

RECLAMATION

Managing Water in the West

Cle Elum Dam Interim Fish Passage Operations 2008 Annual Report

**Storage Dams Fish Passage Study
Yakima Project, Washington**

Technical Series No. PN-YDFP-014



**U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Boise, Idaho**

April 2009

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The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Cover photo caption:

Adult sockeye salmon being captured for hatchery broodstock in the Okanogan River, British Columbia. Okanogan sockeye are being evaluated for reintroduction to the Yakima River Basin.

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Background

Objectives

The Bureau of Reclamation is leading a cooperative investigation with the Yakama Nation (YN), State and Federal agencies, and others, to study the feasibility of providing fish passage at the five large storage dams of the Yakima Project. These dams—Bumping, Kachess, Keechelus, Cle Elum, and Tieton—were never equipped with fish passage facilities. Four of the five reservoirs were originally natural lakes (Rimrock Lake above Tieton Dam is the exception) and historically supported Native American fisheries for sockeye salmon (*Oncorhynchus nerka*) and other anadromous and resident fish.

Implementation of passage features at the dams has the potential to reintroduce sockeye salmon to the watershed; increase populations of upper Yakima basin steelhead (*O. mykiss*), coho salmon (*O. kisutch*), and chinook salmon (*O. tshawytscha*); restore life history and genetic diversity of salmon; and reconnect isolated populations of bull trout (*Salvelinus confluentus*). Bull trout and Mid-Columbia River steelhead (of which Yakima basin steelhead are a subcomponent) are listed under the Endangered Species Act (ESA).

The scope of the Storage Dams Fish Passage Study, Yakima Project, Washington, (feasibility study) is currently limited to the study of passage features at Cle Elum and Bumping dams. Successful implementation of fish passage at Cle Elum and Bumping dams could eventually lead to future detailed study of fish passage at the other three dams (Kachess, Keechelus, and Tieton).

One component of the feasibility study is to provide interim (temporary, experimental) passage features at Cle Elum Dam to test the ability of juvenile salmonids to locate the fish passage features and successfully migrate out of the reservoir under their own volition. Uniquely marked fish will be monitored as they exit the reservoir, migrate downstream, and return as adults. The interim passage protocols use Passive Integrated Transponder (PIT) tags implanted in the test fish to monitor their movement through the system. PIT tag detectors located at Cle Elum, Roza, Prosser, McNary, and Bonneville dams will record the passage of these juveniles as they migrate downstream, and when they return as adults.

Results of these interim passage experiments over a period of 5 to 8 years will be used as one indicator of the feasibility of reintroducing anadromous fish species above the dam and reservoir.

Summary of Activities – 2005-2007

The interim fish passage flume and PIT tag detectors were constructed and tested in 2005. Drought conditions that year prevented the passage flume from being operated for a significant period of time, so no smolts were released in the lake during the spring migration period. A group of 3,000 PIT-tagged coho parr were released during the summer in the Cle Elum River, upstream of the lake.

In 2006 the YN released about 10,000 PIT-tagged coho from a net pen in Cle Elum Lake. The passage flume was operated from June 6 through July 9, 2006. Six hundred and seventeen PIT-tagged coho salmon smolts were recorded passing through the passage flume. Thirty of these fish were from the group of 3,000 coho salmon parr released in 2005. The remaining fish were from the 2006 release group.

In 2007, Yakama Nation biologists again released about 10,000 PIT-tagged coho salmon smolts into the lake from a net pen. The passage flume was operated from April 4 through July 11, 2007, allowing for 98 days of downstream passage. Four thousand five hundred and eighty-seven PIT-tagged coho salmon smolts were detected passing through the passage flume. Of these, 986 (about 20 percent of total detections) were from the coho released in 2006; the remaining fish were from the 2007 release group. Studies were also conducted to evaluate fish health and survival through the passage flume.

More detailed information on activities from 2005-2007 can be found in the following reports:

Bureau of Reclamation. 2006. *Cle Elum Dam Interim Fish Passage Operations—2006 Annual Report, Storage Dam Fish Passage Study, Yakima Project, Washington*, Technical Series No. PN-YDFP-011, 11 pp. Bureau of Reclamation. Boise, Idaho. December 2006.

Bureau of Reclamation. 2008. *Cle Elum Dam Interim Fish Passage Operations—2007 Annual Report, Storage Dam Fish Passage Study, Yakima Project, Washington*, Technical Series No. PN-YDFP-013, 14 pp. Bureau of Reclamation. Boise, Idaho. May 2008.

