



MNDNR  
Minnesota

F29 Segment 31 (Year 2)  
Study 3  
Job 3

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

## SUPPLEMENTAL REPORT



Results of Operating the  
French River  
Juvenile and Adult Fish Traps  
2014

Josh Blankenheim  
Nick Peterson

## **Introduction**

This report is a combined juvenile and adult trap report that serves as a yearly update to the comprehensive juvenile report completed in 2006 (Ward and Blankenheim 2006) and the comprehensive adult report completed in 2007 (Blankenheim 2007). Comprehensive juvenile/adult trap reports will be completed as needed and annual supplemental reports will be completed in the interim. The purpose of this report is to present data collected from the juvenile and adult fish traps that serve as assessment tools for management of steelhead Rainbow Trout. Additionally, this report presents data from the adult trap that is critical to managing the Kamloops strain Rainbow Trout program unique to the Duluth Area. Sampling procedures for the juvenile and adult trap are described in Ward and Blankenheim (2006) and Blankenheim (2007). Specifications of the juvenile trap design can be found in Dexter and Schliep (2007).

### Study Area

The French River (Kittle number: S-011) is an average size stream on the Minnesota shore of Lake Superior that flows for 22.9 kilometers and enters Lake Superior approximately 19 kilometers northeast of Duluth (Figure 1). For information on land use, ownership, and watershed cover types refer to the MNDNR 2013 French River Stream Population Assessment Report.

In 1970, a rudimentary adult fish trap was installed 0.1 km from the mouth of the French River, and was reconfigured to its current design in 1982. The adult trap acts as an assessment tool to evaluate adult returns from stocking events in the French River. The adult trap is also used to collect gametes for continuation of the Kamloops and steelhead stocking programs. Adult trap steelhead data, in conjunction with data collected at the juvenile smolt trap (km 0.3) that was constructed in 1994, allows for study of variables that influence the recruitment of juvenile steelhead to the adult population.

## **Juvenile Trap Operations**

### Daily Operations

The juvenile trap was open for 187 days between April 28<sup>th</sup> and October 31<sup>st</sup>, 2014 (Table 1). The trap was opened two weeks later than average because of ice coverage that remained on the river due to the prolonged winter weather. Additionally, a deep snowpack provided a continual source of runoff that kept the river too high for trap operation until late April.

Since 1994, the entire stream discharge passed through the juvenile trap 81% of the hours it operated, and 89% of the total number of juveniles were caught when the trap was capturing all of the river's flow. In 2014, the trap captured all of the flow 74% of the time (3,321 hours), which accounted for 56% (1,003 fish) of the total number of juveniles captured (1,795). A higher than average percentage of juveniles was captured when the trap was not taking the entire flow of the river. There was a two week time period from June 3<sup>rd</sup> to June 18<sup>th</sup> in which the trap was not capturing the entire flow of the river, but in which a large portion of juveniles were captured.

## Juvenile steelhead Rainbow Trout

A total of 1,795 juvenile steelhead emigrated in 2014, which is approximately 50% fewer than average (Mean=3,512) and at the bottom of the interquartile range (IR=1,795-4,615) (Table 1, Figure 2). The low number of emigrants is mainly attributed to the changes in the stocking program at the French River. Frylings rather than traditional fry were stocked from 2009-2013, with the exception of 2010 when no fish were stocked. Frylings are a product of the Knife River captive broodstock and stocked at a larger size (approximately 2 inches) than traditional fry. Fewer emigrants in these years was expected because only about half the number of frylings were stocked compared to fry. Based on the completely emigrated year-classes of frylings of 2009 and 2011 along with the incompletely emigrated year-classes of 2012 and 2013, fryling emigrants maintained a slightly larger length-at-age compared to emigrants derived from fry (Figure 3). The increased length-at-age may be due to the larger size at stocking, the recent reduction in the number of fish stocked resulting in reduced competition among juveniles, or a combination of factors. Fryling stocking concluded in 2013 and fry stocking resumed in 2014. Refer to the MN DNR internal report #661 for more details on the fryling program.

The number of total emigrants is generally not as important as the number of age-2 and age-3 emigrants, as these individuals return as adults at a rate approximately 30 times greater than that of their age-1 counterparts. In 2014 there were 558 age-2 emigrants, which was 1.0% of the number of fish stocked and represents relatively good survival compared to other year-classes of age-2 juveniles (Table 1). The low number of age-2 and age-3 emigrants from the 2009 (344) and 2011 (100) fryling year-classes, combined with the absent year-class of 2010, will likely limit adult returns to the French River during the next few years (Table 1, Figure 4). However, the survival of frylings to adulthood is not yet known. It will take several year-class returns to be able to assess the success of stocking this life stage.

In most years juveniles begin emigrating in April or early May, and usually there is a large pulse of fish that emigrate in June. In 2014, there was almost no emigration by juvenile steelhead until the end of May (Figure 5). Despite the late start to spring due to the cold weather, 84% of juveniles emigrated in spring, 13% in summer, and 3% in fall, which is comparable to long-term means of 78%, 11%, and 11%. The beginning of juvenile steelhead emigration coincided with the increase in average stream temperature from 14.6°C to 19.0°C in a three day period, and with decreasing stream discharge. Both stream temperature and discharge play an important role in juvenile steelhead emigration.

Fry and frylings currently stocked in the French River are produced from Knife River captive broodstock and French River adults captured in the spring wild run. The number of fish stocked has ranged from 39,856 to 250,100 and is one factor that has contributed to the size of emigrating year-classes of age-2 and age-3 juveniles. The relationship between the number of fish stocked and the number of age-2 and age-3 emigrants displays a positive relationship, although there is considerable variability ( $R^2 = 0.67$ ,  $P < 0.001$ ; Figure 6). The 2004 data point strongly influences this relationship however, and if it is removed, the variability in the number of age-2 and age-3 emigrants that is explained by the number of fish stocked decreases substantially ( $R^2 = 0.46$ ,  $P = 0.004$ ). This indicates other factors besides the number of fish stocked play a role in juvenile emigrant abundance. More data points from stocking greater than 140,000 fish would be necessary to further develop the relationship between the number stocked and smolt abundance. The 2009 and 2011 year-classes of frylings have completely emigrated

and did not produce a high number of age-2 emigrants based on the number of fish stocked (Table 1, Figure 6).

### Other Species Sampled

Historically, a small proportion of the yearly salmonid emigration is Brook Trout and Brown Trout. Twelve Brook Trout and six Brown Trout were captured in the trap in 2014 (Table 2). Few nongame species were captured and included Blacknose Dace (18), Central Mudminnow (1), Creek Chub (6), Fathead Minnow (9), Finescale Dace (1), Longnose Dace (2), Northern Redbelly Dace (2) and Pearl Dace (7).

### In-stream Environmental Influences

Environmental conditions were generally favorable for juvenile trout entering the winter of 2013-2014. Despite less than average precipitation in the fall months, only portions of the North Shore were classified as being abnormally dry, while the rest of the North Shore was free from drought status. Air temperatures were bitterly cold throughout much of the winter and were significantly below average from December 2013 through April 2014. Snowfall totals were high for the second consecutive winter. The National Oceanic and Atmospheric Administration (NOAA) snowfall total for Duluth was 130.2 inches, making it the third snowiest winter on record; the winter of 2013-2014 was fourth at 129.4 inches. Adequate snowfall during the winter months can help insulate streams from excessive ice formation that can decrease overwintering habitat for juvenile trout, and help recharge wetlands and other sources of water for streams.

Similar to 2013, spring arrived later than normal in 2014. Once rivers thawed, snowmelt and frequent rain events kept the North Shore out of drought status and rivers at high flow conditions for most of the spring. Conditions for juvenile trout were generally favorable during the summer months. Air temperatures were very similar to long-term means from June through August, and precipitation totals were near or above average during these months. The fall months of 2014 were drier and warmer than average, but despite this, the North Shore remained out of drought status the entire year until mid-November, when some areas of the North Shore entered abnormally dry conditions. Adequate flows and cool water temperatures continue to be key elements in retaining juvenile steelhead in North Shore rivers for two years until they are large enough to undergo smoltification.

### **Adult Trap Operations**

The French River adult trap season started later than normal in 2014 due to persistent spring snowmelt and high water discharge (Table 3). The trap season ended on July 3, which was the latest closing date on record. Seining in the pool downstream of the adult trap was conducted twice a week for the first month depending upon river conditions and the number of fish captured in the sampling efforts. Trapping and seining did not take place in the fall because of the absence of salmon returning to the French River. Fall migratory runs will be monitored on an as-needed basis.

### Kamloops Rainbow Trout

A total of 437 Kamloops were captured at the French River in the spring of 2014. This was at the lower end of the interquartile range of the 22-year average (Mean=884; IR=444-1259), and very similar to returns in 2009 and 2010 (Table 4, Figure 7). Survival of individual year-classes as measured by returns to the trap has varied considerably throughout time and averaged 1.77% for the 1990 to 2007 year-classes. The 1994 through 2001 year-classes showed above average returns and survival (average percent return=2.7%). The percent of Kamloops returns from the 2002 to 2006 year-classes (average percent return=0.89%) was lower than average. No fish were collected from the 2006 and 2007 year-classes in 2014. The 2008, 2009 and 2010 cohorts made up most (90%) of the total catch in 2014. The 2008 year-class had the highest percent of stocked Kamloops yearlings (3.6%) that have returned to the French River trap as adults. The return of the 2009 year-class surpassed the historic average, and the 2010 year-class surpassed the total return of the 2006 year-class (Table 4, Figure 8). The number of returning Kamloops per year-class are due to the combined differences in size when stocked, total number stocked, forage availability, predation, inter- and intraspecific competition, angler harvest and the annual water temperature of Lake Superior.

Seventy-five percent of Kamloops at the French River return at age-4 and age-5. The age distribution of Kamloops in 2014 ranged from age-2 to age-6, with 84% of the return consisting of age-4 (66%) and age-5 (18%) fish. An additional 9% of the spawning run was age-3 fish (Table 4, Figure 9).

Females and males comprised 55% and 45% of Kamloops returns in 2014, respectively. The overall mean total length was 585 mm and mean weight was 2.0 kg. Fewer Kamloops exceeding 600 mm were captured in 2014 than previous years (Table 5, Figure 10). Nearly 5% of returning Kamloops were recaptures with a previous spring's tag, which was slightly higher than the long-term mean of 3.8% and within the interquartile range (IR= 2.5%-5.3%). Of the Kamloops that have returned to the French River to spawn more than one year, 90% returned only one additional year, 9% returned two additional years and <1% have returned three or more years (Table 4).

