

MINNESOTA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
SECTION OF FISHERIES



SUPPLEMENTAL REPORT

**Knife River Trap Report
2015**

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INTRODUCTION

The Minnesota Department of Natural Resources (MN DNR) operates an adult and juvenile fish trap on the Knife River (MN DNR Kittle ID: S-017), which flows for 25.4 miles (40.9 km) along the boundary of St. Louis and Lake counties in northern Minnesota (Figure 1). Streams in the Knife River watershed provide approximately 43% of the entire accessible fish spawning and rearing habitat below natural barriers on Minnesota's North Shore (Hassinger et al. 1974, Schreiner et al. 1992). These habitats are extensively utilized for spawning by fish species from Lake Superior that spawn in the spring (i.e., steelhead Rainbow Trout) and fall (i.e., coaster Brook Trout, Brown Trout and salmon). The Knife River traps were primarily built to help the MN DNR track rehabilitation efforts for naturalized steelhead Rainbow Trout in the Minnesota waters of Lake Superior, but have also provided valuable information on other fish species with migratory life-history forms.

The Knife River adult fish trap (hereafter, referred to as the adult trap) became operational in the spring of 1996 and is used to capture adult fish migrating upstream from Lake Superior. The Knife River juvenile trap (hereafter, referred to as the juvenile trap) became operational in the spring of 1997 and was constructed with an incline screen to capture juvenile and adult fish migrating downstream from the Knife River and its tributaries. The adult and juvenile traps are contained in the same in-stream structure facility located approximately 0.8 kilometers upstream from the confluence of the Knife River and Lake Superior. Trap specifications and designs are described in Dexter and Schliep (2007).

This report provides an annual update to previous comprehensive juvenile and adult trap reports completed by Ward and Blankenheim (2006) and Ward (2007). Sampling procedures for the juvenile and adult trap are described in Ward and Blankenheim (2006) and Ward (2007).

KNIFE RIVER JUVENILE TRAP

The juvenile trap was open for a total of 157 days between April 13 and November 18, 2015 (Table 1). Since 2009, the trap has been temporarily closed for the summer when few juveniles or adults are collected and then reopened in the fall to capture fall migrants. Historic data collected at the Knife River juvenile trap indicates that relatively few juveniles emigrate during the summer and those that do are typically juveniles that hatched that year (age-0). In 2015, the trap was closed on July 10 and reopened on September 9 and both traps were closed for three days over Independence Day weekend.

In 2003, the French River Coldwater Hatchery (FRCWH) initiated a Knife River captive brood stock program to provide a reliable source of steelhead eggs for the steelhead fry stocking program

(Schreiner et al. 2003). Starting in 2003, 250-350 age-1 juveniles have been collected annually from the Knife River juvenile trap and brought to the FRCWH. These fish are reared to maturity in the FRCWH, spawned each year that they produce eggs or milt, and then tagged and released back into Lake Superior when they reach age-6. Between June 10-15, 2015, approximately 315 juvenile steelhead (mean total length = 122 mm, mean weight = 16 g) were collected at the Knife River juvenile trap and brought to the FRCWH to provide the next year-class for the steelhead fry stocking program. All fish were assumed to be age-1 steelhead based on date and size at capture.

Juvenile Trap Efficiency Trials

The Knife River juvenile trap does not capture all juvenile steelhead emigrating downstream to Lake Superior because at certain flows fish can swim over the concrete weir adjacent to the forebay of the trap. Therefore, trap efficiency trials were conducted to estimate the proportion of juveniles that evade the trap when it is not capturing all the flow of the river. Efficiency trials were conducted with unclipped juvenile steelhead in 1997-2002, 2010, 2014 and 2015 (n = 2,246), and clipped juveniles in 2003-2006 (n=1,539). The cumulative average recapture rate is determined from all previous efficiency trials and used to estimate the number of juveniles of each age-class that are likely missed on days when the trap does not capture the entire flow of the river. A detailed explanation of these trials can be found in Ward and Blankenheim (2006).

An efficiency trial was conducted on June 18 and 25, 2015. A total of 154 juvenile steelhead were given an upper caudal fin clip and released in the Little Knife River (approximately 0.1 miles upstream of the confluence of the Little Knife River and the Knife River). Thirty-nine of the 154 juveniles were recaptured between June 18 and June 26, providing a recapture rate of 25.3%. This data was included in the historic average trap efficiency calculation, which then adjusted the historic trap efficiency to 58%. This adjusted value was then used to estimate the total number of juvenile steelhead by age-class that emigrated from the Knife River in 2015.

Juvenile Steelhead

The majority of all unclipped juvenile steelhead emigrants collected at the Knife River traps between 1996 through 2015 were naturally produced. However, 463,417 fry were stocked upstream of the trap from 1998 through 2006 (Ward and Blankenheim 2006). These fry were offspring provided by captive unclipped and clipped adult steelhead from the FRCWH. From 1996 through 2007, all clipped adult steelhead collected at the adult trap were transported to the FRCWH and used to produce

fry that were stocked in various Minnesota tributaries to Lake Superior. Starting in 2007, all adult steelhead collected at the adult trap have been passed upstream to support natural reproduction.

An estimated 6,050 juvenile steelhead emigrated during the 2015 trapping season, which was 7,080 below the long-term average and at the lower end of the interquartile range (5,633-21,249) (Table 1; Figure 2). The low number of juvenile steelhead that emigrated was largely influenced by below average numbers of age-1 emigrants in 2015 (3,272), which still made up approximately 75% of the total annual juvenile steelhead emigration. The estimated number of age-2 emigrants in 2015 (2,654) was similar to the historic average (2,739; Table 1; Figure 3).

Juvenile steelhead typically emigrate in mid-May to early July during periods of increasing water temperatures and decreasing discharge. The majority of age-2 emigrants are usually collected earlier in the spring, with the bulk of age-0 and -1's emigrating at slightly later dates. In 2015, the majority of age-2 and older juvenile steelhead were captured from in early-May, whereas most age-0 and -1's were collected throughout June. Age-1 emigration corresponded with increasing water temperatures and decreasing water discharge (Figure 4). The majority of age-1 emigrants were collected when water temperatures were between 60 and 70°F, whereas the majority of age-2 juvenile emigrants were collected when the average and maximum daily water temperatures were between 50 and 60°F (Figure 5).

The smolt-adult relationship at the Knife River is an index of the estimated number of adult female steelhead that migrated upstream of the Knife River adult trap in a given year by the total estimated number age-2 juvenile steelhead that they produced. The smolt-adult relationship at the Knife River is weak and not statistically significant ($R^2=0.2094$, $P=0.0763$; Figure 6). Only 21% of the variability in age-2 smolts produced could be attributed to the number of adult female steelhead that migrated upstream to spawn, which indicates that many other abiotic and biotic factors play a role in age-2 smolt production. Abiotic factors that influenced the smolt-adult relationship at the Knife River likely included unfavorable environmental conditions such as low water levels and high water temperatures in summer and extensive snow and ice cover in the winter. Biotic factors that influenced this relationship likely included predation and forage availability. Many of these factors likely also contribute to the premature emigration of age-0 and age-1 juveniles prior to undergoing smoltification. Past stocking events in the Knife River and its tributaries could also have confounded the adult/smolt relationship.

A more complete data set at the French River has shown the smolt-adult relationship to be positive, but fairly weak with 35% of the variation in adult abundance explained by the number of emigrating smolts (Blankenheim and Peterson 2014). Similar abiotic and biotic factors as described

for the Knife River likely played a strong role in the smolt-adult relationship at the French River. Nevertheless, age-2 emigrants at the French River continue to return at a rate 30 times greater than age-1 emigrants.

