2010 Juvenile Fish Collection and Bypass Report
McNary Dam Juvenile Fish Facility

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Summary

The following report is the annual summary of the juvenile fish collection and bypass program at McNary Lock and Dam in Umatilla, Oregon. It is composed of information gleaned mostly from the 44 weekly reports of the McNary staff biologists and from the Pacific States Maritime Fisheries Commission (PSMFS) annual McNary fish transport report. Questions or comments about this report should be directed to Carl R. Dugger, the Supervisory Fisheries Biologist (541-922-2263; carl.r.dugger@usace.army.mil), or Bobby Johnson, the Fisheries Biologist (541-922-2212; bobby.johnson@usace.army.mil).

Introduction

McNary Dam, located at River Mile 292 of the Columbia River, is the first hydroelectric project downstream of the confluence of the Snake and Columbia Rivers. The dam is 7,365 feet long, and rises approximately 183 feet above the riverbed. It consists of a 14 turbine unit powerhouse, a 22 bay spillway, a navigation lock, and an earthfill embankment at the Oregon (south) abutment. The dam raises the normal water surface about 85 feet creating Lake Wallula, which extends 64 miles upstream to the Hanford Reach on the Columbia River and to Ice Harbor Dam on the Snake River. Lake Wallula has a water surface area of 38,800 acres with 242 miles of shoreline.[i]

The McNary powerhouse has extended-length submersible bar screens (ESBS's) that guide fish into the gatewells of each turbine unit. There are three vertical gatewell slots (A, B, and C) for each turbine unit. From the gatewells, water and fish enter the collection channel through 12-inch diameter orifices. The channel leads to a wet separator at the juvenile fish facility (JFF) for separation of fish by size and return of adults to the river. Staff can route the juvenile fish back to the river or hold them in raceways for transport by barge or truck to release locations below Bonneville Dam.[ii]

Staff conducted the usual juvenile fish transportation and bypass operations at the McNary Dam Juvenile Fish Facility (JFF) in 2010. They re-watered the system with primary bypass beginning on April 1. Secondary bypass resumed on April 6. The spring bypass season operated with alternating days of primary and secondary bypass, where the facility returned all fish to the river. This concluded as collection for barge transport began on July 15 at 0700 hours.

The project began daily trucking on September 10, to help avoid primary bypass at night for shad. Staff trucked daily until September 22, when the project returned to every other day trucking due to low smolt numbers. The last truck ran on October 1, and the facility switched to fall primary bypass.

For the 2010 season, staff collected 4,331,732 smolts, which were about 14% more than in 2009 (3,784,658) and almost double those collected in 2008 (2,395,116). Of those collected in 2010, staff trucked 146,824, barged 300,428 and bypassed 3,874,439. There were 10,041 mortalities.

Pacific States Maritime Fisheries Commission (PSMFC) technicians examined 3,788 fish for gas bubble trauma (GBT) in 2010. They conducted examinations once a week from April 1 through August 31 to encompass the duration of the spill season. The bypass numbers include only those GBT fish examined during the transportation season.

The passive integrated transponder (PIT) tag system detected 65,073 PIT tagged fish coming through the JFF from April 1 to October 1, of which 47,110 were diverted to the river or failed to be detected moving to the raceways, the sample, or the exits. None of these 65,073 PIT tagged fish are included in the bypass numbers.

This season's total collection by species group included: 1,224,094 yearling Chinook, 1,951,233 subyearling Chinook, 198,382 clipped steelhead, 61,658 unclipped steelhead, 2,600 clipped sockeye, 846,320 unclipped sockeye and 47,445 coho. Full powerhouse screening and bypass operations continued through November 23, 2010.

Juvenile hatchery Chinook salmon, hatchery coho salmon, and hatchery steelhead in the Snake River Basin are normally designated by fin clips, usually the adipose fin but occasionally one of the pectoral or ventral fins. Before 1998, Idaho Fish and Game (IDFG) was the only agency that released sizeable numbers of unclipped hatchery fish. Starting in 1998, increasing numbers of unclipped hatchery fish were released by state, federal, tribal, or other agencies (FPC). Therefore the reported clipped/unclipped fish collected, sampled, bypassed, and transported no longer represent hatchery/wild origins of these fish. As of the 2005 report, juvenile salmonids are designated as clipped/unclipped not hatchery/wild. Coho were reintroduced by the tribes and if clipped or not they are all hatchery progeny.

Corps of Engineers personnel included: supervisory biologist Brad Eby, assistant biologist Bobby Johnson, who was later acting supervisory biologist after Mr. Eby retired, biological technicians: Charlie Dennis, Kurt Hubbard, Michael Berger, James Davis, and Andrew Pomiak and truck driver / maintenance personnel: Ken LePage and Alan Schoblom. Carl Dugger assumed supervisory responsibilities on November 8. Representing PSMFC was biologist Rosanna L. Mensik.

River Conditions

River flows in April and May 2010 were lower than the 2006-2009 average but were similar for the remainder of the season (Table 1). A peak hourly flow of 395.7 kcfs was recorded on June 12 while a minimum hourly flow of 54.2 kcfs occurred on September 6. The highest average flow day during the 2010 fish collection season was June 11 with an hourly average of 392.6kcfs. The minimum average daily flow of 59.6 kcfs was recorded September 20 (Figure 1). Court ordered summer spill implementation plan began at midnight on April 10 with 40% of the flow going through spill bays to improve fish passage. June 20 through August 31, the spill bays

passed 50% of the flow. The peak hourly spill of 230.0 kcfs occurred on June 11. Maximum average daily spill occurred on June 11 with an hourly average spill of 229.9 kcfs.

In the Biological Opinion for the Columbia River, NOAA Fisheries set minimum flow targets at McNary Dam to aid in salmonid migration. The flow target for April 20 through June 30 was 220-260 kcfs. The average seasonal flow for this period was 241.5 kcfs with the average flows meeting the standard 34 of 72 days. The peak daily flow average for this period was 392.6 kcfs on June 11. From July 1 through August 31, the target was 200 kcfs. The average seasonal flows for this period were 156.9 kcfs with the average flows meeting the standard 12 of 62 days. The peak daily flow for this period was 296.6 kcfs on July 1.

Table 1: Average monthly flow and spill at McNary Dam, 2006-2010.

Month	2006	2007	2008	2009	2010	2006 -2009 Average
Flows (kcfs)						
Apr	287.5	226.6	154.1	213.0	120.2	197.0
May	337.5	266.4	295.6	263.5	195.3	273.7
Jun	319.0	223.0	359.0	286.3	318.5	304.9
Jul	190.1	178.7	215.4	167.5	190.2	194.1
Aug	144.7	147.3	134.3	119.0	124.0	137.6
Sep	91.7	85.9	85.8	79.3	81.6	85.7
Oct	---	---	---	---	---	---
Nov	---	---	---	---	---	---
Dec	---	---	---	---	---	---
Spill (kcfs)						
Apr	136.6	80.8	45.0	68.4	36.0	72.2
May	165.3	106.6	143.7	113.5	78.5	123.5
Jun	160.4	94.9	191.2	134.5	156.0	151.1
Jul	93.6	91.6	109.1	84.2	95.0	97.4
Aug	72.7	72.0	65.5	57.6	61.4	67.9
Sep	1.1	2.9	1.4	1.4	1.1	1.7
Oct	---	---	---	---	---	---
Nov	---	---	---	---	---	---
Dec	---	---	---	---	---	---

--- Seasons varied in length but average daily flows were recorded through the end of September.

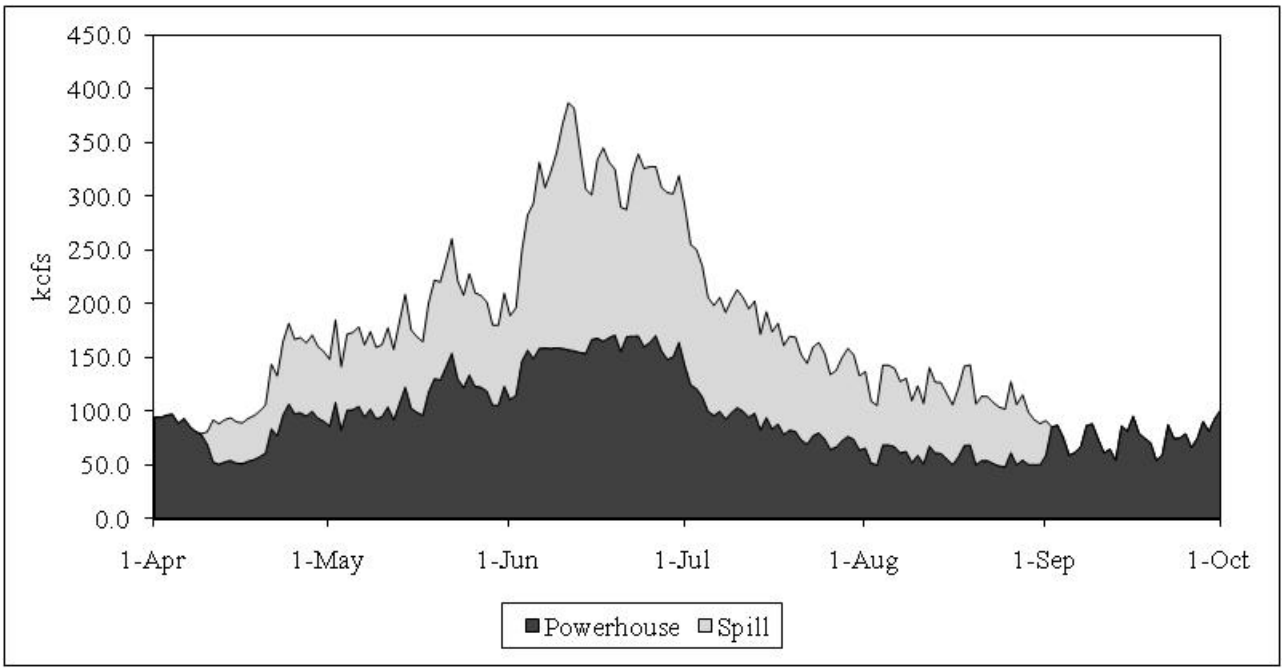

Figure 1. Average Columbia River flow and spill at McNary Dam, 2010.