Due to budgetary constraints, changes to the Kamloops stocking program were implemented in 2010. Seventy-percent of the Kamloops eggs collected in 2014 will be reared to pre-smolt size at the Spire Valley Hatchery and brought back to the French River Cold Water Hatchery in the spring of 2015 before being stocked into Lake Superior. Future data collection will facilitate assessment of program changes.

### Unclipped steelhead Rainbow Trout

Twenty-four unclipped steelhead were captured at the French River in 2014, which is below average and the interquartile range (Mean=90, IR=50-107) and the lowest return on record (Table 6, Figure 11). The average length of unclipped steelhead was 600 mm and the average weight was 1.9 kg; the maximum size collected was 673 mm (Table 5). Unclipped steelhead collected in 2014 ranged from age-3 through age-6, with 8% being age-3, 38% age-4, 25% age-5, and 29% age-6 (Table 6, Figure 9). Repeat-spawning steelhead continue to be uncommon at the French River. On average, 6% of the unclipped steelhead from the 1990-2007 year-classes returned to spawn in multiple years (Table 6). Eight percent (N=2) of the unclipped steelhead collected in 2014 had tags from previous years, which was less than 15% (N=21) in 2013. One of the tagged fish collected in 2014 (Floy tag number: 171021) was a tagged at the French River in 2012 (493 mm TL), and was recaptured at the French River in 2013 (540 mm TL) and 2014

(540 mm TL); this fish showed zero growth from 2013 to 2014. The other tagged fish (Floy tag number: 171224) was tagged at the French River in 2013 (596 mm TL) and recaptured in 2014 (610 mm TL).

The percent of steelhead stocked in the French River that return to spawn as adults has been very low from 1990 to 2014 (Mean=0.08%, Range=0.01-0.15%; Table 6; Figure 12), which shows that stocking more fry does not necessarily guarantee more returning adults. For example, the 1990 and 1991 fry stockings were two of the largest, but yielded below average adult returns (Table 6; Figure 12). Adult returns are dependent upon many factors that include the number of fry stocked and survival of those fry to adulthood.

The number of returning adult steelhead produced from age-2 and age-3 juveniles that emigrate is commonly referred to as the smolt/adult relationship. Only 0.3% of age-1 juvenile emigrants return as adults, compared to 9.5% and 11.8% of age-2 and age-3 emigrants, respectively (Table 7). The relationship between age-2 emigrants and returning adults displays a weak positive trend that is statistically significant ( $P=0.021$ ); however, age-2 smolt production only explains 35% of the variation in adult returns ( $R^2=0.35$ ; Figure 12). The variability not explained by the smolt/adult relationship is likely due to interacting factors such as Lake Superior water temperature, prey availability, predator abundance, and intra- and interspecific competition.

### Clipped steelhead Rainbow Trout

Returns of clipped steelhead to the French River have diminished due to the termination of the smolt-stocking programs at the French River and Knife River in 2002 and 2007, respectively. No clipped steelhead from the French River stocking program were captured in 2014. Very few clipped Rainbow Trout likely remain in Lake Superior so future reports will not include a clipped steelhead summary.

### Fall Returns

The adult trap remained closed and seining did not take place in the fall of 2014. These activities will only take place if considered necessary for monitoring purposes. Fall returns vary considerably and are heavily dependent on stream discharge.

### Run Timing

Both Kamloops and steelhead returns to the French River have historically started around the second full week of April (Table 3). Kamloops returns gradually decline each week thereafter, while steelhead numbers often remain steady before declining after the first week of May. The spring thaw was later than normal in 2014; the first fish were sampled on May 5, which was similar to 2013 and five weeks later than in 2012 (March 27). Only 31% of all Kamloops and 42% of all steelhead were captured by May 16, 2014, whereas 79% of all Kamloops and 76% of all steelhead were captured by May 16, 2013. Eighty-percent of all Kamloops were collected by June 6<sup>th</sup> and 79% of all steelhead were collected by June 1, 2014 (Table 8, Figure 14). Water temperature and stream discharge greatly influence weekly catches. Generally, 60 to 70% of the Kamloops and steelhead spawning runs are captured when river water temperatures are between 4.4 and 9.9°C (40 and 50°F), and after peaks in discharge events. North Shore fishing reports summarizing spring creel angler information, as well as French and

Knife River trap data, are posted every Monday and Friday by the MN DNR at: <http://www.dnr.state.mn.us/areas/fisheries/lakesuperior/report.html>.

## Summary

The spring of 2014 was similar to the spring of 2013 in that it was cold and later than normal. High amounts of snowfall and extremely cold conditions lasted throughout the winter in the Duluth Area. The prolonged winter and high flow conditions during the month of April resulted in both the adult and smolt traps being opened later than normal.

Steelhead frylings have been stocked in the French River from 2009-2013, with the exception of 2010, to evaluate the efficacy of frylings produced from Knife River captive broodstock. Fryling emigrants have achieved slightly greater length-age-ages than emigrants derived from fry stocking, due to the larger size at stocking, a reduction in competition with other juveniles, or a combination of factors. Survival of frylings to age-2 has been variable, ranging from 0.1%-1.0%, and does not appear to be better than survival of fry. Fryling stocking ended in 2013 and fry stocking resumed in 2014.

The 1,795 juvenile steelhead captured in 2014 at the French River smolt trap was about 50% fewer than average. Only about half the number of frylings have been stocked compared to fry and none were stocked in 2010, which accounts for much of the reduced juvenile emigration. Based on fry stocking, age-2 emigrants maintain the steelhead fishery and are approximately 30 times more likely to return as adults compared to their age-1 counterparts. Adult returns in coming years from fryling stocked year-classes will determine the ultimate success of the fryling program. Brook and Brown Trout were also captured in the juvenile trap, but in small numbers.

The 2008 year-class of Kamloops now has the best percent of stocked yearlings that have returned to the French River trap as adults. The percent return of the 2009 year-class is now within the interquartile range of the historic average, and the percent return of the 2010 year-class is similar to the total return of the 2005 and 2006 year-classes. The number of Kamloops collected in 2014 was at the lower end of the interquartile range of the 22-year average and very similar to returns in 2009 and 2010.

The return of unclipped steelhead in 2014 was lower than the long-term average and the interquartile range. The size of individual year-classes continues to be variable and dependent on many stream and lake environmental factors, and not merely a function of the number of fry stocked. Clipped steelhead returns have ceased because of the termination of the French River smolt stocking program in 2002, and no fish from this program were captured in 2014. Very few clipped Rainbow Trout likely remain in Lake Superior, so future reports will not include a clipped steelhead summary.

The Kamloops program has changed in recent years due to budgetary constraints. A portion of eggs collected in 2014 were reared at the Spire Valley hatchery to pre-smolt size and the fish will be brought back to the French River in the spring of 2015 prior to stocking into Lake Superior. Program changes will be evaluated as year-classes of Kamloops return to the French River. We expect three year-classes of Kamloops produced by the new stocking program will have completely returned to the French River by 2018.

## References

- Blankenheim, Joshua E. 2007. A comprehensive summary of salmonid returns to the French River, 1993-2007. Minnesota Department of Natural Resources, St. Paul, MN.
- Dexter, Daniel J. and D.V. Schliep. 2007. Design of a compound inclined screen trap for anadromous salmonid smolts. *North American Journal of Fisheries Management* 27: (885-890).
- Schreiner, D.R., J.J. Ostazeski, T.N. Halpern, and S.A. Geving. 2006. Fisheries Management Plan for the Minnesota waters of Lake Superior. Special Publication 163, Minnesota Department of Natural Resources, Duluth, MN.
- Ward, Matthew C, and J.E. Blankenheim. 2006. Results of operating the juvenile fish trap on the Knife River 1996-2006. Minnesota Department of Natural Resources, St. Paul, MN.



Report prepared by:  
Josh Blankenheim  
Nick Peterson  
Duluth Area Fisheries  
Field crew leader: Nick Peterson

Project Leader: \_\_\_\_\_

Regional Fisheries Supervisor: \_\_\_\_\_

**FRENCH RIVER ADULT/JUVENILE  
TRAP REPORT 2014**

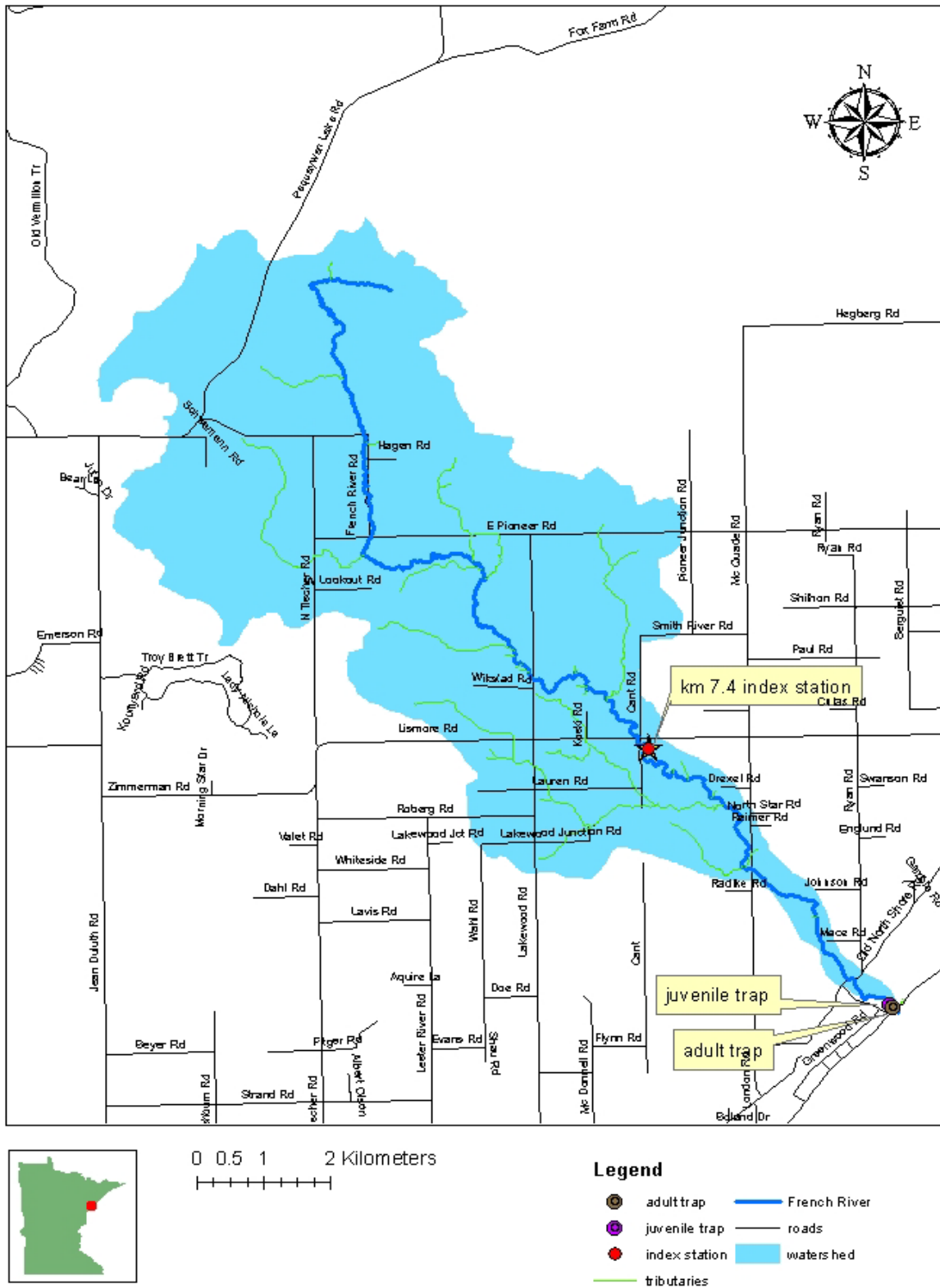


Figure 1. Location of the adult and juvenile fish traps on the French River (S-011), and the French River watershed.

