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SECTION OF FISHERIES



SUPPLEMENTAL REPORT:

KNIFE RIVER ADULT AND JUVENILE FISH TRAP REPORT

2017

Report Completed by:
Nick Peterson

Field Crew Leaders:
Nick Peterson, Keith Reeves, Jeramy Pinkerton, Rebecca Reiche

Knife River Adult Trap

The Knife River adult trap captures adult fish migrating upstream from Lake Superior. The trap was opened on April 5 and closed on July 14, 2016 (101 days) for the spring steelhead run. Steelhead were captured migrating upstream from April 6 through July 8, and approximately 81% (606) were captured from April 6 through April 20. The adult trap was operated from August 25 to November 6, 2017 (74 days) for the fall salmon and trout spawning runs. Run timing was random throughout the fall and fish were collected migrating upstream from August 28 through October 23 (Figure 1). Most fish were caught after water temperatures dropped below 50°F. All fish captured in the adult trap in spring and fall were passed upstream, except for Kamloops Rainbow Trout. Kamloops are not passed upstream to limit reproductive and genetic risks associated with hybridization with steelhead (Close 1999; Negus 1999; Miller et al. 2004; Page et al. 2011). Operation dates and total annual catch by species are provided in Tables 1 and 2.

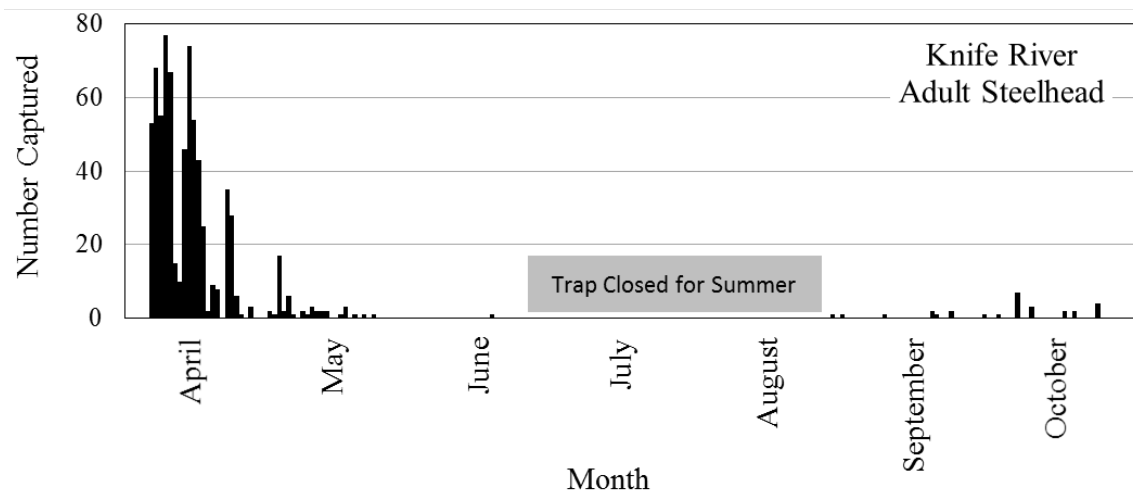


Figure 1. Number of adult steelhead captured in the Knife River adult fish trap by month in 2017.

An estimated 898 (95% CI: 862-934) adult steelhead returned to the Knife River in spring 2017, 583 (95% CI: 554-612) were female and 315 (95% CI: 293-337) were male. Approximately 97% (870, 95% CI: 834-905) of all adults that returned were unclipped, wild-produced fish. The return of wild produced steelhead in 2017 was the third highest return since 1996 when the trap began operation. Unclipped steelhead ranged from age-3 through age-12, and most were from the 2010 (age-7) and 2013 (age-4) year-classes. Average total length of females was 25 inches (range: 16-29) and males was 24 inches (range: 14-32). Approximately 2.5% had lamprey wounds, which was at the low side of the historic range observed at the Knife River trap (1%-9%). Approximately 45% (349) had a numbered Floy® tag from a previous year and 2.3% (18) had a tag stub or mark that indicated tag loss. An additional 20 unclipped steelhead were captured migrating upstream in the fall.