Fish Collection

Migration and Collection

Staff collected juvenile fish during the spring at McNary Dam and bypassed them back to the river through the juvenile fish transportation facility (secondary bypass) or directly to the tailrace without passing through the fish facility (primary bypass). PIT tag detection is possible in either primary or secondary bypass mode. The JFF can also pass fish through the emergency bypass system (flow is discharged through the north end of the ice/trash sluiceway), but there are no PIT tag detectors in that system. Secondary and primary bypass took place on alternate days, through much of the season, to allow the Smolt Monitoring Program to sample fish. Staff continued this mode of operation from April 6 through July 15. On July 15, staff began collection for continuous transportation.

Staff ceased transportation collection on October 1, at 0700 hours when the JFF resumed primary bypass.

With the continued increase in numbers of unmarked hatchery origin juvenile salmonids and different mark and release strategies employed by agencies and organizations within the basin, it is no longer possible to accurately differentiate between unmarked wild/naturally produced and unmarked hatchery origin juveniles. Staff recorded these fish as clipped or unclipped in the daily sampling.

The JFF collected an estimated 4,331,732 juvenile salmonids at McNary Dam this season (Table 2, below). Composition by species in 2010: 1,224,094 yearling Chinook, 1,951,233 subyearling Chinook, 198,382 clipped steelhead, 61,658 unclipped steelhead, 2,600 clipped sockeye, 846,320

Table 2. Annual collection, bypass, and transport at McNary Dam, 2006-2010[1].								
Year[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Collection								
2006	830,058	2,101,866	169,696	60,746	4,163	248,956	47,853	3,463,338
2007	1,316,847	2,400,542	158,928	63,794	6,255	298,206	58,662	4,303,234
2008	752,385	1,184,811	210,156	66,779	5,250	97,060	78,675	2,395,116
2009	1,303,737	1,836,921	359,391	108,349	13,746	92,629	69,885	3,784,658
2010	1,224,094	1,951,233	198,382	61,658	2,600	846,320	47,445	4,331,732
Bypass								
2006	828,856	1,090,008	169,520	60,694	4,149	247,551	47,736	2,448,514
2007	1,315,873	2,361,740	158,606	63,698	6,245	297,694	58,647	4,262,503
2008	751,376	750,490	209,901	66,714	5,154	96,851	78,558	1,959,044
2009	1,301,926	1,353,698	359,208	108,279	13,703	92,149	69,356	3,298,319
2010	1,222,563	1,496,969	198,186	61,542	2,598	845,306	47,275	3,874,439
Truck								
2006	1	14,946	5	0	0	103	0	15,055
2007	0	35,898	15	5	0	15	0	35,933
2008	11	75,708	0	0	5	31	5	75,760
2009	0	32,815	0	4	0	34	15	32,868
2010	0	146,694	0	10	0	80	40	146,824
Barge								
2006	326	988,885	40	29	10	928	100	990,318
2007	0	0	0	0	0	0	0	0
2008	164	349,594	40	15	80	40	50	349,983
2009	196	414,822	65	9	43	382	448	415,965
2010	173	299,909	56	30	0	190	70	300,428
Total Transported								
2006	327	1,003,831	45	29	10	1,031	100	1,005,373
2007	0	35,898	15	5	0	15	0	35,933
2008	175	425,302	40	15	85	71	55	425,743
2009	196	447,637	65	13	43	416	463	448,833
2010	173	446,603	56	40	0	270	110	447,252
[1]Seasons varied in length.								

unclipped sockeye and 47,445 coho. Collection totals do not include fish passage during emergency or primary bypass operations. They also do not include extra fish that staff collected and sampled for tagging on the extra days when the facility was to be in primary bypass. Peak collection occurred on May 29 with a daily total collection of 253,134. Peak collection dates and daily collection totals by species group were: May 21 yearling Chinook (164,219), June 26 subyearling Chinook (195,163), May 5 clipped steelhead (27,816), May 5 unclipped steelhead (6,907), May 11 clipped sockeye/kokanee (500), May 29 unclipped sockeye/kokanee (223,329), and June 2 coho (5,201) (Table 3, below).

Adult Fallbacks

The JFF bypassed a total of 2,569 adult salmonids from the separator to the tailrace in 2010 (Table 4). The composition of adult salmonids that fell back through the system and are released from the McNary juvenile fish separator included: 366 adult Chinook, 200 jack Chinook, 876

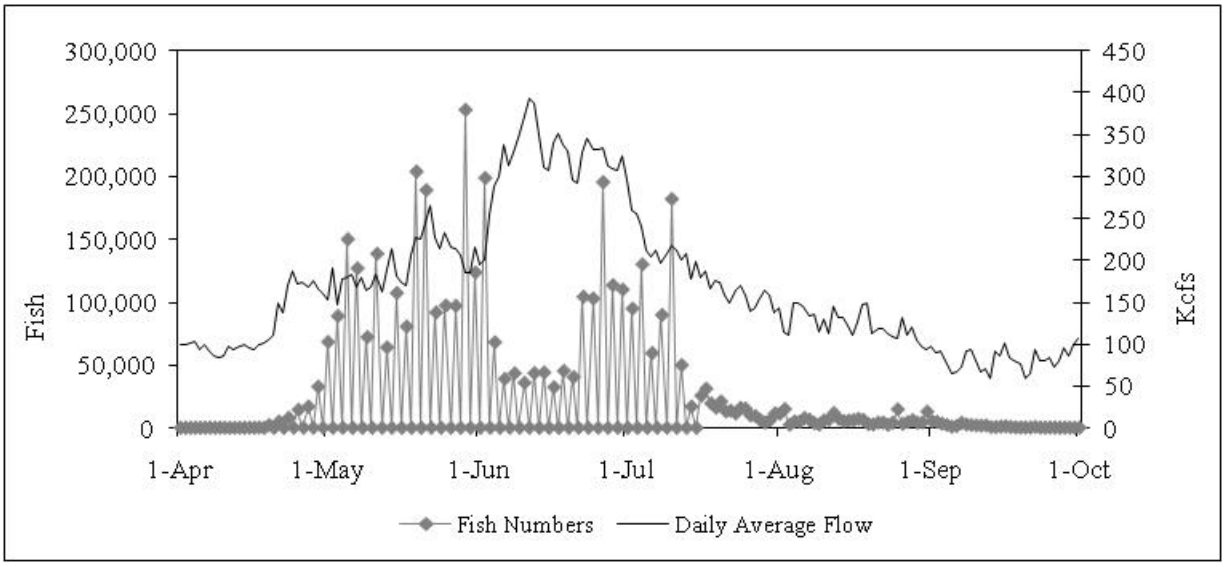

Figure 2. Daily juvenile salmonid collection all species vs. daily average flow at McNary Dam, 2010.

Table 3. Annual peak collection days at McNary Dam, 2006-2010.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2006	Apr 21	July 7	Apr 23	Apr 23	May 9	May 17	May 27	July 7
	(76,704)	(274,621)	(26,707)	(5,500)	(550)	(25,401)	(8,700)	(274,621)
2007	May 9	July 12	May 9	May 9	May 23	May 19	May 21	July 12
	(143,448)	(299,001)	(25,233)	(11,311)	(1,100)	(43,468)	(5,300)	(299,201)
2008	May 19	July 6	May 9	May 13	May 17	May 25	May 29	May 13
	(81,120)	(98,308)	(30,810)	(7,603)	(1,000)	(27,721)	(11,903)	(119,060)
2009	May 19	June 24	May 7	May 7	May 19	May 19	May 23	May 19
	(144,417)	(87,710)	(52,407)	(12,202)	(3,100)	(8,407)	(10,205)	(183,851)
2010	May 21	June 26	May 5	May 5	May 11	May 29	June 2	May 29
	(164,219)	(195,163)	(27,816)	(6,907)	(500)	(223,329)	(5,201)	(253,134)

clipped steelhead, 1,008 unclipped steelhead, 101 sockeye and 18 coho. In 2010, peak fallback activity occurred in September (1,386, Table 5). In previous years peak fallback activity occurred in September and October. Counts of adult fallbacks at McNary ended Sept 30 in 2010, Sept 30 in 2009, Sept 24 in 2008, Sept 13 in 2007 and Sept 14 in 2006.

