CENWW-ODO BARNES (1130) 20 February, 2019

MEMORANDUM THRU:

Jeannette Wilson, Operations Project Manager, Lower Monumental Dam

 FOR: Chief, Operations Division

 ATTN: Eric Hockersmith / Ann Setter

SUBJECT: Submission of 2018 Juvenile Fish Collection and Bypass Report, Lower Monumental Dam Juvenile Fish Facility.

1. Enclosed find the 2018 Juvenile Fish Collection and Bypass Report for Lower Monumental Dam as requested.

2. If you have any questions contact Chuck Barnes at Lower Monumental Dam, (509) 282-7211.

Charles A. Barnes

Supervisory Fisheries Biologist, Lower Monumental Dam

Enclosure

2018 Juvenile Fish Collection and Bypass Report

Lower Monumental Dam Juvenile Fish Facility

Prepared by

Charles A. Barnes

U.S. Army Corps of Engineers

and

Dana Higgins

Anchor QEA

20 February, 2019

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# TRANSPORT OPERATIONS - LOWER MONUMENTAL DAM

## Introduction

Juvenile fish transportation and bypass operations occurred for the twenty sixth year at Lower Monumental Dam Juvenile Fish Facility (JFF) in 2018. The bypass system was watered up at 1000 hours on March 19 and submersible traveling screens (STSs) were installed March 26 through 28. The JFF was watered up for testing at 1100 hours on March 19, and primary bypass occurred through March 31. From April 1 through April 16, primary bypass was intermittently interrupted every third day for fish condition monitoring. From April 13 through April 22, condition monitoring occurred every other day. Early season condition monitoring consisted of a 24-hour sample on target days from 0700 to 0700. During this period, 2,567 fish were examined and returned to the river. These fish are included in the 2018 season spreadsheet (Appendix Tables 1 through 4).

Collection for transport began at 0700 hours on April 23, and ended at 0700 hours on August 18. On August 18, the facility sampled all fish for condition and bypassed them. This operation continued until October 1. On October 1, the facility was returned to primary bypass mode through December 17. Total smolt collection in the 2018 season was 2,761,746. This includes expanded numbers of those sampled during pre-transport. Of the 2,761,746 fish collected in the 2018 season, 129 were trucked, 2,306,744 were barged, and 453,986 were bypassed.

Pacific States Marine Fisheries Commission (PSMFC) technicians examined 1,437 fish for gas bubble trauma (GBT) in 2018. Examinations were conducted once a week from April 10 through July 25.

The passive integrated transponder (PIT) tag bypass system diverted 47,463 PIT-tagged fish at the JFF from April 1 to October 1. None of these fish are included in the bypass numbers.

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 was the only agency releasing sizeable numbers of unclipped hatchery fish. Starting in 1998, increasing numbers of unclipped hatchery fish were released by state, federal, tribal, or other agencies (i.e., the Fish Passage Center); therefore, the reported clipped/unclipped fish collected, sampled, bypassed, and transported no longer represent the origins (i.e., hatchery, wild) of these fish. As of the 2005 report, juvenile salmonids are designated as clipped or unclipped rather than hatchery or wild. Coho salmon were reintroduced by the tribes and regardless of fin clips, these fish are all hatchery progeny.

This season’s total collection by species group included: 880,575 clipped yearling Chinook salmon, 337,530 unclipped yearling Chinook salmon, 130,343 clipped subyearling Chinook salmon, 174,478 unclipped subyearling Chinook salmon, 970,517 clipped steelhead, 208,054 unclipped steelhead, 26,600 clipped sockeye salmon, 8,605 unclipped sockeye/kokanee salmon, and 25,044 coho salmon.

Corps of Engineers personnel included: Supervisory Biologist Charles Barnes, Assistant Biologist Raymond A. Addis, Biological Technicians: Shelly Montoya, Dawn Kunkel, Paul Bertschinger, Houston Adams, Sarah Gaulke, and Robin Henderson, and truck driver/maintenance personnel: Rick Blevins and Kenneth Fletcher. Quality control tasks were conducted by Anchor QEA biologists Dana Higgins, Stacey Cox, and Ben Hagood. Smolt monitoring was conducted by Pacific States Marine Fisheries Commission (PSMFC) biologist Wm. Monty Price and Washington Department of Fish and Wildlife (WDFW) biologist Sharon Lind. PSMFC technicians Carol Williams, Rachel Blackwell, Wanda Blackwell, and Jessica Elder were involved in fish sampling and smolt monitoring quality control and data keeping tasks.

## River Conditions

During the 2018 season, the average daily flow did not exceed 180.0 thousand cubic feet per second (kcfs). The highest daily average flow for the season was 172.4 kcfs on May 27. The lowest daily average flow for the season occurred on September 30 with a flow of 13.5 kcfs. The average flow for the season was 65.2 kcfs. Spill mandated by the Biological Opinion (BiOp) occurred for 151 days from April 3 through midnight on August 31, with a maximum daily average spill of 84.5kcfs on May 27. The Removable Spillway Weir was put into operation when the BiOp‑mandated spill began on April 3, and was taken out of service for the season on August 8, due to 3 consecutive days of average daily outflow less than 30 kcfs.

A comparison of daily flow and spill is shown in Figure 1. Average monthly flow and spill for the 2014 to 2018 collection seasons are provided in Table 1. River temperature averaged 61.9 °F for the 2018 season and ranged from 46.0 °F on April 3 and 8 to 70.5 °F on August 7 and 8.

Figure 1. Daily river flow at Lower Monumental Dam, 2018.

Table 1. Comparison of average monthly flow (kcfs) and spill (kcfs) at Lower Monumental Dam, 2014‑2018.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| Month | 2014 | 2015 | 2016 | 2017 | 2018 | Average |
|  |  |  |  |  |  |  |
| Flow |  |  |  |  |  |  |
| April | 75.2 | 50.0 | 87.0 | 136.5 | 93.7 | 88.5 |
| May | 100.9 | 60.3 | 85.2 | 140.6 | 133.3 | 104.1 |
| June | 84.5 | 41.0 | 51.3 | 126.9 | 78.5 | 76.4 |
| July | 45.5 | 27.0 | 31.5 | 49.7 | 38.0 | 38.3 |
| August | 26.8 | 21.0 | 22.5 | 29.2 | 27.3 | 25.4 |
| Sept. | 20.2 | 18.2 | 19.2 | 25.7 | 22.1 | 21.1 |
|  |  |  |  |  |  |  |
| Spill |  |  |  |  |  |  |
| April | 26.4 | 25.7 | 25.2 | 63.7 | 36.4 | 35.5 |
| May | 29.3 | 24.2 | 35.3 | 69.9 | 54.5 | 42.6 |
| June | 25.9 | 19.3 | 24.5 | 59.8 | 28.5 | 31.6 |
| July | 17.1 | 14.1 | 16.2 | 16.9 | 16.9 | 16.2 |
| August | 13.1 | 8.5 | 10.4 | 14.3 | 13.1 | 11.9 |
| Sept. | 0.3 | 0.2 | 0.2 | 1.7 | 0.4 | 0.6 |
|  |  |  |  |  |  |  |

## Fish Collection

### Migration and Collection

Pre-transport primary and secondary bypass occurred from March 19 through April 23. Fish collection for transportation began at 0700 hours on April 23, and continued until 0700 hours on August 18. An estimated 2,761,746 juvenile salmonids were collected in 2018 (Table 2). Within each species group, the number collected and percent of the total collection was: 880,575 clipped yearling Chinook salmon (31.9%), 337,530 unclipped yearling Chinook salmon (12.2%), 130,343 clipped subyearling Chinook salmon (4.7%), 174,478 unclipped subyearling Chinook salmon (6.3%), 970,517 clipped steelhead (35.1%), 208,054 unclipped steelhead (7.5%), 26,600 clipped sockeye salmon (1.0%), 8,605 unclipped sockeye/kokanee salmon (0.3%), and 25,044 coho salmon (0.9%). Post-season bypass occurred from October 1 through December 17. Daily collection and bypass numbers are provided in Appendix Table 1.