An estimated 28 (95% CI: 21-35) clipped (stocked) steelhead returned in spring 2017, of which 24 were female and 4 were male. Eleven fish captured had a right-pelvic (RR) fin clip which indicated they were part of 59,338 frylings stocked in 2010 (of which only 59.5% were given a RR fin clip). All RR clipped fish were from the 2010 year-class (age-7). Average total length of females was 27 inches (range: 25-29) and males was 27 inches (range: 26-28). More information on the fryling program is provided in MN DNR internal report #661. No RR clipped steelhead were collected in the fall.

Thirteen steelhead had a right-maxillary (RM) clip and were Knife River captive broodstock that were tagged at the French River Coldwater Hatchery and released into Lake Superior. Twelve were females and 1 was a male. Average length of females was 25 inches (range: 22-29) and the male

measured 23 inches. No RM clipped steelhead were captured in the fall. No left-maxillary (LM) clipped steelhead (yearlings stocked between 2003 and 2007 as part of “Phase III” of the Knife River yearling stocking program) were captured in 2017.

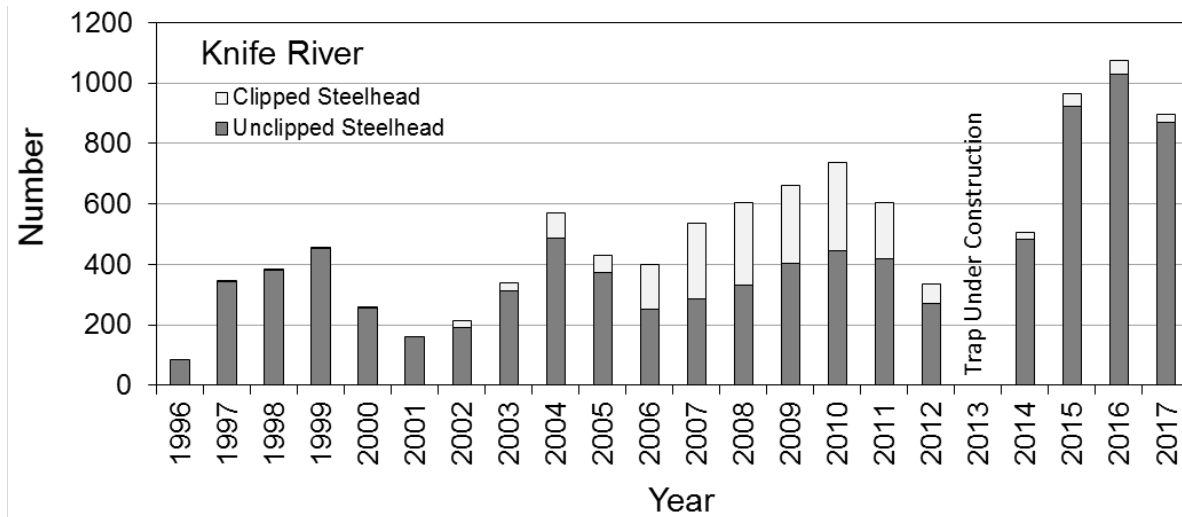


Figure 2. Number of clipped (stocked) and unclipped (wild) steelhead captured at the Knife River adult fish trap by year.

Forty-four Kamloops were captured in the spring run at Knife River, 12 were female and 32 were male. Average length of females was 24 inches (range: 21-27) and males was 22 inches (range: 16-26). Ages ranged from age-3 through age-6, and most were from the 2013 year-class (age-4). No Kamloops were captured in the fall.

