

RECLAMATION

Managing Water in the West

Cle Elum Dam Interim Fish Passage Operations 2009 Annual Report

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

Technical Series No. PN-YDFP-015



**U.S. Department of the Interior
Bureau of Reclamation
Columbia-Cascades Area Office
Yakima, Washington**

December 2010

The mission of the U.S. Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

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.

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Background

Objectives

The Bureau of Reclamation is participating in 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.

Constructing fish passage facilities at the dams would create the potential for: the reintroduction of sockeye salmon to the watershed; increasing populations of upper Yakima basin steelhead (*O. mykiss*), coho salmon (*O. kisutch*), and chinook salmon (*O. tshawytscha*); restoring the life history and genetic diversity of salmon and other fishes such as lamprey and bull trout. Fish passage at the storage dams is being considered for recovery of species 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 – 2005-2008

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.

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. The CLN group was released from the net pen on June 10, 2008. 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.

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.

More detailed information on activities from 2005-2008 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.

Bureau of Reclamation. 2009. *Cle Elum Dam Interim Fish Passage Operations 2008 Annual Report, Storage Dams Fish Passage Study, Yakima Project, Washington. Technical Series No. PN-YDFP-014, 10 pp.* Bureau of Reclamation. Boise, Idaho. April 2009.

Interim Passage Activities in 2009

In 2009, 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 2009 activities are a continuation of the work done in the previous 4 fiscal years.

Juvenile coho salmon releases. For the 2009 releases, YN biologists tagged approximately 11,934 coho salmon smolts with PIT tags to evaluate downstream passage and survival. Fish were released from a truck directly in to the Cle Elum River upstream of the reservoir.

Table 1. Cle Elum fish passage flow and operations data for the 2009 season

		Cle Elum Fish Passage Operations 2009									
									Daily Average		
DATE TIME	CLE	GH	CLE	Q	CLE	FB	left	center	right	FlumeQ	
4/30/2009 0:00		5.36		276		2224.87		5	0.5	5	82.2
5/1/2009 0:00		5.36		277		2225.17		5	0.5	5	100.2
5/2/2009 0:00		5.36		278		2225.55		5	0.5	5	123
5/3/2009 0:00		5.35		275		2225.95		5	0.5	5	147
5/4/2009 0:00		5.39		290		2226.46		5	0.5	5	177.6
5/5/2009 0:00		5.43		306		2227.09		5	0.5	5	215.4
5/6/2009 0:00		5.43		307		2227.81		7	2.5	7	138.6
5/7/2009 0:00		5.43		308		2228.52		7	2.5	7	181.2
5/8/2009 0:00		5.44		317		2229.11		9	4	9	126.6
5/9/2009 0:00		5.42		313		2229.66		9	4	9	159.6
5/10/2009 0:00		5.52		358		2230.19		9	4	9	191.4
5/11/2009 0:00		5.53		367		2230.86		9	5	9	171.6
5/12/2009 0:00		5.54		375		2231.58		9	5	9	214.8
5/13/2009 0:00		5.62		416		2232.21		8	7	8	277.8
5/14/2009 0:00		5.74		476		2232.76		8	7	8	376.8
5/15/2009 0:00		6.02		618		2233.2		9	7	8	396
5/16/2009 0:00		6.48		877		2233.52		9	8	9	333.6
5/17/2009 0:00		6.71		1025		2234.03		9	8	9	425.4
5/18/2009 0:00		7.18		1363		2234.83		10	9	10	389.4
5/19/2009 0:00		7.69		1784		2235.68		11	10	11	362.4
5/20/2009 0:00		7.83		1922		2236.06		12	10	12	310.8
5/21/2009 0:00		7.87		1970		2236.2		12	10	12	336
5/22/2009 0:00		7.8		1918		2236.4		12	12	12	252
5/23/2009 0:00		7.81		1939		2236.7		12	12	12	306
5/24/2009 0:00		7.87		2004		2237.16		13	12	13	268.8
5/25/2009 0:00		7.96		2097		2237.63		13	12	13	353.4
5/26/2009 0:00		8.07		2207		2238.03		14	12	14	305.4
5/27/2009 0:00		8.23		2363		2238.28		14	12	14	350.4
5/28/2009 0:00		8.37		2500		2238.5		14	13	14	330
5/29/2009 0:00		8.47		2600		2238.93		14	14	14	347.4
5/30/2009 0:00		9.04		3178		2239.37		14	14	14	426.6
5/31/2009 0:00		9.6		3808		2239.44		14	14	14	439.2
6/1/2009 0:00		9.5		3688		2239.46		14	14	14	442.8
6/2/2009 0:00		9.39		3563		2239.5		14	14	14	450
6/3/2009 0:00		9.36		3530		2239.46		14	14	14	442.8
6/4/2009 0:00		9.12		3266		2239.47		14	14	14	444.6
6/5/2009 0:00		8.97		3101		2239.63		14	14	14	473.4
6/6/2009 0:00		9.08		3222		2239.8		14	14	14	504
6/7/2009 0:00		9.05		3189		2239.68		14	14	14	482.4
6/8/2009 0:00		8.56		2690		2239.6		14	14	14	468
6/9/2009 0:00		8.23		2363		2239.61		14	14	14	469.8
6/10/2009 0:00		8.11		2255		2239.65		14	14	14	477
6/11/2009 0:00		8.05		2201		2239.74		14	14	14	493.2
6/12/2009 0:00		8.07		2219		2239.79		14	14	14	502.2
6/13/2009 0:00		8.12		2264		2239.9		14	14	14	522
6/14/2009 0:00		8.31		2440		2239.88		14	14	14	518.4
6/15/2009 0:00		8.14		2282		2239.88		14	14	14	518.4
6/16/2009 0:00		8		2155		2239.89		14	14	14	520.2