By the end of May, 92.4% of the total yearly collection for 2018 had arrived. The percent of the total collection arriving by the end of June and the end of July was 98.5% and 99.9% respectively. The months of August and September contributed 0.1% of the total collection and were responsible for the collection of 0.7% of 2018’s unclipped subyearling Chinook salmon.

In 2018, the peak daily collection total and date for each species group were: 61,646 clipped yearling Chinook salmon (May 9), 26,000 unclipped yearling Chinook salmon (April 18), 19,422 clipped subyearling Chinook salmon (May 30), 21,826 unclipped subyearling Chinook salmon (May 30), 71,040 clipped steelhead (May 2), 12,810 unclipped steelhead (May 2), 4,500 clipped sockeye salmon (May 18), 800 unclipped sockeye/kokanee salmon (April 18), and 2,000 coho salmon (May 10). Total daily collection in 2018 peaked at 129,000 (May 1). Peak collection date and daily collection total by species group are listed in Table 3. Daily collection of all species combined versus total flow is shown graphically in Figure 2.

Table 2. Annual collection, bypass, and transport at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
|  | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Year | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. |  | Total |
|  |  |  |  |  |  |  |  |  |  |
| Collection |  |  |  |  |  |  |  |  |  |
| 2014 | 868,447 | 271,339 | 104,635 | 152,371 | 536,410 | 150,324 | 13,550 | 31,858 | 17,705 | 2,146,639 |
| 2015 | 514,612 | 127,462 | 66,316 | 108,154 | 252,560 | 69,705 | 5,840 | 850 | 22,120 | 1,167,619 |
| 2016 | 2,887,590 | 619,657 | 83,808 | 100,029 | 1,009,016 | 276,408 | 10,300 | 1,070 | 40,586 | 5,028,464 |
| 2017 | 1,085,863 | 373,783 | 143,911 | 201,653 | 973,825 | 321,374 | 8,370 | 8,290 | 33,800 | 3,151,499 |
| 2018 | 880,575 | 337,530 | 130,343 | 174,478 | 970,517 | 208,054 | 26,600 | 8,605 | 25,044 | 2,761,746 |
|  |  |  |  |  |  |  |  |  |  |  |
| Bypass |  |  |  |  |  |  |  |  |  |
| 2014 | 175 | 67 | 236 | 380 | 237 | 112 | 0 | 0 | 0 | 1,207 |
| 2015 | 34,051 | 26,431 | 201 | 417 | 31,786 | 5,011 | 0 | 30 | 300 | 98,227 |
| 2016 | 1,195,352 | 417,149 | 307 | 1,663 | 550,091 | 105,023 | 0 | 0 | 6,244 | 2,275,829 |
| 2017 | 277,539 | 212,024 | 1,336 | 4,332 | 472,639 | 87,447 | 0 | 4,597 | 800 | 1,060,714 |
| 2018 | 99,180 | 100,255 | 67 | 611 | 222,896 | 29,278 | 119 | 1,479 | 100 | 453,985 |
|  |  |  |  |  |  |  |  |  |  |  |
| Truck |  |  |  |  |  |  |  |  |  |  |
| 2014 | 0 | 5 | 150 | 1,617 | 11 | 2 | 0 | 2 | 0 | 1,787 |
| 2015 | 0 | 0 | 8 | 760 | 14 | 1 | 0 | 0 | 0 | 783 |
| 2016 | 1 | 0 | 103 | 551 | 12 | 2 | 0 | 0 | 0 | 669 |
| 2017 | 1 | 3 | 32 | 344 | 1 | 2 | 0 | 0 | 0 | 383 |
| 2018 | 0 | 0 | 11 | 118 | 0 | 0 | 0 | 0 | 0 | 129 |
|  |  |  |  |  |  |  |  |  |  |  |
| Barge |  |  |  |  |  |  |  |  |  |  |
| 2014 | 867,541 | 271,038 | 103,940 | 149,906 | 536,007 | 150,172 | 13,544 | 31,566 | 17,705 | 2,141,419 |
| 2015 | 480,257 | 100,972 | 65,845 | 106,548 | 220,464 | 64,610 | 5,821 | 819 | 21,816 | 1,067,152 |
| 2016 | 1,691,793 | 202,472 | 83,276 | 97,727 | 458,818 | 171,354 | 10,280 | 1,066 | 34,341 | 2,751,127 |
| 2017 | 807,367 | 161,580 | 142,397 | 196,759 | 500,873 | 233,819 | 8,329 | 4,239 | 32,959 | 2,088,322 |
| 2018 | 781,029 | 237,187 | 130,126 | 173,644 | 747,509 | 178,748 | 26,447 | 7,113 | 24,941 | 2,306,744 |
|  |  |  |  |  |  |  |  |  |  |  |
| Total Transported |  |  |  |  |  |  |  |  |
| 2014 | 867,541 | 271,043 | 104,090 | 151,523 | 536,018 | 150,174 | 13,544 | 31,568 | 17,705 | 2,143,206 |
| 2015 | 480,257 | 100,972 | 65,853 | 107,308 | 220,478 | 64,611 | 5,821 | 819 | 21,816 | 1,067,935 |
| 2016 | 1,691,794 | 202,472 | 83,379 | 98,278 | 458,830 | 171,356 | 10,280 | 1,066 | 34,341 | 2,751,796 |
| 2017 | 807,368 | 161,583 | 142,429 | 197,103 | 500,874 | 233,821 | 8,329 | 4,239 | 32,959 | 2,088,705 |
| 2018 | 781,029 | 237,187 | 130,137 | 173,762 | 747,509 | 178,748 | 26,447 | 7,113 | 24,941 | 2,306,873 |
|  |  |  |  |  |  |  |  |  |  |  |

Table 3. Annual peak collection dates at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
|  | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Year | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. |  | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| 2014 | May 7 | May 2 | June 6 | June 6 | May 2 | May 2 | May 20 | May 2 | May 19 | May 7 |
|  | 90,000 | 31,400 | 9,750 | 9,400 | 50,800 | 10,000 | 6,200 | 3,400 | 2,000 | 156,800 |
|  |  |  |  |  |  |  |  |  |  |  |
| 2015 | May 6 | May 6 | June 5 | June 5 | May 2 | May 9 | May 18 | May 7a | May 17 | May 9 |
|  | 74,226 | 13,411 | 7,400 | 7,150 | 21,800 | 5,200 | 1,300 | 200 | 2,800 | 109,200 |
|  |  |  |  |  |  |  |  |  |  |  |
| 2016 | May 9 | April 26 | June 10 | June 10 | April 26 | May 9 | May 22 | May 5b | May 9 | April 26 |
|  | 339,800 | 70,000 | 13,550 | 10,300 | 140,200 | 18,200 | 2,900 | 200 | 7,000 | 431,000 |
|  |  |  |  |  |  |  |  |  |  |  |
| 2017 | May 9c | April 18 | June 2 | June 2 | April 22 | May 9 | May 14 | April 20d | May 13 | May 9 |
|  | 78,000 | 34,200 | 11,550 | 12,000 | 98,200 | 24,000 | 2,200 | 1,000 | 5,400 | 181,600 |
|  |  |  |  |  |  |  |  |  |  |  |
| 2018 | May 9 | April 18 | May 30 | May 30 | May 2 | May 2 | May 18 | April 18 | May 10 | May 1 |
|  | 61,646 | 26,000 | 19,422 | 21,826 | 71,040 | 12,810 | 4,500 | 800 | 2,000 | 129,000 |
|  |  |  |  |  |  |  |  |  |  |  |

Notes:

1. May 7, 8, 9, and 18, same number collected each day
2. May 5, 8, and 11, same number collected each day
3. May 9 and 12 same number collected each day
4. April 20 and May 4 same number collected each day

Figure 2. Daily juvenile salmonid collection, all species combined, versus daily average river flow at Lower Monumental Dam, 2018.