Catch of all other fish species during the fall spawning run included 207 Pink Salmon, 5 Coho Salmon, 3 Brook Trout, and 1 Chinook Salmon. The average length of Coho Salmon was 23 inches (range: 21-25), and 2 were female and 1 was a male. The average length of Pink Salmon was 14 inches (range: 12-17), and 106 were female and 101 were males. Average length of Brook Trout was 13 inches (range: 9-18), and all 3 were females. The Chinook Salmon was a male that measured 25.5 inches.

Knife River Juvenile Trap

The Knife River juvenile trap captures juvenile and adult fish emigrating downstream to Lake Superior. The trap was opened for the spring on April 5 and closed on July 14, 2016 (101 days), and was operated in the fall from August 25 to November 6, 2017 (74 days). A total of 21,363 juvenile salmonids were captured in 2017, of which 99% (21,095) were steelhead and less than 1% were Brook Trout (87), Brown Trout (144) and Coho Salmon (37) (Figure 3). Approximately 97% (20,675) of all juvenile fish were captured in the spring, of which 97% (20,534) were steelhead and less than 1% were Brook Trout (46), Brown Trout (60) or Coho Salmon (35). Only 3% (688) of all juvenile fish were captured in the fall, of which 82% (561) were steelhead, 12% (84) were Brown Trout, 6% (41) were Brook Trout, and less than 1% (2) were Coho Salmon.

Approximately 11% (2,240) of the juvenile steelhead captured in the spring were brought back to the French River Hatchery for the Lake Superior Steelhead Association’s (LSSA) Steelhead Relocation Project. All LSSA fish were given a unique fin clip on June 12 and were released into the headwaters of the West Branch of the Knife River (1,125) or Tributary 9 to the Knife River (1,115) on June 13. All other fish were released downstream of the trap.

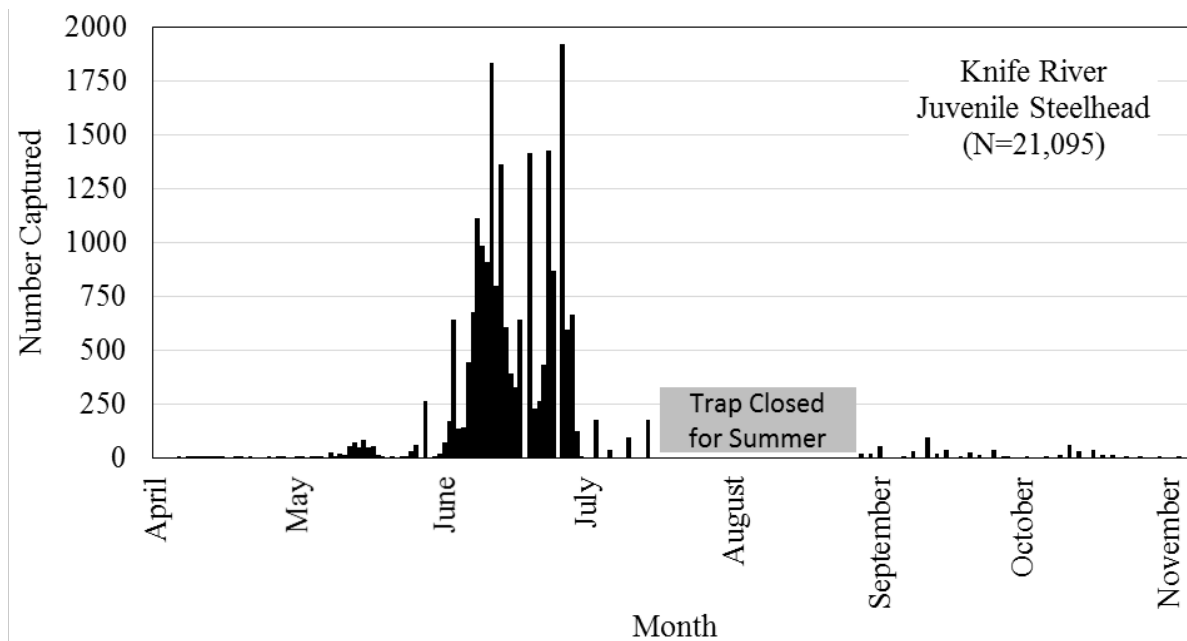


Figure 3. Number of juvenile steelhead captured in the Knife River juvenile fish trap while migrating downstream toward Lake Superior by month in 2017.

