



MNDNR  
Minnesota  
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F29 Segment 31  
Study 3  
Job 3

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

## SUPPLEMENTAL REPORT

Results of Operating the  
Juvenile and Adult Fish Traps  
on the French River  
2013

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## **Introduction**

This report is an interim juvenile/adult trap report and update to the comprehensive juvenile report completed in 2006 (Ward and Blankenheim 2006) and the comprehensive adult report completed in 2007 (Blankenheim 2007). The purpose of this report is to present data that promote the rehabilitation of steelhead stocks using Minnesota strain fish to attain a level that will allow limited angler harvest largely supported by natural reproduction (Schreiner et al. 2006). Additionally, this report presents data critical to managing the Kamloops strain Rainbow Trout program unique to the Duluth Area. The next comprehensive juvenile/adult trap report will be completed in 2014 and annual supplemental reports will be completed in the interim. 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 185 days between May 7<sup>th</sup> and November 7<sup>th</sup>, 2013 (Table 1). While 2012 was the earliest the juvenile trap was opened since trap operations began in 1994, 2013 was the latest the trap was ever opened. The trap was not opened until May 7<sup>th</sup> because of the ice coverage on the river due to the extremely late spring.

Since 1994, the entire stream flow passed through the juvenile trap 81% of the hours it operated, and 90% of the total number of juveniles captured were caught during this time. Daily observations have been used since the discontinuation of the discharge meter in 2009 to determine the number of hours the trap takes the entire stream discharge. If the trap is taking all the water at the time it is visited, then the trap is considered to be taking all the water for that entire day. This method is unlikely to be as accurate as an hourly discharge meter, but a new discharge meter is not scheduled to be installed on the French River. In 2013, the trap captured all of the flow 74% of the time (3,286 hours), which accounted for 64% (473 fish) of the total number of juveniles captured (744). There were several days where the river was just overtopping the dam and relatively high numbers of fish were captured, resulting in a higher

percentage of juveniles captured when the trap was not taking the entire stream flow. Overall, there were relatively few juveniles captured in 2013 so one or two days with high numbers of fish had a considerable effect on the percentages of fish captured when the trap was or was not taking all the flow.

### Juvenile Steelhead Rainbow Trout

A total of 744 juvenile steelhead emigrated in 2013, which is approximately 80% fewer than average (Mean=3,598) and well below the interquartile range (IR= 2,336-4,635) (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 size slightly larger than traditional fry. During these years only about half the number of fish were stocked compared to fry stocked years, so fewer fish in the trap is not alarming. In addition to the reduction in stocking, the June 2012 flood also likely reduced the number of frylings present in the French River, resulting in fewer emigrants in 2013. Based on the complete year-class of frylings (2009) that has emigrated and the incompletely emigrated year-classes of 2011 and 2012, fryling emigrants attained larger length-at-ages 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 stocking resulting in reduced competition among juveniles, or a combination of these factors. Fryling stocking concluded in 2013 and fry stocking will resume in 2014. Refer to the MN DNR internal report #661 for more details on the fryling program.

With fry stocking, the number of total emigrants is generally not as important as the number of age-2 and age-3 smolts, as these individuals return as adults at a rate approximately 30 times greater than that of their age-1 counterparts. The 2007 and 2008 year-classes produced average to above average numbers of age-2 and age-3 emigrants (Table 1, Figure 4), which should provide some angling opportunity over the next few years. The number of age-2 and age-3 emigrants from the 2009 (344) and 2011 (71) fryling year-classes, combined with the absent year-class of 2010, may limit future angling opportunities. However, the return rate of frylings as adults is not yet known. It is possible that because of their larger size, age-1 fryling emigrants may return as adults at a higher rate than fry that emigrated at age-1.

On average, 78% of emigrants leave in spring, 13% in summer, and 10% in the fall. In 2013 emigration rates were 52% spring, 46% summer, and 2% fall. In most years juveniles begin emigrating in April or early May, and usually there is a large pulse of fish that emigrate in June. A higher than normal percentage of juveniles emigrated in the summer (July/August) in 2013, likely due to the extremely late spring that kept water levels higher and temperatures cooler later into the year. Most age-2 juveniles emigrated when daily mean water temperatures reached 13-16°C and most age-1 juveniles emigrated at temperatures between 14-20°C, which is similar to previous years.

In the French River, one factor that has contributed to the size of an emigrating year-class is the number of fry stocked from adults spawned in the French River Hatchery. The relationship between the number of fry stocked and the number of age-2 and age-3 emigrants displays a significant positive relationship ( $R^2 = 0.66$ ,  $P = 0.0001$ ; Figure 5). The 2004 data point strongly influences this relationship. If it is removed, the variability in the number of age-2 and age-3 smolts that is explained by the number of fry stocked decreases substantially, though

the relationship remains significant ( $R^2 = 0.43$ ,  $P = 0.008$ ). More data points from stocking greater than 140,000 fish would be necessary to further develop this relationship. The 2009 year-class was the first complete year-class of frylings to emigrate, and it does not appear to have produced a noticeably higher or lower number of age-2 smolts or total emigrants based on the number of fish stocked (Table 1, Figure 5). No frylings were stocked in 2010, but three consecutive year-classes of frylings were stocked from 2011-2013. Only 0.1% of the 2011 year-class of frylings survived to emigrate as age-2 smolts, which is the lowest percentage of age-2 smolts from any year-class since the trap became operational in 1994 (Table 1). The June 2012 flood likely negatively impacted the number of smolts produced from the 2011 year-class as well as the survival of the 2012 year-class. The survival of frylings to adulthood is not yet known, but adults from the 2009 year-class should return to the French River as age-5 spawning adults in 2014.

### Other Species Sampled

Historically, a small proportion of the yearly salmonid emigration is brook and brown trout. Sixteen brook trout and six brown trout were captured in the trap in 2013 (Table 2). All brook and brown trout were relatively small with the exception of one brown trout of 332 mm. Few nongame species were captured and included blacknose dace (12), central mudminnow (2), creek chub (8), fathead minnow (3), finescale dace (1), and longnose dace (9).

### In-stream Environmental Influences

Conditions were unfavorable for juvenile trout entering the winter of 2012-2013. Less than average precipitation fell in the fall, and many streams entered the winter with low flows and the North Shore was classified as being in moderate drought status (D1). Fortunately, air temperatures were moderate and adequate snowfall during the winter months helped insulate streams from excessive ice formation that can decrease overwintering habitat for juvenile trout.

However, winter-like conditions prevailed throughout April of 2013. Nearly 51 inches of snow fell during April, making it the snowiest month ever recorded in Duluth. Air temperatures were also below average from March through May and streams remained locked in ice until nearly May. Precipitation totals through spring were above average which helped maintain adequate flows in streams early in the open water season. Conditions for juvenile trout were fair during the summer months. Precipitation totals were lower than average and air temperatures were higher than normal, but the North Shore remained out of significant drought status most of the summer. Periods of abnormally dry conditions were present during the fall of 2013, but drought status was not reported. Above average precipitation fell in October, and early season snow events should help insulate streams from excessive ice formation that can lead to winterkill.

Adequate flows and cool water temperatures are key components to retaining juveniles upstream for two years until they are large enough to undergo smoltification. Low precipitation totals and warm air temperatures can result in low stream flows and water temperatures that stress juvenile trout. The range of thermal stress for juvenile steelhead starts at 68°F and reaches lethal temperatures at 77°F. Water temperatures are annually monitored at the French River index station at kilometer 7.4 between June 1 and September 30 (2,928 hours). In 2013, 11.2%

of the hourly temperature records were within the range of stress for juvenile steelhead, and 0.1% were above the lethal threshold.