Interim Passage Activities in 2008

In 2008, the Yakama Nation participated in the feasibility study of fish passage at Cle Elum and Bumping Lake Dams. YN worked with the Washington Department of Fish and Wildlife (WDFW) in developing the Master Plan for reintroduction of anadromous fish above the lakes. The 2008 activities are a continuation of the work done in the previous 3 fiscal years.

Fish Releases. For the 2008 releases, YN biologists tagged approximately 12,000 coho salmon smolts with PIT tags to evaluate downstream passage and survival. The release strategy in 2008 was modified from previous years to include a new

strategy of direct releases of smolts into the upper end of the lake along with releases from the net pen. Direct releases were made so that biologists could observe the ability of fish to migrate the entire span of the lake and find the outlet works, mimicking a more natural migration condition.

In April, 5,973 tagged smolts were placed in a net pen (CLN) to be acclimated in the reservoir about ½-mile upstream from the juvenile passage facility (Figure 1). The CLN group was released from the net pen on 06/10/08. The other 5,944 smolts were released directly into the reservoir (UCL) in April to assure that sufficient numbers of “physiologically-ready” migrant smolts were present to adequately test the facility.



Figure 1. Yakama Nation biologists transfer PIT-tagged coho smolts to a net pen in Cle Elum Lake for acclimation.

Spillway operations. The forebay elevation reached the spillway crest (2,223 feet) on 06/03/08. Fish passage operations at Cle Elum Dam were initiated at 11:30 a.m. on 06/06/08 when the reservoir elevation reached 2,225.26 feet (Table 1). Flow in the spillway flume was estimated to be 43 cfs.

Table 1. Cle Elum fish passage flow and operations data for the 2008 season.

DATE TIME	CLE Q	CLE FB¹	left	center	right	H1	H2	H3	FlumeQ	24-hour average
6/6/2008 11:30	258	2225.71	7	2	7	0	0.71	0	43	
6/7/2008 0:00	293	2226.18	7	2	7	0	1.18	0	71	57
6/8/2008 0:00	324	2226.91	7	2	7	0	1.91	0	115	93
6/9/2008 0:00	368	2227.56	7	2	7	0	2.56	0	154	135
6/10/2008 0:00	372	2228.24	7	2	7	0	3.24	0	194	173
6/11/2008 0:00	402.5	2228.88	10	3	10	0	2.88	0	173	177
6/12/2008 0:00	402.5	2229.43	10	3	10	0	3.43	0	206	190
6/13/2008 0:00	398	2229.94	10	3	10	0	3.94	0	236	221
6/14/2008 0:00	402.5	2230.58	12	4	12	0	3.58	0	215	221
6/15/2008 0:00	407	2231.34	12	6	12	0	2.34	0	140	165
6/16/2008 0:00	398	2232.15	12	6	12	0	3.15	0	189	165
6/17/2008 0:00	398	2232.96	13	7	13	0	2.96	0	178	177
6/18/2008 0:00	425	2233.76	13	7	13	0	3.76	0	226	203
6/20/2008 0:00	555	2235.07	13	7	13	0	5.07	0	304	287
6/21/2008 0:00	1101	2235.50	13	7	13	0	5.5	0	330	318
6/22/2008 0:00	1115	2236.06	13	7	13	0.06	6.06	0.06	371	348
6/23/2008 0:00	819	2236.73	12	11	12	1.73	2.73	1.73	371	357
6/24/2008 0:00	758.5	2237.32	12	11	12	2.32	3.32	2.32	478	426
6/25/2008 0:00	860	2237.81	13	11	13	1.81	3.81	1.81	446	460
6/26/2008 0:00	998	2238.21	13	12	14	2.21	3.21	1.21	398	409
6/27/2008 0:00	1157	2238.52	14	12	14	1.52	3.52	1.52	394	393
6/28/2008 0:00	1592	2238.83	15	13	14	0.83	2.83	1.83	329	348
6/29/2008 0:00	2363	2239.06	15	13	14	1.06	3.06	2.06	371	354
6/30/2008 0:00	2680	2239.26	15	14	14	1.26	2.26	2.26	347	354
7/1/2008 0:00	2410	2239.50	15	14	14	1.5	2.5	2.5	390	364
7/2/2008 0:00	2372	2239.75	15	14	14	1.75	2.75	2.75	435	413
7/3/2008 0:00	2510	2239.87	15	14	14	1.87	2.87	2.87	457	451
7/4/2008 0:00	2530	2239.93	15	14	14	1.93	2.93	2.93	467	462
7/5/2008 0:00	2640	2239.86	15	14	14	1.86	2.86	2.86	455	466
7/6/2008 0:00	1985	2239.73	15	14	14	1.73	2.73	2.73	431	441
7/7/2008 0:00	1624	2239.70	15	14	14	1.7	2.7	2.7	426	425
7/8/2008 0:00	1608	2239.64	15	14	14	1.64	2.64	2.64	415	421
7/9/2008 0:00	1696	2239.51	15	14	14	1.51	2.51	2.51	392	404
7/10/2008 0:00	1850	2239.32	15	14	14	1.32	2.32	2.32	358	376
7/11/2008 0:00	2183	2239.03	15	14	14	1.03	2.03	2.03	305	336
7/12/2008 0:00	2300	2238.62	15	14	14	0.62	1.62	1.62	232	272
7/13/2008 0:00	2630	2238.00	15	14	14	0	1	1	120	184
7/14/2008 0:00	3030	2237.19	15	14	14	0	0.19	0.19	23	73
7/14/2008 5:15	3030	2237.00	15	14	14	0	0	0	0	51