The numbers of juvenile steelhead that are caught in the trap is adjusted to account for flow conditions that might have allowed juvenile fish to swim around the trap. Based on gauge height and catch data from previous years, it was determined that a gauge height greater than or equal to 0.20 could allow juvenile salmonids to avoid the trap and pass over the falls. Therefore, when the gauge height was greater than 0.20 the total number caught per day was divided by the average trap efficiency from mark-recapture trials conducted in previous years (0.58). Both the total number caught in the trap and the estimated number adjusted for flow are provided.

A total of 21,069 unclipped juvenile steelhead were captured in 2017, which was above the historic average of 11,614. The total number of juvenile steelhead captured in 2017 was the highest number captured since 2005, and the third highest on record in the history of trap operations. From the total captured, 81% (17,237) were age-1, 18% (3,744) were age-2, and <1% were age-0 (83) and age-3 (5). Most age-2 and older juvenile steelhead were captured in the last week of May and the first week of June, and most age-1 juvenile steelhead were captured throughout June (Figure 3). Average length-at-age for juvenile steelhead measured in the spring was 2.4 inches for age-0 (range: 2.3 – 2.5), 4.5 inches for age-1 (range: 2.7 – 6.4), 6.6 inches for age-2 (range: 5.0 – 9.3), and 9.6 inches for age-3 (range: 8.9 – 10.8). Average length-at-age for juvenile steelhead measured in the fall was 3.2 inches for age-0 (range: 2.4 – 4.6), 6.1 inches for age-1 (range: 4.2 – 8.7), and 8.9 inches for age-2 (range: 7.8 – 10.5).

The estimated total after adjusting for fish that bypassed the trap during high water events was 22,674, which was above the historic average of 13,444. The estimated total of juvenile steelhead that emigrated in 2017 was the highest number observed since 2005, and the third highest on record in the history of trap operations (Figure 3). From the estimated total, less than 1% were age-0 (103), 79% (18,063) were age-1, 20% (4,500) were age-2, and less than 1% were age-3 (8). The estimated number of age-2 and older emigrants in 2017 (4,508) was higher than the historic average of 2,778 (Figure 3).