Staff collected and examined all salmonid fallbacks for condition and ranked them using a standard protocol (Table 6). Overall, staff classified 86.5% of the fish examined as in good

Table 4. Annual totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2006-2010.[1]

Year[1]	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Total
2006	347	40	425	481	37	3	1,333
2007	178	73	543	389	11	9	1,203
2008	239	245	516	566	98	20	1,684
2009	456	785	2,054	1,610	131	96	5,132
2010	366	200	876	1,008	101	18	2,569

[1]Seasons varied in length. See text.

Table 5. Monthly totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2010.

Month	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Total
April	29	1	55	151	0	0	236
May	60	17	119	214	0	0	410
June	30	5	14	59	16	0	124
July	11	6	36	51	82	0	186
August	8	5	107	105	2	0	227
September	228	166	545	428	1	18	1,386
Total	366	200	876	1,008	101	18	2,569

condition, the same as in 2009 (92.4% were good/fair). The percentage of each species group that were in good condition: adult Chinook 89.9%, jack Chinook 95.5%, clipped steelhead 89.4%, unclipped steelhead 82.6%, sockeye/kokanee 71.3% and coho 72.2%. During the course of the season, staff recovered two adult salmonid mortalities, a clipped steelhead and a jack Chinook, from the walkway grating in the juvenile collection channel.

Table 6. Condition of adult salmonids released from the juvenile fish separator at McNary Dam, 2010.

Condition	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Total
Good	329	191	783	833	72	13	2,221
Fair	13	8	40	83	7	3	154
Poor	13	1	37	74	19	2	146
Dead	11	0	16	18	3	0	48
Total	366	200	876	1,008	101	18	2,569

Due to delays in fish screen removals, staff did not dewater the emergency bypass channel until December 29. They observed approximately 150-200 adult steelhead and dozens of Chinook smolts. Staff moved these fish from the collection channel to the tailrace through the emergency bypass route.

Separator Efficiency

In addition to separating adult fish from juvenile fish, the separator at the McNary JFF is designed to separate smaller juvenile salmonids (Chinook, coho and sockeye) from the larger individuals (steelhead), which are more aggressive in raceways and barges. This is intended to reduce stress from inter-species aggression that may result from holding different sized juveniles together in the same raceway. Separator efficiency is defined as the percentage of a group in the sample that was collected in the desired location.

Separator efficiency by species in 2010: yearling Chinook 63.5%, subyearling Chinook 64.8%, clipped steelhead 87.1%, unclipped steelhead 68.1%, sockeye 27.5% and coho 24.5% (Table 7). As in past years, sockeye and coho were the least efficiently separated species where over 70% exited from the "B" side or large fish side of the separator.

Table 7. Annual separator efficiency in % at McNary Dam, 2006-2010.

	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho
Year	A-side	A-side	B-side	B-side	A-side	A-side
2006	54.5	65.7	77.2	58.2	18.4	24.3
2007	67.6	69.4	68.3	51.9	20.9	31.5
2008	59.0	58.5	72.3	60.3	24.5	26.3
2009	48.9	53.0	83.6	64.9	17.0	20.5
2010	63.5	64.8	87.1	68.1	27.5	24.5

Sampling

On April 6, personnel collected the first sample during secondary bypass. The JFF bypassed 110 smolts for report week six and 289 smolts for report week seven. Staff sampled a total of 91,126 juvenile salmonids (2.1% of the total collection) in 2010. Sample percentages by species group were: yearling Chinook 1.6%, subyearling Chinook 2.9%, clipped steelhead 2.0%, unclipped steelhead 1.7%, clipped sockeye 1.4%, unclipped sockeye 1.2% and coho 1.4% (Table 8).

Table 8. Annual percentage of total juvenile salmonids collected that were sampled at McNary Dam, 2006-2010.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2006	1.7	3.7	1.7	2.4	1.9	2.0	2.8	3.0
2007	1.7	2.5	1.7	2.1	1.5	1.7	1.8	2.1
2008	3.2	4.4	3.6	3.4	2.2	2.5	2.5	3.8
2009	1.5	3.3	1.7	2.2	1.3	1.8	2.0	2.4
2010	1.6	2.9	2.0	1.7	1.4	1.2	1.4	2.1

Staff elevated the daily sample rate during the NOAA light study (Monday, Tuesday and Wednesday May 3 – July 15) to provide sufficient numbers of yearling Chinook, subyearling Chinook, steelhead, coho and sockeye for tagging (14,642). Staff did not include these numbers in the totals. Sample rates ranged from a low of 1.0%, during the peak of the spring migration,

to a high of 20.0% at the end of the season (Table 9, below).

Table 9. Weekly sample rates in % and sample totals at McNary Dam, 2010.

Week Ending	Weekly Rate (%)[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 1	0.0%	0	0	0	0	0	0	0	0
Apr 8	10.0%	2	0	0	9	0	0	0	11
Apr 15	16.3%	26	4	0	16	0	1	0	47
Apr 22	19.7%	683	3	655	46	0	12	32	1,431
Apr 29	3.5%	1,599	8	510	130	0	166	71	2,484
May 6	2.0%	3,845	5	1,078	303	5	887	20	6,143
May 13	1.5%	3,942	10	861	167	16	972	72	6,040
May 20	1.5%	4,332	30	295	85	3	1,177	35	5,957
May 27	1.2%	3,927	127	344	187	6	1,004	127	5,722
Jun 3	1.0%	654	94	86	51	3	4,754	111	5,753
Jun 10	1.0%	434	536	87	36	2	643	110	1,848
Jun 17	1.0%	40	945	21	10	0	135	30	1,181
Jun 24	1.0%	37	2,814	3	4	0	41	21	2,920
Jul 1	1.0%	9	4,166	0	3	1	7	2	4,188
Jul 8	1.2%	3	4,628	2	0	0	2	2	4,637
Jul 15	1.0%	1	2,482	1	0	0	3	0	2,487
Jul 22	2.7%	4	3,736	1	0	0	0	0	3,741
Jul 29	5.0%	2	3,581	0	1	0	7	2	3,593
Aug 5	10.0%	1	5,565	0	1	0	2	2	5,571
Aug 12	10.0%	0	4,453	0	0	0	4	3	4,460
Aug 19	10.0%	0	4,034	1	0	0	3	2	4,040
Aug 26	19.2%	0	6,749	0	0	0	4	0	6,753
Sep. 2	19.9%	0	8,251	0	0	0	1	0	8,252
Sep 9	12.0%	0	1,974	0	0	0	1	0	1,975
Sep 16	13.2%	0	1,151	0	1	0	0	0	1,152
Sep 23	20.0%	0	534	0	0	0	1	0	535
Sep 30	20.0%	0	179	0	0	0	0	0	179
Oct 7 [2]	20.0%	0	26	0	0	0	0	0	26
Total Sampled		19,541	56,085	3,945	1,050	36	9,827	642	91,126
% of Sample		21.4%	61.5%	4.3%	1.2%	0.0%	10.8%	0.7%	100.0%
% of Collection		1.6%	2.9%	2.0%	1.7%	1.4%	1.2%	1.4%	2.1%

Note: Collection and sampling conducted every-other-day from April 8 – July 15.
[1] Fish sampled/fish collected x100.
[2] (One day only.)

Transportation

Staff transported an estimated 447,252 juvenile salmonids (10.3% of the total collection) from McNary in 2010 (Table 2). The percentage of species transported from their respective collection totals ranged from 0.0% for clipped sockeye to 22.9% for subyearling Chinook. Barges transported fish from the McNary JFF to below Bonneville Dam from July 15 through August 17. Crews barged 300,428 juvenile salmonids, representing 6.9% of the total collection and 67.2% of all transported salmonids. Staff transported fish by truck from August 18 through October 1. They trucked 146,824 fish, representing 3.4% of the total collection and 32.8% of all transported salmonids. The majority of transported fish, 446,603 or 99.9%, were subyearling

Chinook. As flows increased in June during rain storms, juvenile lamprey out migration picked up, with a high count of 189,300 bypassed on June 10.

On July 15 at 0700, barge transport began as staff ended the spring bypass season. PIT tag detection had occurred in the full flow pipe during primary bypass and throughout the facility during secondary bypass. With transport season beginning, staff turned off and closed the primary (A and B) PIT tag slide gates, which provide a better bypass route for PIT tagged fish as the return to river lines. Staff tested, maintained, and activated these. This system then rerouted the PIT tagged fish directly to the river.

At first staff only monitored smolts on secondary bypass days; now they monitored them daily. When collection began, staff closed the secondary (C and D) PIT/bypass gates, which had been off and open for the bypass season. These gates remained off as there are no studies requiring them this year. Staff turned off or on the sample gates, which continued to function well, at 0700 hours each day. Staff had turned them off so that they only functioned during secondary bypass, including the extra sampling days for the NMFS light study. For transport collection, the sample gates remained on. When the extra samples occur, Corps data only includes adult fallback counts for that day.