Juvenile Brook Trout and Brown Trout

Juvenile Brook Trout and Brown Trout accounted for a small percentage of the total catch in the Knife River juvenile trap in 2015. An estimated total of 40 juvenile Brook Trout were collected in 2015, which was within the historic range (1997-2015 range: 5-176). An estimated 87 Brown Trout were also caught, which was within the historic range (1997-2015 range: 26-666; Table 1).

Other Species

Other species collected in the Knife River juvenile trap in 2015 included 17 White Suckers, 15 Common Shiner, 7 Longnose Dace, 5 Black Bullhead, 4 Creek chubs, 4 Blacknose Dace, 3 Northern Redbelly Dace, 2 Fathead Minnows, and 2 Coho Salmon.

In-Stream Environmental Influences

Environmental conditions and habitat (i.e., adequate water levels and cool water temperatures) are two primary factors that dictate whether steelhead will remain in tributaries for at least two years and reach an age/size that is needed to survive in Lake Superior. Ample precipitation in the fall and snowfall in winter maintains overwintering habitat for fish by recharging water sources (e.g., wetlands) and insulating stream temperatures from excessive ice formation that can decrease overwinter survival.

Environmental conditions were not ideal for juvenile trout entering the winter of 2014/2015. Below average precipitation in the fall left many North Shore streams in abnormally or moderately dry drought conditions throughout the winter of 2014/15. However, the snowfall total for Duluth in 2014 (111.2 inches) was above average. Spring arrived on schedule in 2015 after two consecutive years of late ice and cold spring conditions in 2013 and 2014. Ice started to clear in streams near Duluth in early April, and all rivers shore wide were free of ice by late April. Above average snowfall in winter 2014/15 helped to counteract fall drought conditions and resulted in only slightly below-average spring discharge in many rivers for most of the spring season.

Stream conditions were favorable for juvenile trout during the summer and fall of 2015. Air temperatures and precipitation totals were similar to the historic averages throughout the summer. Abnormally dry or moderate drought conditions reappeared in August. Frequent rain events provided average or above average discharge in the fall. Two significant runoff events occurred in September

and November at the Knife River that were the highest mean daily discharge observed in those months since 2000 (Figure 7). The North Shore was free of drought conditions from October through December.

KNIFE RIVER ADULT TRAP

Spring Trap Operations

The Knife River adult trap was open for 85 days (April 13 - July 6) in spring 2015 (Table 2). The adult trap was closed for the spring on July 6 after multiple weeks of no adult upstream migration. All fish species captured in the adult trap in the spring season were passed upstream of the trap, except for Kamloops Rainbow Trout that were released downstream of the trap. Kamloops are not passed upstream of the adult trap to limit reproductive and genetic risks associated with hybridization between these Rainbow Trout strains (Close 1999; Negus 1999; Miller et al. 2004; Page et al. 2011).

Unclipped Adult Steelhead

An estimated 923 (95% CI: 886-960) unclipped steelhead migrated upstream in the Knife River to spawn in the spring of 2015, which ranks as the highest number of unclipped steelhead that have returned to the Knife River since the trap began operation in 1996 (Table 2, Figure 8). Unclipped steelhead ranged from age-3 through age-10. Many fish collected were from the 2009 (age-6) and 2010 (age-5) year-classes, which corresponded to high abundances of these age-classes in 2014 (Table 2; Figure 9). Average total length of all steelhead measured in spring 2015 was 609 mm (range: 394-755; Table 3) and average weight was 2.1 kg (range: 0.6-4.0). Five percent of unclipped steelhead collected had lamprey wounds, which was equal to the historic average (historic range: 1%-9%). Nineteen percent (N=147) of fish had a Floy® tag from a previous year and 2.4% (N=19) had a tag stub or mark that indicated tag loss.

Clipped Adult Steelhead

Seventeen right-maxillary clipped steelhead migrated up the Knife River to spawn in the spring of 2015 (Table 4). Right-maxillary clipped steelhead that returned to the Knife River in 2015 were Knife River captive broodstock fish that were held in the French River Coldwater Hatchery for at least 5 years and then were tagged and released into Lake Superior. Right-maxillary clipped steelhead measured had an average length of 698 mm (range: 668-721; Table 3) and average weight of 2.3 kg (range: 1.9-3.6). No left-maxillary clipped steelhead were collected in 2015. Left-maxillary clipped adults were part of “Phase 3” of the Knife River yearling stocking program that took place from 2003

through 2007. These fish would be at least 11 years old in 2015 and are unlikely to still exist in Lake Superior.

In addition to hatchery broodstock or other maxillary clipped steelhead, 31 right-pelvic fin clipped steelhead were collected in 2015. These fish are the products of stocking 42,011 frylings in 2010, 58.5% of which were clipped. These frylings were intended to be stocked in the French River for evaluation of stocking this life stage. However, due to concerns of spreading VHS from Lake Superior to inland waters no stocking was allowed above barriers in North Shore streams in 2010. Therefore, French River frylings were stocked in the Knife River because it does not have an obvious upstream barrier to upstream fish migration. All pelvic clipped steelhead that returned in 2015 were age-5, with an average length of 625 mm (range: 455-706) and average weight of 2.2 kg (0.88-3.22). Please refer to the MN DNR internal report #661 for more information on the fryling program.

Kamloops

Seventeen Kamloops were captured in the spring of 2015, which was the lowest Kamloops catch at the Knife River trap since 1996 (Table 4). Eleven Kamloops were male and 6 were female. Kamloops ranged from age-4 to age-7 and had an average length of 603 mm (range: 570-654 mm) and average weight of 2.13 kg (range: 1.58-2.80).

Fall Trap Operations

The trap was open for 71 days (September 9 to November 18, 2015) in fall of 2015 (Table 5). Catch of fall-run steelhead was above average in 2015 and was likely driven by above average flow conditions (Figure 7). Total catch by species in the 2015 fall trap season included 160 steelhead (155 unclipped and 5 clipped), 8 Coho salmon, 5 Brown Trout, 3 Chinook Salmon, 2 Kamloops, 1 Brook Trout, 1 Splake (Brook Trout x Lake Trout), and 1 Pink salmon (Table 5).

Run Timing

Since 1996, the majority of adult steelhead were captured between April 8th and May 5th during periods of key water temperatures (40-45°F) and moderate discharge, but most steelhead migration in the spring typically occurs in mid-April. In 2015, 83% of all steelhead were collected in April with 22% (N=155) collected on April 18th. The last adult steelhead was collected migrating upstream on June 10th.

Steelhead spawning success is correlated to the timing of upstream migration whereas fish that arrive early in the spring are more likely to reproduce and provide viable offspring than fish that arrive

later in the spring season (Miller *et al.* 2014). The timing of steelhead spawning migrations are largely driven by water temperature and discharge. Most adults are captured when the average water temperatures reach 5.0°C (41°F) for the first time in the spring and immediately following peaks in water discharge. In 2015, most adult steelhead were collected when water temperatures reached 40°F and during the first significant increase in water discharge (Figures 10 and 11).