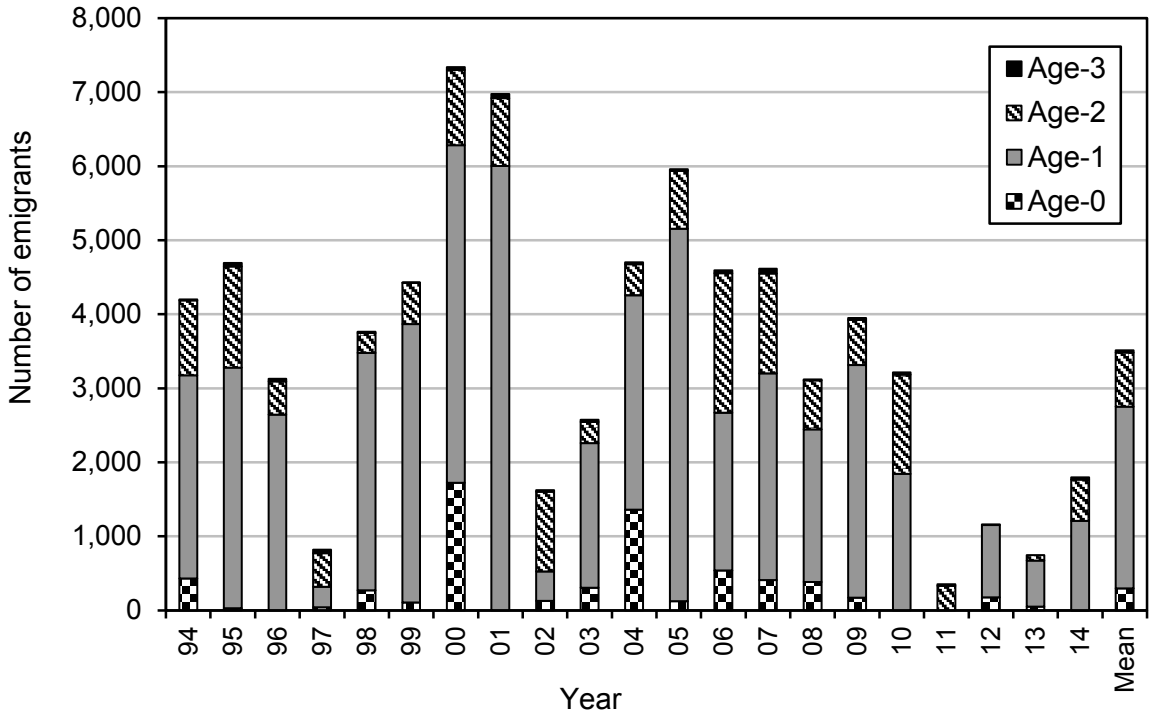


Figure 2. Number of juvenile steelhead emigrants captured in the French River from 1994 through 2014.

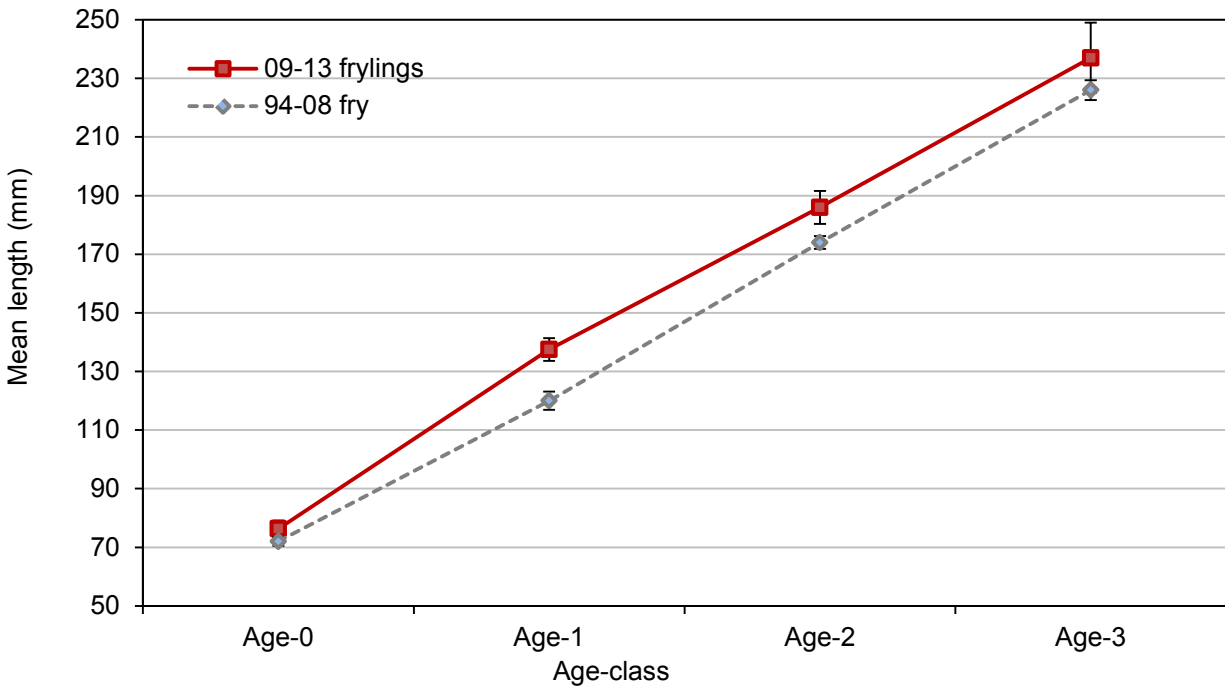


Figure 3. The mean length of fry-stocked and fryling-stocked juvenile steelhead by year-class captured at the French River juvenile trap, 1994-2013.

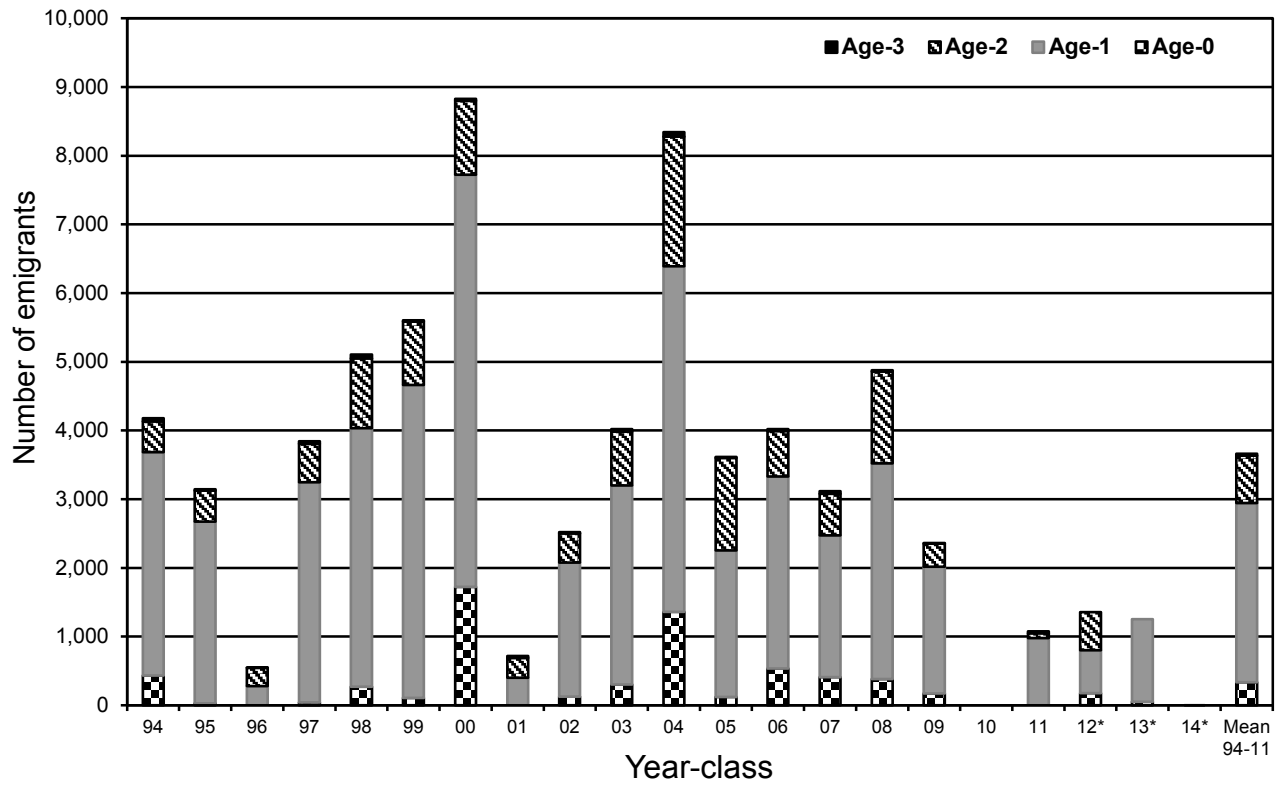


Figure 4. The number of juvenile steelhead per year-class emigrating down the French River from 1994 through 2014. The 2009 and 2011-2013 year-classes were stocked as frylings. No fish were stocked in 2010. Year-classes are incomplete from 2012-2014 (\*).