On July 11, for two power outages due to a Transmission Line 1 outage, the system stayed in secondary bypass but the sample gates were off for a total of 4.4 hours. The power outages totaled at total of 1.8 hours. Staff delayed the first outage because transmission line and Unit 1 were needed due to unit outages at Grande Coulee dam, resulting in the sample gates being off longer than anticipated. These long power outages did affect the GBT water supply pump and sampling, the sample gates' timer and the bird hazing water cannon along other facility equipment. Periodic ice block checks of the return to river lines revealed no problems. Also, staff tested and prepared all facility systems for barge transportation season.

On July 14, staff reinstalled the upstream barge dock mooring bit with no problems to report. Therefore, on July 15 at 0700, with the system ready, after regional discussion, staff began collection for barge transport. With Unit 1 on, flows for the tug and barge as they came to and left the dock were not an issue. On July 15, staff opened the facility emergency water supply.

With transport season, staff activated the primary (A and B) PIT tag slide gates. This system reroutes the PIT tagged fish directly to the river. Periodic balloon tests of the PIT tag release lines revealed no problems. The secondary (C and D) PIT/bypass gates remained closed and off for collection. Staff also continued daily smolt monitoring with the sample gates remaining on continuously.

From August 31 at 2300 to September 1 at 0400, the system was in primary bypass for the end of the spill program. When staff closes the spill and units which have been in standby for long periods come on line, it is possible to draw large debris loads into the system. To avoid this possibility and to monitor the collection channel, staff switch the system to primary bypass. Fortunately this year, the debris load was fairly light. Also, on September 1, due to the transformer T1 outage, the facility experienced a power outage from 0635 to 0647. The facility will now receive its power from the project's service units during the Transformer T1 outage.

From September 2 at 2206 to September 3 at 0200, the system was in primary bypass due to high juvenile shad numbers. Since shad can obstruct the fish trailer's circulation system and endanger smolts, the system must bypass the shad at night during their peak out migrations. There were no other changes in facility operations.

On September 3, due to high numbers of juvenile shad in the raceway after two days collection, staff bypassed the fish in the raceway back to the river while only trucking the sample for two days. After this date, they switched the raceway every morning to allow more flexibility in trucking options. The project began daily trucking on September 10, to help avoid primary bypass at night for shad. Staff trucked daily until September 22, when the project returned to every other day trucking due to low smolt numbers. Also, on September 22, staff placed the system on primary bypass from 2200 to 0000 hours due to high juvenile shad numbers. The last truck ran on October 1, and the facility switched to fall primary bypass.

Bypass

The JFF bypassed an estimated 3,874,439 juvenile salmonids (89.4% of the total collection) in 2010 (Table 2). The numbers of fish bypassed and the percentages of total collected by species group were 1,222,563 yearling Chinook (99.9%), 1,496,969 subyearling Chinook (76.7%), 198,186 clipped steelhead (99.9%), 61,542 unclipped steelhead (99.8%), 2,598 clipped sockeye (99.9%), 845,306 unclipped sockeye (99.9%), and 47,275 coho (99.6%). When the facility is in operation of primary bypass, there is no enumeration of individual fish. There is only the detection on the full flow PIT tag system.

Staff re-watered the system with primary bypass beginning on April 1. They tested the PIT and sample systems, which functioned well when in primary bypass. Staff restarted them when secondary bypass resumed on April 6. The fisheries staff monitored the channel on all shifts during the bypass season. During the spring, they only monitored smolts on secondary bypass days.

Crews lowered the ESBS's into the gatewell slots of the turbine units between April 5 and April 14. The delay was to allow for the passage of juvenile Pacific lamprey. Primary bypass mode passed fish directly to the tailrace, while secondary bypass mode passed fish through the collection facility. Although PIT detections were possible in either bypass mode, secondary bypass took place ever other day to allow Smolt Monitoring Program personnel to index juvenile salmonid passage.

After testing in early April, staff turned off and closed the primary (A and B) PIT tag slide gates as the return to river lines provided a better bypass route for PIT tagged fish. They left off and open the secondary (C and D) PIT/bypass gates as there were no studies requiring them in 2010. Alternating primary and secondary bypass modes started in early April with the switch between bypass modes occurring each morning at 0700 hours. They continued until July 15, when collection for continuous transport began. Collection for transportation ceased October 1 when the facility was placed in primary bypass. Primary bypass continued until November 23 when the system was switched to emergency bypass mode. Staff dewatered the juvenile collection channel on December 29. Table 10 (below) shows the weekly smolt bypass count, as well as juvenile lamprey and shad counts.

The sample gates were functioning well. Staff turned them off or on at 0700 hours each day so they would function only during secondary bypass including the extra sampling days for the National Marine Fisheries Service (NMFS) light study. When the extra samples occur, Corps data only includes adult fallback counts for that day.

In late May, PIT tag data suggested that some fish were getting past the secondary (C and D) gates and going into the raceway. Staff drained the raceway. No fish were seen as staff raised the tailscreens and the fish could go out the raceway bank's drain and return safely to the river. However, on May 25, as a precaution against this, staff installed soft rubber flips just downstream of the two bypass gates, which should retain any "over shooters" in the return to river lines preventing any possible raceway entry. This was the first time PIT tag data had ever indicated such a problem.

There were times, during the collection and transport season, when the facility was placed in primary bypass mode for other operational reasons. There were 13 occurrences; 11 took place when large numbers of shad were present. When shad dominated the collection, staff would place the facility in primary bypass mode in late evening and early morning hours, typically from 2200 to 0200 hours. This prevented shad accumulation in the raceways.

Table 10. Weekly Smolt, Lamprey and Shad Bypass Count.

Week	Smolt Count	Smolts Collected for Possible Tagging	Juvenile Lamprey Collected	Juvenile Shad Collected
6	110			
7	289			
8	7265			
9	71822			
10	307,417	2,474		
11	401,780	2,259		
12	391,946	1,776		
13	475,421	1,737		
14	575,595	4,043		
15	186,319	2,922	189,300 (1day,June 10)	
16	119,843	860	80,715	
17	292,738	1,957	3,400	
18	419,162	617	4,460	
19	374,423	658	5865	
20	248,887	1,805	1450	
21	139,800	100+	1100	
22	72,060		300	
23	55,910		200	
24	44,800		410	
25	40,600		470	
26	35,175		150	
27	41,460		95	44,220
28	16,485		75	107,845
29	8,725		60	98,725
30	2675		30	72,560
31	895		5	282,505
32	130		0	30,985

Fish Condition

Descaling

The descaling percentage for all groups combined was 2.6% in 2010. This is higher than the overall rate of 1.3% for 2009 (Table 11). The difference can be attributed to the fact that in 2009 staff did not tabulate descaling caused by predators. Annual descaling percentages in 2010 by species were: yearling Chinook 4.1%, subyearling Chinook 1.3%, clipped steelhead 3.2%, unclipped steelhead 3.4%, clipped sockeye 0.0%, unclipped sockeye 7.1% and coho 3.3%.

Weekly descaling percentages for all species combined ranged from 0.9% to 9.1% (Table 12). The combined average descaling percentage was 4.1% during the spring migration period (April 1 to June 30), 1.2% during the summer migration period (July 1 to August 31) and 1.5% during the month of September. The 2010 spring migration descaling percentages were significantly higher than in 2009 (spring 1.7%). Descaling percentages for the summer migration and late season were comparable to 2009, 0.9% and 1.6% respectively. Personnel calculated these percentages using full sample descaling data.

Detailed Examination for Injuries and Disease[1]

Staff examined daily subsamples of up to 100 juvenile salmonids of the dominate species from the daily sample for detailed injury and disease. In 2009, a new program was implemented for recording injuries on the fish examined for the detailed subsample. This new program does not allow for the amount of detail that the old program did. Therefore, the ability to distinguish between descaling that is greater than 50% and descaling that is less than 50% is no longer in existence. Of the 13,415 fish subsampled, 1,505 (8.3%) were injured, descaled or exhibited symptoms of disease and 0.6% had multiple injuries or a combination of injury and disease.

Unclipped steelhead had the highest incidence of injuries and disease at 15.7%. Staff examined 451 unclipped steelhead. Unclipped sockeye experienced the second highest incidence of injuries and disease (13.3% out of 1724 examined), followed by unclipped subyearling Chinook (11.7%), clipped subyearling Chinook (11.4%), clipped sockeye (10.3%), clipped steelhead

Table 11. Annual descaling rates in percent for fish sampled at McNary Dam, 2006-2010.[1]

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2006	5.2	1.4	3.5	2.9	5.0	7.8	3.8	2.4
2007	4.2	1.5	3.7	3.8	6.4	10.3	3.4	2.8
2008	3.2	1.8	6.1	4.8	9.6	10.3	3.7	2.9
2009[1]	2.1	0.8	2.1	1.0	3.8	5.4	1.8	1.3
2010	4.1	1.3	3.2	3.4	0.0	7.1	3.3	2.6

[1]Descaling by predators not included.

[1] This is above and beyond the full sample descaling.