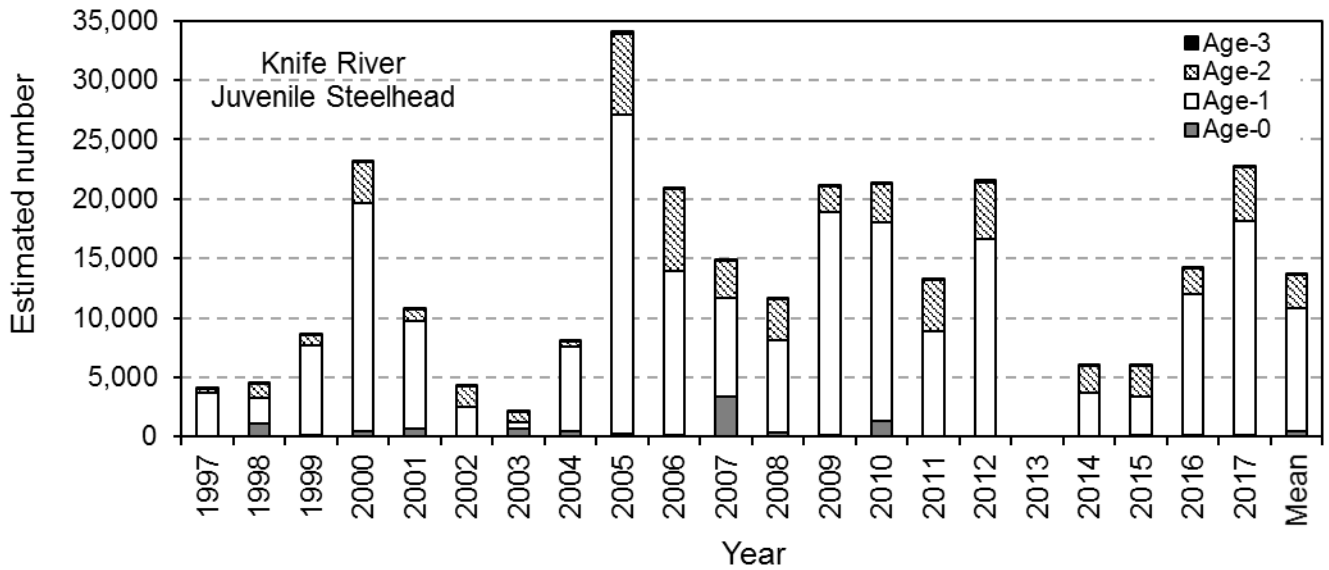


Figure 4. Estimated number of juvenile steelhead emigrants in the Knife River by year, including the historic average (Mean) from 1997 to 2017.

An additional 26 juvenile steelhead captured had a fin clip which indicated they were part of LSSA’s Steelhead Relocation Program, 14 had a left pelvic (LR) fin clip and 12 had a right pectoral (RF) fin clip. After adjusting for trap efficiency, the estimated total with fin clips was 37, 21 with a LR clip and 16 with a RF clip.

Two of the LR clipped fish captured were age-1 with an average total length of 6.0 inches (range: 5.7 - 6.3), and 12 were age-2 with an average total length of 7.3 inches (range: 5.9 - 8.4). The two LR clipped age-1 fish were caught in the juvenile trap in June 2017, clipped and relocated to Tributary 9 of the Knife River in June 2017, and then recaptured again emigrating downstream in the same year. The 12 age-2 fish were captured in the juvenile trap in spring 2016, were clipped and relocated to Tributary 9 of the Knife River in June 2016, and then overwintered in the stream for one additional year.

Eleven of the RF clipped fish were age-2 with an average total length of 7.2 inches (range: 6.3 – 8.4), and 1 was age-3 and measured 11.1 inches. The 11 age-2 fish were caught in the juvenile trap in June 2016, relocated to the West Branch of the Knife River, and then overwintered in the stream for one additional year. The one age-3 fish was originally captured in the juvenile trap in spring 2015, relocated to the West Branch of the Knife River in June 2015, and then overwintered in the stream for two additional years.

A total of 87 Brook Trout were captured and average total length at capture was 7.8 inches (range: 4.8 – 11.9). Approximately 26% (23) were age-1, 59% (68) were age-2, and 6% (5) were age-3. A total of 144 Brown Trout were captured and average total length at capture was 5.8 inches (range: 4.0 – 9.0). Approximately 82% (118) were age-1, 17% (25) were age-2, and <1% (1) was age-3. A total of 37 Coho Salmon were captured, average total length at capture was 4.8 inches and all fish were age-1.

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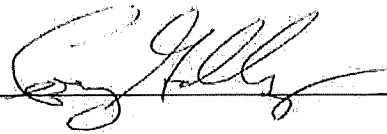
Knife River Adult and Juvenile Trap Report
2017

Prepared by:
Nick Peterson

Edited by:
Cory Goldworthy

Field Crew Leaders:
Nick Peterson, Josh Blankenheim, Keith Reeves, Jeramy Pinkerton

Lake Superior Area Fisheries Supervisor:



Date: 2/9/2018

Regional Fisheries Supervisor:



