 1,680 jacks were transported to Lyons Ferry Hatchery on the Snake River in Washington. In addition, 976 adults and 992 jacks were transported to the Nez Perce Tribal Hatchery on the Clearwater River in Idaho. The remaining 3,530 fall Chinook salmon were passed upstream to continue their adult migration. Scale samples were taken from 2,670 PIT-tagged fall Chinook that were collected by the separation-by-code system.

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INTRODUCTION

Lower Granite Dam, located 695 river kilometers from the mouth of the Columbia River, is the farthest upstream dam on the Snake River with adult fish passage facilities. With the completion of Lower Granite Dam in 1975 (Harmon 2003), collection and sampling of adult salmonids have been an integral part of many studies. Trap operations have been conducted primarily by National Oceanic and Atmospheric Administration (NOAA) Fisheries personnel in cooperation with other agencies. Demands on use of the Lower Granite Dam adult trap have increased in recent years and are expected to continue to increase. To meet this increased demand, the adult trapping facility was remodeled during winter 2006-2007 and the modified facility was used for the first time during the 2007 adult migration.

Current uses of the Lower Granite Dam adult trap include: collection of fall Chinook salmon *Oncorhynchus tshawytscha* for a captive broodstock program; collection of multiple species samples for run-reconstruction monitoring, collection of fish tagged with passive integrate transponder (PIT) tags for transportation and life history studies, collection of steelhead *O. mykiss* for adult PIT-tag studies, and collection of adults from radio telemetry studies (with both tagging and tag removal conducted at the adult trap).

Operation of the Lower Granite Dam adult trap provides the following benefits to listed stocks:

- 1) Reduces risk to the fall Chinook salmon ESU by improving hatchery practices (i.e., providing the ability to collect and use natural-origin fish for broodstock in order to improve the integration between natural-origin and hatchery-origin fish).
- 2) Jump-starts fall Chinook salmon production in underutilized area of the Clearwater Basin by providing natural-origin fish collected at the trap.
- 3) Reduces risks to ESUs from atypical straying of hatchery-origin fish from areas outside the Snake River Basin (i.e., allows the removal of unusual numbers of stray fish).
- 4) Provides information on age-class distribution and hatchery/wild composition for spring/summer Chinook salmon and steelhead returns to improve understanding of ESU status, and provides critical information needed for run-reconstructions of these stocks.

- 5) Provides critical fall Chinook salmon life history information (from scale samples) to better manage this stock.

The adult trap at Lower Granite Dam has been operated for many years; however, the Bonneville Power Administration (BPA) began funding trap operations in mid-2005 (Harmon 2006, 2007, 2008, 2009). Here we report on adult trap operations during 2009.

METHODS

The adult salmonid trap is located adjacent to the south shore adult fish ladder at Lower Granite Dam on the Snake River. A complete description of the adult trap and its operation was reported by Harmon (2003). When in operation, a gate is rotated across the fish ladder to divert upstream-migrating fish toward the adult trap. Fish then enter the attraction pool at the trap and pass through pipes fitted with coded-wire-tag (CWT) and PIT-tag detectors. Tagged fish are then diverted to a holding area (for PIT tagged fish, only those selected by tag code), while non-tagged adults continue through the pipes to the exit ladder where they re-enter the main fish ladder to continue their upstream migration. Diversion gates are also set to sample the run-at-large at a pre-selected sample rate.

The trap has a gravity-flow dewatering system that reduces stress on fish by allowing them to pass directly from the holding area to an anesthetic tank without being handled. Fish are sedated with eugenol (99.9% pure) and inspected, and sample data are collected and recorded. Fish are then placed either in a freshwater recovery tank for release back to the fish ladder, or into holding tanks for eventual transfer to trucks to be hauled from the facility.

The adult trap is generally operated 7 d/week, 24 h/d during the adult migration period, from early March through November each year, except during short periods in the summer when water temperatures are too high to handle fish safely.

RESULTS AND DISCUSSION

The Lower Granite Dam adult trap was remodeled during winter 2006-2007. Work was contracted through the U.S. Army Corps of Engineers, with funding provided by BPA. Modifications to the trap addressed the need for increased holding capacity for fall Chinook salmon broodstock collection. Holding capacity was increased by adding four additional holding tanks, which are approximately one and one-half times larger than the original two tanks. The original holding tanks were also modified, but their capacity was not increased. Anesthetic capacity was also increased, with an increase in size of the main anesthetic and recovery tanks, and installation of two additional anesthetic tanks.

The modifications also provided substantial expansion of the work area. These modifications now make it feasible to handle a larger proportion of the adult steelhead and Chinook migrations. However, when the Lower Granite forebay is at minimum operating level, as it is during early September, there is only enough water available to use three of the new holding tanks. Throughout the 2009 season, the U.S. Army Corps of Engineers worked to increase the water supply so that all tanks can be used in the future.