Table 12. Weekly descaling percentages for fish sampled at McNary Dam, 2010.								
Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
1-Apr	---	---	---	---	---	---	---	---
8-Apr	0.0*	---	---	11.1*	---	---	---	9.1*
15-Apr	3.8*	0.0*	---	0.0*	---	0.0*	---	2.3*
22-Apr	1.8	---	3.2	2.2*	---	25.0*	0.0*	2.6
29-Apr	2.1	---	3.2	1.6	---	3.6	1.4*	2.4
6-May	3.2	0.0*	3.2	2.3	0.0*	2.8	5.3*	3.1
13-May	4.0	0.0*	3.3	6.0	0.0*	5.3	1.4*	4.1
20-May	7.3	6.7*	4.4	3.5*	0.0*	14.1	2.9*	8.4
27-May	3.0	0.0	2.0	5.3	0.0*	7.4	7.9	3.8
3-Jun	2.0	1.1*	4.7*	3.9*	0.0*	5.4	2.7	4.9
10-Jun	4.0	2.7	3.5*	0.0*	0.0*	12.1	0.9	6.1
17-Jun	11.1*	3.2	4.8*	0.0*	---	18.1	0.0*	5.0
24-Jun	13.5*	1.1	0.0*	0.0*	---	13.5*	15.8*	1.5
1-Jul	11.1*	1.0	---	0.0*	0.0*	14.3*	0.0*	1.0
8-Jul	0.0*	1.1	0.0*	---	---	0.0*	0.0*	1.1
15-Jul	100.0*	0.9	0.0*	---	---	0.0*	---	1.0
22-Jul	0.0*	0.9	0.0*	---	---	---	---	0.9
29-Jul	50.0*	1.5	---	0.0*	---	14.3*	0.0*	1.6
5-Aug	0.0*	1.4	---	0.0*	---	50.0*	0.0*	1.4
12-Aug	---	1.7	---	---	---	25.0*	0.0*	1.7
19-Aug	---	1.3	---	---	---	66.7*	0.0*	1.3
26-Aug	---	1.2	---	---	---	0.0*	---	1.2
2-Sep	---	1.0	---	---	---	0.0*	---	1.0
9-Sep	---	0.9	---	---	---	0.0*	---	0.9
16-Sep	---	2.1	---	0.0*	---	---	---	2.1
23-Sep	---	2.3	---	---	---	---	---	2.3*
30-Sep	---	5.2	---	---	---	---	---	5.2*
07-Oct [1]	---	3.9	---	---	---	---	---	3.9*
Total								
Descaled	796	711	127	36	0	689	21	2,380
Total								
Examined	19,420	55,607	3,931	1,047	34	9,732	637	90,408
%								
Descaled	4.1	1.3	3.2	3.4	0.0	7.1	3.3	2.6

Note: Collection and sampling conducted every other day April 8 – July 15.
* Fewer than 100 fish sampled during the week.
--- No fish sampled during the week. [1]One day only.

(10.3), unclipped yearling Chinook (9.4%), unclipped coho (8.8%), clipped yearling Chinook (8.0) and clipped coho (5.3%). Due to changes in FPC protocol, staff no longer examined fry for injuries or descaling. They are also unavailable for weights and lengths.

Descaling is always a concern and is usually indicative of a problem within the system. In 2010, the average descaling percentage for the subsample (of 100 fish per species) was 4.0%. Bird predation was responsible for 10.0% of overall descaling. Birds accounted for 47.6% of the descaled clipped steelhead, and 23.5% of the descaled unclipped steelhead. Bird marks in general, whether they caused descaling or not, were found on 4.1% of all clipped steelhead and 2.7% of all unclipped steelhead in the subsample. Fin hemorrhaging, where there is blood down

the rays of the fins, was prevalent this year at 1.2%. Anesthetizing fish in very warm water usually brings this on.

All fish in the subsample were examined for lamprey marks. In 2010, 0.3% of all subyearling Chinook had wounds caused by lamprey. In previous years, the injury percentages for subyearling Chinook caused by lamprey were: 1.0% in 2009, 1.8% in 2008, 0.6% in 2007, 0.6% in 2006. Lamprey bite marks are not as common on other species, because lamprey are not as aggressive in the spring.

Mortality

Total facility mortality for all groups combined was 0.2% in 2010 (Table 13). This is lower than last year's rate of 1.0%. Mortality rates by species were: yearling Chinook 0.1%, subyearling Chinook 0.4%, clipped steelhead 0.1%, unclipped steelhead 0.1%, clipped sockeye 0.1%, unclipped sockeye 0.1% and coho 0.1%. The overall facility mortality rate was 0.1% during the spring migration period, 0.5% during the summer migration period and 0.7% during the last month of facility operations. This compares to rates of 0.1%, 3.4%, and 0.9% during the respective periods in 2009. Since 1998, facility mortalities have been collected off the separator and factored into the collection and facility mortality totals.

Weekly facility mortality rates varied from a low of 0.0% to a high of 2.1% (Table 14). The

Table 13. Annual facility mortality in % at McNary Dam, 2006-2010.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2006	0.1	0.4	0.1	<0.1	0.1	0.2	<0.1	0.3
2007	<0.1	0.1	0.2	0.1	0.2	0.2	<0.1	0.1
2008	0.1	0.8	0.1	0.1	0.2	0.1	0.1	0.4
2009	0.1	1.9	<0.1	0.1	0.0	0.1	0.1	1.0
2010	0.1	0.4	0.1	0.1	0.1	0.1	0.1	0.2

highest weekly facility mortality rate of 2.1% occurred during the week ending September 30. The lowest rate occurred during the week ending April 8, at the beginning of the season. During transport operations, 176 (0.1%) staff recovered subyearling Chinook mortalities from fish transportation trucks. We did not include these mortalities in any totals or rates detailed elsewhere in this report.

The overall sample tank mortality percentage for 2010 was 0.9% (Table 15). This is down from 2009 (1.7%). It is important to note that subyearling Chinook mortality (70.0% of the total mortality sampled) drives the overall sample tank mortality percentage each year. The sample mortality percentage is the best available indicator of the actual facility mortality percentage during spring bypass operations. Staff bypassed directly to the tailrace those mortalities that occurred or passed the separator between sampling intervals, and did not count them. The sample mortality percentage included mortalities recovered from the sample holding tanks and any mortality that occurred during the sampling process. It does not include mortalities recovered from the post-sample raceway.

Table 14. Weekly facility mortality in % at McNary Dam, 2010.[1]								
Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 1	---	---	---	---	---	--	---	---
Apr 8	0.0*	---	---	---	---	---	---	---
Apr 15	0.6	---	---	---	---	---	---	---
Apr 22	0.1	---	<0.1	---	---	---	---	0.1
Apr 29	<0.1	---	0.1	0.1	---	<0.1	<0.1	<0.1
May 6	<0.1	0.0	<0.1	0.1	0.0	<0.1	0.1	<0.1
May 13	<0.1	0.4	<0.1	<0.1	0.0	<0.1	<0.1	<0.1
May 20	<0.1	0.1	<0.1	0.1	0.0	<0.1	0.1	<0.1
May 27	<0.1	<0.1	0.1	0.1	0.0	<0.1	0.1	<0.1
Jun 3	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1
Jun 10	1.2	0.6	0.3	0.6	0.5	0.7	0.2	0.7
Jun 17	8.5	1.1	1.2	2.0		0.9	0.4	1.4
Jun 24	1.5	0.2	1.0	0.5		0.2	0.1	0.2
Jul 1	0.6	0.1		0.0	0.0	0.6	0.5	0.1
Jul 8	0.0	0.1	1.0	100.0		0.0	2.9	0.1
Jul 15	0.0	<0.1	0.0			0.0		<0.1
Jul 22	0.0	1.3	2.0					1.3
Jul 29	2.5	1.4		0.0		0.0	0.0	1.4
Aug 5	10.0	1.3		0.0		0.0	0.0	1.3
Aug 12		1.1				0.0	0.0	1.0
Aug 19		0.8	30.0			0.0	0.0	0.8
Aug 26		0.8				0.0		0.8
Sep 2		0.6				0.0		0.6
Sep 9		0.5				0.0		0.5
Sep 16		0.7		0.0				0.7
Sep 23		1.4				0.0		1.4
Sep 30		2.1						2.1
Oct 7		1.5						1.5

---No fish collected during the week.
[1]The McNary Fish Facility began collection for continuous transportation on July 15.

Table 15. Annual sample mortality in percent at McNary Dam, 2006-2010.								
Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2006	1.1	0.8	0.5	0.3	1.2	0.9	0.3	0.9
2007	0.7	2.3	0.9	0.7	0.0	1.2	0.4	1.7
2008	0.7	1.2	0.4	0.6	0.9	1.1	0.3	1.0
2009	0.9	2.2	0.2	0.2	0.0	0.2	0.1	1.7
2010	0.6	1.0	0.4	0.3	5.6	1.0	0.8	0.9

Sampling activities accounted for 24 of the 796 (3.0%) mortalities recovered from the sample holding tanks. These mortalities represent 0.03% of the salmonids sampled. There were four categories for handling mortality: Fish that were overexposed to anesthetics (2), fish pinched by the pre-anesthetic chamber gates (4), fish stranded in the flush pipe to the sorting trough (17), and fish that jumped from the sample tank (1). This compares to 18 sampling activity mortalities in 2009, or 1.2% of the mortalities recovered that year.