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SUPPLEMENTAL REPORT

Results of Operating the
Juvenile and Adult Fish Trap
on the Knife River
2015

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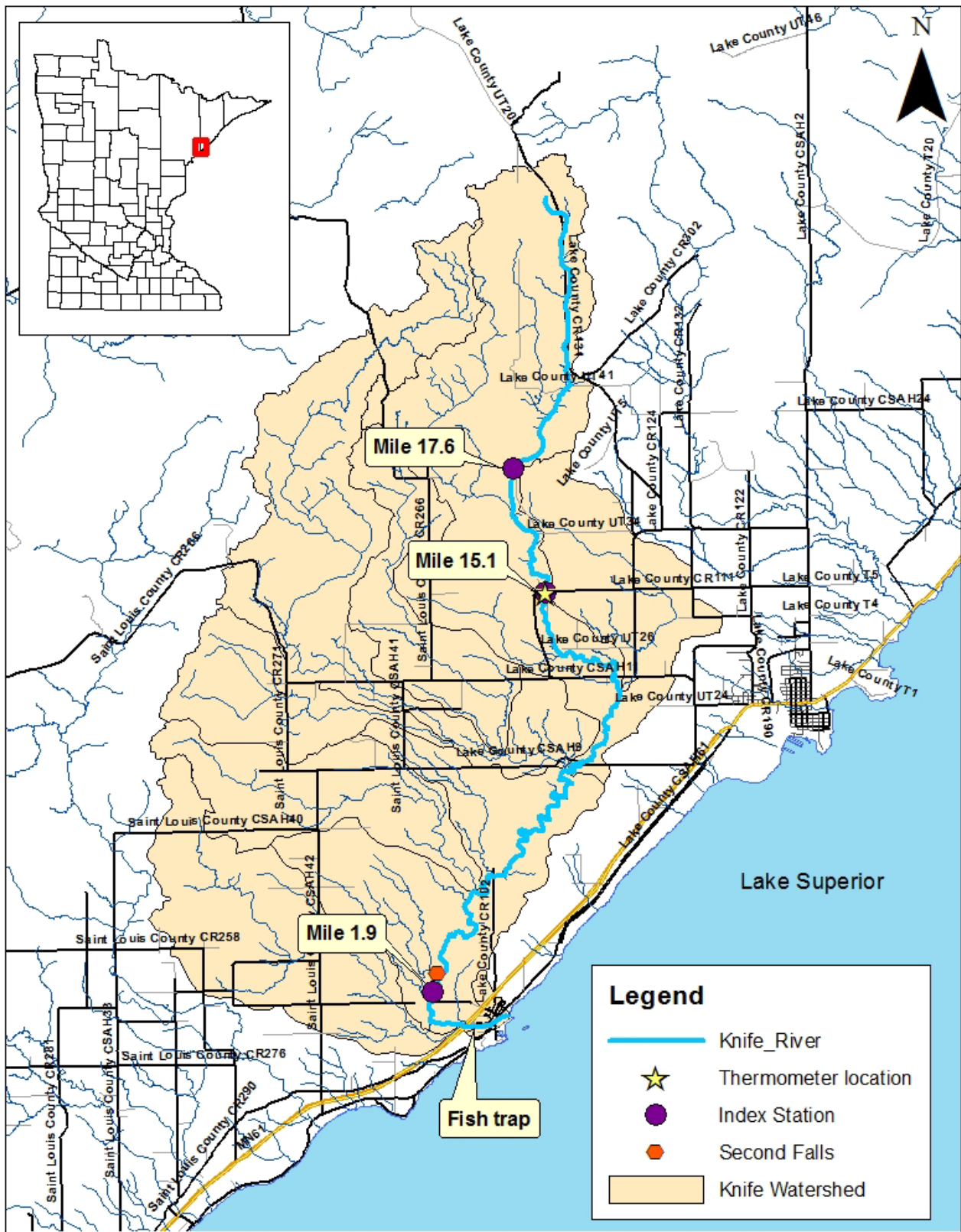


Figure 1. Location of the Knife River watershed on the Minnesota shore Lake Superior.

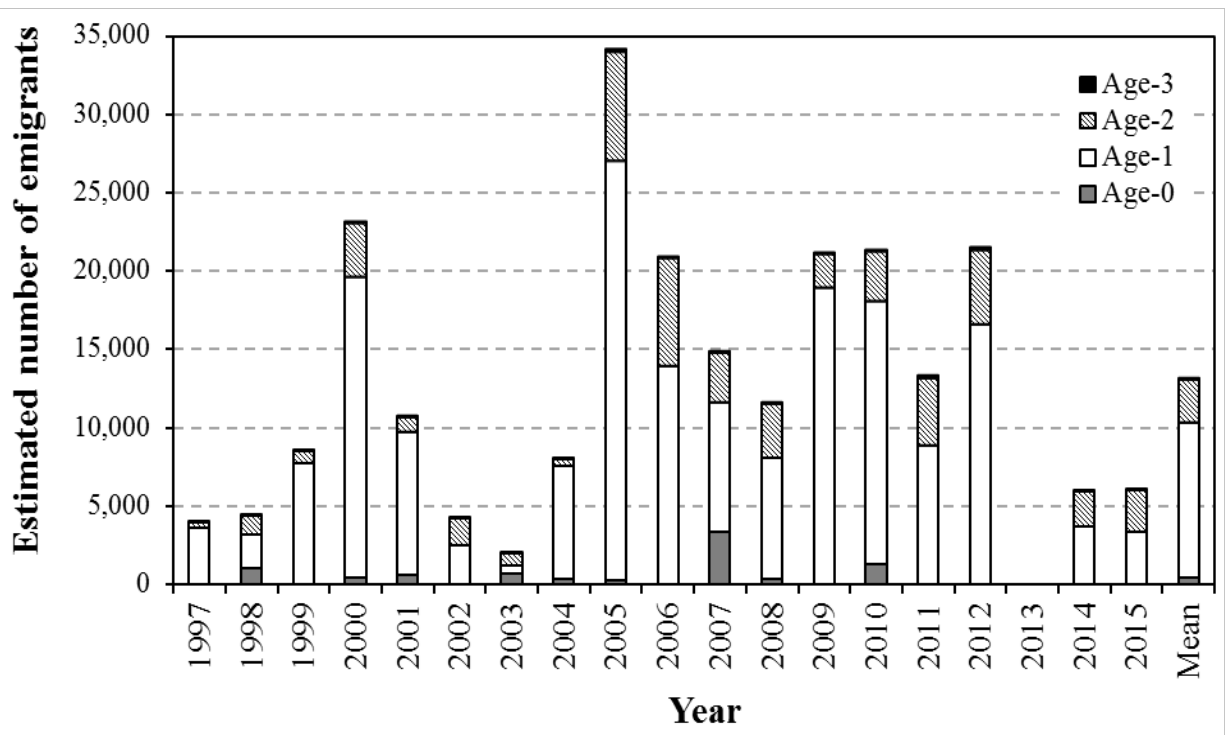


Figure 2. The estimated total number of juvenile steelhead that emigrated downstream in the Knife River by age and year. The trap was being rebuilt and not operated in 2013.