### Adult Fallbacks

A total of 706 adult salmonids fell back through the juvenile bypass system and were bypassed from the separator between April 1 and October 1, 2018 (Table 4). The total includes: 106 adult Chinook salmon, 20 jack Chinook salmon, 232 clipped steelhead, 347 unclipped steelhead, and 1 unclipped sockeye salmon. The daily number of adult fallbacks and fallback mortalities at Lower Monumental Dam can be found in Appendix Table 4.

As has been the case in previous years, most adult fallbacks in 2018 were steelhead. The months of April and May accounted for 91.5% of steelhead fallbacks and included kelt while June through September accounted for 8.5% of all steelhead fallbacks (Table 5). Spring/summer Chinook salmon accounted for 73.0% and fall Chinook salmon accounted for 27.0% of Chinook salmon fallbacks. Monthly adult salmonid fallback peaked in April and May, with a second (much smaller) increase in September.

Table 4. Annual totals of adult salmonids released from the juvenile fish separator at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  | Jack | Clipped | Unclipped |  |  |  |
| Year | Chinook | Chinook | Steelhead | Steelhead | Sockeye | Coho | Total |
|  |  |  |  |  |  |  |  |
| 2014 | 163 | 58 | 321 | 992 | 20 | 7 | 1,561 |
| 2015 | 178 | 34 | 224 | 312 | 7 | 6 | 761 |
| 2016 | 113 | 26 | 339 | 432 | 2 | 3 | 915 |
| 2017 | 101 | 42 | 263 | 322 | 0 | 0 | 728 |
| 2018 | 106  | 20  | 232  | 347  | 1 | 0 | 706 |
|  |  |  |  |  |  |  |  |

Table 5. Monthly totals of adult salmonids released from the juvenile fish separator at Lower Monumental Dam, 2018.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|   |  | Jack | Clipped | Unclipped |  |  |   |
| Month | Chinook | Chinook | Steelhead | Steelhead | Sockeye | Coho | Total |
|  |  |  |  |  |  |  |  |
| April | 1 | 0 | 83 | 133 | 0 | 0 | 217 |
| May | 20 | 0 | 128 | 186 | 1 | 0 | 334 |
| June | 47 | 4 | 9 | 17 | 0 | 0 | 77 |
| July | 13 | 2 | 2 | 1 | 0 | 0 | 18 |
| August | 8 | 1 | 1 | 0 | 0 | 0 | 10 |
| September | 16 | 12 | 8 | 8 | 0 | 0 | 44 |
| October | 1 | 1 | 1 | 2 | 0 | 0 | 5 |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Total | 106 | 20 | 232 | 347 | 1 | 0 | 706 |

The condition of adult salmonids was evaluated as the fish were released from the separator. Their condition was predominantly good to fair with 90.2% of the fallbacks rated in these categories (Table 6). Condition ratings of the 706 adults examined were as follows: 486 good (68.8%), 151 fair (21.4%), 53 poor (7.5%), and 16 dead (2.3%). The number of dead in each species group of adult salmonids was: 1 jack Chinook salmon, 9 clipped steelhead and 6 unclipped steelhead. Adult Chinook salmon had a higher percentage of good/fair fish (98.4%) than adult steelhead (88.4%).

Table 6. Condition of adult salmonids released from the juvenile fish separator at Lower Monumental Dam, 2018.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|   |  | Jack | Clipped | Unclipped |  |  |  |
| Condition | Chinook | Chinook | Steelhead | Steelhead | Sockeye | Coho | Total |
|   |  |  |  |  |  |  |  |
| Good | 93 | 18 | 139 | 235 | 1 | 0 | 486 |
| Fair | 12 | 1 | 62 | 76 | 0 | 0 | 151 |
| Poor | 1 | 0 | 26 | 26 | 0 | 0 | 53 |
| Dead | 0 | 1 | 9 | 6 | 0 | 0 | 16 |
|  |  |   |   |  |  |  |  |
| Total | 106 | 20 | 236 | 343 | 1 | 0 | 706 |

### Separator Efficiency

The separator is designed with bar spacing to allow only smaller smolts—subyearling Chinook and sockeye salmon—to divert to the A side of the collection facility. Larger smolts—steelhead and yearling Chinook salmon—divert to the B side through wider spaced bars. Separator efficiency for 2018 by species group was: clipped yearling Chinook salmon 64.5%, unclipped yearling Chinook salmon 58.8%, subyearling Chinook salmon 52.4%, clipped steelhead 90.9%, unclipped steelhead 73.2%, clipped sockeye salmon 39.2%, and unclipped sockeye/kokanee salmon 36.7% (Table 7).

Table 7. Annual separator efficiency in percent at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  | Clipped | Unclipped |  |  |  |  | Unclipped |
|  | Yearling | Yearling | Subyearling | Clipped | Unclipped | Clipped  | Sockeye/ |
|  | Chinook | Chinook | Chinook | Steelhead | Steelhead | Sockeye | Kokanee |
| Year | A-side | A-side | A-side | B-side | B-side | A-side | A-side |
|  |  |  |  |  |  |  |  |
| 2014 | 70.6 | 68.0 | 59.1 | 78.8 | 32.5 | 38.0 | 44.3 |
| 2015 | 87.1 | 79.6 | 60.8 | 83.2 | 74.9 | 41.4 | 60.7 |
| 2016 | 85.1 | 80.2 | 75.0 | 76.6 | 47.9 | 63.1 | 4.7 |
| 2017 | 60.8 | 57.0 | 64.4 | 86.8 | 63.0 | 45.0 | 28.2 |
| 2018 | 64.5 | 58.8 | 52.4 | 90.9 | 73.2 | 39.2 | 36.7 |
|  |  |  |  |  |  |  |  |

### Sampling

From the 2014 Federal Columbia River Power System BiOp:

Data on fish survival, adult returns, current year in-river conditions, and water supply forecast will be reviewed with Regional Implementation Oversight Group each year to determine the best operation for the fish transport start date. The Technical Management Team (TMT) will review the results of transport studies annually and provide an annual recommendation on how to operate the juvenile transport program to achieve the goal of transporting about 50% of juvenile steelhead. Planning dates to initiate juvenile transport at Lower Granite Dam will be April 21 to April 25, unless the Corps adopts a recommendation by TMT that proposes a later start date (No later than May 1) and accompanying alternative operation in their annual recommendation to achieve the goal of transporting about 50% of juvenile steelhead. Transport will begin up to 4 days and up to 7 days after the Lower Granite start date at Little Goose and Lower Monumental dams, respectively. Transport will continue until approximately September 30 at Lower Monumental and through October 31 at Lower Granite and Little Goose dams.

Sampling for condition and outmigration indexing at Lower Monumental Dam began April 1. Sampling for transport began at 0700 hours on April 23, and ended at 0700 hours on October 1.

Sampling is defined as diverting and segregating groups of fish in a consistent fashion so data collected from those segregated groups will accurately represent the sum total of the fish being collected. Sampling is not the act of evaluating those groups.

Fish were sampled every third day (24-hour sampling) from April 1 through April 13, and every other day from April 13 through April 22, to monitor fish condition, ensure the system was operating correctly, and to train personnel on facility operation and sampling protocols. This type of sampling is termed “sampling for condition.” There was a total number of 3,747 fish sampled during the April 1 through April 22 period. The number sampled within each species group was: 995 clipped yearling Chinook salmon, 1,009 unclipped yearling Chinook salmon, 1,534 clipped steelhead, 194 unclipped steelhead, 2 clipped sockeye salmon, 12 unclipped sockeye/kokanee salmon, and 1 unclipped coho salmon. Sampling for transport was conducted daily from April 23 through August 18.

Total sampling includes both “sampling for condition” as well as “sampling for transport,” which was conducted during the 2018 operating year. A total of 27,846 fish (1.0% of the collection) were sampled in 2018. Within each species group, the number and percent sampled of those collected in that group was: 5,477 clipped yearling Chinook salmon (0.6%), 2,496 unclipped yearling Chinook salmon (0.7%), 3,889 clipped subyearling Chinook salmon (3.0%), 8,025 unclipped subyearling Chinook salmon (4.6%), 5,905 clipped steelhead (0.6%), 1,424 unclipped steelhead (0.7%), 288 clipped sockeye salmon (1.1%), 75 unclipped sockeye/kokanee salmon (0.9%), and 267 coho salmon (1.1%). (Table 8)

Average weekly sample rates can be found in Table 9 and ranged from 0.5% to 100%.