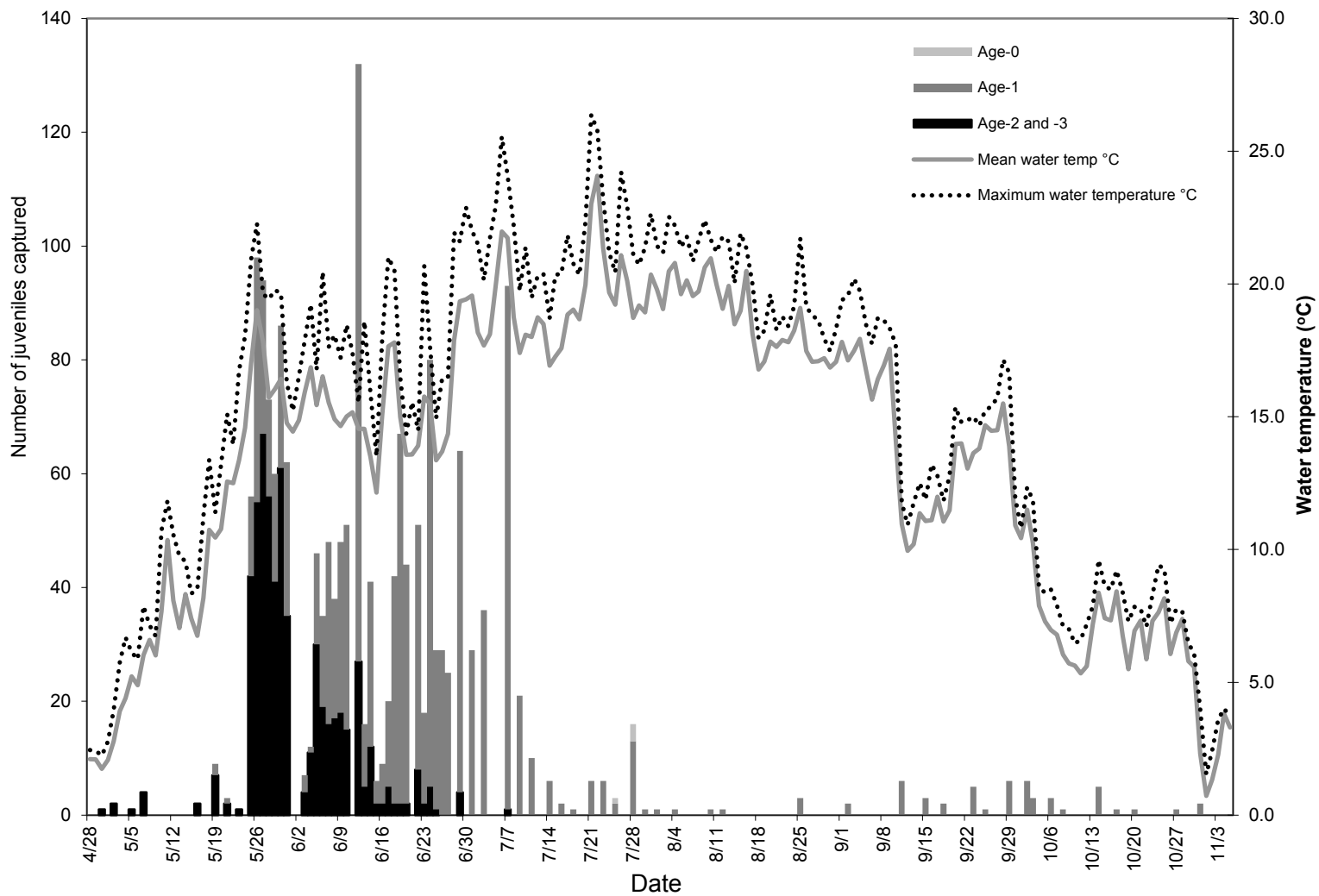


Figure 5. The number of juvenile steelhead captured per day in the French River, and the daily mean and maximum water temperatures (°C).

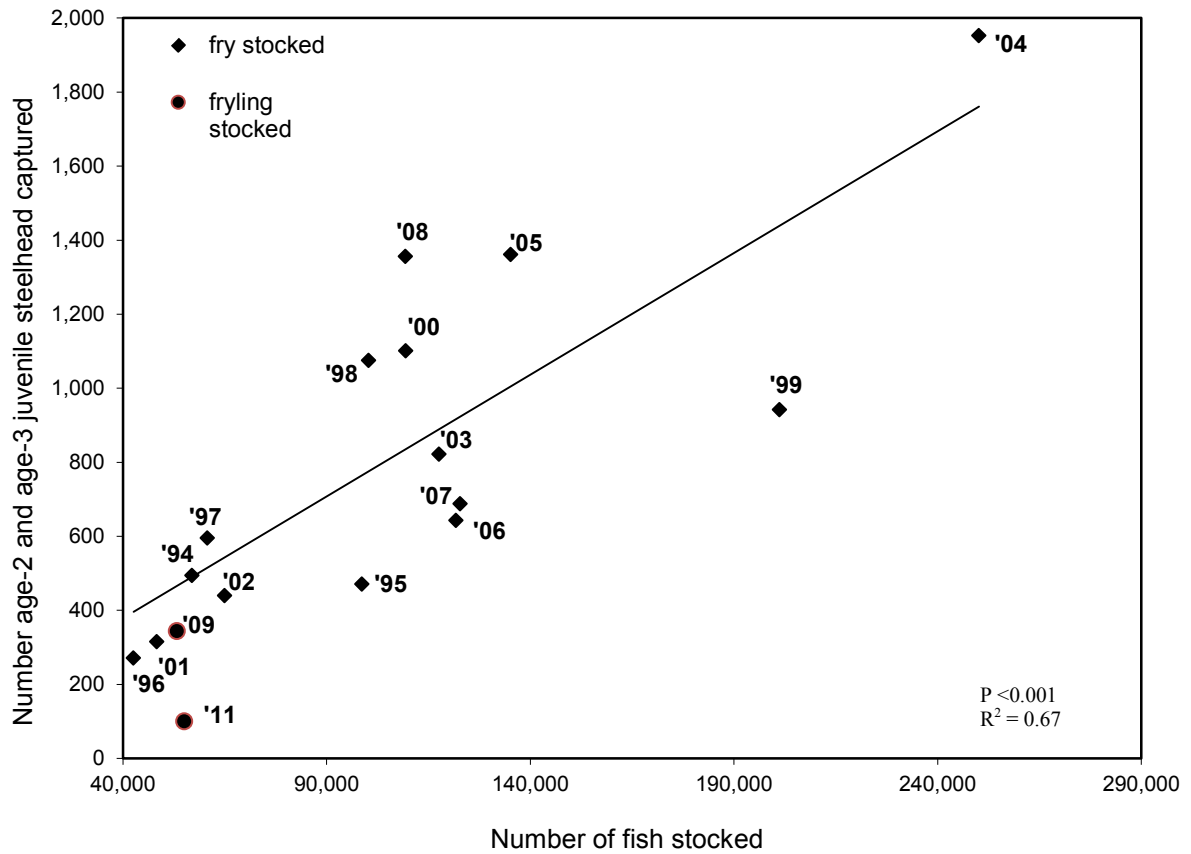


Figure 6. Relationship between the number of steelhead stocked and the number of juvenile emigrants (age-2 and -3) by year-class for the French River from 1994-2011. Frylings were stocked in 2009 and 2011 instead of fry.

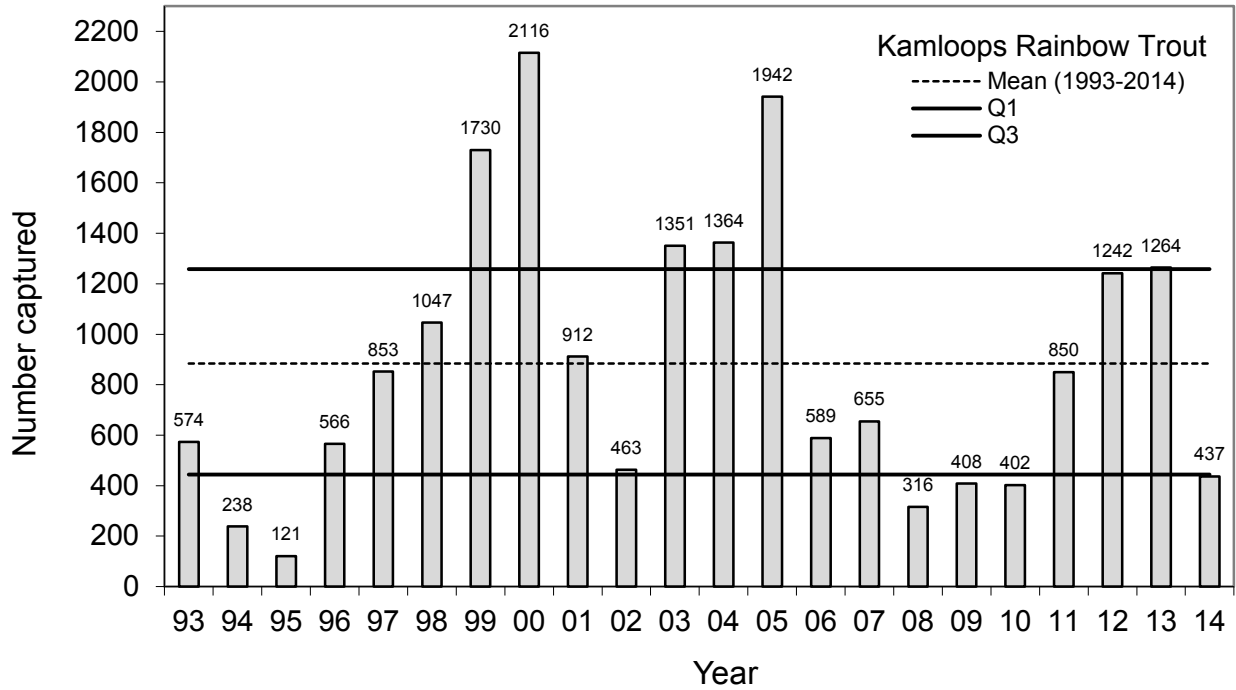


Figure 7. Number of Kamloops Rainbow Trout captured at the French River from 1993 to 2014. The historic average (Mean) with 25<sup>th</sup> (Q1) and 75<sup>th</sup> (Q3) percentiles are also provided.