The overall post-sampling mortality percentage was 0.3% in 2010, with a daily range of 0.0% to 10.0%. The peak occurred on a day with low sample numbers. Staff calculated the post-sampling mortality percentage using the mortalities recovered from the sample recovery raceway. Post-sampling mortality percentages for species sampled in 2010 were: yearling Chinook 0.2%, subyearling Chinook 0.4%, clipped steelhead 0.1%, unclipped steelhead 0.1%, clipped sockeye 0.0%, unclipped sockeye 0.3%, and coho 0.1%.

Incidental Species

In addition to salmonids, the McNary facility collected approximately 992,365 fish of various species. These consisted primarily of 642,385 juvenile American shad (*Alosa sapidissima*),

Table 16. Collection of incidental species at McNary Dam, 2010.

Common Name	Scientific Name		Sample	Collection
Pacific Lamprey (adult)	*Lampetra tridentata*		1	5
Pacific Lamprey (morph)	*L. tridentata*		3,489	316,985
Pacific Lamprey (ammocoete)	*L. tridentata*		5	405
American Shad (adult)	*Alosa sapidissima*		4	35
American Shad (juvenile)	*A. sapidissima*		113,045	642,385
Largemouth Bass	*Micropterus salmoides*		0	0
Smallmouth Bass	*M. dolomieui*		564	5,710
Bluegill	*Lepomis macrochirus*		2	10
Crappie	*Pomoxis spp.*		0	0
Channel Catfish	*Ictalurus punctatus*		19	715
Bullhead	*Ameiurus spp.*		3	20
Mountain Whitefish	*Prosopium williamsoni.*		53	1,965
Common Carp	*Cyprinus carpio*		32	240
Chiselmouth	*Acrocheilus alutaceus*		1	10
Longnose Dace	*Rhinichthys cataractae*		35	230
Peamouth	*Mylocheilus caurinus*		1,426	14,095
Sandroller	*Percopsis transmontana*		1	5
Sucker	*Catostomus spp.*		21	685
Three-spine Stickleback	*Gasterosteus aculeatus*		449	4,475
Walleye	*Stizostedion vitreum*		0	0
Yellow Perch	*Perca flavescens*		53	1,750
Sculpin	*Cottus spp.*		29	365
Northern Pikeminnow	*Ptychocheilus oregonensis.*		14	70
Redside Shiner	*Richardsonius balteatus.*		1	20
Crayfish	*Pacifastacus spp.*		85	690
Siberian Prawn	*Exopalaemon modestus*		140	1,280
Total			119,476	992,265

317,025 juvenile (morph) Pacific lamprey (*Lampetra tridentata*), 14,095 peamouth (*Mylocheilus caurinus*), 5,710 smallmouth bass (*Micropterus dolomieui*), 4,535 three-spine sticklebacks (*Gasterosteus aculeatus*), 1,965 mountain whitefish (*Prosopium williamsoni*), 1,750 yellow perch (*Perca flavescens*) and 1,280 Siberian prawn (*Exopalaemon modestus*) (Table 16). Of these, 642,385 juvenile American shad, 13,795 peamouth, 5,215 smallmouth bass, 2,905 juvenile Pacific lamprey, 2,345 three-spine sticklebacks and 3,985 fish of other species were transported to locations below Bonneville Dam. The facility bypassed the remaining fish to the tailrace below McNary Dam. Staff did not record non-salmonid species released from the separator.

The numbers of Siberian prawns appeared higher than in previous years.

In early June, as flows increased due to rain storms, juvenile lamprey out migration picked up with a high count of 189,300 bypassed on June 10. Juvenile lamprey and shad counts were heavy during several weeks duration. Significant counts of these species are shown in Table 2 (above). High numbers of shad complicated transport operations, by threatening to plug up or overwhelm transport equipment and systems.

Research

Gas Bubble Trauma (GBT) Monitoring

WDFW personnel collected juvenile salmonids as they entered the separator and examined them for symptoms of GBT as part of the Smolt Monitoring Program. They conducted examinations from April 19 through August 31. The protocol states that staff shall capture 100 fish of Chinook and steelhead off the separator for examination for GBT. These can be any combination of yearling or subyearling Chinook or clipped or unclipped steelhead. Prior to July 15, fish came over the separator only every other day. Therefore, GBT sampling had to adjust to that schedule. Starting July 15, staff collected samples every day and conducted GBT examinations on Monday and Thursday. Staff scanned all fish for PIT tags immediately upon capture and returned tagged fish to the separator without examination. After examination, staff sent fish to the sample recovery/holding raceway and transported or bypassed them along with fish from the daily sample. Staff included fish examined for GBT in the daily collection totals. In 2010, staff examined 3,788 salmonids for GBT at McNary, including 1,059 yearling Chinook, 2,336 subyearling Chinook, 337 clipped steelhead and 56 unclipped steelhead.

NMFS Channel Work

The NMFS was studying the effects of running turbine units outside of the 1% criteria on fish condition. Staff collected fish upon exiting the orifices in the collection channel and examined them for occurrence and severity of descaling. NMFS staff handled a total of 25,545 fish during the course of this study. Please contact NMFS for the results of this study.

NMFS Light Study

The NMFS conducted research on the effects of a lighted orifice intake on juvenile salmonid travel time from May 3 to July 15. There were 3,219 yearling Chinook, 5,028 subyearling Chinook, 2,301 steelhead, 3,675 sockeye and 419 coho tagged for a total of 14,642 fish. Staff collected and affected 35,127 fish of all species, combined collect the fish that were eligible for tagging. On the NMFS permit report, there were 169 tagging mortalities and 281 mortalities that were collected in the sample tanks. Please contact NMFS for the results of this study.

Development of Design Criteria for a Functional Juvenile Pacific Lamprey Active Tag

The US Fish and Wildlife Service conducted a study to determine the size and shape specifications appropriate for an active acoustic tag for use with juvenile Pacific lamprey. The

Service collected 659 juvenile Pacific lamprey at McNary Dam and transported them to the Dworshak National Fish Hatchery, where staff conducted the research.

Facility Operation and Maintenance

Turbine Operations

McNary had 14 turbine units available for power generation on March 1, and 10 to 14 units available the rest of the season. Crews took various units out of service for brief periods for various sundry reasons, including XJ breaker bushing repairs, semi-annual maintenance, ESBS installation, testing, system checks, hub tapping, electrical work, trash rack cleaning, preparing for the orifice light study, camera inspections of the ESBS's and cleaning of the VBS's. On July 1, crews took Units 2 and 7 out of service for the rewind contract. Those two units remained out of service for the rest of the year. Turbine outages in excess of 24 hours are shown in Table 17. On April 1, the hard constraint one percent criteria began.

Table 17. McNary Lock and Dam Extended Turbine Outages (> 24 hours)

Date	Unit:	Reason:	Date returned to service:
3/17	6	Rack exchange & hub tap	3/18
3/29	6	Orifice light installation	3/30
4/8	8	ESBS install./annual maint.	4/9
4/12	2, 7	Asbestos removal	4/30
4/30	2	ESBS repair	5/3
5/20	8	Asbestos removal	6/3
5/27	9	Asbestos removal	6/14
7/1	2,7	Rewind contract	Still OOS
7/1	3,4	Transformer replacement	8/28
7/13	5,6,8	BPA line upgrades	7/14
7/28	11	Repairs (gov. oil pump)	7/29
9/1	1	Transformer replacement	10/29
9/1	13,14	Transformer repair	13: 9/27 14: 9/14
9/14	11,12	Unit & transformer repairs	9/17
9/17	9,10	Transformer repairs	9/20
9/20	5,6	Unit & transformer repairs	9/21
10/4	8	Transformer maintenance	10/7
10/5	6	ESBS failure	10/6
11/1	8	Relay upgrades	12/17
11/2	13	Hydraulic fluid leak	11/3
11/15	12	Annual maintenance	11/17
12/15	4	Governor repair	12/16

Forebay Debris/Trash Racks

Forebay debris was light to moderate most of the season, depending on wind direction. Crews

started cleaning the trash racks on March 15. Addition trash rack cleaning started on April 1 as more wood and tumbleweeds began to enter the project site. The first cleaning of all the racks was concluded on May 6. No fish were noted in the debris. Intensive cleaning began in mid-June, when large amounts of tumbleweeds and Eurasian milfoil accumulated in the racks. From June 15 to 17 rack cleaning at all units removed approximately 30 ten-yard truck loads. Staff did not detect any smolt mortalities entangled in it. Heavy debris, mostly Eurasian milfoil, began accumulating the week beginning June 25, but there were no rack differential problems, so crews did not clean the racks.

Extended-length Submersible Bar Screens (ESBS)

On April 5, crews began installing ESBS's, and installed the last screens by April 14, except on Units 2 and 7, which were out of service. This was 2 weeks later than previously, to avoid juvenile lamprey runs. On April 30, the ESBS at 2B slot failed, resulting in Unit 2 being out of service until May 3, when crews repaired the screen. ESBS camera inspections resumed in May. Various problems with ESBS cleaning devices and both real and false alarms occurred during the course of the season, and crews resolved them at those times. On Week 39 (November 19-25), crews began winter maintence on spare ESBS's.