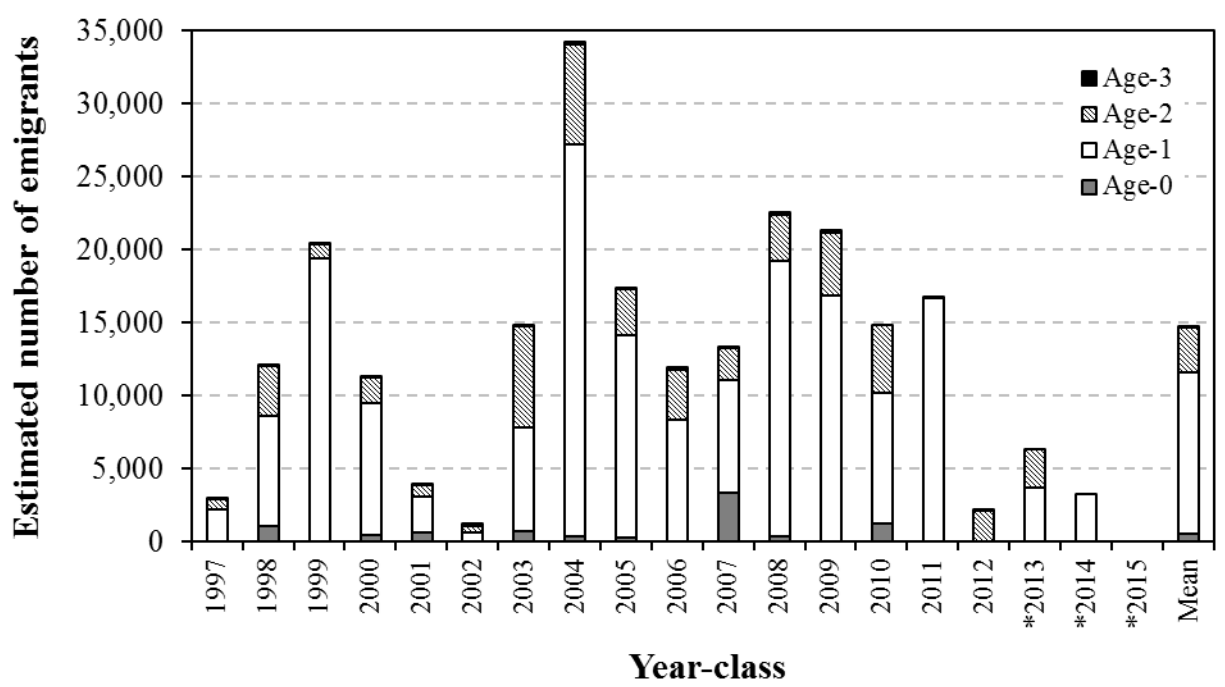


Figure 3. The estimated total number of juvenile steelhead that emigrated downstream in the Knife River from 1997 through 2015. The year-classes from 2010-2013 were not completely sampled because the trap was not operated in 2013, and * indicates year-classes that have not completely emigrated.

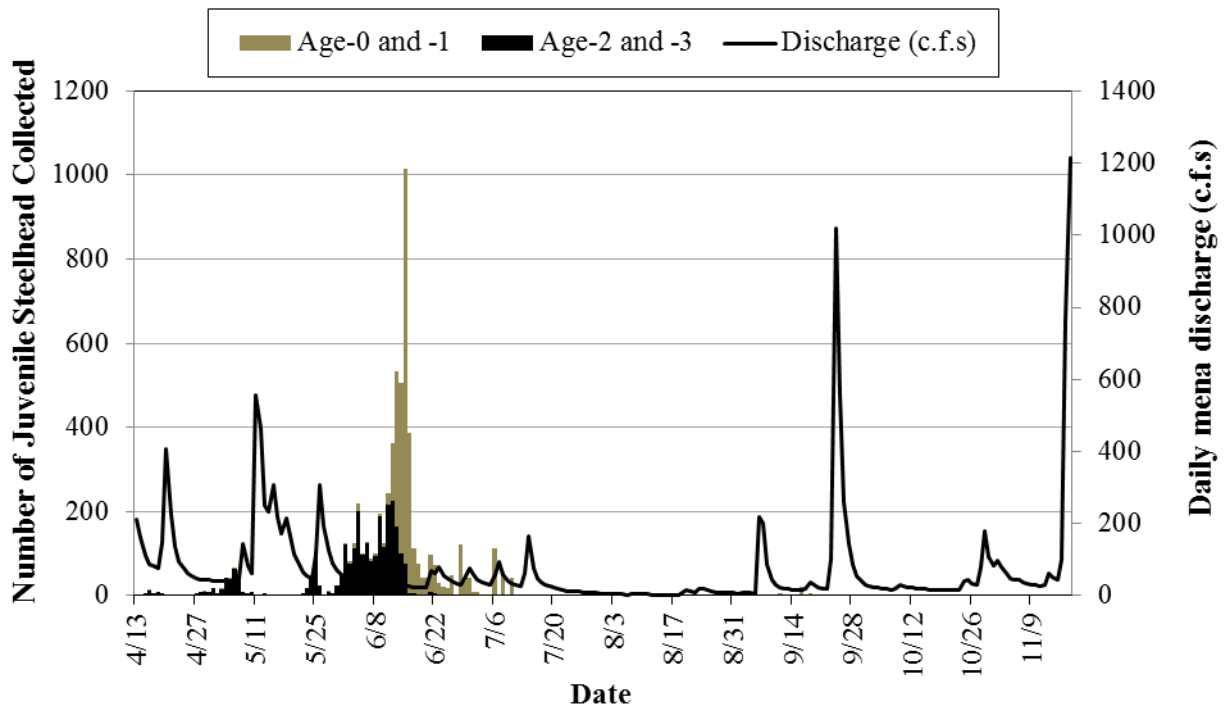


Figure 4. The number of juvenile steelhead captured and the mean daily discharge (cms) at the Knife River by day in 2015. The trap was not operated between July 11 and September 8, 2015.

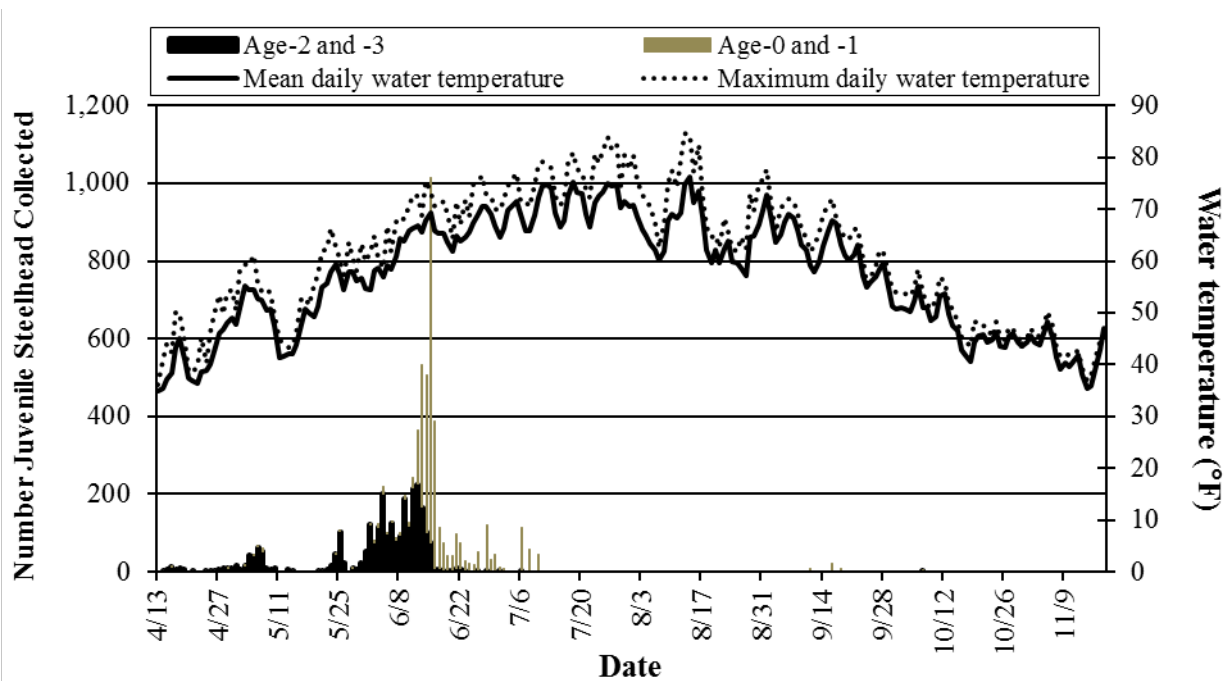


Figure 5. The number of juvenile steelhead captured in the Knife River juvenile trap compared and the mean and maximum daily water temperature (°F) by day in 2015. The trap was not operated between July 11 and September 8, 2015.