### **Adult Trap Operations**

The French River adult trap season started 46 days later in 2013 than in 2012 due to later than normal spring snowmelt and high discharge, and was the latest and shortest operation on record (Table 3). Seining in the pool downstream of the adult trap was conducted twice a week for the first three weeks depending upon river conditions and the number of fish captured in the sampling efforts. The 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 1,264 Kamloops were captured at the French River in the spring of 2013. This was at the upper end of the interquartile range of the 21-year average (Mean= 905; IR= 463-1264), and very similar to the return in 2012 (Table 4, Figure 6). Survival of individual year-classes as measured by returns to the trap has varied considerably throughout time and averaged 1.79% for the 1990 to 2005 year-classes. Record survival helped make the 2001 year-class the largest returning cohort of Kamloops at the French River. Survival dropped dramatically for year-classes from 2002 to 2005, with the 2002 year-class having the smallest returning cohort since the early stages of the Kamloops program. The 2006 and 2007 year-classes are still assigned as incomplete year-class returns but few fish from these cohorts were collected in 2013. Although it is too early to make predictions about the 2008, 2009 and 2010 cohorts, these year-classes made up most (90%) of the total catch in 2013. The 2008 year-class has already surpassed the 16-year average from 1990 to 2005 (Mean= 924, IR= 469-1140), the 2009 year-class is near the 16-year average, and the 2010 year-class is already equal to the return of the 2002 year-class (Table 4, Figure 7). The number of returning Kamloops year-classes are due to the combined differences in condition 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 2013 ranged from age-2 to age-7, with 73% of the return consisting of age-4 (58%) and age-5 (15%) fish. An additional 17% of the spawning run was age-3 fish, which was noticeably higher than 2011 and 2012 (Table 4, Figure 8). Unfortunately, a large number of age-3 fish does not always guarantee that the year-class will be strong.

Females and males comprised 57% and 43% of Kamloops returns in 2013, respectively. Overall, mean total length and was 583 mm and mean weight was 2.2 kg. A higher number of Kamloops  $\leq 500$  mm were captured in 2013 than previous years (Table 5, Figure 9). Nearly 6.0% of returning Kamloops were recaptures with a previous spring's tag, which was higher than the long-term mean of 3.8% and higher than the interquartile range (IR= 2.5%-5.4%). 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. A portion of Kamloops eggs collected in 2013 were reared to pre-smolt at the Spire Valley Hatchery and will be brought back to the French River Hatchery in the spring of 2014 for imprinting before being stocked into Lake Superior. Future data collection should include assessment of program changes.

### Unclipped Steelhead Rainbow Trout

In 2013, 141 unclipped steelhead were captured at the French River, which is significantly above average and interquartile range (Mean=93, IR=50-109) (Table 6, Figure 10). Though incomplete, the 2006, 2007, and 2008 year-classes are already within the interquartile range of the 16-year average (Mean=91, IR=56-124) (Figure 11). Year-class size is dependent upon many factors, including both the number of fry stocked as well as survival of those fry to adulthood. The below average returns of the 2001 and 2002 year-classes were in part due to half or less than the average amount of fry being stocked per year. However, the data continue to suggest 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 average to below average returns of adults.

Returning unclipped steelhead in 2013 ranged from age-3 through age-8, with 42% being age-5, 30% age-6, 13% age-7, and <1% age-8 (Table 6, Figure 8). Repeat-spawning steelhead continue to be uncommon at the French River. Only 6% of the unclipped steelhead from the 1990-2004 year-classes returned to spawn in multiple years (Table 6). Fifteen percent (N=21) of the unclipped steelhead collected in 2013 had tags from previous years, which was much higher than 5% (N=5) in 2012. Among the tags found, 95% (N=20) were applied in 2012 and 20% (N=4) were applied in 2011. Unclipped steelhead were captured up to 780 mm, the average length was 600 mm and the average weight was 2.0 kg (Table 5).

One factor affecting the number of returning adult steelhead per year-class is the number of age-2 and age-3 juveniles that emigrate, commonly referred to as the smolt/adult relationship. Only 0.3% of age-1 juvenile emigrants return as adults, compared to 9.6% and 11.9% of age-2 and age-3 emigrants, respectively (Table 7). The relationship between age-2 smolts and returning adults is statistically significant ( $P=0.0282$ ), but only explains 34% of the variation in adult returns ( $R^2=0.3415$ , Figure 12). The variability in adult returns that is not explained by the number of emigrating smolts is likely due to interacting factors including Lake Superior water temperature, prey availability, predator abundance and interspecific competition.

### Clipped Steelhead Rainbow Trout

Returns of clipped steelhead to the French River have nearly disappeared due to the termination of the smolt-stocking programs at the French River and Knife River in 2002 and 2007, respectively (Table 8). No clipped steelhead from the French River stocking program were captured in 2013. One left maxillary clipped age-7 adult was captured that was planted as a smolt in the Knife River but strayed to the French River as an adult.

### Fall Returns

The adult trap remained closed and seining did not take place in the fall of 2013. 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 came much later in 2013 than in 2012; the first fish were sampled on May 6, five weeks later than in 2012 (March 27). Seventy-nine percent of all Kamloops and 76% of all steelhead were captured by May 16<sup>th</sup> (Table 9, Figure 13). 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**

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 greater length-age-age than emigrants derived from fry stocking, either due to the larger size at stocking or a reduction in competition with other juveniles, but survival of frylings to age-2 so far does not appear to be better than for fry. This was the last year of fryling stocking, and fry stocking will resume in 2014.

The 744 juvenile steelhead captured in 2013 at the French River smolt trap was about 80% fewer than average. Only about half the number of frylings have been stocked compared to fry and none were stocked in 2010, which, along with the flood of 2012, accounts for the reduced juvenile emigration. Based on fry stocking, age-2 smolts 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 emigrating at all age-classes will determine the ultimate success of the fryling program.

The spring of 2013 was another abnormal spring. While the spring of 2012 was extremely warm and came very early, the spring of 2013 was cold and arrived late. Nearly 51 inches of snowfall was recorded during April in Duluth. The French River remained frozen until nearly May, which resulted in both the adult and smolt traps being opened later than ever before.

Survival of Kamloops, as measured by adult returns to the trap, dropped beginning with the 2002 year-class. However, strong 2008 and 2009 year-classes became apparent in 2012 and 2013. The number of Kamloops collected in 2013 was above both the long-term mean and the interquartile range, and similar to 2012.

The 2013 return of unclipped steelhead was higher than the long-term average and above 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. No fish from this program were captured in 2013.

Budgetary constraints have caused changes to the Kamloops program. A portion of eggs collected in 2013 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 2014 for imprinting prior to stocking into Lake Superior. Evaluation of these changes should be conducted in the coming years.