Crews began raising ESBS's on December 17 for winter maintenance and repairs. After raising the screens, crews examined them, and only the screens at 9C and10C slots, which had been in bypass mode, appearing to be short cycling, as each ESBS was not fully cleaned.

Vertical Barrier Screens

VBS installations occurred concurrently with ESBS installations. On May 5-10, crews replaced the VBS's in Slots 1A, 1B and 1C. This was the start of a program to eventually replace the mesh on all 42 screens.

VBS cleanings continued throughout the seasson, whenever required by differentials due to debris loads. With the deck crane out of commission part of the season, crews brought in a portable crane to raise the VBS's for cleaning. On November 18, crews cleaned and replaced the VBS in Slot 1A, which had developed a bent frame.

On Week 15 (June 4-10), the VBS meshes caught a total of 95 juvenile lamprey mortalities. These were the first mortalities of the year, and corresponded with the peak out-migration. Crews detected 27 lamprey mortalities the following week. These were the last lamprey mortalities detected during the bypass season.

Gatewells

Light amounts of fish screen/hydraulic oil occurred in the gatewell slots from time to time and crews removed it with absorbent pads. During the 2nd week of March, crews removed a small amount of hydraulic fluid from the 9C gatewell slot. During the 2nd week of May, the power house inadvertently cut power to the juvenile channel twice for a short period of time. Fortunately there was no ill affect on channel elevation.

On July 1, during headgate lowering in Unit 2, about 2 or 3 gallons of hydraulic fluid spilled into Gatewells 2A and 2B. Staff closed orifices at 2A, 2B and 2C, and promptly cleaned up the spill with absorbent pads and booms. On November 2, staff observed hydraulic fluid for the headgate in 13A slot on the water's surface. Personnel immediately removed the unit from service and closed Unit 13's channel orifices. Staff repaired the headgate hydraulic system to prevent a re-occurrence. By November 3, absorbent pads and booms along with a skimmer had removed the oil allowing the unit and orifices to return to service. From March 29-30, Gatewell Slot 6 B was dewatered for installation of orifice attraction lighting guides for the upcoming study. Crews covered various gatewell slots from time to time for transformer replacement and for the rewind of Units 2 and 7. Staff noted algae in Gatewell Slot 7B in August, but it appeared to be dissipating.

Other Oil Spills

On March 9, staff noted oil coming from a USGS boat that had sunk during the winter storm late last year. Crews contained the oil, and on March 12 and 13 a contractor removed the boat and successfully retained the oil.

Orifices/Collection Channel

Orifices were still closed for winter maintenance at the start of the reporting season, and staff re-opened them on April 1 with the system on primary bypass. During the winter maintenance season, crews replaced the orifice lighting system with new conduit by April 1 and repaired the bypass pipe joint. Secondary bypass began on April 6. During the season, most automatic systems operated well. The fisheries staff monitored the channel on all shifts during primary bypass.

From time to time, issues arose over fisheries technicians and NOAA researchers leaving both orifices to a gatewell open, and other operational issues. Proper orifice operations were reviewed with the Corps fisheries staff and the researchers.

Occasionally, orifices clogged with debris, which staff promptly cleaned out soon after discovery. Also, staff occasionally closed orifices to prevent spread of hydraulic fluids when they were discovered in gatewells. Staff opened makeup orifices to maintain juvenile collection channel water levels. Staff reopened the closed orifices once they cleaned up the fluids.

Crews performed regularly scheduled maintenance on the hoist, compressor, side dewatering valves, the screen cleaning mechanisms and orifices. The cycle times for the side and rectangular screen cleaning devices were changed between 75 and 120 minutes each as debris loads dictated. Throughout the season, the orifices in Unit 2, which was shut down for rewinding, were opened or closed as required as a reduced orifice count during high forebay elevations allows the side dewatering valves to operate in a more favorable range.

This winter, staff again noted moisture in the orifice supply line, and the project was looking to resolve the issue. Later, after the channel was de-watered, crews installed water traps in the air supply lines. Also, staff determined that the cover at the Unit 6 orifice trap was dilapidated and unsafe, and had NMFS remove it during the winter maintenance season.

On November 22, with sub-freezing temperatures forecast, staff switched the collection channel into emergency bypass, where it remained until it was dewatered on December 29. This allowed dewatering of the JFF to avoid freeze damage to the facility. On November 22, staff removed approximately 50 adult salmonids, mostly steelhead, with a few miscellaneous species and two smolts. During dewatering, on December 29, staff removed 150 to 200 adult steelhead, both clipped and non-clipped, and dozens of Chinook smolts.

Primary Dewaterer

Contractors removed the prototype cylindrical dewatering screen supply pipe from the emergency bypass outfall prior to the season, completing the removal of that experimental unit. Bypass operations began in late March. Staff only ran the transition screen brush in the morning on Monday to Thursday to avoid problems with it all year this season. The collection channel was switched into emergency bypass from October 26 through 28 to allow repair of the east retraction spring on the rectangular screen cleaning device, which was critical to the proper operation of the dewatering structure. Other than that, the primary dewaterer operated reasonably well this season.

On March 23, the project finished repairs on the stop log hoist and removed the stop logs in preparation for primary bypass, which began on March 30. Staff closely monitored the rectangular screen cleaner lifting cables until crews replaced them on May 12.

Separator

The separator at the McNary juvenile fish facility separates smaller juvenile salmonids (Chinook, coho and sockeye) from the larger individuals (steelhead) which are more aggressive in raceways and barges. As in past years the separator was configured in 2 sections: the upstream or "A side" section for smaller fish, and the downstream or "B side" for larger fish. The A side section is 5' in width and 13' in length with separator bars situated lengthwise in line with the flow. These bars are spaced 11/16 inch apart. The B side section is 5' in width and 9' in length with separator bars also situated lengthwise in line with the flow. These bars are spaced 1-5//16 inches apart. To facilitate separation, both sets of bars are raised at the downstream end. Water depths in the A side section ranges from 3 inches at the upstream end to 6 inches at the downstream end. The upstream end of the B section separation bars is submerged two inches below the tops of the downstream end of the A bars. B-side water depths range from 5 inches at the upstream end to 3 inches at the downstream end by the adult release gate.

In general, the separator performed satisfactory through most of the season. At times, debris blocked the perforated plate upstream of the separator and the separator exits. A blocked perforated plate usually produced higher water velocities at the separator entrance. In most cases normal operation resumed when the perforated plates and staff cleared the separator exits. Separator up well flow was regularly improved by tapping and back flushing the screens. Otherwise, the flow exiting the separator was quite stable. Technicians continually monitored the separator 24 hours per day, 7 days per when in operation.

Separator performance during the 2010 season was impacted by debris, flow fluctuations, adult

shad migration. If extreme amounts of debris were present, staff would sometimes switch the facility to primary bypass mode. Primary bypass mode also became necessary during times of severe channel fluctuations. Typical causes of channel fluctuations include: changes in spill and turbine operations, juvenile collection channel flow adjustments, and primary dewaterer maintenance and power outages. When high numbers of adult shad fall back through the facility, staff installed PVC pipe over B side bars to exclude shad from the sample system and raceways. They placed the piping in such a way that still permitted larger juvenile salmonids to pass through the bars and exit the separator.

During the fall bypass season, the system remained watered up to avoid frozen pipes. After a period of cold weather in late November, the staff switched the system to emergency bypass to avoid freezing damage to the JFF.

The primary bypass gate also operated satisfactorily this season although some in-season maintenance was necessary. The backup air supply system performed well this season.

Sample System/PIT Tag System

During the winter maintenance season, crews rehabilitated all PIT and sample gates and installed new actuators for the in-flow valves on the sample holding tanks. Staff tested the PIT tag detection systems and they functioned well with no significant problems. However, after the end of the season the facility lost PIT tag detection ability when it was forced to switch the juvenile collection channel into emergency bypass, due to severe freezing conditions, on November 22. Due to the prolonged cold snap, crews did not restart that system, and dewatered the juvenile collection channel on December 29.

McNary currently has no practical way to avoid going into emergency bypass during freezing conditions. Staff are working with project engineers to design a bypass system that could dewater the JFF without going into emergency bypass, thus enabling the facility to continue to collect PIT tag data after dewatering the JFF to prevent serious freeze damage.

On April 6, crews prepared and placed the sample and PIT tag systems service during secondary bypass operations on an every other basis. The sample system was not in use during alternate days when primary bypass was taking place. Staff turned on or off the sample gates each morning at 0700 hours. The full flow PIT tag detector continued to operate whenever the facility was in primary bypass mode. The sample timers and gates were also in service for extra sampling in support of USGS research activities. As in past years, whenever the sample rate was 20% or higher, the primary PIT tag gates (A and B) overrode the sample gate operations. At lower sample rates sample gate operation overrode PIT tag gate operation.

The sampling system performed well all season. The primary PIT tag detection/deflection system (A and B gates) worked well this year. The secondary pit tag detection/diversion system was not used this year as no study required its utilization. This system uses the secondary bypass gates as PIT tag slide gates (C gate is on the A side and D gate is on the B side). On April 1, after preseason adjustments, staff turned off these gates and switched them to permit the passage of bypassed fish to the tailrace. When the transport season began on July 15, staff turned on

these gates momentarily and closed them to route all collected fish to the raceways. The gates then remained off and closed for the rest of the season.

