Dworshak Draft Tube Fish Mortality Report

22 December 2010

Introduction:

Dworshak Dam is a U.S. Army Corps of Engineers' (Corps) project located on the Clearwater River in Idaho. This project is authorized for multiple purposes including flood control, navigation, power generation, and fish and wildlife conservation. Dworshak Dam has three turbine units that are typically dewatered every third year to perform required maintenance. In early November, turbine unit dewatering activities entrapped 1,505 adult salmonids. Of these, there were 994 mortalities - 34 unclipped and 960 clipped Snake River steelhead Endangered Species Act (ESA) fish.

On 3 November 2010, National Marine Fisheries Service (NMFS or NOAA Fisheries) was notified about the incident and the fish mortalities. As a result of the significance of this incident, the Commander of the Corps' Walla Walla District initiated an AR15-6 Investigation[1] on 5 November to ensure a complete understanding of how this incident occurred and to prevent this from recurring in the future. As a result of the level of mortality, NOAA Fisheries launched an official investigation.

Purpose: By letter dated 29 November 2010, NOAA Fisheries requested the Corps' final report on the incident. This report responds to NOAA's request.

Background:

For a number of years, the Corps, the Bureau of Reclamation and the Bonneville Power Administration (collectively the Action Agencies), have consulted with NOAA Fisheries on the effects of operating and maintaining the Federal Columbia River Power System (FCRPS) on listed salmon and steelhead. Dworshak Dam is one of the 14 FCRPS projects included in the consultation. In August 2007, the Action Agencies submitted a biological assessment (2007 BA)[2] to NOAA Fisheries. The proposed action addressed both the operation and maintenance of the Corps' projects.[3] In May 2008 a biological opinion was issued (2008 FCRPS BiOp).

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[1] AR 15-6 Investigation refers to Army Regulation 15-6 which provides guidance on conducting informal investigations.

[2] Biological Assessment on Effects of Federal Columbia River Power System and Mainstem Effects of other Tributary Action on Anadromous Salmonid Species Listed under the Endangered Species Act.

[3] 2007 BA Executive Summary, p. 8 Section 3.2 describes the proposed RPA to include the operation and maintenance of Dworshak Dam including "[o]ther actions associated with multipurpose operations of the FCRPS (that are also part of the proposed RPA) are as described in Section B.1 of the FCRPS BA and its associated attachments." Section B.1, Attachment B.1-5, Paragraph 4.2.2.2, p. B.1-5-8 describes Dworshak Dam hydropower maintenance activities.

Subsequently, the Action Agencies entered into a voluntary remand of the 2008 BiOp, which resulted in the 2010 Supplemental FCRPS BiOp.

Dworshak Dam has three turbine units that are typically dewatered every third year to perform required maintenance. Before 1995, unit maintenance was completed during the summer months. After the 1995 FCRPS BiOp, unit maintenance was shifted to occur during the fall months (mid-September to mid-December) immediately following flow augmentation for juvenile fish passage below Dworshak, but prior to cold winter weather and flood control operations associated with the spring runoff. The annual return of adult steelhead to the Dworshak tailrace coincides with the current turbine unit tri-annual maintenance schedule.

Fish can be entrapped in a turbine unit's draft tube when the tailrace draft tube stoplogs are installed. Historically, the number of entrapped fish in a dewatered unit varied between 5-30 fish with no mortalities. Exceptions were 2000 or 2001, 2008, 2009, and this incident in 2010. In 2000 or 2001, approximately 50 fish were entrapped, of which 8 were mortalities. In 2008, there were approximately 200-300 entrapped with no mortalities when the emergency gate was closed on 3 October and draft tube stoplogs installed 8 October. In 2009, there were approximately 40 entrapped fish with no mortalities.