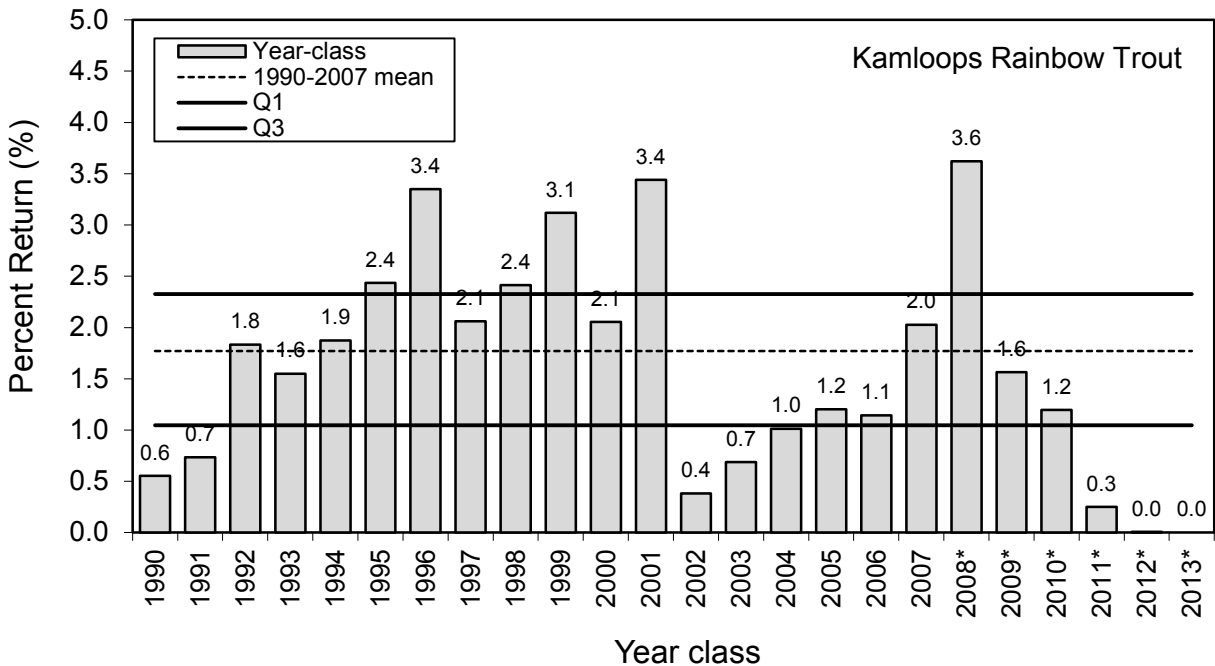


Figure 8. Percent of Kamloops Rainbow Trout that returned to the French River from the 1990-2013 year-classes. The historic average (Mean) with 25<sup>th</sup> (Q1) and 75<sup>th</sup> (Q3) percentiles are also provided from complete year-classes. Year-classes are not complete for 2008-2013 and are indicated by (\*).

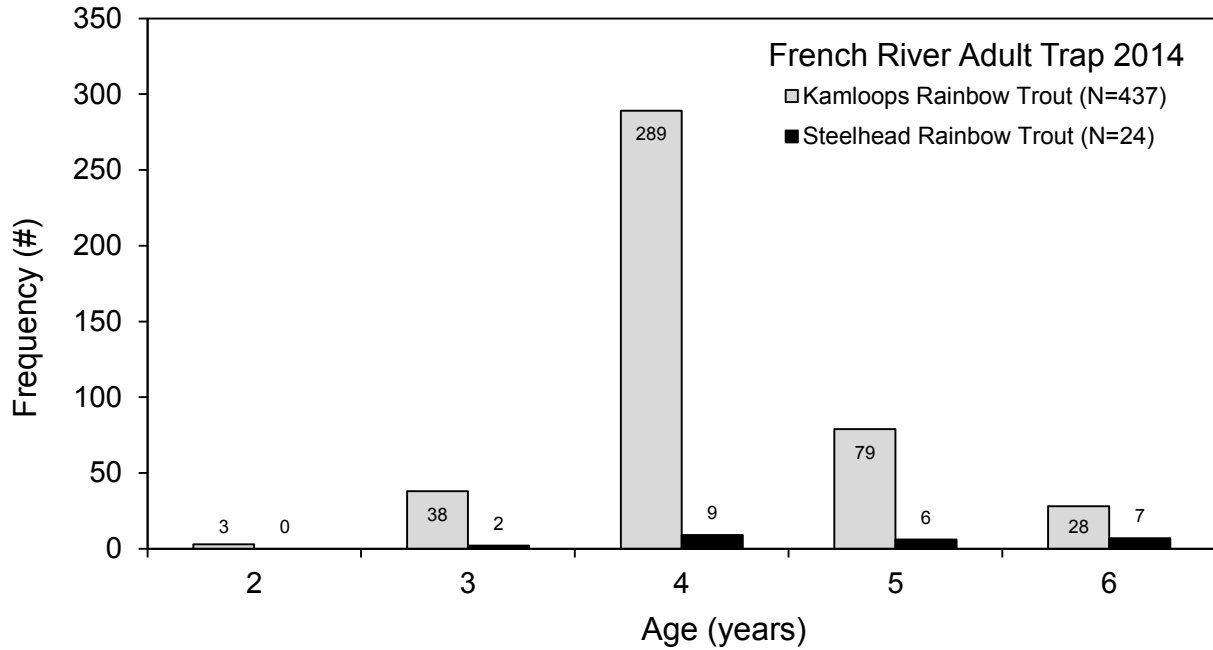


Figure 9. Age-frequency distributions of Kamloops and steelhead Rainbow Trout collected at the French River adult trap in 2014.

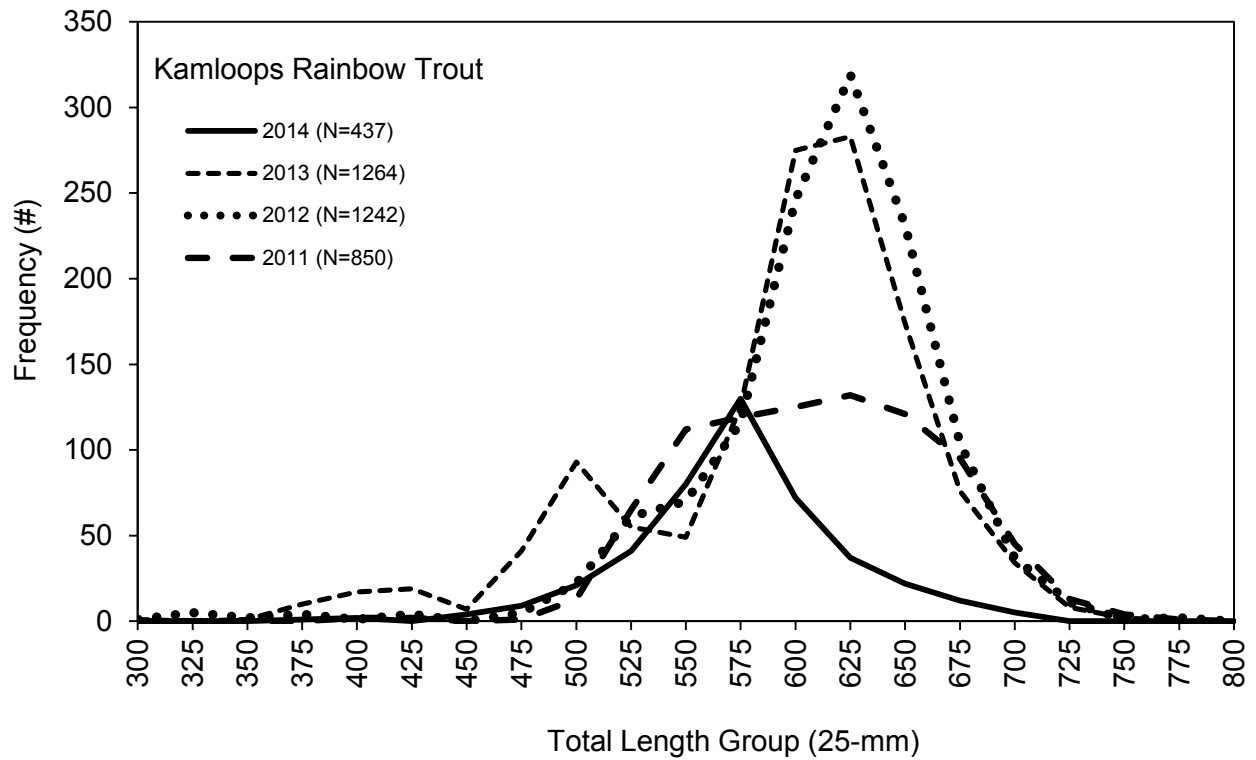


Figure 10. Length-frequency distributions of Kamloops Rainbow Trout captured in the spring at the French River in 2011, 2012, 2013 and 2014.



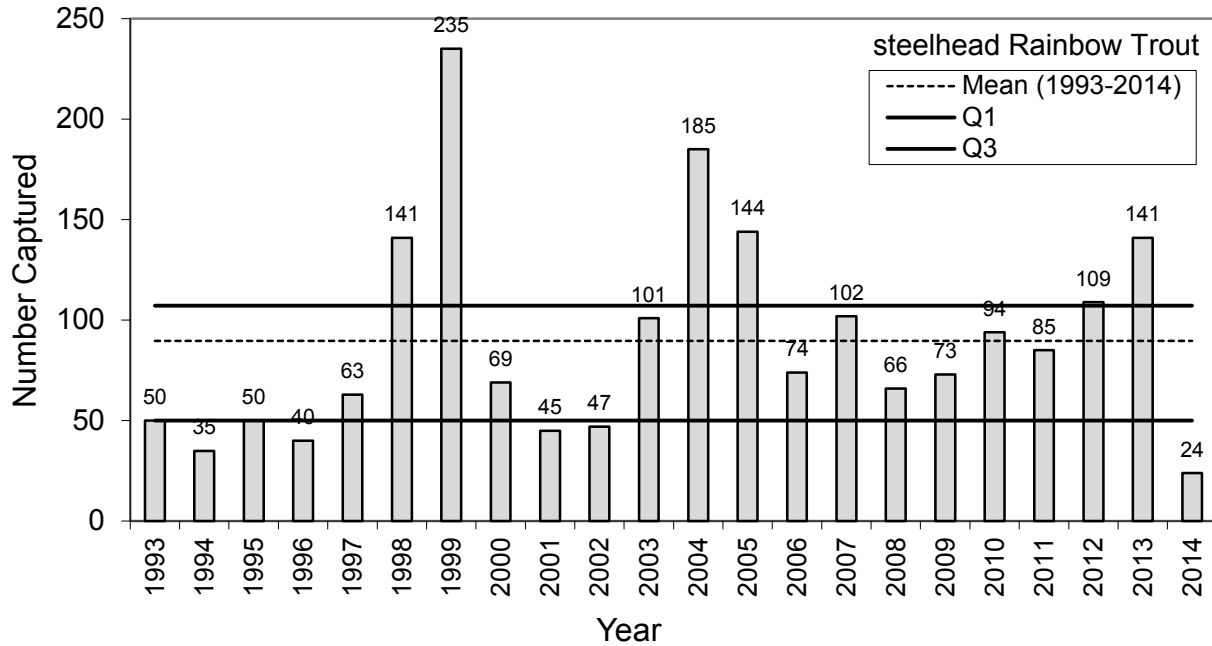


Figure 11. Number of unclipped steelhead Rainbow Trout collected at the French River from 1993 to 2014. The historic average (Mean) with 25th (Q1) and 75th (Q3) percentiles are also provided.