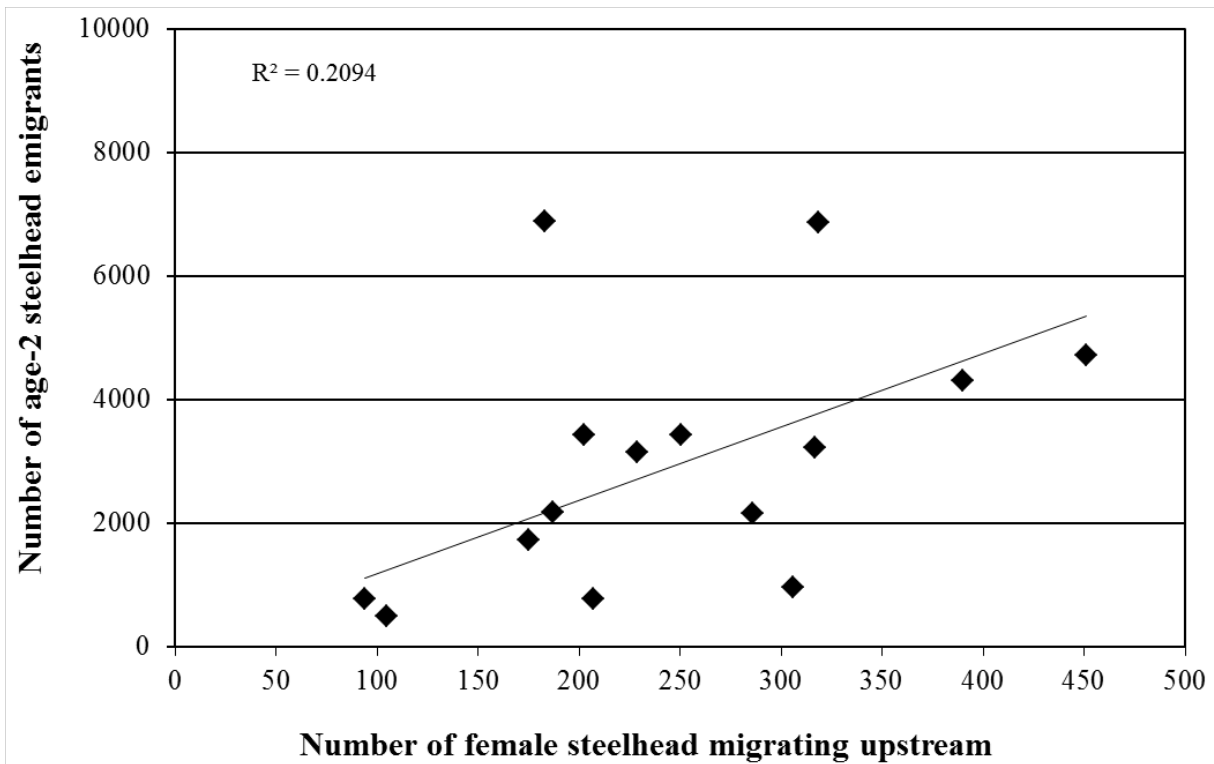


Figure 6. The number of age-2 juvenile steelhead emigrants captured in the Knife River juvenile trap by the number of mature adult female steelhead that migrated upstream (smolt-adult relationship).

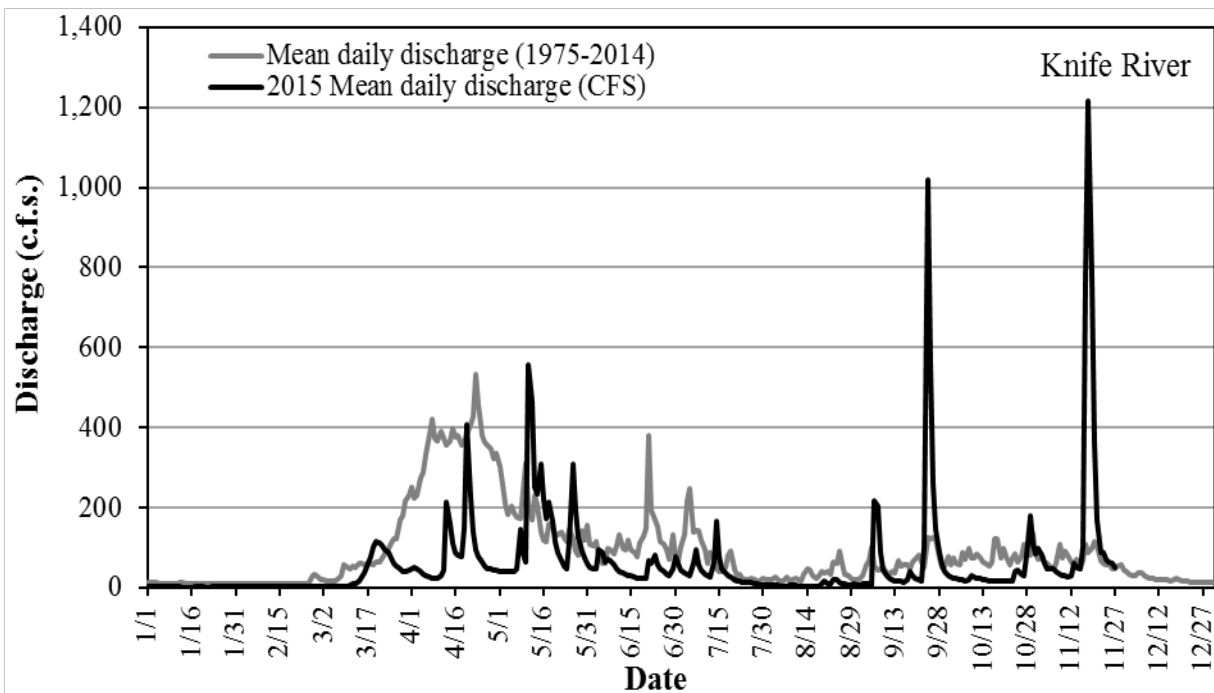


Figure 7. Mean daily discharge (cubic feet per second) in 2015 and the historic average daily discharge (1975-2014) by date in the Knife River.