6/17/2009 0:00	7.82	1992	2239.86	14	14	14	514.8
6/18/2009 0:00	7.54	1741	2239.87	14	14	14	516.6
6/19/2009 0:00	7.34	1580	2239.91	14	14	14	523.8
6/20/2009 0:00	7.29	1539	2239.92	14	14	14	525.6
6/21/2009 0:00	7.24	1498	2239.89	14	14	14	520.2
6/22/2009 0:00	7.01	1319	2239.86	14	14	14	514.8
6/23/2009 0:00	6.84	1199	2239.81	14	14	14	505.8
6/24/2009 0:00	6.86	1212	2239.72	14	14	14	489.6
6/25/2009 0:00	7.22	1478	2239.54	14	14	14	457.2
6/26/2009 0:00	7.43	1645	2239.28				0
data prepared by Teresa Hauser, Yakima Field Office							

Spillway operations. The water surface elevation of Cle Elum Reservoir reached the spillway crest (2,223 feet) on April 26, 2009. Fish passage operations at Cle Elum Dam were initiated at 11:30 a.m. on April 30 when the reservoir elevation reached 2,224.7 feet (Table 1). Flow in the spillway flume was estimated to be 82 cfs.

The highest daily average forebay elevation during the 2008 spill period was 2,239.91 feet on June 20, with 526 cfs calculated in the flume. Spillway operations ceased on June 25, when the forebay elevation fell below the crest of the weir boards. Although the weir and passage flume could have been operated after June 25, Reclamation, in consultation with YN Fisheries staff, decided to discontinue operations due to low numbers of fish migrating and because the timing was becoming late in the season for yearling smolt migration.

2009 Pit-tag detections. In 2009, a total of 316 tags were detected by the PIT-tag readers. Of the tags detected in the flume, 193 were from fish released in the spring of 2009, while 123 came from fish that were released in the spring of 2008. Daily tag detections and other operational data are displayed in Figure 1.

Table 4 show PIT-tag detections of fish released at Cle Elum and other monitoring sites in the Yakima and Columbia Rivers. Only three tags were detected downstream that were not detected at Cle Elum (Table 4). Detection efficiency at Cle Elum was high, over 98%.

The mean dates of passage from the 2009 juvenile releases at Cle Elum and Prosser were June 15 and June 23, respectively; the median dates of passage at these sites were June 14 and June 20. Although fish were able to migrate throughout May, most migration for 2009 fish occurred in June. Although these statistics were not calculated for the fish released in 2008 that migrated in 2009, they appeared to migrate earlier overall.