### **References**

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**FRENCH RIVER ADULT/JUVENILE  
TRAP REPORT 2013**

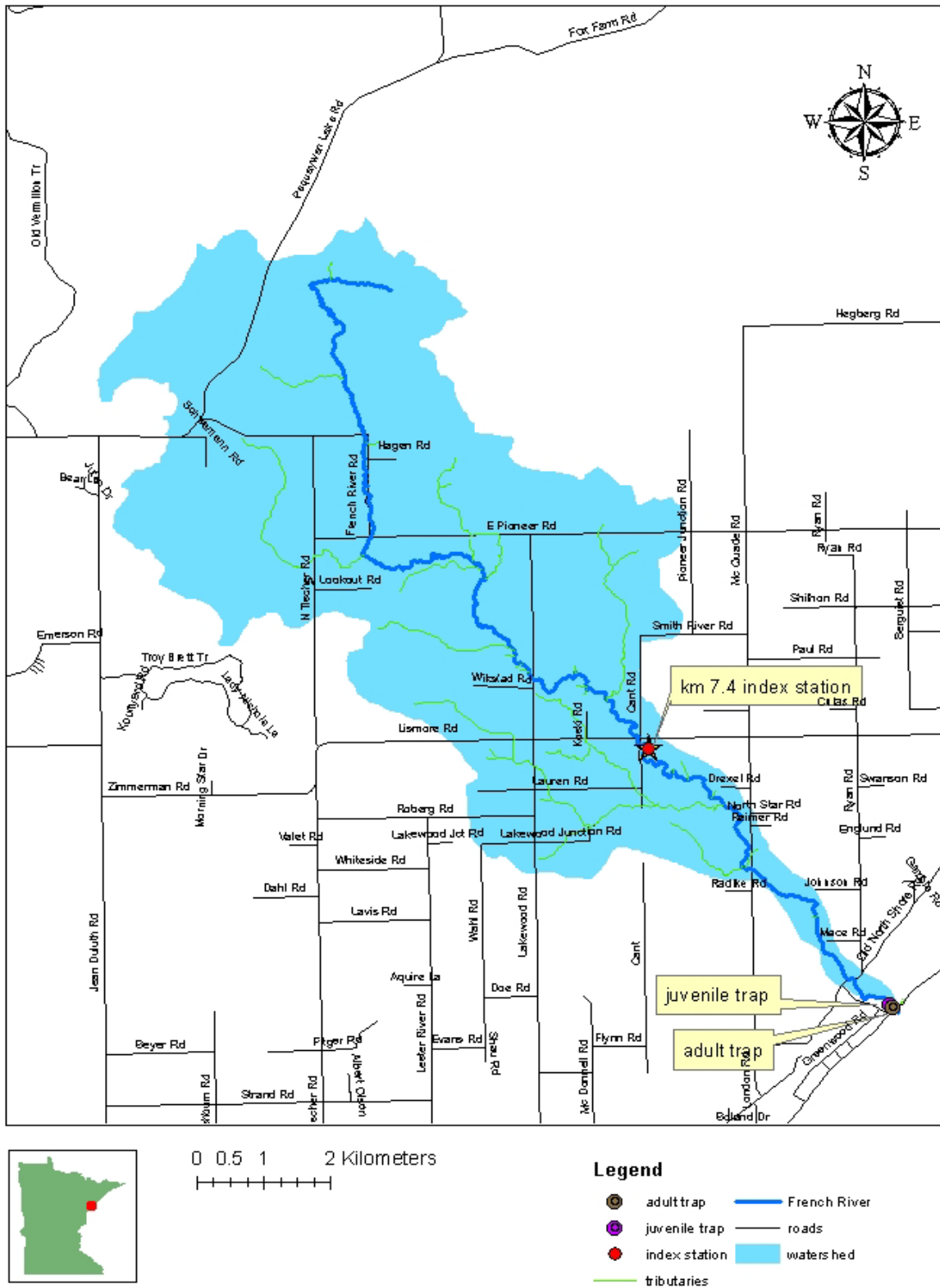


Figure 1. Location of the adult and juvenile fish traps on the French River (S-011), and the French River watershed.

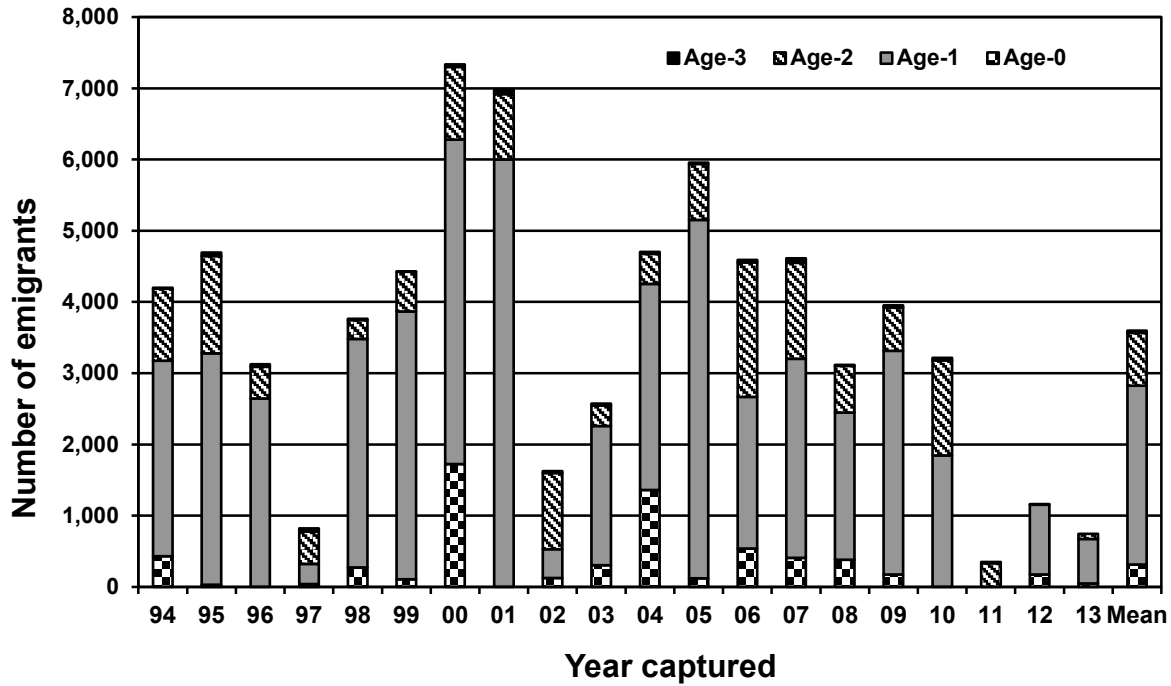


Figure 2. Number of juvenile steelhead emigrants captured in the French River from 1994 through 2013.

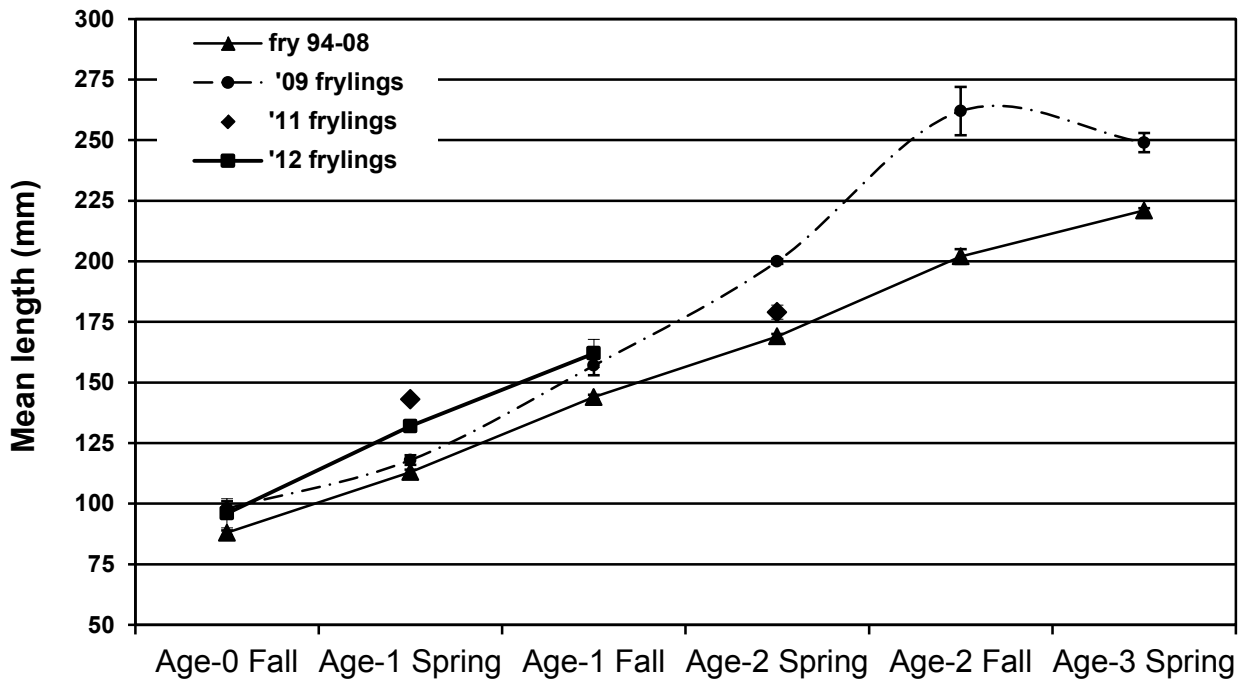


Figure 3. Mean lengths by season of aged juvenile steelhead year-classes sampled at the French River juvenile trap. The 94-08 year-classes were stocked as fry and the 2009, 2011, and 2012 year-classes were stocked as frylings. No stocking occurred in 2010.