Table 8. Annual percentage sampled of each juvenile salmonid species group at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
|  | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Year | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clip/Un. | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| 2014 | 0.6 | 0.7 | 4.9 | 7.8 | 0.7 | 0.8 | 0.6 | 0.8 | 0.7 | 1.4 |
| 2015 | 0.7 | 0.9 | 3.5 | 5.4 | 1.0 | 1.1 | 1.1 | 1.1 | 1.5 | 1.4 |
| 2016 | 0.6 | 0.7 | 4.9 | 7.0 | 0.6 | 0.7 | 2.7 | 1.3 | 0.8 | 0.8 |
| 2017 | 0.6 | 0.7 | 2.7 | 3.4 | 0.6 | 0.8 | 1.1 | 0.8 | 2.2 | 0.9 |
| 2018 | 0.6 | 0.7 | 3.0 | 4.6 | 0.6 | 0.7 | 1.1 | 0.9 | 1.1 | 1.0 |
|  |  |  |  |  |  |  |  |  |  |  |

Table 9. Weekly sample rates in percent and sample totals at Lower Monumental Dam, 2018.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  | Weekly | Yearling | Subyearling |  |  |  |  |  |  |
| Week | Rate  | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Ending | (%) | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clip/Un. | Totals\* |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 5-Apr | 5.5 | 193 | 178 | --- | --- | 4 | 1 | --- | --- | --- | 376 |
| 12-Apr | 3.0 | 288 | 287 | --- | --- | 203 | 19 | 1 | 6 | --- | 804 |
| 19-Apr | 0.7 | 346 | 371 | --- | --- | 937 | 123 | 1 | 5 | 1 | 1,784 |
| 26-Apr | 0.5 | 466 | 422 | --- | --- | 1,005 | 137 | --- | 4 | --- | 2,034 |
| 3-May | 0.5 | 1,101 | 458 | --- | --- | 1,651 | 265 | --- | 11 | 16 | 3,502 |
| 10-May | 0.5 | 1,505 | 259 | --- | 2 | 882 | 195 | --- | 2 | 33 | 2,878 |
| 17-May | 0.6 | 905 | 132 | --- | --- | 491 | 228 | 23 | 4 | 23 | 1,806 |
| 24-May | 1.3 | 603 | 182 | 106 | 14 | 397 | 227 | 197 | 21 | 38 | 1,785 |
| 31-May | 1.0 | 47 | 61 | 434 | 438 | 184 | 152 | 58 | 12 | 30 | 1,416 |
| 7-Jun | 1.6 | 10 | 47 | 377 | 474 | 53 | 37 | 4 | 5 | 31 | 1,038 |
| 14-Jun | 5.0 | 9 | 54 | 822 | 909 | 54 | 24 | 4 | 3 | 66 | 1,945 |
| 21-Jun | 7.9 | 1 | 9 | 669 | 905 | 10 | 10 | --- | --- | 9 | 1,613 |
| 28-Jun | 5.7 | 3 | 11 | 459 | 960 | 9 | 3 | --- | --- | 7 | 1,452 |
| 5-Jul | 10.0 | --- | 16 | 364 | 916 | 3 | 1 | --- | --- | 11 | 1,311 |
| 12-Jul | 8.6 | --- | 3 | 175 | 580 | 5 | --- | --- | 1 | 1 | 765 |
| 19-Jul | 8.6 | --- | 3 | 219 | 946 | 6 | --- | --- | --- | --- | 1,174 |
| 26-Jul | 17.1 | --- | 1 | 92 | 568 | 3 | 1 | --- | 1 | --- | 666 |
| 2-Aug | 25.0 | --- | --- | 72 | 430 | 1 | --- | --- | --- | --- | 503 |
| 9-Aug | 25.0 | --- | --- | 15 | 91 | --- | --- | --- | --- | 1 | 107 |
| 16-Aug | 46.4 | --- | --- | 9 | 101 | 1 | --- | --- | --- | --- | 111 |
| 23-Aug | 100.0 | --- | --- | 24 | 206 | 3 | 1 | --- | --- | --- | 234 |
| 30-Aug | 100.0 | --- | --- | 11 | 83 | --- | --- | --- | --- | --- | 94 |
| 6-Sep | 100.0 | --- | --- | 15 | 202 | --- | --- | --- | --- | --- | 217 |
| 13-Sep | 100.0 | --- | --- | 15 | 121 | 1 | --- | --- | --- | --- | 137 |
| 20-Sep | 100.0 | --- | --- | 6 | 32 | 1 | --- | --- | --- | --- | 39 |
| 27-Sep | 100.0 | --- | 2 | 3 | 27 | --- | --- | --- | --- | --- | 32 |
| 1-Oct | 100.0 | --- | --- | 2 | 20 | 1 | --- | --- | --- | --- | 23 |
| Total Sampled | 5,477 | 2,496 | 3,889 | 8,025 | 5,905 | 1,424 | 288 | 75 | 267 | 27,846 |
| % of Sample | 19.7 | 9.0 | 14.0 | 28.8 | 21.2 | 5.1 | 1.0 | 0.3 | 1.0 | 100.0 |
| % of Collection  | 0.6 | 0.7 | 3.0 | 4.6 | 0.6 | 0.7 | 1.1 | 0.9 | 1.1 | 1.0 |
|  |  |  |  |  |  |  |  |  |  |  |

\* Daily 24-hour sampling at Lower Monumental Dam began this year on April 23.

### Transportation

An estimated 2,306,873 juvenile salmonids (83.5% of the collection) were transported from Lower Monumental Dam in 2018. Of these, 129 were transported by truck and approximately 2,306,744 by barge. Within each species group, the number transported and percent of those collected in each group was: 781,029 clipped yearling Chinook salmon (88.7%), 237,187 unclipped yearling Chinook salmon (70.3%), 130,137 clipped subyearling Chinook salmon (99.9%), 173,762 unclipped subyearling Chinook salmon (99.6%), 747,509 clipped steelhead (77.0%), 178,748 unclipped steelhead (85.9%), 26,447 clipped sockeye salmon (99.4%), 7,113 unclipped sockeye/kokanee salmon (82.7%), and 24,941 coho salmon (99.6%). Daily truck and barge transportation numbers are provided in Appendix Table 3.

Juvenile fish were scheduled to be trucked by midi-tanker from August 15 at 1500 hours through October 1 at 0700 hours. Per the 2018 Fish Passage Plan, continuation of Lower Monumental trucking schedule was contingent upon fish numbers. Therefore, trucking ceased August 18 due to that being the third consecutive day with fewer than 50 smolts collected.

A total of 129 fish (<0.01%) of the collection) were transported by truck in 2018 (Table 2). Within each species group, the number trucked and percent of those collected in each group was: 11 clipped subyearling Chinook salmon (8.5%) and 118 unclipped subyearling Chinook salmon (91.5%).

Juvenile fish collected at Lower Monumental Dam from April 23 at 0700 hours through August 18 at 1500 hours were transported by barge. An estimated 2,306,744 (83.5% of the collection) were transported by barge in 2018 (Table 2). Within each species group, the number barged and percent of those collected in each group was: 781,029 clipped yearling Chinook salmon (88.7%), 237,187 unclipped yearling Chinook salmon (70.3%), 130,126 clipped subyearling Chinook salmon (99.8%), 173,644 unclipped subyearling Chinook salmon (99.5%), 747,509 clipped steelhead (77.0%), 178,748 unclipped steelhead (85.9%), 26,447 clipped sockeye salmon (99.4%), 7,113 unclipped sockeye/kokanee salmon (82.7%), and 24,941 coho salmon (99.6%).