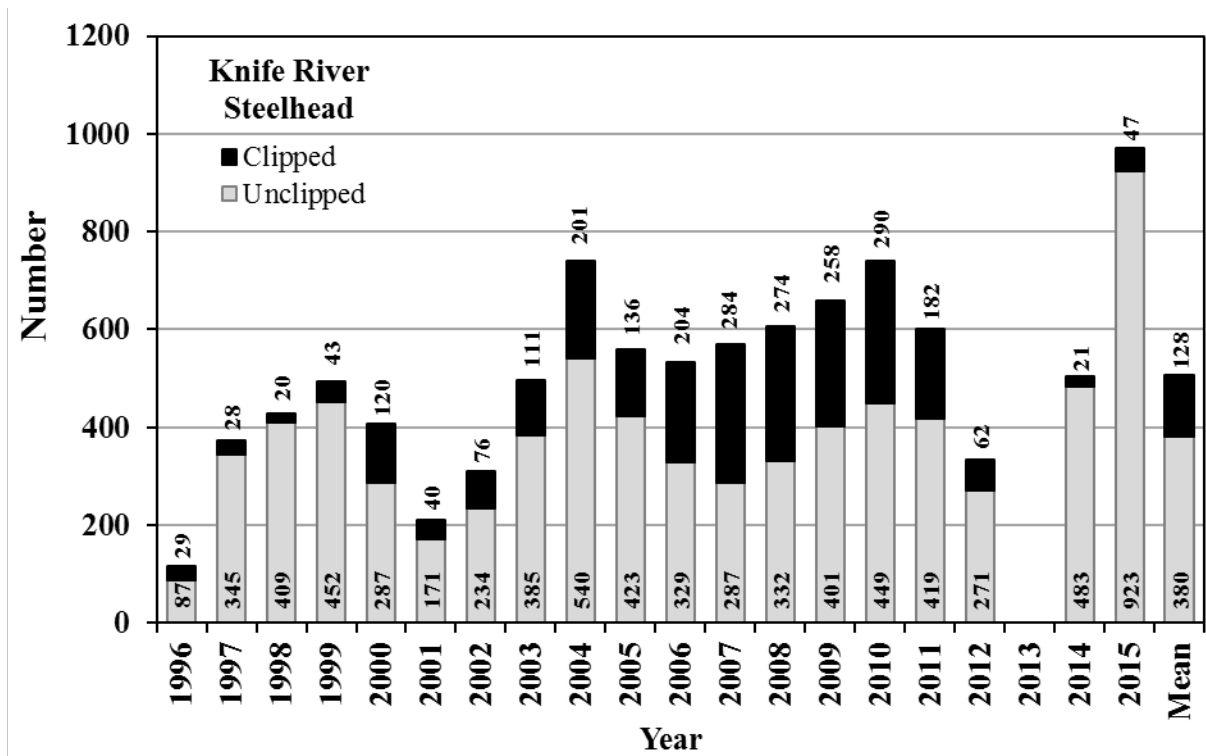


Figure 8. The estimated number of adult unclipped and clipped steelhead that have migrated up the Knife River by year and the historic average from 1996-2015 (Mean). The trap was being rebuilt and not operated in 2013.

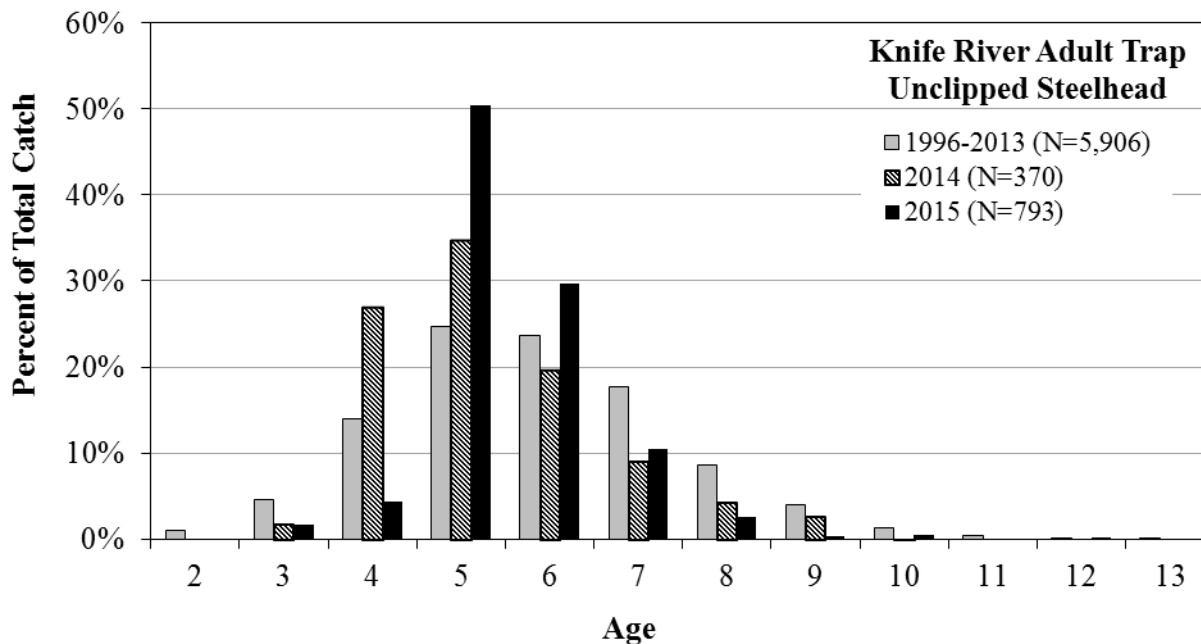


Figure 9. The age distributions of unclipped (wild) steelhead captured in the Knife River fish traps in 2014 and 2015 compared to the historic average from 1996-2013.

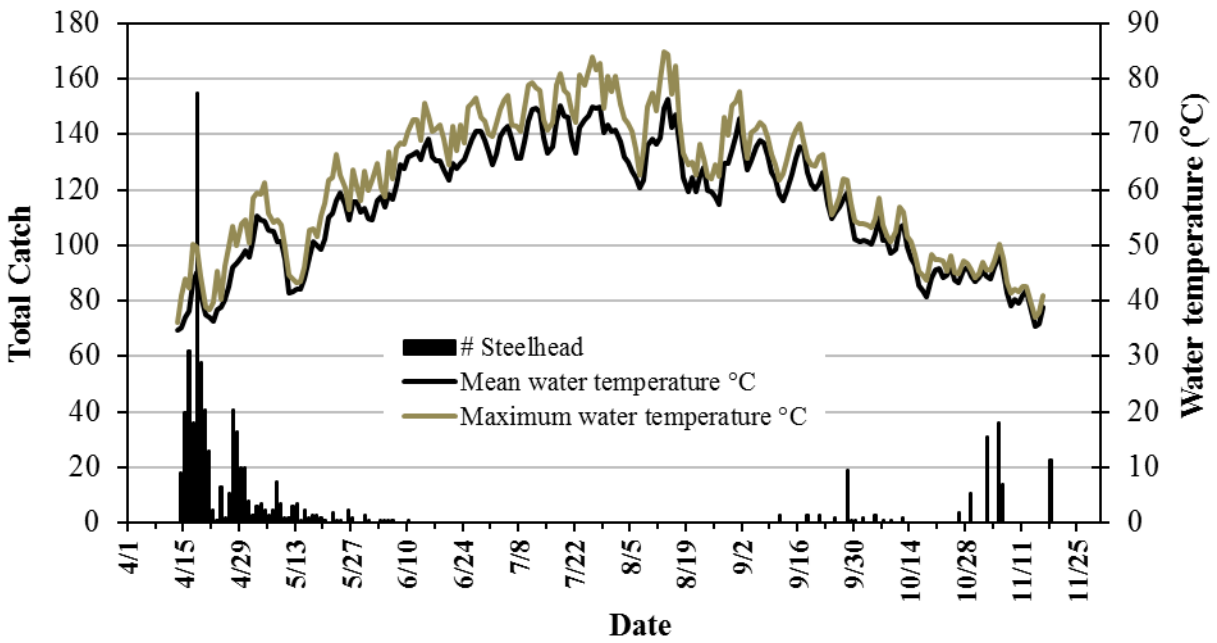


Figure 10. Number of steelhead collected at the Knife River adult trap compared with the mean and maximum daily water temperature (Celcius) throughout 2015.