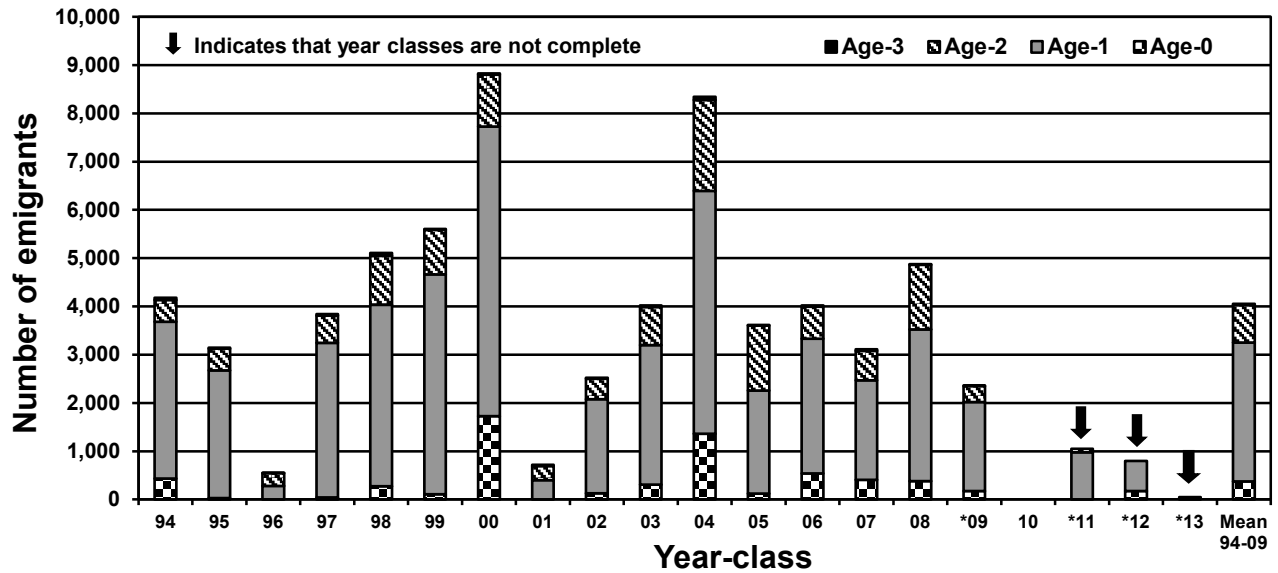


Figure 4. Number of juvenile steelhead per year-class emigrating down the French River from 1994 through 2013. The 2009 and 2011-2013 year-classes were stocked as frylings. No fish were stocked in 2010.

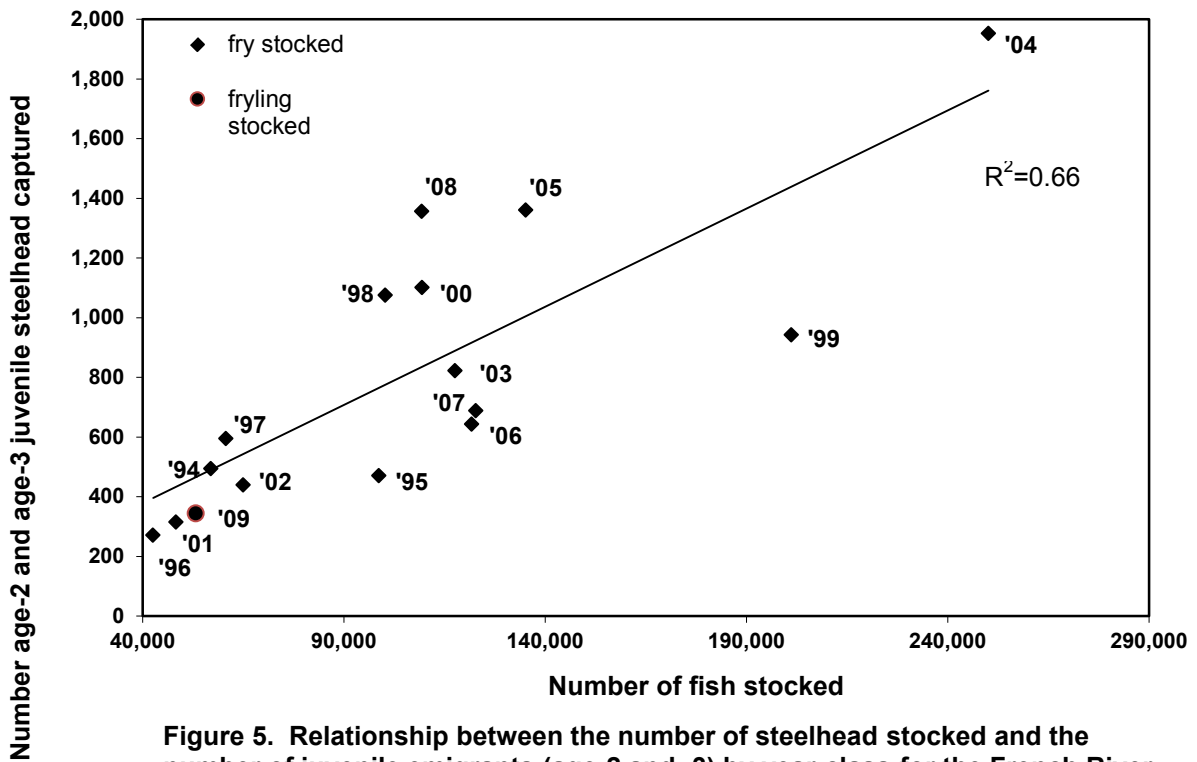


Figure 5. Relationship between the number of steelhead stocked and the number of juvenile emigrants (age-2 and -3) by year-class for the French River from 1994-2009. Frylings were stocked in 2009 instead of fry.