### Bypass

During the 2018 season (April 1 to October 1) a total of 453,985 fish were bypassed (16.4% of the collection) (Table 2). Within each species group, the number bypassed and percent of those collected in each group was: 99,180 clipped yearling Chinook salmon (11.3%), 100,255 unclipped yearling Chinook salmon (29.7%), 67 clipped subyearling Chinook salmon (0.1%), 611 unclipped subyearling Chinook salmon (0.4%), 222,896 clipped steelhead (23.0%), 29,278 unclipped steelhead (14.1%), 119 clipped sockeye salmon (0.4%), 1,479 unclipped sockeye/kokanee salmon (17.2%), and 100 coho salmon (0.4%). These numbers do not include fish bypassed by the PIT-tag diversion system.

Juvenile salmonids were bypassed rather than transported for the following purposes this season:

1. Condition sampling and secondary bypass occurred from 0700 hours on April 1 through 0700 hours on April 22 (see condition sampling frequency in sampling section). A total of 453,298 fish were bypassed during this period. Within each species group, the number bypassed was: 99,180 clipped yearling Chinook salmon, 100,253 unclipped yearling Chinook salmon, 222,890 clipped steelhead, 29,277 unclipped steelhead, 119 clipped sockeye salmon, 1,479 unclipped sockeye/kokanee salmon, and 100 coho salmon. These numbers include fish examined for GBT during this primary bypass period.
2. Condition sampling and secondary bypass occurred from 0700 hours August 18 through 0700 hours on October 1. A total of 687 fish were bypassed during this period. Within each species group, the number bypassed was: 2 unclipped yearling Chinook salmon, 67 clipped subyearling Chinook salmon, 611 unclipped subyearling Chinook salmon, 6 clipped steelhead, and 1 unclipped steelhead.
3. Salmonid fry measuring less than 60 millimeters (mm) were bypassed and not sampled due to smolt monitoring protocol.
4. The PTAGIS database revealed 47,463 PIT-tagged fish of different species groups were bypassed through the PIT-tag system. These fish are not included in the facility bypass total.

PIT-tag diversion gates are set to bypass PIT-tagged fish when sample rates are 20% or higher and during sampling intervals when fish were being collected for research to prevent anesthetizing study fish a second time.

The fish rearing designation used by PTAGIS is hatchery/wild, not clipped/unclipped; therefore, the hatchery/wild designation is used to report the PIT-tag numbers in the following section rather than the clipped/unclipped designation used throughout the rest of this report. According to the PTAGIS3 database the total of bypassed PIT-tagged fish was 47,463. The total by unit group was: 9,486 hatchery spring Chinook salmon, 3,236 hatchery summer Chinook salmon, , 825 hatchery Chinook salmon of unknown run, 2,243 wild spring Chinook salmon, 1,753 wild summer Chinook salmon, 3,113 wild Chinook salmon of unknown run, 105 spring Chinook salmon of unknown rearing disposition, 55 Chinook salmon of unknown run or rearing disposition, 18,973 hatchery steelhead, 5,259 wild steelhead, 5 steelhead of unknown rearing, 370 steelhead of unknown run or rearing disposition, 7 winter steelhead, 1,296 hatchery sockeye salmon, 149 wild sockeye salmon, and 588 hatchery coho salmon. An unknown number of other fish were bypassed incidentally with the PIT-tagged fish as the PIT-tag diversion gates opened and closed to divert the PIT-tagged fish.

###

### Incidental Species

Non-target fish species that were too large to pass through the separator bars were recorded and bypassed through the adult release pipe at the separator. Those small enough to pass through the separator bars were either sampled and bypassed, or held in the raceways and transported with the juvenile salmonids. Fortunately, most incidental fishes generally arrive late in the season when 100% of the collection is sampled. At this time, incidental species are removed while working up the sample; therefore, avoiding transport. Sample fish from each incidental species were counted and their total numbers were calculated using the sample rate. These numbers were then added with separator counts of the same group to estimate the total collection for each species. The most common incidental species groups for 2018 included: juvenile shad (72,363), juvenile Pacific lamprey (55,781), sucker (5,116), Siberian prawn (1,557), large/smallmouth bass (1,046), adult shad (400), walleye (352), and sculpin (222).

The number of juvenile shad (72,363) collected in 2018 was, once again, greater than collected in any previous operating year. Historically, juvenile crappie was one of the most encountered incidental species. Their numbers this year have continued to decrease from 407 in 2017 to 214 in 2018. Juvenile Pacific lamprey numbers collected in 2018 (54,404) were much higher than 2017 (1450) and the highest they have been since 2013. Siberian prawn collection in 2018 (1,557) was notably lower than in recent years. It is important to note that estimated numbers of some groups may become exaggerated high or low due to the low sample rates at the time of their collection. A summary of incidental fish collection is provided in Table 10.

Table 10. Estimated collection of incidental species at Lower Monumental Dam, 2018.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  | Exp. |  | Total |
| Common Name | Scientific Name | Sample | Separator | Collection1 |
|  |  |  |  |  |
| American shad (Adult) | *Alosa sapidissima* | 17 | 383 | 400 |
| American shad (Juvenile)  | *A. sapidissima* | 72,335 | 28 | 72,363 |
| Banded Killifish | *Fundulus diaphanus* | 0 | 0 | 0 |
| Bullhead (misc.) | *Ameiurus* spp. | 246 | 9 | 255 |
| Bull Trout | *Salvelinus confluentus* | 0 | 0 | 0 |
| Brown Trout | *Salmo trutta* | 0 | 0 | 0 |
| Channel catfish | *Ictalurus punctatus* | 124 | 28 | 152 |
| Chiselmouth | *Acrocheilus alutaceus* | 0 | 1 | 1 |
| Common carp | *Cyprinus carpio* | 44 | 54 | 98 |
| Crappie | *Pomoxis* spp. | 120 | 94 | 214 |
| Kokanee | *Oncorhynchus nerka* | 0 | 0 | 0 |
| Mosquitofish | *Gambusia affinis* | 0 | 0 | 0 |
| Northern Pikeminnow | *Ptychocheilus oregonensis* | 1 | 0 | 1 |
| Pacific lamprey (Adult) | *Lampetra tridentatus* | 97 | 1 | 98 |
| Pacific lamprey (Juvenile) | *L. tridentatus* | 54,404 | 0 | 54,404 |
| Pacific lamprey (Ammocoete) | *L. tridentatus* | 1377 | 0 | 1,377 |
| Peamouth | *Mylocheilus caurinus* | 222 | 2 | 224 |
| Redside Shiner | *Richardsonius balteatus* | 0 | 0 | 0 |
| Sandroller | *Percopsis transmontana* | 0 | 0 | 0 |
| Sculpin | *Cottus* spp. | 222 | 0 | 222 |
| Siberian Shrimp/Prawn | *Exopalaemon modestus* | 1,557 | 0 | 1,557 |
| Largemouth/Smallmouth bass | *Micropterus dolomieu/salmoides* | 1,044 | 2 | 1,046 |
| Sucker (misc.) | *Catostomus* spp. | 4,935 | 181 | 5,116 |
| Sunfish (misc.) | *Lepomis* spp. | 0 | 0 | 0 |
| Tadpole Madtom | *Noturus gyrinus* | 0 | 0 | 0 |
| Whitefish | *Prosopium* spp. | 232 | 3 | 235 |
| White Sturgeon | *Acipenser transmontanus* | 0 | 2 | 2 |
| Walleye | *Sander vitreus* | 154 | 198 | 352 |
| Warmouth | *Lepomis gulosus* | 0 | 0 | 0 |
| Yellow perch | *Perca flavescens* | 114 | 42 | 156 |
|  |  |  |  |  |
| Others  | -------------------- | 249 | 0 | 249 |
|  |  |  |  |  |
| Total |  | 137,494 | 1,028 | 138,522 |
|  |  |  |  |  |

1 Incidental species collection estimates are based on (sampled number of group expanded by the sample rate) plus separator count. All incidental fish in the sample and the separator are removed and bypassed.

## Fish Condition

### Descaling

Descaling data were collected from all live sample fish (full sample) rather than just a portion (subsample). Full sample data collection provides a larger sample size and therefore a better representation of fish condition.