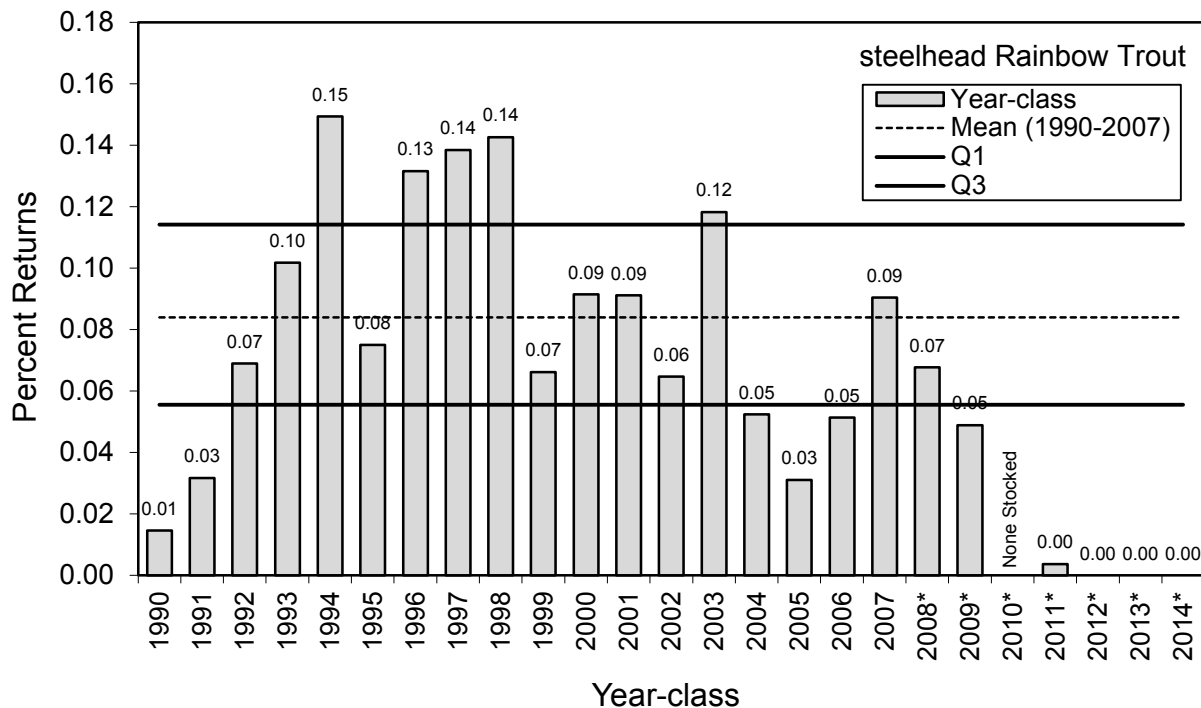


Figure 12. The percent of unclipped steelhead Rainbow Trout (Percent Returns) that were stocked from the 1990-2014 year-classes that returned to the French River to spawn. The historic average (Mean) with 25th (Q1) and 75th (Q3) percentiles are provided. Incomplete year-classes are indicated by (\*).

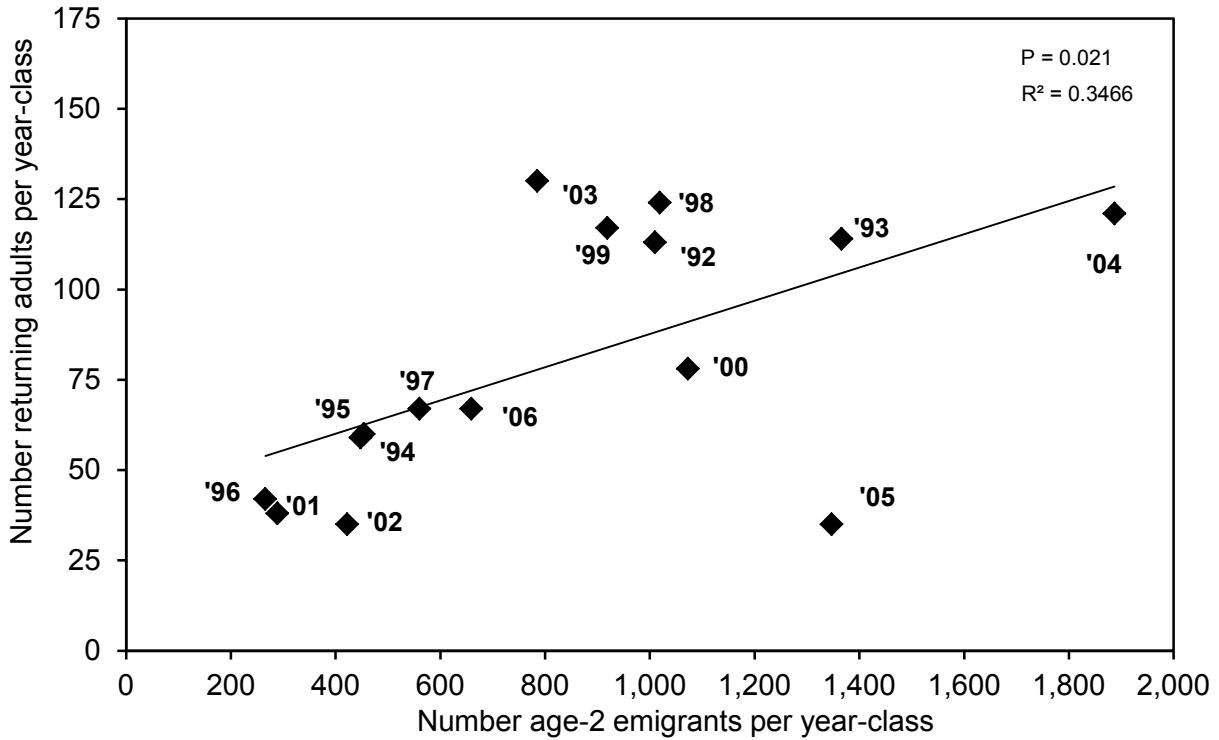


Figure 13. The relationship between the number of age-2 steelhead emigrants per year-class at the French River and the number of returning unclipped steelhead adults produced from them, 1992-2006 (smolt/adult relationship).

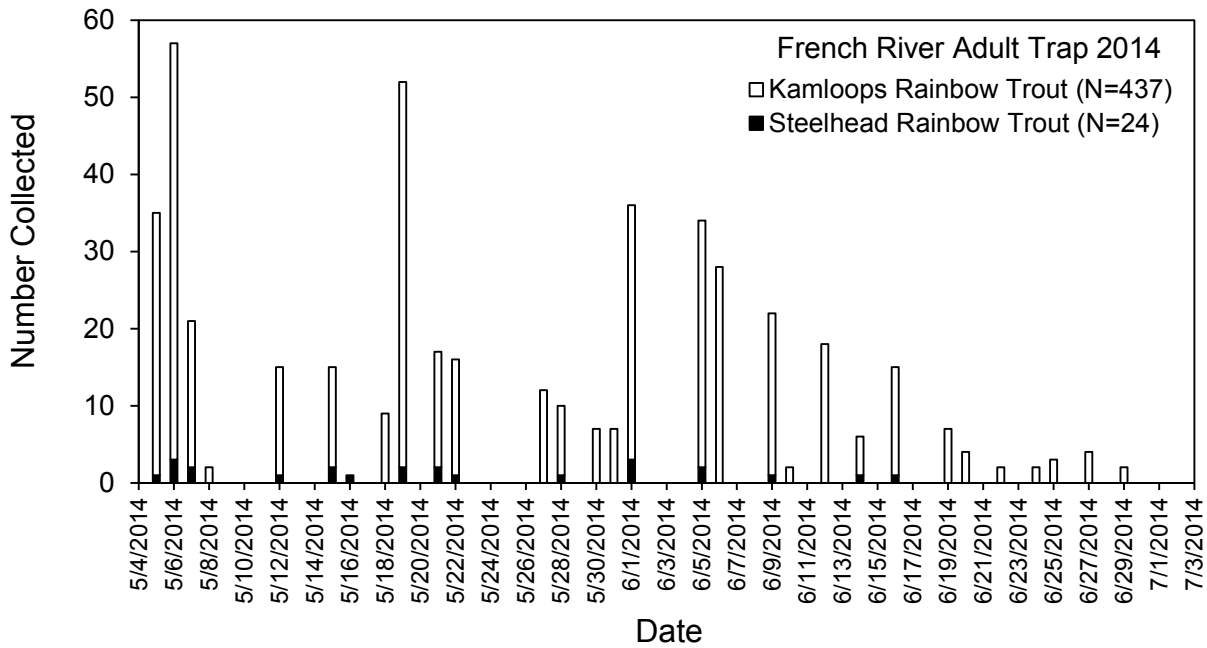


Figure 14. Number of Kamloops Rainbow Trout and steelhead Rainbow Trout collected by date during French River adult trap operations in 2014.

Table 1. Descriptive statistics (number (n) and percentage (%)) for French River juvenile steelhead, determined from juvenile trap data, from 1994-2014. No fish were stocked in 2010 and frylings were stocked instead of fry in 2009 and 2011-2013.