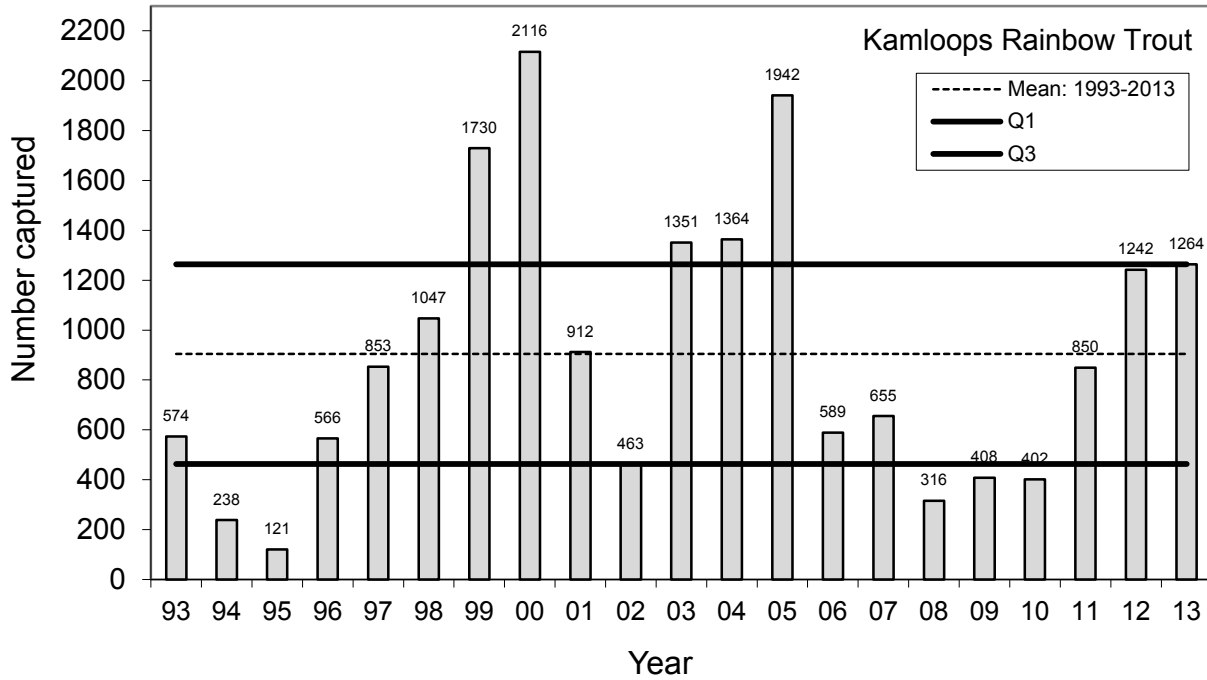


Figure 6. Number of Kamloops Rainbow Trout returning to the French River from 1993 to 2013. The historic average (Mean) with 25th (Q1) and 75th (Q3) percentiles are also provided.

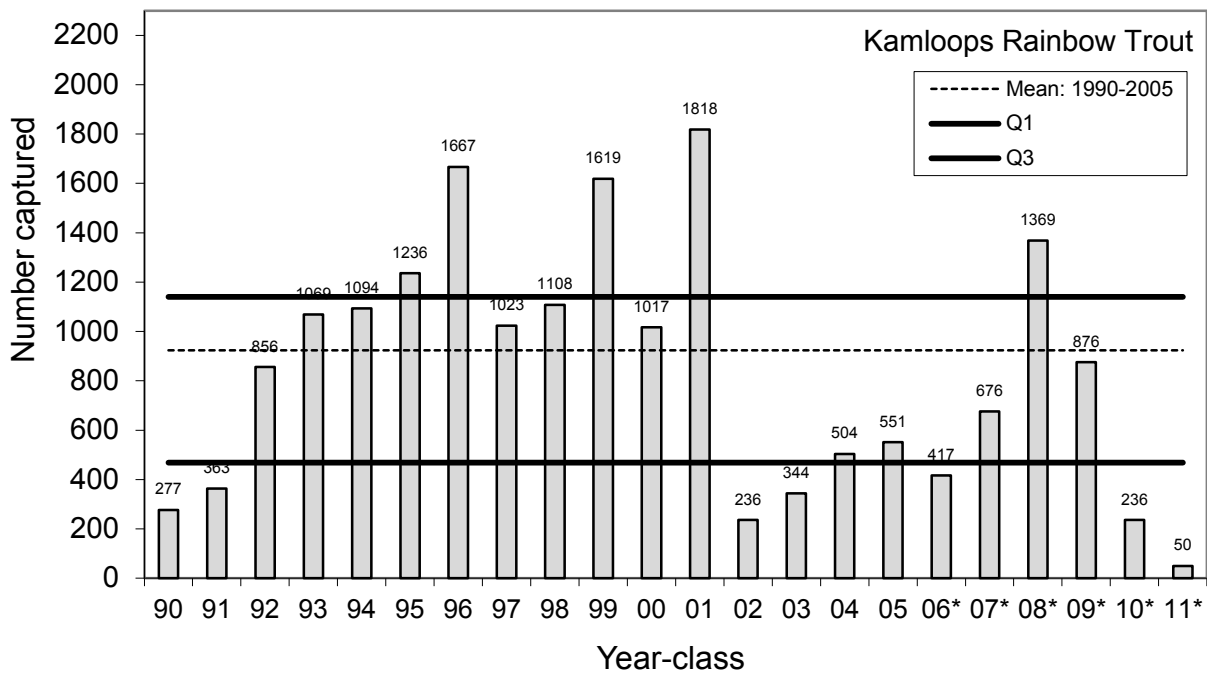


Figure 7. Number of Kamloops Rainbow Trout that returned to the French River from the 1990-2011 year-classes. The historic average (Mean) with 25th (Q1) and 75th (Q3) percentiles are also provided. Year-classes are not complete for 2006-2011 and are indicated by (\*).

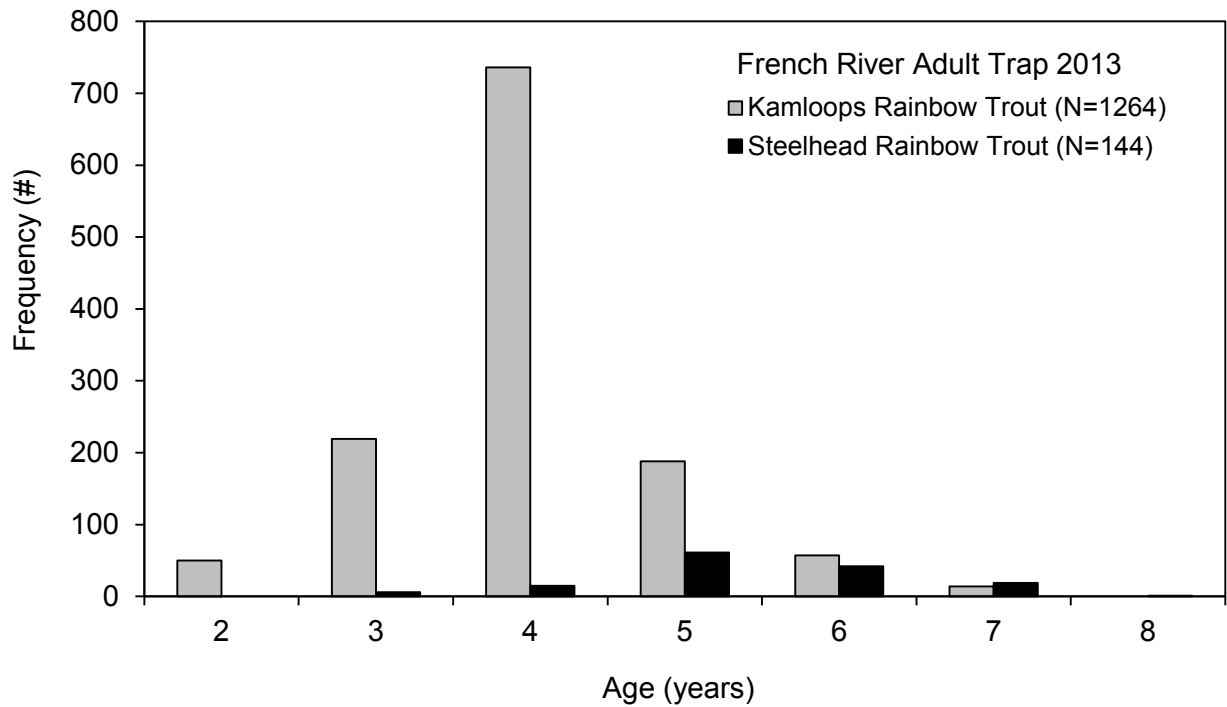


Figure 8. Age-frequency distribution of Kamloops and steelhead Rainbow Trout collected at the French River adult trap in 2013.