¹ Average forebay elevations

The highest daily average forebay elevation during the 2008 spill period was 2,240 feet on 07/04, with 462 cfs calculated in the flume. Detections continued until 07/11 with the lake level still at 2,239 feet (16 feet above spillway crest). Although the weir and passage flume could have been operated after 07/11/08, Reclamation, in consultation with YN Fisheries staff, decided to discontinue operations due to low numbers of fish migrating (0-2 per day) and because mid-July is considered too late in the year for yearling smolt migration.

2008 PIT tag detections. In 2008, 3,072 tags were detected by the PIT tag readers. Of the tags detected in the flume, 2,021 were from the UCL group, while 1,030 were from the CLN treatment. Four of the tags detected were from coho parr released in Lake Tucquala in 2007; six tag detections were from the 2007 net pen group. An additional 11 tag detections were fish that were double-tagged in 2008. The double-tagged fish were released with the CLN group but were assigned to a separate tag file for subsequent analysis. Daily tag detections and other operational data are displayed in Figure 2.

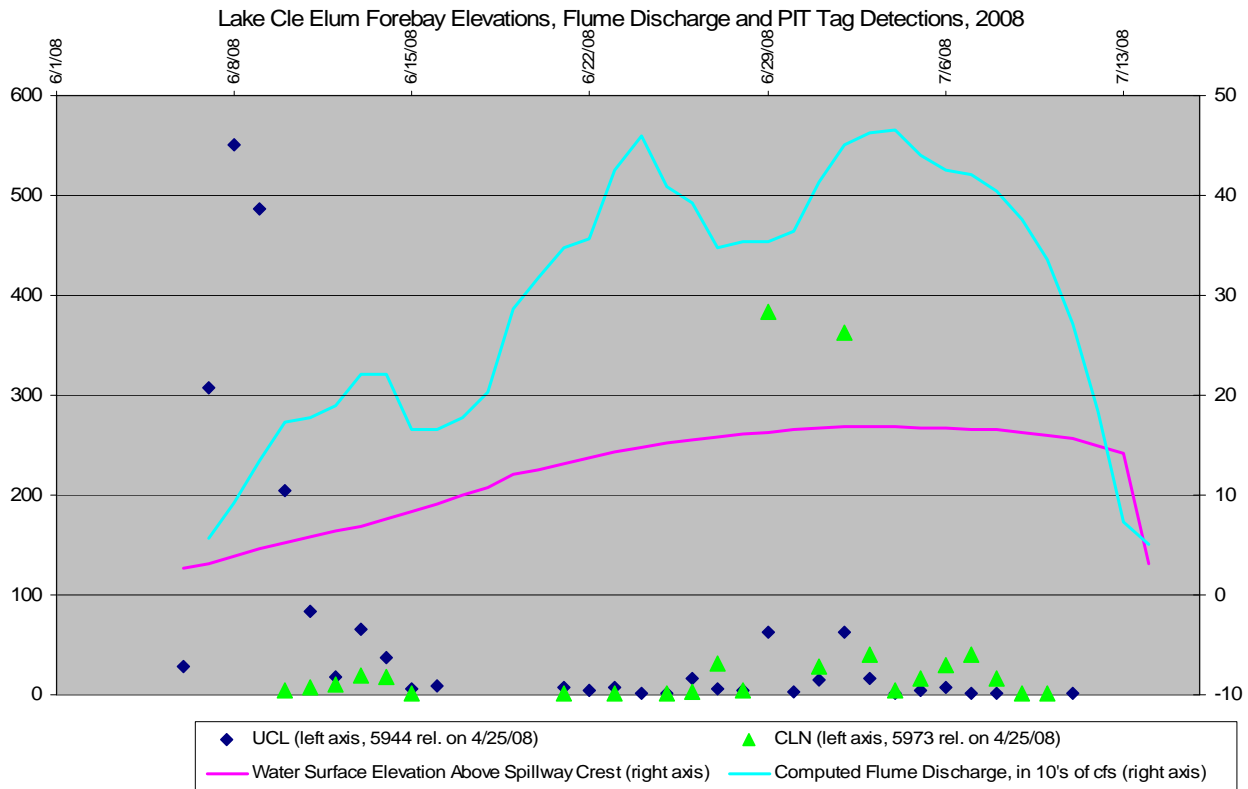


Figure 2. Cle Elum Lake forebay elevations, flume discharge, and PIT-tag detections; 2008 operations. UCL refers to fish released at the upper end of the lake; CLN were fish reared and released from the net pen.

The rate of fish passage through the flume was not closely correlated with forebay elevation or flume discharge. However, the two treatments appeared to affect migration timing. The median date of passage for UCL fish was 06/09/08. The CLN fish migrated significantly later, with a median passage date of 07/01. Biologists speculate that the UCL group migrated sooner because they had more time to travel the lake and stage near the spillway at the downstream end of the lake. In contrast, CLN group was held in the net pen and fed a hatchery ration for weeks, then released 4 days after the spillway operations commenced. It may have taken these fish more time to become oriented to the outlet of the lake or, having been well fed, perhaps fish were less inclined to migrate quickly.

PIT-tag data were not regularly reported into the database from June 16-21 due to problems with the computer and communications systems. While it is uncertain how many fish migrated out the passageway during that time period, detections of PIT tags at downstream locations, along with information about the efficiency of the PIT tag detectors at the Cle Elum flume (CLE), can provide some indication as to the total numbers of migrants passing over the dam.