The descaling rate for all fish sampled in 2018 was 1.9%. The annual descaling rate by species group was: clipped yearling Chinook salmon (2.0%), unclipped yearling Chinook salmon (2.0%), clipped subyearling Chinook salmon (1.7%), unclipped subyearling Chinook salmon (1.5%), clipped steelhead (2.1%), unclipped steelhead (2.9%), clipped sockeye salmon (2.4%), unclipped sockeye/kokanee salmon (1.3%), and coho salmon (1.9%) (Table 11). The highest rate ever recorded at the JFF was 6.7% in 1993. Rates over the last 5 years have ranged from a low of 1.7 in 2016 to a high of 2.6% in 2015.

In 2018, the highest weekly descaling rate for all species combined was 7.4% for the week ending August 30 (with 94 fish sampled in a week of condition sampling), while the lowest rate (0.0%) occurred in the weeks ending July 19 and October 1 (Table 12). Daily descaling rates are provided in Appendix Table 2.

Table 11. Annual descaling rates in percent for fish sampled at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
|  | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Year | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clip/Un. | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| 2014 | 2.4 | 1.8 | 1.2 | 1.3 | 3.5 | 1.8 | 5.3 | 3.8 | 2.3 | 1.9 |
| 2015 | 3.0 | 3.0 | 1.3 | 1.6 | 4.6 | 4.7 | 3.2 | 22.2 | 2.7 | 2.6 |
| 2016 | 1.4 | 1.4 | 1.2 | 1.6 | 2.6 | 2.7 | 6.9 | 0.0 | 1.0 | 1.7 |
| 2017 | 2.2 | 2.2 | 1.7 | 1.9 | 3.5 | 1.6 | 3.3 | 3.1 | 1.1 | 2.3 |
| 2018 | 2.0 | 2.0 | 1.7 | 1.5 | 2.1 | 2.9 | 2.4 | 1.3 | 1.9 | 1.9 |
|  |  |  |  |  |  |  |  |  |  |  |

Table 12. Weekly descaling rates in percent for fish sampled at Lower Monumental Dam, 2018.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
| Week | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Ending | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clip/Un. | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| 5-Apr | 0.5 | 1.1 | --- | --- | 0.0\* | 0.0\* | --- | --- | --- | 0.8 |
| 12-Apr | 0.7 | 0.3 | --- | --- | 1.5 | 0.0\* | 0.0\* | 0.0\* | --- | 0.7 |
| 19-Apr | 0.3 | 2.2 | --- | --- | 1.6 | 0.0 | 0.0\* | 0.0\* | 0.0\* | 1.3 |
| 26-Apr | 3.0 | 2.4 | --- | --- | 1.0 | 2.2 | --- | 0.0\* | --- | 1.8 |
| 3-May | 2.8 | 2.6 | --- | --- | 1.9 | 2.6 | --- | 0.0\* | 0.0\* | 2.3 |
| 10-May | 1.9 | 1.5 | --- | 0.0\* | 1.9 | 3.6 | --- | 0.0\* | 0.0\* | 1.9 |
| 17-May | 1.9 | 2.3 | --- | --- | 4.3 | 4.4 | 0.0\* | 0.0\* | 0.0\* | 2.8 |
| 24-May | 2.2 | 3.3 | 0.0 | 7.1\* | 2.8 | 5.3 | 1.5 | 0.0\* | 2.6\* | 2.6 |
| 31-May | 0.0\* | 3.3\* | 0.7 | 0.9 | 4.3 | 1.3 | 6.9\* | 8.3\* | 6.7\* | 1.8 |
| 7-Jun | 0.0\* | 2.1\* | 1.3 | 0.4 | 0.0\* | 0.0\* | 0.0\* | 0.0\* | 0.0\* | 0.8 |
| 14-Jun | 22.2\* | 0.0\* | 0.6 | 0.3 | 3.7\* | 4.2\* | 0.0\* | 0.0\* | 0.0\* | 0.7 |
| 21-Jun | 0.0\* | 0.0\* | 0.1 | 0.6 | 0.0\* | 0.0\* | --- | --- | 0.0\* | 0.4 |
| 28-Jun | 33.3\* | 0.0\* | 0.0 | 0.1 | 0.0\* | 0.0\* | --- | --- | 0.0\* | 0.1 |
| 5-Jul | --- | 6.3\* | 3.3 | 0.7 | 0.0\* | 0.0\* | --- | --- | 0.0\* | 1.4 |
| 12-Jul | --- | 0.0\* | 4.6 | 2.4 | 0.0\* | --- | --- | 0.0\* | 0.0\* | 2.9 |
| 19-Jul | --- | 0.0\* | 5.0 | 2.4 | 16.7\* | --- | --- | --- | --- | 0.0 |
| 26-Jul | --- | 0.0\* | 2.2\* | 1.8 | 33.3\* | 0.0\* | --- | 0.0\* | --- | 2.0 |
| 2-Aug | --- | --- | 2.8\* | 1.6 | 0.0\* | --- | --- | --- | --- | 1.8 |
| 9-Aug | --- | --- | 0.0\* | 2.2\* | --- | --- | --- | --- | 0.0\* | 1.9 |
| 16-Aug | --- | --- | 33.3\* | 1.0 | 0.0\* | --- | --- | --- | --- | 3.6 |
| 23-Aug | --- | --- | 0.0\* | 1.0 | 0.0\* | 0.0\* | --- | --- | --- | 0.9 |
| 30-Aug | --- | --- | 0.0\* | 8.4\* | --- | --- | --- | --- | --- | 7.4\* |
| 6-Sep | --- | --- | 6.7\* | 3.5 | --- | --- | --- | --- | --- | 3.7 |
| 13-Sep | --- | --- | 6.7\* | 4.1 | 0.0\* | --- | --- | --- | --- | 4.4 |
| 20-Sep | --- | --- | 16.7\* | 3.1\* | 0.0\* | --- | --- | --- | --- | 5.1\* |
| 27-Sep | --- | 0.0\* | 33.3\* | 3.7\* | --- | --- | --- | --- | --- | 6.3\* |
| 1-Oct | --- | --- | 0.0\* | 0.0\* | 0.0\* | --- | --- | --- | --- | 0.0\* |
| Total |  |  |  |  |  |  |  |  |  |  |
| Descaled | 110 | 50 | 65 | 118 | 122 | 42 | 7 | 1 | 5 | 520 |
| Total |  |  |  |  |  |  |  |  |  |  |
| Examined | 5,477 | 2,496 | 3,889 | 8,025 | 5,905 | 1,424 | 288 | 75 | 267 | 27,846 |
| Percent |  |  |  |  |  |  |  |  |  |  |
| Descaled | 2.0 | 2.0 | 1.7 | 1.5 | 2.1 | 2.9 | 2.4 | 1.3 | 1.9 | 1.9 |
|  |  |  |  |  |  |  |  |  |  |  |

--- No fish sampled during the week.

\* Fewer than 100 fish sampled during the week.

### Other Injuries and Disease

Injury and disease data were collected from a subsample of 100 of the dominant species and not more than 100 each of the non-dominant species. A total of 19,077 fish were examined for condition. The most common symptom observed in 2018 was pink fin (683 affected fish) and fin injury (673 affected fish). A vast majority of fin injuries were observed to be split caudal and pectoral fins; however, other fin injuries were also included in this category. Split caudal fins have been defined as a split in the caudal fin membrane that extends the full length of the fin to the caudal peduncle. Split fin injuries are primarily observed in the lower lobe of the caudal fin within each species rearing and run type, aside from subyearling Chinook salmon, where most fin injuries were located at the center of the caudal and pectoral fins.

Blood pooling is defined as the vasodilatation of the capillaries in fins (also referred to as pink fin). It seems to be a symptom of anesthetic use during higher water temperatures and is mostly found on subyearling Chinook salmon. Evidence of blood pooling was found on 683 (3.6%) of all fish examined. The incidence of blood pooling by species group was: Chinook salmon (4.7%), steelhead (<0.1%), and sockeye/kokanee/coho salmon (0.3%).