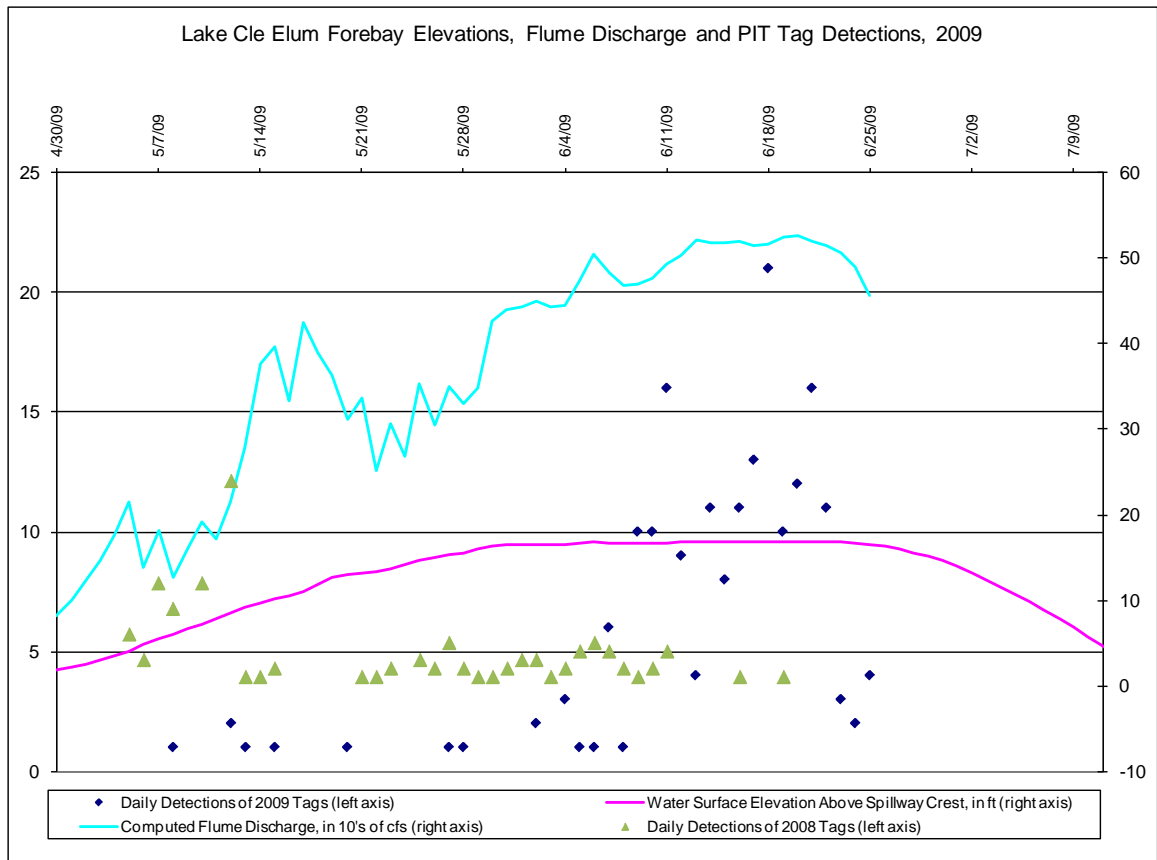


Figure 1. Cle Elum Lake forebay elevations, flume discharge, and PIT-tag detections; 2009 operations

Table 2. Detections at CLE OR anywhere else (including detections of the same tags at multiple sites)

2009 tags								
tag file id	CLE	RZF	PRO	MCJ	JDJ	B2J	BCC	TOTAL
DTL09062.CL1	79		8	1	4	1	2	
DTL09062.CL2	114		11	6	2	1	1	
	193		19	7	6	2	3	230
2008 tags								
tag file id	CLE	RZF	PRO	MCJ	JDJ	B2J	BCC	TOTAL
DTL08084.CLN	108	1	6	8	3		7	
DTL08084.UCL	15			4	1		1	
	123		6	12	4	0	8	153

Table 3. Detections at CLE AND anywhere else

2009 tags								
tag file id	CLE	RZF	PRO	MCJ	JDJ	B2J	BCC	TOTAL
DTL09062.CL1			8		4	1	2	
DTL09062.CL2			10	6	2		1	
			18	6	6	1	3	34
2008 tags								
tag file id	CLE	RZF	PRO	MCJ	JDJ	B2J	BCC	TOTAL
DTL08084.CLN		1	5	7	2		6	
DTL08084.UCL				3	1			
			5	10	3	0	6	24

Table 4. Detections from other PIT-tag readers that were NOT detected at CLE

2009 tags								
tag file id	CLE	RZF	PRO	MCJ	JDJ	B2J	BCC	TOTAL
DTL09062.CL1				1				
DTL09062.CL2			1			1		
			1	1		1		3

* 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.