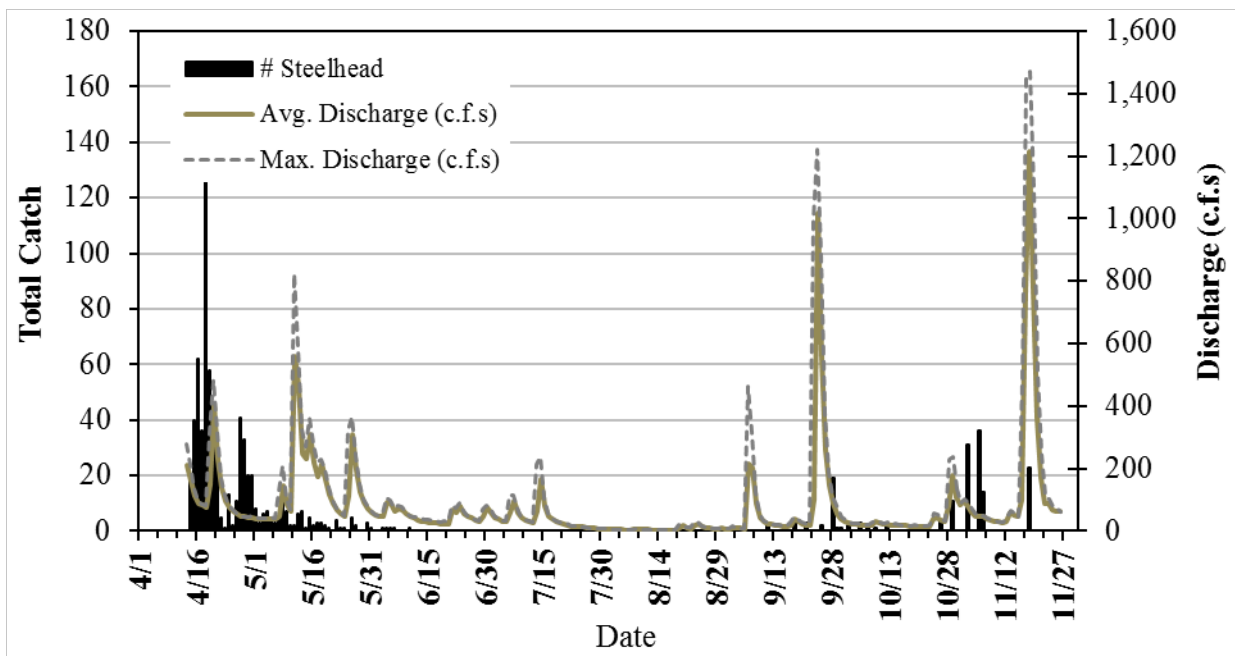


Figure 11. Number of steelhead collected at the Knife River adult trap compared with the daily water discharge (cubic feet per second) throughout 2015.

Table 1. The total estimated number (N) and percentage (%) of juvenile steelhead, Brown Trout, and Brook Trout emigrants collected in the Knife River juvenile trap by year and year-class. The trap was being rebuilt and not operated in 2013.

Juvenile Steelhead												
Year	2011		2012		2013		2014		2015		Mean (1997-2015)	
Date trap was opened	4/18 and 9/16		3/25		Not Operated		4/28 and 9/9		4/13 and 9/9		4/10	
Date trap was closed	6/30 and 11/4		6/19				7/21 and 11/6		7/10 and 11/18		11/2	
Number days trap open	124		87				144		157		182	
Estimated emigrants by year	N	%	N	%	N	%	N	%	N	%	N	%
Age-0	0	0%	0	0%	Not Operated		9	0%	88	1%	511	4%
Age-1	8,854	66%	16,649	77%			3,739	62%	3,272	54%	9,803	75%
Age-2	4,313	32%	4,727	22%			2,179	36%	2,654	44%	2,739	21%
Age-3	155	1%	170	1%			92	2%	36	1%	77	1%
Total	13,322		21,546		--		6,019		6,050		13,130	
Est. emigrants by year-class	N	%	N	%	N	%	N	%	N	%	N	%
Age-0	0	--	0	--	??	--	9	--	88	--	511	4%
Age-1	16,649	--	??	--	3,739	--	3,272	--	**	--	10,164	74%
Age-2	??	--	2,179	--	2,654	--	**	--	**	--	2,986	22%
Age-3	92	--	36	--	**	--	**	--	**	--	87	1%
Total	16,741		2,215**		6,393**		3,281**		88**		13,748	

Juvenile Brown Trout												
Year	2011		2012		2013		2014		2015		Mean (1997-2015)	
Estimated emigrants by year	N	%	N	%	N	%	N	%	N	%	N	%
Age-0	0	0%	0	0%	Not Operated		0	0%	1	1%	7	3%
Age-1	16	10%	7	11%			2	7%	78	90%	121	52%
Age-2	139	84%	47	73%			28	93%	6	7%	100	43%
Age-3	10	6%	10	16%			0	0%	2	2%	3	1%
Total	165		65		--		30		87		231	
Est. emigrants by year-class	N	%	N	%	N	%	N	%	N	%	N	%
Age-0	0	--	0	--	??	--	0	--	1	--	9	4%
Age-1	7	--	??	--	2	--	78	--	**	--	139	54%
Age-2	??	--	28	--	6	--	**	--	**	--	104	41%
Age-3	0	--	2	--	**	--	**	--	**	--	3	1%
Total	7**		30**		8**		78**		1**		255	

Juvenile Brook Trout												
Year	2011		2012		2013		2014		2015		Mean (1997-2015)	
Estimated emigrants by year	N	%	N	%	N	%	N	%	N	%	N	%
Age-0	0	0%	0	0%	Not Operated		0	0%	5	13%	1	1%
Age-1	2	2%	13	53%			7	14%	16	40%	25	56%
Age-2	53	61%	4	16%			31	61%	18	45%	13	30%
Age-3	32	37%	8	32%			13	25%	1	3%	5	12%
Total	87		24		--		51		40		44	
Est. emigrants by year-class	N	%	N	%	N	%	N	%	N	%	N	%
Age-0	0	--	0	--	??	--	0	--	5	--	1	1%
Age-1	13	--	??	--	7	--	16	--	**	--	23	52%
Age-2	??	--	31	--	18	--	**	--	**	--	14	31%
Age-3	13	--	1	--	**	--	**	--	**	--	6	15%
Total	26		32		25**		16**		5**		43	

** Incomplete year-class: Fish of this age for this year-class have not completely emigrated.

?? Knife River Traps were not operated in 2013 so complete contributions of this year-class are not available.

Table 2. The estimated number of adult unclipped steelhead captured in the spring at the Knife River fish trap by year and year-class.