Fin injuries were found on 673 (3.5%) of all fish examined. The incidence of fin injury was: Chinook salmon (3.7%), steelhead (3.0%), and sockeye/kokanee/coho salmon (1.9%). Fin hemorrhaging often coincided with split fin injuries.

Fin hemorrhaging is the discharge of blood outside the fin tissue. Fin hemorrhaging is a sign of trauma and was found on 453 (2.4%) of all fish examined for injuries. The incidence of fin hemorrhaging was: Chinook salmon (3.1%), steelhead (0.1%), sockeye/kokanee/coho salmon (0.8%). Other common injuries included: bird marks, fish marks, fungus, and *Columnaris*.

Bird marks were observed on 501 (2.6%) of all fish examined. The incidence of bird marks was: Chinook salmon (1.9%), steelhead (5.5%), and sockeye/kokanee/coho salmon (2.1%).

Fish marks were found on 449 (2.4%) of all fish examined. The incidence of fish marks was: Chinook salmon (2.7%), steelhead (1.2%), and sockeye/kokanee/coho salmon (2.1%).

Fungus was found on 13 (0.1%) of all fish examined. There were zero instances of fungus found on sockeye, kokanee, and coho salmon. The occurrence of fungus is generally seen early in the season while the water is still relatively cold. Fungus on fish was often found concurrently with body injuries.

*Columnaris* was seen again this year. It occurs most frequently in subyearling Chinook salmon, but has been seen on coho salmon and steelhead as well. Typically, it is found on the fish during the warmer water conditions of July, August, and September. *Columnaris* can be recognized by the presence of yellowish lesions on the belly, as well as some damage to the gills, pelvic fins, snout, and caudal fins. It has also been found in the dorsal region. This year, subyearling Chinook salmon showed the greatest number of *Columnaris*:60 affected fish (0.6%).

### Mortality

Annual facility mortality for all groups combined was <0.1% in 2018 (Table 13) and totaled 888 fish. Within each species group, the number of facility mortalities and percent of those collected in that group was: 366 clipped yearling Chinook salmon (<0.1%), 88 unclipped yearling Chinook salmon (<0.1%), 139 clipped subyearling Chinook salmon (0.1%), 105 unclipped subyearling Chinook salmon (0.1%), 112 clipped steelhead (<0.1%), 28 unclipped steelhead (<0.1%), 34 clipped sockeye salmon (0.1%), 13 unclipped sockeye/kokanee salmon (0.2%), and 3 coho salmon (<0.1%). In 2018, weekly mortality rates reached a high of 5.3% for the week ending August 30 and a low of 0.0% for multiple weeks (Table 14). Daily mortality rates are provided in Appendix Table 2.

Annual sample mortality for all groups combined was 0.2% in 2018 (Table 15) and totaled 42 fish. The number of sample mortalities and mortality rate by species group was: 5 clipped yearling Chinook salmon (0.1%), 2 unclipped yearling Chinook salmon (0.1%), 6 clipped subyearling Chinook salmon (0.2%), 19 unclipped subyearling Chinook salmon (0.2%), 7 clipped steelhead (0.1%), 2 clipped sockeye salmon (0.7%), and 1 unclipped sockeye/kokanee salmon (1.3%). There were no unclipped steelhead or coho salmon sample mortalities in 2018.

Table 13. Annual facility mortality in percent at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
|  | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Year | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clip/Un. | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| 2014 | 0.1 | 0.1 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.1 |
| 2015 | 0.1 | 0.0 | 0.4 | 0.4 | 0.1 | 0.1 | 0.3 | 0.1 | 0.0 | 0.1 |
| 2016 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.2 | 0.4 | 0.0 | 0.0 |
| 2017 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.5 | 0.9 | 0.1 |  0.1 |
| 2018 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.2 | 0.0 |  0.0 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |

Table 14. Weekly facility mortality rates in percent at Lower Monumental Dam, 2018.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
| Week | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Ending | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clip/Un. | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| 5-Apr | 0.0 | 0.0 | --- | --- | 0.0 | 0.0 | --- | --- | --- | 0.0 |
| 12-Apr | 0.0 | 0.0 | --- | --- | 0.0 | 0.0 | 0.0 | 0.0 | --- | 0.0 |
| 19-Apr | 0.0 | 0.0 | --- | --- | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 26-Apr | 0.0 | 0.0 | --- | --- | 0.0 | 0.0 | --- | 0.3 | --- | 0.0 |
| 3-May | 0.0 | 0.0 | --- | --- | 0.0 | 0.0 | --- | 0.1 | 0.0 | 0.0 |
| 10-May | 0.0 | 0.0 | --- | 0.0 | 0.0 | 0.0 | --- | 0.0 | 0.0 | 0.0 |
| 17-May | 0.1 | 0.1 | --- | --- | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| 24-May | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.0 | 0.2 | 0.4 | 0.0 | 0.1 |
| 31-May | 0.9 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| 7-Jun | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 | 0.1 | 0.7 | 0.0 | 0.0 | 0.1 |
| 14-Jun | 0.0 | 0.2 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21-Jun | 0.0 | 0.6 | 0.1 | 0.0 | 0.0 | 0.0 | --- | --- | 0.0 | 0.1 |
| 28-Jun | 2.0 | 1.6 | 0.3 | 0.1 | 0.0 | 0.0 | --- | --- | 0.0 | 0.1 |
| 5-Jul | --- | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | --- | --- | 0.0 | 0.1 |
| 12-Jul | --- | 0.0 | 0.2 | 0.2 | 0.0 | --- | --- | 0.0 | 0.0 | 0.2 |
| 19-Jul | --- | 0.0 | 0.4 | 0.1 | 0.0 | --- | --- | --- | --- | 0.2 |
| 26-Jul | --- | 0.0 | 0.2 | 0.4 | 0.0 | 0.0 | --- | 0.0 | --- | 0.3 |
| 2-Aug | --- | --- | 3.2 | 0.2 | 0.0 | --- | --- | --- | --- | 0.6 |
| 9-Aug | --- | --- | 1.9 | 0.0 | --- | --- | --- | --- | 25.0 | 0.5 |
| 16-Aug | --- | --- | 4.2 | 0.7 | 0.0 | --- | --- | --- | --- | 1.0 |
| 23-Aug | --- | --- | 4.2 | 0.5 | 0.0 | 0.0 | --- | --- | --- | 0.9 |
| 30-Aug | --- | --- | 9.1 | 4.8 | --- | --- | --- | --- | --- | 5.3 |
| 6-Sep | --- | --- | 0.0 | 0.5 | --- | --- | --- | --- | --- | 0.5 |
| 13-Sep | --- | --- | 0.0 | 0.8 | 0.0 | --- | --- | --- | --- | 0.7 |
| 20-Sep | --- | --- | 0.0 | 0.0 | 0.0 | --- | --- | --- | --- | 0.0 |
| 27-Sep | --- | 0.0 | 0.0 | 3.7 | --- | --- | --- | --- | --- | 3.1 |
| 1-Oct | --- | --- | 0.0 | 5.0 | 0.0 | --- | --- | --- | --- | 4.3 |
|  |  |  |  |  |  |  |  |  |  |  |

--- No fish collected during the week

Table 15. Annual sample mortality in percent at Lower Monumental Dam, 2014-2018.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
|  | Yearling | Subyearling |  |  |  |  |  |  |
|  | Chinook | Chinook | Steelhead | Sockeye/Kokanee | Coho |  |
| Year | Clipped | Unclip | Clipped | Unclip. | Clipped | Unclip. | Clipped | Unclip. | Clip/Un. | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| 2014 | 0.2 | 0.2 | 0.9 | 1.6 | 0.1 | 0.2 | 0.0 | 0.4 | 0.0 | 0.9 |
| 2015 | 0.8 | 1.4 | 0.9 | 0.8 | 1.2 | 1.3 | 0.0 | 0.0 | 0.6 | 0.9 |
| 2016 | 0.7 | 0.2 | 0.8 | 0.5 | 0.2 | 0.4 | 1.8 | 0.0 | 0.0 | 0.5 |
| 2017 | 0.4 | 0.5 | 0.6 | 0.4 | 0.3 | 0.5 | 1.1 | 5.9 | 0.5 | 0.4 |
| 2018 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.0 | 0.7 | 1.3 | 0.0 | 0.2 |
|  |  |  |  |  |  |  |  |  |  |  |