Date: 2/13/18

Table 1. The date the Knife River adult trap was open and closed, the total number of days the trap was operated, and the total number of all fish species collected in the spring trap season by year, including the historic averages (Average) from 1996 to 2017. The trap was being repaired and not operated in spring 2013.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Date trap was opened	4/23	4/14	3/25	4/7	3/26	4/18	4/14	4/21	4/7	4/10	4/6	4/15	4/16	4/12	3/28	4/18	3/25	—	4/28	4/13	3/27	4/5	4/9
Date trap was closed	6/5	6/30	6/22	6/30	6/30	6/30	6/30	6/28	6/30	6/30	5/25	6/26	6/30	6/22	5/31	6/20	6/1	—	7/7	7/6	7/19	7/14	6/24
Days trap was open	43	77	89	84	96	73	77	68	84	81	49	72	75	71	64	63	68	—	70	85	115	101	76
Brook Trout	0	3	3	7	3	11	1	0	0	0	1	0	0	0	0	4	6	—	0	7	39	5	4
Brown Trout	0	2	0	1	2	4	2	0	1	0	0	0	0	0	0	0	1	—	0	5	4	0	1
Chinook Salmon	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	—	0	0	0	0	0
Kamloops	37	48	48	82	65	108	44	72	120	97	27	22	21	46	26	29	20	—	29	17	19	44	49
Steelhead Rainbow Trout (clipped)	29	28	20	43	120	40	76	111	201	136	204	284	274	258	290	182	62	—	21	47	47	28	119
Steelhead Rainbow Trout (unclipped) ¹	87	345	409	452	287	171	234	385	540	423	329	287	332	401	449	419	271	—	483	923	1,029	870	435

¹ Numbers estimated using a mark-recapture population estimate.

Table 2. The date the Knife River adult trap was open and closed, the total number of days the trap was operated, and the number of all fish species collected in the fall trap season by year, including the historic averages (Average) from 1996 to 2017. The trap was being repaired and not operated in fall 2012 and 2013.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004 ¹	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Date trap was opened	8/19	8/18	8/17	8/9	8/4	8/13	8/16	9/8	9/8	9/5	9/5	9/5	9/2	9/21	9/13	9/19	—	—	9/9	9/9	9/6	8/25	8/30
Date trap was closed	11/8	11/7	11/6	11/12	11/10	11/16	11/8	11/7	11/5	11/4	11/4	11/2	11/7	11/7	11/5	11/4	—	—	11/6	11/18	11/16	11/6	11/7
Days trap was open	81	81	81	95	98	95	84	60	58	60	60	58	66	47	53	46	—	—	58	71	72	74	70
Brook Trout	0	2	3	1	0	3	2	0	3	2	0	1	1	0	0	1	—	—	1	1	1	3	1
Brown Trout	32	67	43	61	58	20	45	30	27	26	9	7	17	8	7	1	—	—	7	5	5	0	24
Chinook Salmon	4	1	9	9	2	0	2	0	0	0	0	11	5	0	0	0	—	—	1	3	0	1	2
Coho Salmon	6	16	37	10	5	1	16	0	3	3	0	9	11	9	71	0	—	—	0	8	17	5	11
Kamloops	4	0	12	1	4	1	0	0	0	0	0	5	7	0	3	10	—	—	0	2	0	0	2
Pink Salmon	0	9	20	39	48	0	3	0	0	2	7	10	0	2	258	103	—	—	0	1	4	207	36
Rainbow Trout - unknown type ²	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	—	—	0	0	0	0	1
Splake (Brook Trout x Lake Trout)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—	—	0	1	0	0	0
Steelhead Rainbow Trout (clipped)	2	0	16	6	9	0	2	0	0	7	0	22	10	5	2	0	—	—	0	5	3	1	5
Steelhead Rainbow Trout (unclipped)	60	16	105	17	37	19	23	6	49	9	1	50	49	21	18	2	—	—	8	155	22	25	35

¹ Fishway was operated in fall instead of the adult trap

² Specific clips/strains were not identifiable on videotape