Spring Trap Season	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	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	4/10
First Stt up (KRAT)	4/24	4/15	3/28	4/8	3/27	4/19	4/16	4/22	4/13	4/11	4/7	4/16	4/18	4/14	3/29	4/19	3/26		4/30	4/14	4/12
Most Stt up (KRAT)	4/25	4/23	4/12	4/13	4/24	4/26	4/24	4/27	4/14	4/11	4/11	4/21	4/22	4/24	4/1	4/22	3/28		5/5	4/18	4/18
Last Stt up (KRAT)	5/22	6/19	6/5	6/6	6/21	5/23	5/31	6/12	6/16	5/19	5/22	6/18	6/19	6/13	5/25	6/12	5/27		6/30	6/10	6/7
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	6/22
Days trap was open	43	77	89	84	96	73	77	68	84	81	49	72	75	71	64	63	68		70	85	73
Year-class / Year collected	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total - All Years
1988	8	3	1																		12
1989	14	14	6	5																	39
1990	13	28	15	10	2																68
1991	17	57	41	40	10	5	1														170
1992	19	147	119	123	48	24	6	3	1	1											492
1993	16	95	194	174	85	30	21	11	2	4											632
1994		1	30	56	33	27	14	9	5	2											177
1995			2	25	44	24	19	19	19	2	1										156
1996				20	58	38	36	31	27	4	1										214
1997					7	16	29	42	69	41	16	6	3		1						231
1998						7	78	197	233	150	77	28	13	4	2	1					790
1999						1	30	65	146	122	105	26	15	7	4	1					522
2000								8	34	66	76	34	16	12	3	1					251
2001									4	31	21	43	30	32	19	5					185
2002											19	59	72	89	55	28	8				330
2003											12	56	107	147	145	64	26			1	557
2004												35	72	99	145	95	25		1		472
2005													4	10	37	55	32		13	3	154
2006														1	36	98	62		21	5	222
2007															2	64	83		44	24	218
2008																7	27		95	99	228
2009																	7		167	271	446
2010																			133	465	598
2011																			9	39	48
2012																				15	15
2013																					0
2014																					0
Total	87	345	409	452	287	171	234	385	540	423	329	287	332	401	449	419	271		483	923	7227

Table 3. Length-frequency distributions of all fish measured at the Knife River adult trap in the spring and fall of 2015.

10-mm Length Group	Spring				Fall							
	Brook Trout	Brown Trout	Kamloops	Steelhead	Brook Trout	Brown Trout	Chinook Salmon	Coho Salmon	Kamloops	Pink Salmon	Splake	Steelhead
220	1											
230												
240												
250												
260	3											
270												
280	1											
290												
300	1											
310												
320												1
330	1											1
340												
350								1				3
360												2
370												4
380												
390				1								1
400											1	3
410				2								3
420				4								4
430				1	1							3
440				2								1
450				3								3
460				1								2
470				1								1
480								1				
490				5						1		
500		1		5		1		1				2
510		3		3								
520				11			1					
530		1		25				2				
540				25		1						3
550				23		1						2
560				43		1						4
570			3	62			1	2				3
580			1	64								2
590			2	55								5
600			3	72								3
610			5	70								5
620			2	57				1	1			5
630				68								9
640				60								14
650			1	35		1						18
660				45								16
670				25			1					10
680				19					1			4
690				18								6
700				16								6
710				4								7
720				7								2
730				4								1
740				3								1
750				2								
Totals	7	5	17	841	1	5	3	8	2	1	1	160

Table 4. The estimated number of adult clipped steelhead captured in the spring at the Knife River fish trap by year and year-class.

Spring Trap Season	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	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	4/10
First Stt up (KRAT)	4/24	4/15	3/28	4/8	3/27	4/19	4/16	4/22	4/13	4/11	4/7	4/16	4/18	4/14	3/29	4/19	3/26		4/30	4/14	4/12
Most Stt (KRAT)	4/25	4/23	4/12	4/13	4/24	4/26	4/24	4/27	4/14	4/11	4/11	4/21	4/22	4/24	4/1	4/22	3/28		5/5	4/18	4/18
Last Stt up (KRAT)	5/22	6/19	6/5	6/6	6/21	5/23	5/31	6/12	6/16	5/19	5/22	6/18	6/19	6/13	5/25	6/12	5/27		6/30	6/10	6/7
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	6/22
Days trap was open	43	77	89	84	96	73	77	68	84	81	49	72	75	71	64	63	68		70	85	73
Year-class / Year collected	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total - All Years
1989 - AdLm ²	2	1																			3
1989 - AdRmRf ²	0	0																			0
1990 - AdRmLr ²	4	3	4																		11
1990 - AdRmRr ²	6	6	0																		12
1991 - AdRmLf ²	9	8	3	3																	23
1991 - AdLmLf ¹	1		1																		2
1992 - AdRmRf ²	7	10	5	1																	23
1992 - AdLmRf ¹			1																		1
1996 - AdRmLr ²			6	35	111	4	7	3													165
1996 - AdRm ^{3,4}				4	7	1															12
1997 - AdRmRf ^{3,4}					0	2	0	1													3
1997 - AdLmLr ¹					1	4	2	1													8
1998 - AdRmRr ²						26	42	14	8	2											92
1998 - AdRmLf ^{3,4}					1	4	3	5	2												16
1999 - AdRm ⁴							2	5	3	6											16
1999 - AdLmRr ¹								1	1		4										6
2000 - AdRm ⁴							2	1	5	5											13
2000 - AdRmLr ²							17	80	165	76	43	2	5	1							390
2001 - AdRm ⁴										1		1									2
2001 - AdLmLr ¹									12	15	5										32
2002 - Lm ²									5	30	105	124	68	46	32	8					420
2003 - Lm ²											20	25	14	31	26	13	4				134
2004 - Rm ²											27	125	156	115	121	61	21		3		629
2005 - Lm ²												6	26	36	49	49	17		1		184
2006 - Rm ²													4	29	61	52	20		2		168
2006 - Rm ⁶																					2
2008 - Rm ⁶																					1
2009 - Rm ⁶																					14
2010 - RR ⁵																			15	30	45
Total Clipped Steelhead	29	28	20	43	120	40	76	111	201	136	204	284	274	258	290	182	62		21	47	2426
Kamloops	37	48	48	82	65	108	44	72	120	97	27	22	21	46	26	29	20		29	17	958

¹ stocked in French River; ² stocked in Knife River; ³ stocked in Silver Creek; ⁴ stocked in Gooseberry River; ⁵ stocked in Knife River as frylings; ⁶ Right maxillary clipped Knife River captive broodstock that were released in McQuade Harbor

Table 5. The number of trout and salmon collected in the fall at the Knife River adult trap by year.

Fall Trap Season	1996	1997	1998	1999	2000	2001	2002	2003	2004 ¹	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	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	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	11/7
Days trap was open	81	81	81	95	98	95	84	60	58	60	60	58	66	47	53	46			58	71	70
Year collected	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Brook Trout	0	2	3	1	0	3	2	0	3	2	0	1	1	0	0	1			1	1	21
Brown Trout	32	67	43	61	58	20	45	30	27	26	9	7	17	8	7	1			7	5	470
Chinook Salmon	4	1	9	9	2	0	2	0	0	0	0	11	5	0	0	0			1	3	47
Coho Salmon	6	16	37	10	5	1	16	0	3	3	0	9	11	9	71	0			0	8	205
Kamloops	4	0	12	1	4	1	0	0	0	0	0	5	7	0	3	10			0	2	49
Pink Salmon	0	9	20	39	48	0	3	0	0	2	7	10	0	2	258	103			0	1	502
Rainbow Trout - unknown type ²	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0			0	0	14
Splake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	1	1
Steelhead Rainbow Trout (clipped)	2	0	16	6	9	0	2	0	0	7	0	22	10	5	2	0			0	5	86
Steelhead Rainbow Trout (unclipped)	60	16	105	17	37	19	23	6	49	9	1	50	49	21	18	2			8	155	645

¹ Fishway was operated in fall instead of the adult trap

² Specific clips/strains were not identifiable on videotape