## Research

### Gas Bubble Trauma Monitoring (PSMFC)

Juvenile Chinook salmon and steelhead were sampled once a week for GBT from April 10 through July 25 in 2018. The GBT inspections were stopped early due to small numbers of available fish. Typically, inspections end when spill stops (August 31). This season, 1,437 fish were sampled for GBT. PSMFC personnel examined up to 100 individuals of each of the following groups: yearling Chinook salmon, subyearling Chinook salmon, and juvenile steelhead. The fish were searched for evidence of bubbles in paired and unpaired fins and in the eye, as per Fish Passage Center GBT protocols. Prior to collection for transport, the GBT fish were bypassed to the river after examination. Weekly GBT sampling continued for up to 8 hours or until 100 fish had been sampled per species group. The number of fish sampled for GBT, by species group was: 256 clipped yearling Chinook salmon, 123 unclipped yearling Chinook salmon, 174 clipped subyearling Chinook salmon, 417 unclipped subyearling Chinook salmon, 338 clipped steelhead, and 129 unclipped steelhead. In the 2018 season, 30 fish showed signs of GBT in the fins (2.1%).

## Operation and Maintenance

### Turbine Operations

Efforts were made to operate all turbine units within 1% of peak efficiency from April 1, 2018 to October 31, 2018. Deviations were infrequent and brief or required by the Bonneville Power Administration.

Below is a summary of unit outages and cause from March 1 through October 1, 2018.

|  |  |  |
| --- | --- | --- |
| **Unit** | **Dates out of service** | **Reason out of service** |
| All Units | March 20–22 | Trash rack raking(6-8 hours/day alternating units) |
|  | March 26–29 | STS installation |
| All Units | Monthly (2–3 days) | STS/VBS inspection |
| All Units | June 19-20 | Trash rack raking (6-8 hours/day alternating units) |
| Unit 1 | All Year | Contractor continuing rehab/rewind |
| Unit 2 | April 3 | Hub tapping |
|  | July 26 | BPA outage |
| Unit 3 | March 5 | Validation testing |
|  | March 20 | Hub tapping |
|  | April 16 | Clean brush rigging and brushes |
|  | June 25 – October | 6 year overhaul/ blade seal replacement |
| Unit 4 | February–March 29 | Stator ground |
|  | March 29–April 10 | VBS failure |
|  | July 26 | BPA outage |
|  | September 19 - October | Inspection of governor oil system |
| Unit 5 | March 22 | Oil leak investigation and repair |
|  | April 5–6 | STS 5B and 5C repair |
|  | July 26–August 2 | Doble testing/ BPA outage |
| Unit 6 | March 27 | Validation testing |
|  | April 23–May 11 | Unit annual and return to Kaplan |
|  | May 14–15 | Faulting differential trip, CO2 discharge |
|  | June 28–July 3 | Troubleshoot oil governor |
|  | July 26–August 6 | Doble testing/ BPA outage |

### Debris/Trash Racks

In 2018, trash rack raking occurred March 20 through 22 and June 19 through 20. Debris loads seen in 2018 were much lighter than 2017.

### Submersible Traveling Screens

The STSs were inspected and tested on March 22, 2018, and were installed from March 26 through March 29, 2018. An STS could not initially be installed into Gatewell 4A; investigation found that the vertical barrier screen (VBS) frame for 4A came loose and was obstructing the gatewell. The loose VBS panel was inspected by divers and removed 30 March. The VBS was repaired and a screen was installed April 10. After installation, inspection was done monthly by underwater video camera through November. The mesh was found separated from the framework on two slots (B and C) in Unit 5 on April 5 and the screens were replaced and reinstalled April 6.

STSs are usually operated in “cycle” mode while the average fork length of subyearling Chinook salmon and/or sockeye/kokanee is greater than 120 mm, and in continuous “run” mode when either is less than 120 mm. The STSs were operated in cycle mode until 1445 hours on May 9. At this time, they were changed to continuous mode due to average sockeye lengths less than 120 mm. On July 11, average subyearling Chinook salmon and sockeye lengths allowed for the screens to return to cycle mode.

### Vertical Barrier Screens

The VBSs were inspected by underwater video camera on April 4 and 5. Additionally, they were spot-checked monthly during STS inspections. After the VBS screen in slot 4A was repaired, no other problems were found during the fish passage season.

### Gatewells

Gatewells rarely exceeded the 50% debris criterion during the 2018 passage season. When debris coverage nearing 50% was reported, the powerhouse crew promptly removed the debris by dipping the gatewells.

### Orifices/Collection Channel

During the 2018 season, the number of open orifices varied from 18 to 21 according to forebay level. With the Lower Monumental reservoir at minimum operating pool, water discharge through an orifice is reduced. During this period, extra orifices were opened to supply additional water to the adult fishway. Orifices were cycled and backflushed with air daily to remove debris. Orifices 17 and 18 were found to have a log protruding through them on May 31 and June 4, respectively. Powerhouse maintenance crews were informed and the logs were removed; no fish injuries were observed. Orifice lights were also checked daily. If a light was not working, the operating orifice was switched to the other orifice in the slot until repairs could be made.

### Primary Dewaterer

The compressed air screen cleaner functioned well throughout the 2018 season. The mechanical screen cleaner intermittently malfunctioned from July 4 until the end of the season. Electricians found the problem and plan on replacing antiquated PLC’s and rotary switches when funding/time allows. This problem had little impact on keeping debris off of the incline screen, as the bubbler was still operating and technicians were able to run the brush manually during their shifts.

### Wet Separator/Distribution and Sampling Systems

Sudden water level drops at the separator were not a problem this year. Water level remained fairly consistent at the separator with the automated weirs of the primary dewaterer in manual mode. As has been the case for the last few years, the separator was run at a higher water level to assure no problem with exposed separator bars would occur.

PIT-tag diversion gate position sensors were installed 10 years ago. These sensors act to prevent the over-travel problem Lower Monumental dam once had, and by so doing, they eliminated gate failure problems caused by metal fatigue.

### Barge Loading Operations

Fish were transported by barge from April 24 through August 14, 2018. Barge loading at Lower Monumental occurred without any issues during the 2018 transport season.

### Truck Loading Operations

Juvenile fish were scheduled to be transported by truck from August 16 to October 1. Per 2018 Fish Passage Plan, the Lower Monumental trucking schedule is contingent upon fish numbers. Saturday, August 18, was the third consecutive day with less than 50 smolts collected, therefore trucking ceased after the second trip. Truck transport never resumed in 2018.

## Recommendations

1. Install a shear boom across the forebay to direct debris to the spillway during the high flow/high debris period to reduce orifice fouling and associated fish injury.
2. Research converting the pipe system between the PIT-facility counter tanks and the PIT-facility holding tank exits with an open system that eliminates the need to hold fish in the PIT-system holding tanks. This idea has been discussed with District engineers and they believe it can be accomplished.

# APPENDIX TABLES

Appendix Table 1. Daily collection and bypass numbers and river conditions at Lower Monumental Dam, 2018.

See Excel Spreadsheet “2018 Fish Numbers LoMo.xls”.

Appendix Table 2. Percent descaling and daily facility mortality numbers at Lower Monumental Dam, 2018.

See Excel Spreadsheet “2018 Fish Numbers LoMo.xls”.

Appendix Table 3. Daily number of fish trucked and barged from Lower Monumental Dam, 2018.

See Excel Spreadsheet “2018 Fish Numbers LoMo.xls”.

Appendix Table 4. Daily number of adult fallbacks and fallback mortality at Lower Monumental Dam, 2018.

See Excel Spreadsheet “2018 Fish Numbers LoMo.xls”.