Incident Description

On 1 November 2010 Dworshak turbine unit #1 was taken out of service at 0400 hours for routine annual maintenance. A bulkhead upstream of the unit was placed in the penstock to stop any water from entering the turbine 11.5 hours later at 1535 hours. This process normally takes 5 to 6 hours after crews start working but took longer due to excess leakage behind the upstream bulkhead. The tailrace stoplogs cannot be installed if the leakage is in excess of drain capacity. The next morning, 2 November 2010 around 1000 hours, approximately 30 hours after turbine shutdown and 19 hours after the bulkhead was installed, tailrace stop logs were placed in the draft tube discharge to isolate the tailrace and turbine unit. At 0834 on 3 November 2010, about 52 hours after the unit was taken out of service, personnel entered the draft tube and discovered a large number of fish in a relatively small pool of water. Personnel immediately concentrated on removing live fish and returning them to the tailrace. Crews finished removing fish from the draft tube at 0015 hours, the morning of 4 November. Dead fish were donated to local food banks and the Idaho Correctional Institution in Orofino.

The Walla Walla District office was first informed by the Dworshak project personnel of the incident around 1225 hours on 3 November. At 1505 hours of the same day, Dworshak project personnel informed the District about the steps which led to the incident and ongoing fish salvage. Dworshak project personnel were requested to determine the clipped and unclipped status of the salvaged fish. NOAA Fisheries managers were notified of the incident at 1420 hours. Regional fish managers were notified by email of the incident through the Fish Passage Operations and Maintenance Coordination Team (FPOM) at 1535 hours. A second, follow up email was sent to FPOM on November 4 summarizing the fish salvage operation.

Biological Analysis of the Adult Steelhead Impacts

Description of Fish Impacted

A total of 1,505 fish were trapped in the turbine unit during this incident. All were adult steelhead (*Oncorhynchus mykiss*) with the exception of one unclipped adult fall Chinook (*Oncorhynchus tshawytscha*). These fish are listed as threatened under the Endangered Species Act (ESA) and the majority of the fish were the Clearwater River (major population group or MPG) B-run steelhead.[4]

Of the 1,505 fish entrapped, there were 994 known mortalities while 511 steelhead were released back into the Dworshak Dam tailrace alive.[5] The Dworshak Hatchery and the Clearwater Hatchery, located just downstream of Dworshak Dam, are the hatcheries of primary origin of all the steelhead involved in this incident. Of the known mortalities, 960 were adipose fin clipped, confirming hatchery origin. Although 34 of the mortalities were not fin clipped, it is expected that most of these fish were not wild, but unclipped hatchery origin fish. These hatcheries do not clip the adipose fin of many of their production steelhead - approximately 200,000 of 2.1 million total production at Dworshak Hatchery and over 300,000 of 843,000 total production at Clearwater Hatchery.[6] All of the unclipped steelhead at Dworshak and Clearwater Hatcheries are released off-site.

Table 1. Adipose fin clip status and sex of the adult salmonid mortalities collected at Dworshak Dam.

	Female		Male		Unknown	
	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped
Steelhead	407	13	222	13	330	8
F. Chinook	0	1	0	0	0	0

Effects of the Dworshak Incident on Hatchery Production

The Corps has conferred with hatchery personnel to assess the impact of the incident on broodstock needs to meet production goals at the Dworshak Fish Hatchery, Clearwater Fish Hatchery, and Magic Valley Fish Hatchery. Dworshak Fish Hatchery provides broodstock for

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[4] Steelhead are classified as A-run or B-run fish. A-run steelhead typically spend one year in the ocean and return earlier in the year (June-August) than B-run steelhead, which typically spend two years in the ocean and return later in the year (August-September). This extra time in the ocean and later return result in B-run fish that are much larger than A-run fish. Clearwater River drainage B-run steelhead are known for their large size and are prized by steelhead anglers.

[5] These fish were not evaluated for an adipose fin or identified by sex as project staff were focused on returning these fish to the river as quickly as possible.