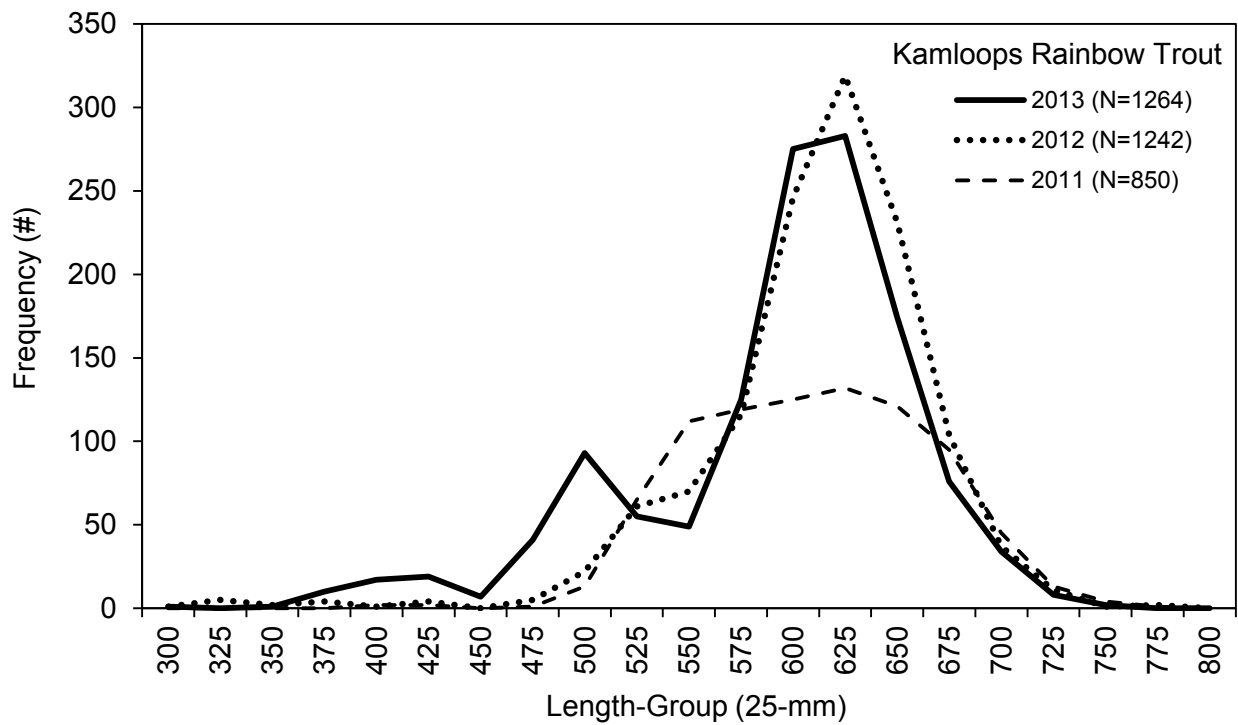


Figure 9. Length-frequency distributions of Kamloops Rainbow Trout captured in the spring at the French River in 2011, 2012 and 2013.

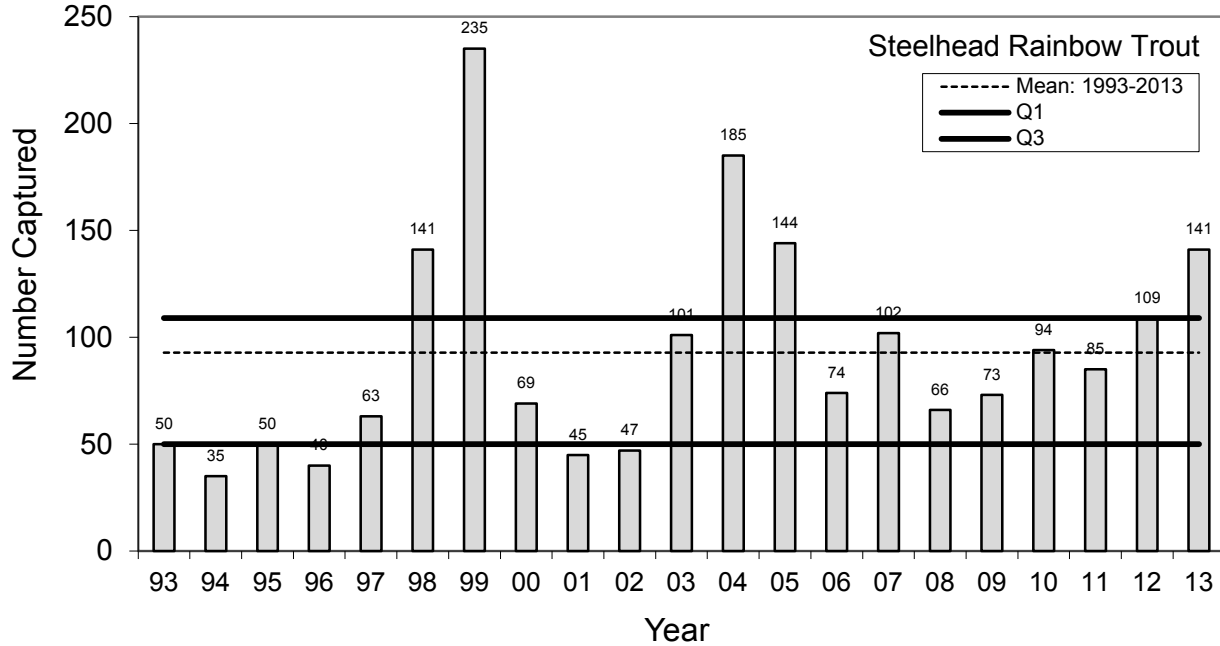


Figure 10. Number of unclipped steelhead Rainbow Trout returning to the French River from 1993 to 2013. The historic average (Mean) with 25th (Q1) and 75th (Q3) percentiles are also provided.