In mid-August while the trap was shut down due to high water temperatures, a remote operated vehicle was run through the water supply pipes to check for debris blockage. Nothing was found in the water supply pipes that would obstruct water flow. The next step taken was to replace a faulty butterfly valve on the water supply pipe. This operation was performed at the end of the season in mid-November the day after the trap was shut down. The following day, a test was performed on the water supply pipe. During the water test, we were able to run the adult trap at full capacity with all six holding tanks operating. Further testing will be done throughout the 2010 season to verify the improvements during normal trap operations.

During 2009 we operated the adult trap from 3 March to 15 November, except during the period of 20 July to 18 August, when the trap was shut down due to a mechanical failure, and 1 to 6 September, when it was shut down due to high water temperatures. We monitored spring-migrating steelhead from 4 March to 18 May at a 10% sample rate, and from 19 May to 20 August at a 5% sample rate. We monitored spring and summer Chinook salmon at a 10% sample rate from 26 April to 18 May, and at a 5% sample rate from 19 May to 20 July. We monitored fall Chinook salmon and fall-migrating steelhead at a 12% sample rate from 18 August to 8 September, and at a 9% sample rate from 9 September to 15 November.

Samples were taken automatically four times an hour, 24 h/d for the entire trapping period. In addition to periodic samples of the run at large, we also collected PIT-tagged spring, summer, and fall Chinook salmon that had been tagged as juveniles using the sort-by-code system. Sampled fish were inspected for species, length, injuries, brands, visible implant tags, PIT tags, and fin clips. Scale and tissue samples were also taken from some spring, summer, and fall Chinook, as well as some steelhead. Fall Chinook salmon collected at the trap and transported to hatcheries were inoculated with erythromycin and oxytetracycline, and their operculi were hole-punched for identification.

The following data is preliminary and will be further analyzed by researchers from the respective agencies for which the data were collected. A total of 31,073 steelhead were collected and handled during the sampling period (Table 1). Of those fish, 1,364 were sampled during spring and 29,709 were sampled during fall. Of the 29,709 steelhead sampled during fall, 3,795 wild steelhead were PIT tagged. Data taken from these fish will be analyzed to evaluate the A- and B-run segments, as well as the hatchery/wild composition of the steelhead run. These data will be analyzed and reported by the Idaho Department of Fish and Game (Bill Schrader, IDFG, personal communication). No freeze brands were observed during 2009 adult collections.

Table 1. Number of adult salmonids collected and handled at the Lower Granite Adult trap during 2009.

Species	Number collected
Spring Chinook	5,333
Summer Chinook	1,478
Fall Chinook	8,894
Steelhead	31,073

We also collected and handled 5,333 spring Chinook salmon and 1,478 summer Chinook salmon (Table 1). Scale samples were taken from all fish and will be analyzed by IDFG. Age structure and genetic analysis will be determined from the scale samples. Information from these analyses will be available from IDFG (Bill Schrader, IDFG, personal communication).

We collected 12 Lemhi River origin PIT-tagged adult spring Chinook salmon using separation by code and radio tagged them for IDFG. This study is part of the NOAA Fisheries Integrated Status Effectiveness Monitoring Project. Study objectives are as follows:

- 1) Determine adult Chinook salmon timing from Lower Granite Dam to spawning grounds in the Lemhi River watershed,
- 2) Identify stream flow and in stream migration barriers in the Lemhi River watershed to prioritize future habitat actions,
- 3) Determine effectiveness of completed habitat actions to reduce fish migration barriers in the Lemhi River watershed,
- 4) Identify staging area habitat in the Lemhi River watershed to prioritize future habitat actions, and
- 5) Determine adult Chinook salmon distribution in the Lemhi River watershed.

Information about this study is available from IDFG (Mike Biggs, IDFG, personal communication).

We collected and handled a total of 8,894 fall Chinook salmon (Table 1). Of those fish, 1,716 adults and 1,680 jacks were transported to Lyons Ferry Hatchery on the Snake River in Washington. In addition, 976 adults and 992 jacks were transported to the Nez Perce Tribal Hatchery on the Clearwater River in Idaho. The remaining 3,530 fall Chinook salmon were passed upstream to continue their migration.

Fall Chinook salmon run reconstruction and hatchery data collected from fish transported to Lyons Ferry Hatchery and the Nez Perce Tribal Hatchery have not been finalized, but will be available in the future from the Washington Department of Wildlife (Debbie Milks, WDFW, personal communication). Scale samples were taken from 2,670 PIT-tagged fall Chinook that were collected by the sort-by-code system. Detailed information on this study is available from the NOAA Fisheries Service (Doug Marsh, NOAA Fisheries, personal communication).

ACKNOWLEDGMENTS

We thank the U.S. Army Corps of Engineers for providing maintenance on the Lower Granite Dam adult trap.

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