Barge/Truck Loading Operations

Prior to the transport season, staff had dewatered the transportation facility for winter maintenance. Crews replaced a gasket in the full flow flume upstream of the separator, painted the separator and two raceway release drains, and repaired various leaks. Also, they covered two more raceway tail screens with perforated plate to help reduce impingement of juvenile lamprey. On March 25, crews flushed supply lines and cleaned diffuser screens. They had previously pressure washed the remainder of the facility and replaced lamps.

Barge transportation began on July 16, and barge loading occurred every other day. On August 11, due to the forebay being at 340 feet, the upper constraint, the fish tug and barge had to leave the facility with 20 kcfs of spill occurring in order to maintain the forebay elevation within the constraint. Collection for daily transport with alternating days of barge and truck transportation concluded on August 17, when the last barge of the season left McNary. Even with Unit 1 on, flows did not appear to seriously affect the movements of the tug and barge.

The first truck left for the regular truck season on August 18. Trucking occurred every other day. In August, staff replaced the oxygen indicator light on the trailer, smoothed the trailer's release line, examined the trailer's circulation pump and repaired the flush nozzle at the release site.

The project began daily trucking on September 10, to help avoid primary bypass at night for shad. Daily trucking occurred until September 22, when the project returned to every other day trucking due to low smolt numbers. The last truck trip occurred on October 1.

Avian Predation

As noted earlier, bird predation was responsible for 10.0% of overall descaling. Bird marks in general, whether they caused descaling or not, were found on 4.1% of all clipped steelhead and 2.7% of all unclipped steelhead in the subsample. In order to assess potential bird predation, staff conducted predatory bird counts twice daily in the tailrace, and once daily in the forebay, throughout the season, beginning on March 28, when technicians returned to shift work. Bird numbers appeared to follow fish numbers, and appeared to be fluctuating, in particular, with juvenile shad outmigrations.

The most common avian fish predators in the tailrace were gulls, pelicans, terns and cormorants. Most birds were seen in the spill basins, with pelicans working the calmer edges. The water cannon operated well at the outfall. In the forebay, grebes and juvenile gulls were more common, with a few pelicans, terns, cormorants and ospreys. Occasionally grebes would appear in the gatewell slots or in the juvenile collection channel. Predatory bird counts concluded on October 1.

Bird abatement measures continued throughout the 2010 season. Measures included the deployment of water sprinkler/cannon at the facility outfalls, the hazing of predator birds with

by Agricultural Department personnel, and the physical removal of grebes from the juvenile collection channel. From April 2 to June 30, when the contract concluded, Agricultural Department personnel hazed predatory birds at the bypass outfalls daily. Regulations did not allow the hazing of pelicans and lethal removal of other species. The water cannon at the bypass outfalls was in use from April 1 to November 22, except for a brief closure from October 26-28 during emergency bypass for screen repairs, and during the fall bypass season it was the main hazing technique used. Severe freezing forced the cannon to be shut down on November 22, prior to the end of the fall primary bypass season. These measures appeared to be effective during the transport season.

Staff conducted daily bird counts from March 28 to October 1 for the tail water area, including the bypass outfalls, powerhouse and spill basin. These counts were usually done twice daily with binoculars from the separator, once in the morning and once in the evenings. Only one tailrace count occurred during the first two and last two weeks of this period. Staff reported the week's highest daily counts for each species from the tail water area. They reported the bypasses' outfalls separately. Staff counted birds for the fore bay area, with the unaided eye, once daily when fish staffs were available from March 28 to October 1, while doing gatewell observations, usually in the morning. Staff observed included gulls, cormorants, white pelicans, terns, night heron, osprey, grebe, kingfisher, blue heron and mergansers. They reported the week's highest daily counts for each species from the tail water area. The reported the bypasses' outfalls separately.

During the spring bypass season from April 1 to July 15, the highest tailrace counts were 475 gulls, 25 cormorants, 96 pelicans and 68 terns. The highest outfall counts during this period were 25 gulls, 20 pelicans and 13 terns. During the transport season from July 16 to October 1, the highest tailrace counts were 247 gulls, 47 cormorants, 18 pelicans and 92 terns. Birds dispersed with the conclusion of spill, and few birds continued to feed at the bypass outfalls. Peak weekly forebay observations seen in April through October included 136 grebes, 110 gulls, 65 pelicans and 9 terns.

It is difficult to count grebes due to their diving behavior, their response to project and fishway operations, and the variety of locations in which they can appear. Grebes passed into the gatewell slots from late April to late October, with most birds being seen in the slots during May and June. An estimated 35 grebes entered the gatewell slots this year. Most passed through into the juvenile collection channel, and eventually exited the system on their own. Staff removed about 1/3 after they either passed to the separator, or after staff netted them from either the gatewells or the channel.

Facility Modifications

Several modifications made during the winter of 2009-2010 improved system performance over previous seasons. Fisheries, maintenance staff and/or contractors:

1. Performed all scheduled preventative maintenance at the channel and facility;
2. Covered the rest of the raceway tailscreens with perforated plates to help reduce juvenile

lamprey impingement;
3. Placed new conduit for the orifice lighting system;
4. Installed proximity switches on approximately half of the ESBS's, replacing transducers;
5. Removed the prototype cylindrical dewatering screen supply pipe from the emergency bypass outfall, completing the removal of that experimental unit;
6. Placed new actuators on both sample holding tank flow valves;
7. Repaired or replaced both barge dock mooring bits;
8. Repaired the clam shell for trash rack cleaning;
9. Rehabilitated spill gates;
10. Rehabilitated the PIT tag and sample gates;
11. Painted Raceway 3's drain area to improve truck loading;
12. Installed entry ladders for the east raceways; and
13. Rehabilitated VBS's.

Recommendations

1. Have common replacement parts in stock. A critical example is a primary gate actuator;
2. Remove orifice traps not being operated to improve visibility and free up orifices for general use;
3. Install PIT tag detection equipment in the emergency bypass channel; or better yet:
4. Install a "Y" with two valves where the JFF water supply line runs through the old, unused south trash sluiceway, so that the flow could be diverted from the structure without having to go into emergency bypass during freezing conditions;
5. Cover the old bulkhead slot in the emergency bypass route with solid plate;
6. Reinstall forebay debris shield at Unit 5C and 3A if researchers are not moving equipment in and out of the open area where the shield would normally go;
7. Conduct a safety inspection of channel ladders and other supports that are subject to moisture;
8. Continue installation of new mesh on VBS's;
9. Continue installation of proximity switches on ESBS's;
10. Install new water supply actuators for raceways 5 and 9 west completing the actuator upgrade for the raceways;
11. For safety, install escape ladders and a tailscreen hoist at the east raceway bank;
12. Install new raceway weir boards;
13. Continue juvenile lamprey improvements per district recommendations;
14. Order a temporary safety net and harness points for the area next to the outfall of the emergency bypass facility, to protect personnel while they are working in the area (this has recently occurred);
15. Seal up the serious leaks in the Washington ladder. They are slowly destroying the ladder and portions of the project structures that lie below the ladder; and
16. Install the circular orifice lighting system in all orifices. Last years' study using the new orifice design showed significant improvement in juvenile attraction to the orifice.

Acknowledgments

Much of this report is based on the 2010 Transport Operations report provided by Rosanna Mensik, a supervisory biologist with the Pacific States Maritime Fisheries Commission. Les Layng, another biologist with PSMFC, was also a key contributor to that program. Most of the rest of the report was based on the weekly fish facilities reports, mostly provided by McNary Assistant Biologist Bobby Johnson. Corps of Engineers personnel involved in the operation of the JFF included: Supervisory Biologist Brad Eby, Assistant Biologist Bobby Johnson, who was later Acting Supervisory Biologist after Mr. Eby retired, biological technicians: Charlie Dennis, Kurt Hubbard, Michael Berger, James Davis, and Andrew Pomiak and truck driver / maintenance personnel: Ken LePage and Alan Schoblom. Carl Dugger assumed supervisory responsibilities on November 8.

List of Acronyms

BPA – Bonneville Power Administration
CRITFC – Columbia River Inter-Tribal Fish Commission
ESBS – extended-length submersible bar screen
FGE – fish guidance efficiency
FPC – Fish Passage Center
GBT – gas bubble trauma
JFF – McNary Juvenile Fish Facility
MOP – minimum operating pool
NBS - National Biological Survey
NMFS – National Marine Fisheries Service (now NOAA Fisheries)
NOAA – National Oceanographic and Atmospheric Administration
OCFRU - Oregon Cooperative Fishery Research Unit
ODFW – Oregon Department of Fish and Wildlife
PIT – Passive Integrated Transponder (tag)
PITAGIS – Pit Tag Information System
PLC - programmable logic controllers
PSMFC – Pacific States Marine Fisheries Commision
RM – river mile
STS – submersible traveling screens
USFWS – U.S. Fish and Wildlife Service
VBS – vertical barrier screen
VI Tag- visible implant tag
WDFW – Washington Department of Fish and Wildlife

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