[6] 2008 through 2010 Annual Operating Plans for Fish Production Programs in the Clearwater River Basin, USFWS, IDFG, and Nez Perce Tribes Fisheries.

all three hatcheries, and requires less than 2,000 adult steelhead (approximately 1:1 male-female ratio) annually to meet these hatcheries' production goals. In October, 500 adult steelhead were collected - of these, approximately 150 males and 150 females will be spawned. The unspawned adults collected in October will be released to the river (providing harvest opportunities) after it has been determined that they are not needed for broodstock purposes. An additional 1,500-1,700 adult steelhead (750-850 males and 750-850 females) will be collected by opening the Dworshak Fish Hatchery ladder on a weekly basis starting at the end of January and continuing through the end of April for the remaining broodstock needs of all three hatcheries. (Personal communication, Cassie Sundquist, Assistant Manager, Clearwater Fish Hatchery.)

Hatchery personnel indicate that the fish mortalities associated with the incident at Dworshak Dam have not impacted their broodstock collection schedule and expect to have sufficient broodstock available to meet production goals. (Larry Peltz, DFH complex manager, personal communication). Steelhead returns for recent years, including the record setting 2009 returns, have been above the 10-year average and have resulted in adequate broodstock collection.

Effects of the Dworshak Incident on Harvest Opportunities

Dworshak Dam is the terminus of steelhead migration for the North Fork of the Clearwater River. Approximately one mile of river exists between the Dworshak Dam and the confluence with the mainstem of the Clearwater River. Steelhead found in the North Fork of the Clearwater River below Dworshak Dam, are predominantly excess hatchery broodstock that provide a unique sport fishery. The effects on this fishery from the loss of fish related to this incident are unknown at this time.

Preliminary Biological Effects Estimates Associated with the Incident at Dworshak Dam

Adult Snake River steelhead overwinter throughout the Columbia and Snake rivers and tributaries. Because of overwintering, final counts will not be available until May, therefore estimating the proportion of the Snake River DPS losses as a result of the incident at Dworshak at this time of year would be based on incomplete data. As noted above, most of the fish impacted were hatchery origin fish, however 34 of the fish mortalities were not adipose fin clipped. The following is a preliminary assessment of the impact of the mortality of these 34 unclipped fish on this MPG, assuming in the worst case that they were actually wild fish.[7]

The Snake River steelhead DPS includes all anadromous populations that spawn and rear in the mainstem Snake River and its tributaries between Ice Harbor and the Hells Canyon hydro complex. There are five MPGs with 24 populations. Wild B-run steelhead are thought to reproduce only in the Clearwater and Salmon rivers. The Clearwater MPG consists of five extant populations, four of which are B-run steelhead. The Salmon River MPG consists of 12 populations, four of which are B-run (NOAA Fisheries Supplemental Comprehensive Analysis of the Federal Columbia River Power System and Mainstem Effects of the Upper Snake and other Tributary Actions, 5 May 2008).

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[7] Steelhead have been observed digging redds in this reach but successful natural spawning below the dam is believed to be low. For instance, 3 of 858 steelhead captured at a trap at Dworshak Hatchery this year were presumed to be wild. (Dr. William Connor, United States Fish and Wildlife Service, personal communication).

Lower Granite Dam is the most upstream location where Snake River steelhead are sampled during migration to estimate proportions of A and B runs, and distribution of origin determined as part of assessing fish runs for harvest management. Known origin is currently based primarily on passive integrated transponder (PIT) and coded wire tagged hatchery fish. Specific origin of wild B-run steelhead is not known. The following status of the Snake River steelhead run is based on the available data from Idaho Department of Fish and Game (IDFG)/ NOAA Fisheries summarizing steelhead run information through 7 November 2010 at Lower Granite Dam:

SNAKE RIVER STEELHEAD STOCK TYPE	COUNT	PERCENTAGE OF TOTAL
A-run Wild	30,329	16.0%
A-run Hatchery (clipped)	(103,792)	(54.8%)
A-run Hatchery (unclipped)	(15,507)	(8.2%)
A-run Hatchery (total)	119,299	63.0%
B-run Wild	9,609	5.1%
B-run Hatchery (clipped)	(27,258)	(14.4%)
B-run Hatchery (unclipped)	(3,075)	(1.6%)
B-run Hatchery (total)	30,333	16.0%