Year	2004 <sup>2</sup>	2005 <sup>2</sup>	2006	2007 <sup>2</sup>	2008	2009	2010	2011	2012	2013	2014	Mean 94-14												
Date trap was opened	4/13	4/11	4/8	4/15	4/16	4/17	3/28	4/18	3/25	5/7	4/28	4/13												
Date trap was closed	11/5	11/4	11/1	11/2	11/6	11/6	10/29	11/3	10/29	11/7	10/31	11/4												
Number days trap open	206	207	207	194 <sup>3</sup>	204	203	215	178 <sup>4</sup>	166 <sup>5</sup>	185	187	201												
<b>Emigrants by age</b>																								
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%												
Age-0	1,360	29%	122	2%	537	12%	408	9%	382	12%	173	4%	0	0%	0	0%	176	15%	50	7%	4	0%	297	8%
Age-1	2,895	62%	5,032	84%	2,132	46%	2,795	61%	2,064	66%	3,140	79%	1,844	57%	0	0%	976	84%	623	84%	1,204	67%	2,453	70%
Age-2	422	9%	785	13%	1,887	41%	1,347	29%	659	21%	609	15%	1,338	42%	333	95%	0	0%	71	10%	558	31%	734	21%
Age-3	26	1%	18	0%	37	1%	65	1%	14	0%	29	1%	34	1%	18	5%	11	1%	0	0%	29	2%	28	1%
Age-4	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%	0	0%
<b>Cumulative number down</b>	<b>4,703</b>		<b>5,957</b>		<b>4,593</b>		<b>4,615</b>		<b>3,119</b>		<b>3,952</b>		<b>3,216</b>		<b>352</b>		<b>1,163</b>		<b>744</b>		<b>1,795</b>		<b>3,512</b>	
<b>Emigrants by year-class</b>																								
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Age-0	1,360	16%	122	3%	537	13%	408	13%	382	8%	173	7%			0	0%	176		50		4		354	9%
Age-1	5,032	60%	2,132	59%	2,795	70%	2,064	66%	3,140	64%	1,844	78%			976	91%	623		1,204		**		2761	71%
Age-2	1,887	23%	1,347	37%	659	16%	609	20%	1,338	27%	333	14%			71	7%	558		**		**		734	19%
Age-3	65	1%	14	0%	29	1%	34	1%	18	0%	11	0%			29	3%	**		**		**		29	1%
<b>Total number</b>	<b>8,344</b>		<b>3,615</b>		<b>4,020</b>		<b>3,115</b>		<b>4,878</b>		<b>2,361</b>		<b>----</b>		<b>1,076</b>		<b>1,357**</b>		<b>1,254**</b>		<b>4**</b>		<b>3,878</b>	
<b>Percent emigration by year-class</b>																								
Number of fry stocked	250,100		135,202		122,776		121,740		109,324		53,214		0		55,013		55,032		55,596		39,856		102,816 <sup>1</sup>	
Number of fry stocked/ha	33,468		18,093		16,430		16,291		14,630		7,121		0		7,362		7,364		7,440		5,334		13,759 <sup>1</sup>	
Age-0	0.5%		0.1%		0.4%		0.3%		0.3%		0.3%				0.0%		0.3%		0.1%		0.0%		0.3% <sup>1</sup>	
Age-1	2.0%		1.6%		2.3%		1.7%		2.9%		3.5%				1.8%		1.1%		2.2%		**		2.8% <sup>1</sup>	
Age-2	0.8%		1.0%		0.5%		0.5%		1.2%		0.6%				0.1%		1.0%		**		**		0.7% <sup>1</sup>	
Age-3	0.0%		0.0%		0.0%		0.0%		0.0%		0.0%				0.1%		**		**		**		0.0% <sup>1</sup>	
<b>Cumulative Est. Survival</b>	<b>3.3%</b>		<b>2.7%</b>		<b>3.3%</b>		<b>2.6%</b>		<b>4.5%</b>		<b>4.4%</b>		<b>----</b>		<b>2.0%</b>		<b>2.5%</b>		<b>2.3%</b>		<b>0.0%</b>		<b>3.9%<sup>1</sup></b>	

<sup>1</sup> numbers and percentages reflect the year classes that have completely emigrated (1994 through 2009)

<sup>2</sup> some individuals were subsampled in 2004, 2005, and 2007

<sup>3</sup> the trap was closed for 8 days for dredging of the reservoir

<sup>4</sup> the trap was closed for 21 days in July due to the government shutdown

<sup>5</sup> the trap was closed for 6 days from June 20th-25th due to a major flood, and then for 47 days from August 8th - September 23rd for gravel removal from the reservoir

\*\* numbers are incomplete for a given year-class

Table 2. Descriptive statistics (number (n) and percentage (%)) for French River Brook and Brown Trout, determined from juvenile trap data, 1994-2014.

<b>Brook Trout</b>										
Year	2011		2012		2013		2014		Mean 94-14	
Date trap was opened	4/18		3/25		5/7		4/28		4/13	
Date trap was closed	11/3		10/29		11/7		10/31		11/4	
Number days trap open	178 <sup>2</sup>		166 <sup>3</sup>		185		187		201	
<b>Emigrants by age</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Age-0	0	0%	52	68%	4	25%	4	33%	22	36%
Age-1	3	33%	18	23%	9	56%	8	67%	31	51%
Age-2	1	11%	5	6%	3	19%	0	0%	7	11%
Age-3	5	56%	2	3%	0	0%	0	0%	1	2%
<b>Cumulative number down</b>	<b>9</b>		<b>77</b>		<b>16</b>		<b>12</b>		<b>61</b>	
<b>Emigrants by year-class</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b> <sup>1</sup>	<b>(%)</b> <sup>1</sup>
Age-0	0	0%	52		4		4		22	35%
Age-1	18	86%	9		8		**		33	52%
Age-2	3	14%	0		**		**		7	11%
Age-3	0	0%	**		**		**		1	2%
<b>Total number</b>	<b>21</b>		<b>61**</b>		<b>12**</b>		<b>4**</b>		<b>64</b>	
<b>Brown Trout</b>										
Year	2011		2012		2013		2014		Mean 94-14	
Date trap was opened	4/18		3/25		5/7		4/28		4/13	
Date trap was closed	11/3		10/29		11/7		10/31		11/4	
Number days trap open	178 <sup>2</sup>		166 <sup>3</sup>		185		187		201	
<b>Emigrants by age</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Age-0	0	0%	1	3%	0	0%	0	0%	2	8%
Age-1	1	7%	32	86%	1	17%	0	0%	12	60%
Age-2	12	86%	2	5%	4	67%	5	83%	5	26%
Age-3	0	0%	1	3%	1	17%	1	17%	1	4%
Age-4	1	7%	1	3%	0	0%	0	0%	0	2%
	<b>14</b>		<b>37</b>		<b>6</b>		<b>6</b>		<b>20</b>	
<b>Emigrants by year-class</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b> <sup>1</sup>	<b>(%)</b> <sup>1</sup>
Age-0	0		1		0		0		2	10%
Age-1	32		1		0		**		12	59%
Age-2	4		5		**		**		5	24%
Age-3	1		**		**		**		1	4%
Age-4	**		**		**		**		0	2%
<b>Total number</b>	<b>37</b>		<b>7</b>		<b>0</b>		<b>0</b>		<b>20</b>	

<sup>1</sup> determined from the 1994 - 2009 time period when all complete year classes have been sampled

<sup>2</sup>the trap was closed for 21 days due to the government shutdown

<sup>3</sup>the trap was closed for 6 days in June due to a major flood, and then for 47 days from August 8th - September 23rd for gravel removal from the reservoir

\*\* Numbers are incomplete for particular year class

Table 3. Opening date, closing date, and days of operation of the French River adult trap, 1993-2014.

Spring				Fall			
Year	Opening date	Closing date	Days of operation	Year	Opening date	Closing date	Days of operation
1993	4/12	5/17	37	1993	8/18	11/10	85
1994	4/18	5/23	36	1994	9/13	11/21	70
1995	4/17	5/26	40	1995	9/7	11/21	76
1996	4/26	6/14	50	1996	9/6	11/13	69
1997	4/16	6/2	48	1997	9/16	11/6	52
1998	4/5	5/26	52	1998	9/14	11/3	51
1999	4/12	5/17	36	1999	9/6	11/9	65
2000	3/27	5/22	57	2000	9/1	11/15	76
2001	4/16	5/23	38	2001	9/10	11/15	67
2002	4/16	5/20	35	2002	9/9	11/12	65
2003	4/23	5/28	36	2003	9/11	11/4	55
2004	4/13	5/19	37	2004	8/31	11/8	70
2005	4/11	5/27	47	2005	9/7	11/17	72
2006	4/6	5/19	44	2006	9/1	10/30	60
2007	4/15	5/25	41	2007	9/6	11/3	59
2008	4/17	5/24	35	2008	8/28	11/10	75
2009	4/21	5/29	39	2009	9/8	11/6	60
2010	3/28	5/18	52	2010	Closed		
2011	4/18	5/27	40	2011			
2012	3/26	5/16	52	2012			
2013	5/6	6/7	33	2013			
2014	5/5	7/3	60	2014			
Mean (1993-2014)	4/14	5/26	43	Mean (1993-2009)	9/5	11/10	66

Table 4. Annual returns, number of repeat spawners, and year-class strength indices of Kamloops Rainbow Trout collected at the French River. The average of annual returns and number of repeat spawners is summarized from 1993 to 2014, and the average year-class strength for complete year-classes is summarized from 1990 to 2007.