Table 2 displays the numbers of fish detected at various PIT-tag readers in the Yakima and Columbia Rivers. At Prosser Dam (PRO), 844 tags were detected from 2008 releases in Cle Elum. Of those tags, 544 were detected at CLE, while 260 were not. From this one may conclude that about 31% of the tags detected at PRO were not detected at CLE.

Table 2. Numbers of fish from 2008 releases at Cle Elum that were detected at various PIT tag readers in the Columbia River Basin.

CLE	RZF	PRO	MCJ	JDJ	B2J	BCC	
2021	2	708	40	9	14	60	All detections of UCL tags.
	2	472	27	6	10	42	Downstream detections of UCL tags previously detected at CLE.
	0	236	13	3	4	18	Downstream detections of UCL tags NOT previously detected at CLE.
1030	0	136	35	7	7	44	All detections of CLN tags.
	0	112	29	6	7	40	Downstream detections of CLN tags previously detected at CLE.
	0	24	6	1	0	4	Downstream detections of CLN tags NOT previously detected at CLE.
3051	2	844	75	16	21	104	All detections of UCL and CLN tags.
	2	584	56	12	17	82	Downstream detections of UCL and CLN tags previously detected at CLE.
	0	260	19	4	4	22	Downstream detections of UCL and CLN tags NOT previously detected at CLE.
		31%	25%	25%	19%	21%	Percent of all tags not detected at CLE but detected downstream.

* CLE = Cle Elum; RZF = Roza Dam; PRO = Prosser Dam; MCJ = McNary Dam; JDJ = John Day Dam; B2J = Bonneville Dam Powerhouse 2; BCC = Bonneville Dam corner collector.

There are two PIT tag readers at CLE. Detection efficiency is estimated by comparing the numbers of tags that are detected at one reader to the number detected at both readers. Out of 3,078 total detections at CLE, 447 tags were detected only at the upstream detector, 458 only at the downstream detector, and 2,173 at both detectors. This suggests that each detector had a 15% chance of missing a tag, and both detectors had at least a 15% x 15%, or a 2.25% combined chance of missing a tag.

The total number of fish detected at CLE from CLN and UCL groups was 3,051, but 31% of the tags detected downstream at Prosser were not detected at CLE. If the detected and undetected fish had an equal probability of reaching Prosser Dam, then the numbers of migrants that went through the passage flume may have been closer to 4,421, or about 37% of the total number of fish released in 2008.

Other Activities

Parr releases. In 2008, the Yakama Nation received 500,000 surplus coho eggs from Eagle Creek Hatchery in Oregon. The Yakama Nation does not recognize eggs as surplus and acquired them. The eyed eggs were transported to Yakama Nation's Prosser Hatchery to be reared before release. In early May, 200,000 fry from the Eagle Creek group were released and in late June the remaining 300,000 fish were released as summer parr (Figure 3).