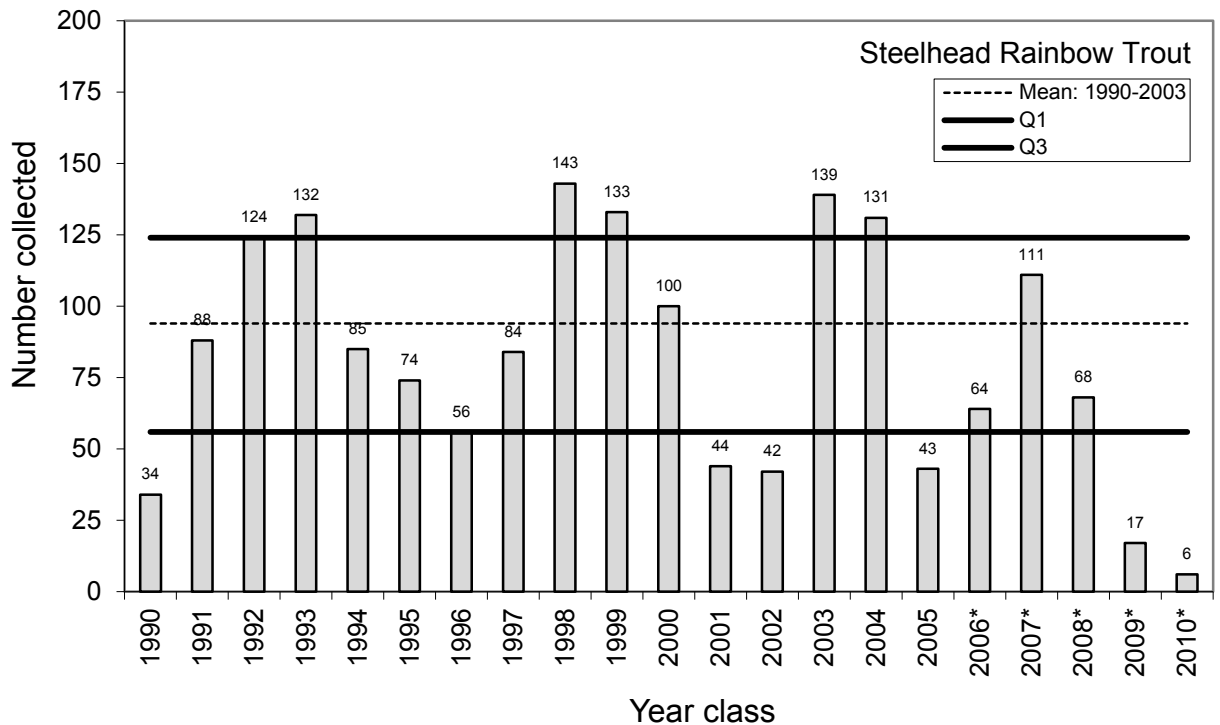


Figure 11. Number of unclipped steelhead Rainbow Trout that returned to the French River from the 1990-2010 year-classes. The historic average (Mean) with 25th (Q1) and 75th (Q3) percentiles are provided. Year-classes are not complete for 2006-2010 and are indicated by (\*).

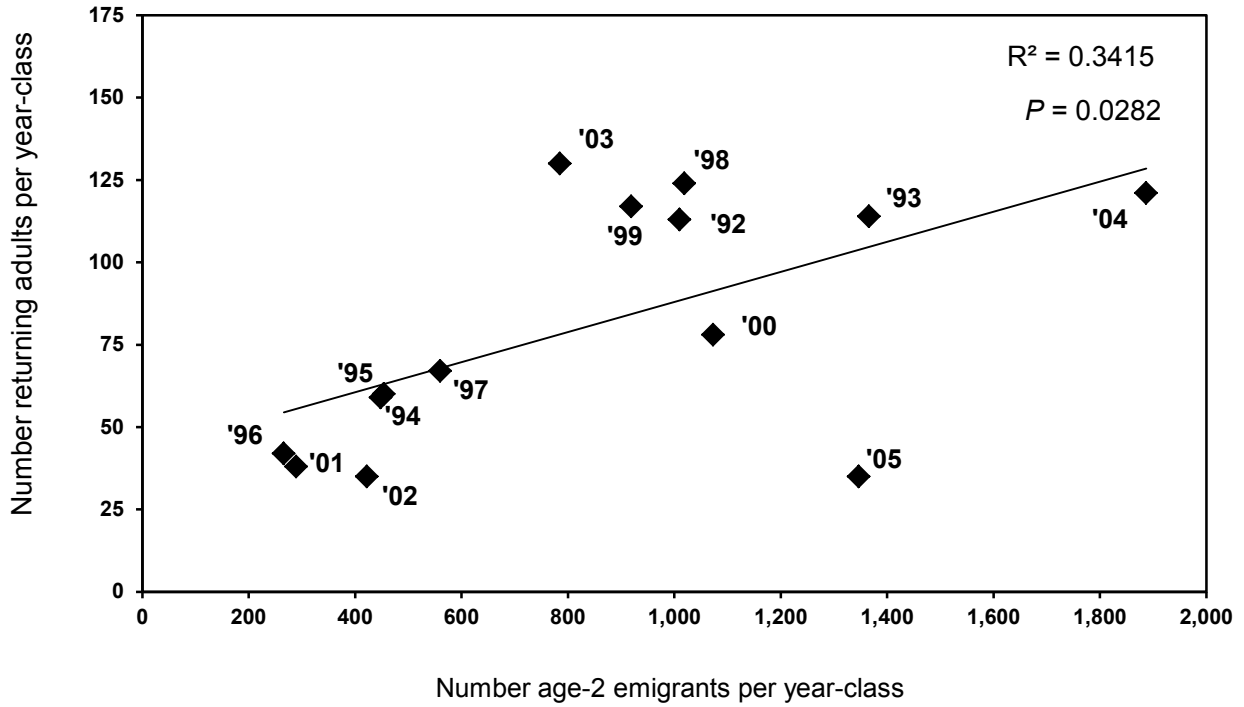


Figure 12. The relationship between the number of age-2 steelhead emigrants per year-class at the French River and the number of returning unclipped steelhead adults produced from them, 1992-2005 (smolt/adult relationship).

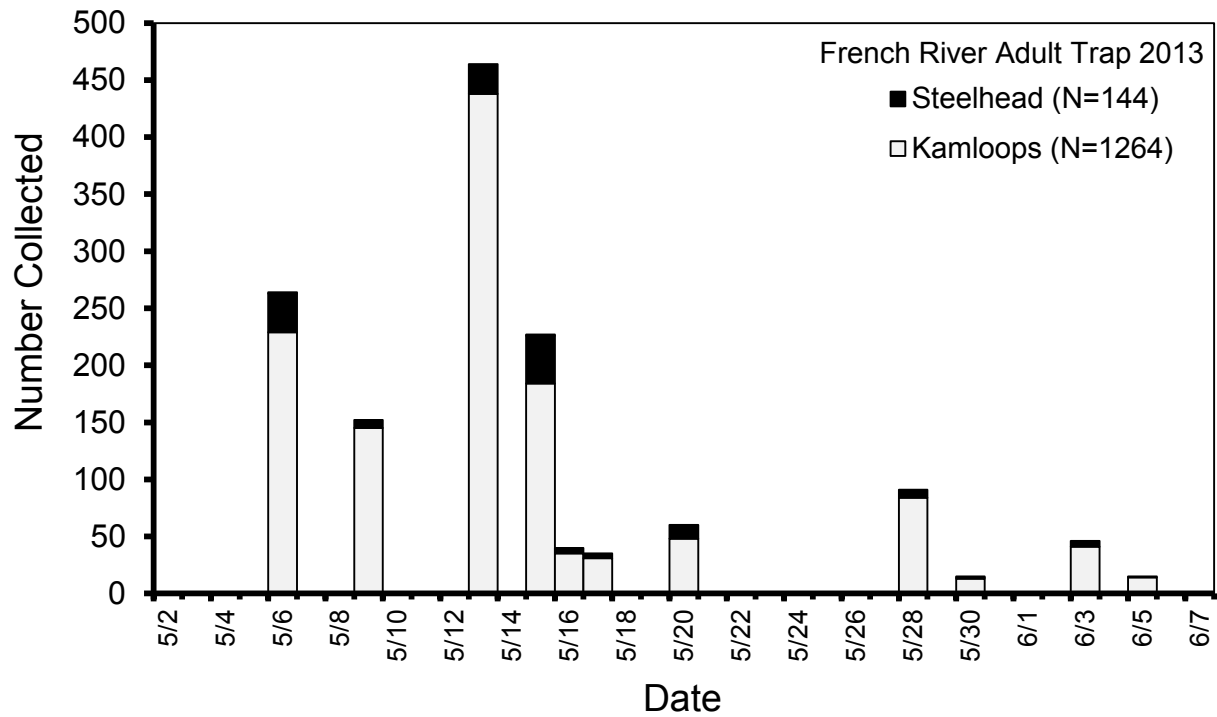


Figure 13. Number of all fish species, Kamloops Rainbow Trout and steelhead Rainbow Trout collected by date during the French River adult trap operations in 2013.