Year	Year of Sampling																												Mean 1993-2014			
	2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013				2014	
Age	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M		
Age-2	0	90	0	40	0	14	0	126	0	3	0	11	0	0	0	52	0	2	2	15	0	47	0	4	0	17	0	50	0	3	0	35
Age-3	144	84	74	82	9	16	33	72	57	77	14	0	12	11	121	93	39	41	6	15	15	47	148	104	59	77	46	173	12	26	43	54
Age-4	933	394	332	271	219	96	364	273	326	172	711	463	58	59	180	72	142	53	190	102	108	54	261	108	624	258	478	258	175	114	285	156
Age-5	175	82	57	18	57	37	195	127	345	205	208	119	190	155	65	29	24	6	45	8	71	27	117	66	119	52	148	40	39	40	133	79
Age-6	102	54	21	0	5	0	41	10	125	21	194	138	53	16	26	10	5	1	13	10	23	4	18	8	20	14	44	13	15	13	48	21
Age-7	34	12	7	0	2	0	20	55	14	3	49	27	29	3	0	5	2	1	1	1	3	3	11	5	2	0	5	9	0	0	14	10
Age-8	12	0	2	8	0	8	22	0	9	0	6	2	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1
Age-9	0	0	0	0	0	0	13	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Sex total	1400	716	493	419	292	171	688	663	880	484	1182	760	345	244	394	261	212	104	257	151	220	182	555	295	824	418	721	543	241	196	527	356
Grand total	2116		912		463		1351		1364		1942		589		655		316		408		402		850		1242		1264		437		884	

1x repeat	18	48	11	30	80	76	46	24	14	22	12	19	55	61	19	30
2x repeat	2	2	3	2	5	12	11	1	1	2	3	0	6	9	1	3
3x repeat	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1	0
4x repeat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fall tag	0	4	0	2	0	57	36	4	2	4	0	0	0	0	0	5
K.R. tag	13	6	3	1	0	7	5	0	3	1	0	1	0	0	2	3

Complete Year-classes									
Year-class	2000	2001	2002	2003	2004	2005	2006	2007	Mean 1990-2007
Stocked	49,484	52,850	61,871	49,906	49,772	45,796	36,474	33,337	50,064
Returned	1017	1818	236	344	504	551	417	676	882
% return <sup>2</sup>	2.06%	3.44%	0.38%	0.69%	1.01%	1.20%	1.14%	2.03%	1.77%

Incomplete Year-classes						
Year-class	2008	2009	2010	2011	2012	2013
Stocked	38,589	61,032	43,870	35,050	39,712	36,374
Returned	1397	955	525	88	3	0
% return <sup>1</sup>	3.62%	1.56%	1.20%	0.25%	0.01%	0.00%

<sup>1</sup>: percent return of stocked yearlings returned to the French River trap as adults

Table 5. Length-frequency distribution of all fish measured by species at the French River in 2014.

Length Group (10 mm)	Kamloops Rainbow Trout	Steelhead Rainbow Trout	Coho salmon	Northern Pike	White Sucker
300					
310					
320					
330					
340					
350			1		
360			1		
370			2		
380	1		1		
390			2		
400					
410	2				
420					
430					1
440		1			
450					
460	2				
470	3				
480	3	1			
490	5				
500	12				
510	6				1
520	11				
530	14				
540	19	3			
550	25				
560	39	1			
570	39	1			
580	58	1			
590	49				
600	40	2			
610	26	3			
620	14	3			
630	14	1			
640	15	4			
650	11	1			
660	9	1			
670	3	1			
680	5				
690	6				
700	2				
710	3				
720					
730				1	
740					
750					
760					
770					
780					
790					
800					
<b>Total</b>	<b>436</b>	<b>24</b>	<b>7</b>	<b>1</b>	<b>2</b>

Table 6. Annual returns, number of repeat spawners, and year-class strength indices of unclipped steelhead Rainbow Trout collected at the French River. The average of annual returns and number of repeat spawners is summarized from 1993 to 2014, and the average year-class strength for complete year-classes is summarized from 1990 to 2007.

Year	Year of Sampling																												Mean (93-14)			
	2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		F	M
<b>Age</b>	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
2	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
3	3	2	0	8	0	7	0	9	0	1	1	0	1	13	2	9	0	0	0	1	1	2	0	0	0	3	0	6	0	2	1	4
4	8	2	2	1	6	5	10	12	8	6	7	4	3	4	24	21	7	7	4	3	0	1	8	8	7	8	6	9	6	3	7	7
5	16	9	6	6	14	3	20	21	27	10	34	19	12	4	10	9	26	14	29	15	6	6	14	9	27	30	32	27	5	1	17	12
6	4	3	6	5	6	2	14	8	50	25	32	23	14	5	9	3	5	4	4	10	35	9	12	8	19	8	33	9	3	4	16	9
7	8	5	7	2	1	2	3	3	21	20	13	4	8	7	7	4	1	0	3	1	10	18	12	9	2	1	11	7	0	0	7	5
8	3	2	2	0	0	1	0	0	12	3	2	3	1	1	3	0	1	1	2	0	2	3	3	2	1	0	1	0	0	0	2	2
9	0	4	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Sex total</b>	42	27	23	22	27	20	48	53	120	66	91	53	39	35	55	47	40	26	42	31	54	40	49	36	56	50	83	58	14	10	51	39
<b>Total</b>	69		45		47		101		186		144		74		102		66		73		94		85		106		141		24		<b>90</b>	

Year-class	Complete year-classes																	Mean (90-07)	
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006		2007
<b>Stocked</b>	233,720	277,585	179,981	129,685	56,928	98,637	42,571	60,669	100,281	201,156	109,427	48,311	64,932	117,596	250,100	135,202	122,776	121,740	<b>130,628</b>
<b>Returned</b>	34	88	124	132	85	74	56	84	143	133	100	44	42	139	131	42	63	110	<b>90</b>
<b>% return<sup>1</sup></b>	0.01%	0.03%	0.07%	0.10%	0.15%	0.08%	0.13%	0.14%	0.14%	0.07%	0.09%	0.09%	0.06%	0.12%	0.05%	0.03%	0.05%	0.09%	<b>0.08%</b>
<b>1x repeat</b>	3	5	6	9	5	1	7	7	7	6	4	0	3	5	5	1	6	7	<b>5</b>
<b>2x repeat</b>	0	0	1	1	0	0	0	0	2	0	2	0	0	1	0	0	0	2	<b>1</b>
<b>3x repeat</b>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	<b>0</b>

Year-class	Incomplete year-classes						
	2008	2009	2010	2011	2012	2013	2014
<b>Stocked</b>	109,324	53,214	0	55,013	55,032	55,596	39,856
<b>Returned</b>	74	26	15	2	--	--	--
<b>% return<sup>1</sup></b>	0.07%	0.05%	--	0.00%	--	--	--
<b>1x repeat</b>	4	1	0	0	--	--	--
<b>2x repeat</b>	2	0	0	0	--	--	--
<b>3x repeat</b>	1	0	0	0	--	--	--

<sup>1</sup>percent return of stocked fry or fingerlings to the French River trap as adults



Table 7. Percent of unclipped steelhead Rainbow Trout return as adults by year-class of juveniles emigrating at ages 1-3. Standard error of the mean is presented in parentheses.

Year-class	# adults	# age-1 emigrants	% return	# adults	# age-2 emigrants	% return	# adults	# age-3 emigrants	% return
1992	No data			113	1,010	11.2%	2	47	4.3%
1993	13	2,746	0.5%	114	1,366	8.3%	4	35	11.4%
1994	23	3,253	0.7%	59	448	13.2%	3	46	6.5%
1995	13	2,644	0.5%	60	454	13.2%	1	17	5.9%
1996	9	280	3.2%	42	266	15.8%	5	5	100.0%
1997	12	3,207	0.4%	67	560	12.0%	5	35	14.3%
1998	14	3,760	0.4%	124	1,019	12.2%	4	56	7.1%
1999	11	4,558	0.2%	117	919	12.7%	5	23	21.7%
2000	17	6,001	0.3%	78	1,073	7.3%	5	28	17.9%
2001	3	401	0.7%	38	289	13.1%	2	26	7.7%
2002	3	1,953	0.2%	35	422	8.3%	3	18	16.7%
2003	3	2,895	0.1%	130	785	16.6%	4	37	10.8%
2004	5	5,032	0.1%	121	1,887	6.4%	4	65	6.2%
2005	3	2,132	0.1%	35	1,347	2.6%	3	14	21.4%
2006	0	2,795	0.0%	67	659	10.2%	3	29	10.3%
2007 <sup>1</sup>	3	2,064	0.1%	113	609	18.6%	3	34	8.8%
2008 <sup>1</sup>	4	3,140	0.1%	79	1,338	5.9%	0	18	0.0%
2009 <sup>1</sup>	6	1,844	0.3%	18	333	5.4%	0	11	0.0%
2010 <sup>2</sup>	6	0		9	0		0	0	
2011 <sup>1</sup>	0	976		2	71	2.8%	0	29	
<b>Cumulative total 94-06</b>	<b>129</b>	<b>41,657</b>		<b>1,087</b>	<b>11,494</b>		<b>51</b>	<b>434</b>	
<b>Weighted mean 94-06</b>	<b>0.3%</b>			<b>9.5%</b>			<b>11.8%</b>		
<b>Annual mean 94-06</b>	<b>0.5% (0.2%)</b>			<b>11.0% (1.1%)</b>			<b>19.0% (6.9%)</b>		

<sup>1</sup> all adults have not likely returned from these year-classes

<sup>2</sup> no stocking occurred in 2010

Table 8. Total catch by date for all species collected during the French River adult trap operations in 2014. Unidentifiable Rainbow Trout species are shown as Unk Kam/Stt.

Date	Species						
	All Species	Kamloops Rainbow Trout	Steelhead Rainbow Trout	Northern Pike	Coho salmon	White Sucker	Unk Kam/Stt
5/5/2014	36	34	1	0	0	0	1
5/6/2014	57	54	3	0	0	0	0
5/7/2014	21	19	2	0	0	0	0
5/8/2014	2	2	0	0	0	0	0
5/12/2014	15	14	1	0	0	0	0
5/15/2014	15	13	2	0	0	0	0
5/16/2014	1	0	1	0	0	0	0
5/18/2014	9	9	0	0	0	0	0
5/19/2014	62	50	2	0	7	2	1
5/21/2014	17	15	2	0	0	0	0
5/22/2014	16	15	1	0	0	0	0
5/27/2014	13	12	0	1	0	0	0
5/28/2014	11	9	1	0	1	0	0
5/30/2014	7	7	0	0	0	0	0
5/31/2014	7	7	0	0	0	0	0
6/1/2014	36	33	3	0	0	0	0
6/5/2014	34	32	2	0	0	0	0
6/6/2014	28	28	0	0	0	0	0
6/9/2014	22	21	1	0	0	0	0
6/10/2014	2	2	0	0	0	0	0
6/12/2014	18	18	0	0	0	0	0
6/14/2014	6	5	1	0	0	0	0
6/16/2014	15	14	1	0	0	0	0
6/19/2014	7	7	0	0	0	0	0
6/20/2014	4	4	0	0	0	0	0
6/22/2014	2	2	0	0	0	0	0
6/24/2014	2	2	0	0	0	0	0
6/25/2014	3	3	0	0	0	0	0
6/27/2014	4	4	0	0	0	0	0
6/29/2014	2	2	0	0	0	0	0
6/30/2014	0	0	0	0	0	0	0
7/1/2014	0	0	0	0	0	0	0
7/2/2014	0	0	0	0	0	0	0
7/3/2014	0	0	0	0	0	0	0
Total	474	437	24	1	8	2	2