Figure 3. Yakama Nation Fisheries staff released coho parr into the upper Cle Elum River in the summer of 2008.

Snorkel surveys. Later that summer, a multiagency group of biologists conducted nighttime snorkel surveys in a number of Yakima basin tributaries to determine the presence bull trout, including areas of the upper Cle Elum River and Fortune Creek that were stocked with coho parr. Teams of two biologists moved upstream while recording the abundance of all salmonids observed. The length of the river surveyed was approximately 2 miles. Coho parr were the most abundant fish species (Table 3) in the upper Cle Elum River.

Table 3. Salmonids observed during nighttime snorkel surveys of the upper Cle Elum River, 2008.

	Rainbow Trout	Coho	Brook Trout	Cutthroat Trout
Count	225	2,188	525	9

Fiscal Year 2009 Objectives

Overview

Interim Passage at Cle Elum Dam

The immediate priority of the interim passage study is to evaluate the interim infrastructure modifications and juvenile passage efficiency at Cle Elum Dam. The proposed fiscal year 2009 activities are a continuation of the work done in the previous 4 fiscal years. In addition to the ongoing studies, experiments with sockeye salmon will be initiated and field surveys will be conducted to obtain baseline data regarding ecological conditions in the Cle Elum watershed.

In 2009, Yakama Nation biologists will tag 12,000 coho salmon smolts with PIT tags to evaluate downstream passage and survival. The 12,000 smolts will be released directly into the reservoir in March/April at the north end of the lake.

The Yakama Nation will obtain 500,000 coho juvenile for spring and summer plants for 2009. As in 2008, coho smolts/parr (250,000 fed fry in the spring and 250,000 summer parr) will be placed directly into Cle Elum Lake and into the Cle Elum River and its tributaries above the lake.

In 2009, a total of 1,000 to 2,000 (average fecundity of 2,600) pairs of adult sockeye salmon will be collected at Priest Rapids on the Columbia River and transported to Cle Elum to be placed directly in Cle Elum Lake. The trapping of these adults will occur at the earliest time of migration, when sockeye are less likely to have pathogens. Twenty-five sockeye females will be radio-tagged so they can be tracked to spawning areas.

In the summer of 2009, data will be collected from overwintering thermographs for water temperatures of streams and tributaries in the Cle Elum Lake watershed.

The YN would also like to conduct invertebrate and plankton studies to obtain baseline data for future research of the YN in this basin.

Feasibility Study of Fish Passage at Cle Elum and Bumping Lake Dams

The Yakama Nation will continue to participate in completing the feasibility study of fish passage at Cle Elum and Bumping Lake Dams and will work with the WDFW to develop a Master Plan for reintroduction and begin implementing the reintroduction of anadromous fish above the reservoirs.

Proposed Plan and Key Activities for Fiscal Year 2009

1. Manage the biological aspects of interim passage as the lead fisheries agency.
2. Develop monitoring and evaluation plans for interim passage activities.
3. Provide technical review of the interim passage facility including overall performance and fish health concerns.
4. Obtain hatchery coho salmon smolts, mark with PIT tags, acclimate 6,000 in net pen and release 6,000 directly into head of Cle Elum Lake.
5. Release coho salmon fry (spring) and parr (summer) into Cle Elum Lake and in rivers, streams, and tributaries above the Lake.
6. Collect data, including biological and environmental data from the release groups and the Cle Elum River watershed.
7. Retrieve and interpret all available data from PTAGIS.
8. Assist Reclamation with producing an overall annual report on interim passage activities.
9. Participate in Storage Dams Fish Passage Core Team meetings.
10. Review and comment on reports produced by Reclamation staff and other team members.
11. Work with WDFW and the U.S. Forest Service to finalize a Master Plan for SEPA/NEPA reintroduction of fish above Cle Elum and Bumping Lake Dams.
12. Attend Yakima Basin Aquatic Management and Science Conference and report on Storage Dams Fish Passage Study activities.
13. Obtain 500,000 coho eggs and set up and implement the taking and rearing of sockeye or reintroduction.

Budget for Fiscal Year 2009

Table 4. Fiscal year 2009 budget

Item	Estimated Cost
Biologist 20-A	\$36,530.00
Fringe Benefits @ 21%	7,671.00
Total labor	\$44,201.00
Truck rental	\$2,388.00
Mileage	7,373.00
Misc. small tools, supplies, and equipment	710.39
Indirect costs @18.89%	\$10,327.61
Total fiscal year 2009 budget	\$65,000.00