Based on these data and assuming that all 34 of the unclipped mortalities at Dworshak Dam were wild B-run fish, the loss to the Clearwater and Salmon River MPG would be 34/9,609 or 0.35%. Assuming an equal distribution to the four B-run populations in the Clearwater MPG and the four B-run populations in the Salmon River MPG, the estimate of loss for Clearwater MPG B-run fish would be 34/4,804 or 0.71%.

Similarly, assuming all hatchery mortalities were B-run fish, the loss to hatchery steelhead from the 960 hatchery mortalities would be 960/30,333 or 3.16% B-run fish. Based on the estimate that 89.3% of hatchery origin of B-run steelhead at Lower Granite are from the Clearwater River[8], we can separate out the loss to those fish at 960/27,087 or 3.54%.

Summary of Effects

Although the Corps' preliminary analysis indicates that negative effects to the 2010 wild run of Snake River Clearwater MPG steelhead is small, the number of mortalities associated with the dewatering of the turbine unit at Dworshak Dam are unacceptable and steps will be made to reduce such incidents in the future. The 3.5% loss of available Clearwater MPG hatchery B-run is not expected to negatively affect the additional collection of broodstock because of the above average returns, however, this loss may result in a reduction to the catch in the sport fishery below Dworshak Dam.

[8] IDFG In-Season Adult Chinook and Steelhead Run Documents data summaries at the Fisheries Research Site webpage https://research.idfg.idaho.gov/PublicDocuments/Forms/AllItems.aspx.

Assessment of Operation Practices and Recommended Actions

Recognizing this incident demonstrated inadequacies in the Corps' procedures for performing this maintenance activity resulting in fish mortalities, the Corps is moving forward aggressively with the following actions:

1. Unit Dewatering. The Corps has initiated efforts to establish a Standard Operating Procedure (SOP) to minimize entrapment and reduce mortalities of fish with unit dewatering. The SOP will be completed by 31 January 2011 or prior to another dewatering procedure, whichever comes first. The SOP will provide the following considerations:

- Minimize the time interval from unit shutdown (spinning of the unit and closing of the emergency gate) to having draft tube stoplogs in place. Procedures for installation of the intake bulkhead will be reviewed to determine if the bulkhead can be installed after the tailrace stoplogs are in place, instead of before, thereby minimizing the amount of time fish have to swim back up into the draft tube.

- Minimize the time interval between placement of the draft tube stoplogs and startup of fish recovery

- Have fish biologists present throughout the fish recovery process responsible for fish handling

2. Collaborative discussions have begun with the Regional forum[9] and will continue as remediation plan details are finalized for inclusion in the Fish Passage Plan (FPP).

3. The Corps will re-evaluate timing of current generating unit tri-annual maintenance schedule to determine if that can be shifted to a time with less ESA-listed fish present, thereby minimizing the risk of fish entrapment while still meeting the requirements of flow augmentation, flood damage reduction, dissolved gas standards, and minimum generation requirements. This will also be discussed with the Regional forum.

4. The Walla Walla District has initiated efforts to establish guidance for the Project personnel, which addresses consultation, handling, and reporting requirements for situations where ESA listed species are encountered no later than 31 January 2011. Project personnel that may be involved in future unit dewatering will be briefed on the importance of protecting fish by following the new SOP.

5. The Walla Walla District will review Unit Dewatering and Fish Handling SOPs for all Walla Walla District FCRPS operating projects no later than 15 February 2011 based on the new Dworshak SOP.

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[9] The Regional Forum consists of federal, state and tribal representatives working together in collecting information, providing input, and making recommendation on a variety of matters related to the operation and maintenance of the FCRPS projects.