Table 1. Descriptive statistics (number (n) and percentage (%)) for French River juvenile steelhead, determined from juvenile trap data, from 1994 through 2013. No fish were stocked in 2010 and frylings were stocked instead of fry in 2009, 2011, 2012, and 2013.

Year	2003	2004 <sup>2</sup>	2005 <sup>2</sup>	2006	2007 <sup>2</sup>	2008	2009	2010	2011	2012	2013	Mean 94-13												
Date trap was opened	4/25	4/13	4/11	4/8	4/15	4/16	4/17	3/28	4/18	3/25	5/7	4/13												
Date trap was closed	11/7	11/5	11/4	11/1	11/2	11/6	11/6	10/29	11/3	10/29	11/7	11/4												
Number days trap open	196	206	207	207	194 <sup>3</sup>	204	203	215	178 <sup>4</sup>	166 <sup>5</sup>	185	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>	<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>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Age-0	304	12%	1,360	29%	122	2%	537	12%	408	9%	382	12%	173	4%	0	0%	0	0%	176	15%	50	7%	312	9%
Age-1	1,953	76%	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%	2,515	70%
Age-2	289	11%	422	9%	785	13%	1,887	41%	1,347	29%	659	21%	609	15%	1,338	42%	333	95%	0	0%	71	10%	743	21%
Age-3	28	1%	26	1%	18	0%	37	1%	65	1%	14	0%	29	1%	34	1%	18	5%	11	1%	0	0%	28	1%
Age-4	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%
<b>Cumulative number down</b>	<b>2,574</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>3,598</b>												
												<b>Mean 94-09</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>	<b>%</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>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Age-0	304	8%	1,360	16%	122	3%	537	13%	408	13%	382	8%	173	7%			0		176		50		376	9%
Age-1	2,895	72%	5,032	60%	2,132	59%	2,795	70%	2,064	66%	3,140	64%	1,844	78%			976		623		**		2872	71%
Age-2	785	20%	1,887	23%	1,347	37%	659	16%	609	20%	1,338	27%	333	14%			71		**				776	19%
Age-3	37	1%	65	1%	14	0%	29	1%	34	1%	18	0%	11	0%			**		**				29	1%
<b>Total number</b>	<b>4,021</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>1,047**</b>	<b>799**</b>	<b>50**</b>	<b>4,053</b>												
<b>Survival by year-class</b>																								
Number of fry stocked	117,596	250,100	135,202	122,776	121,740	109,324	53,214	0	55,013	55,032	55,596	105,804 <sup>1</sup>												
Number of fry stocked/ha	15,737	33,468	18,093	16,430	16,291	14,630	7,121	0	7,362	7,364	7,440	14,159 <sup>1</sup>												
Age-0	0.3%	0.5%	0.1%	0.4%	0.3%	0.3%	0.3%		0.0%	0.3%	0.1%	0.3% <sup>1</sup>												
Age-1	2.5%	2.0%	1.6%	2.3%	1.7%	2.9%	3.5%		1.8%	1.1%	**	2.9% <sup>1</sup>												
Age-2	0.7%	0.8%	1.0%	0.5%	0.5%	1.2%	0.6%		0.1%	**	**	0.7% <sup>1</sup>												
Age-3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		**	**	**	0.0% <sup>1</sup>												
<b>Cumulative Est. Survival</b>	<b>3.4%</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>1.9%</b>	<b>1.4%</b>	<b>0.1%</b>	<b>4.0%<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, 1994-2013.

<b>Brook trout</b>										
Year	2010		2011		2012		2013		Mean 94-13	
Date trap was opened	3/28		4/18		3/25		5/7		4/13	
Date trap was closed	10/29		11/3		10/29		11/7		11/4	
Number days trap open	215		178 <sup>2</sup>		166 <sup>3</sup>		185		201	
<b>Emigrants by age</b>	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Age-0	20	18%	0	0%	52	68%	4	25%	23	36%
Age-1	68	62%	3	33%	18	23%	9	56%	33	51%
Age-2	22	20%	1	11%	5	6%	3	19%	7	11%
Age-3	0	0%	5	56%	2	3%	0	0%	1	2%
<b>Cumulative number down</b>	<b>110</b>		<b>9</b>		<b>77</b>		<b>16</b>		<b>64</b>	
<b>Emigrants by year-class</b>	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i> <sup>1</sup>	(%) <sup>1</sup>
Age-0	20	71%	0		52		4		24	36%
Age-1	3	11%	18		9		**		34	51%
Age-2	5	18%	3		**		**		7	11%
Age-3	0	0%	**		**		**		1	2%
<b>Total number</b>	<b>28</b>		<b>21**</b>		<b>61**</b>		<b>4**</b>		<b>66</b>	
<b>Brown trout</b>										
Year	2010		2011		2012		2013		Mean 94-13	
Date trap was opened	3/28		4/18		3/25		5/7		4/13	
Date trap was closed	10/29		11/3		10/29		11/7		11/4	
Number days trap open	215		178 <sup>2</sup>		165 <sup>5</sup>		185		201	
<b>Emigrants by age</b>	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Age-0	0	0%	0	0%	1	3%	0	0%	2	9%
Age-1	9	82%	1	7%	32	86%	1	17%	13	61%
Age-2	2	18%	12	86%	2	5%	4	67%	5	25%
Age-3	0	0%	0	0%	1	3%	1	17%	1	4%
Age-4	0	0%	1	7%	1	3%	0	0%	0	2%
	<b>11</b>		<b>14</b>		<b>37</b>		<b>6</b>		<b>21</b>	
<b>Emigrants by year-class</b>	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i> <sup>1</sup>	(%) <sup>1</sup>
Age-0	0		0		1		0		2	11%
Age-1	1		32		1		**		13	60%
Age-2	2		4		**		**		5	24%
Age-3	1		**		**		**		1	4%
Age-4	**		**		**		**		0	2%
<b>Total number</b>	<b>4</b>		<b>36</b>		<b>2</b>		<b>0</b>		<b>21</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, 1993-2013.

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			
Mean (1993-2013)	4/13	5/24	42	Mean (1993-2009)	9/5	11/10	66

Table 4. Annual returns, number of repeat spawners, and year-class strength of Kamloops Rainbow Trout at the French River from 2000 to 2013. The average for 1993 to 2013 (N=21) is also provided.

Year	Year of Sampling																													
	2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		Mean (93-13)	
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	36
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	44	56
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	290	158
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	137	81
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	49	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	15	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	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	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	541	364
Grand total	2116		912		463		1351		1364		1942		589		655		316		408		402		850		1242		1264		905	

1x repeat	18	48	11	30	80	76	46	24	14	22	12	19	55	61	31
2x repeat	2	2	3	2	5	12	11	1	1	2	3	0	6	9	3
3x repeat	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0
4x repeat	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	5
K.R. tag	13	6	3	1	0	7	5	0	3	1	0	1	0	0	3

Year-class	Complete Year-classes																
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Mean (90-05)
Stocked	50,099	49,510	46,721	68,945	58,403	50,759	49,746	49,630	45,906	51,934	49,484	52,850	61,871	49,906	49,772	45,796	51,958
Returned	277	363	856	1069	1094	1236	1667	1023	1108	1619	1017	1818	236	344	504	551	924
% return <sup>2</sup>	0.55%	0.73%	1.83%	1.55%	1.87%	2.44%	3.35%	2.06%	2.41%	3.12%	2.06%	3.44%	0.38%	0.69%	1.01%	1.20%	1.79%

Year-class	Incomplete Year-classes						
	2006*	2007*	2008*	2009*	2010*	2011*	2012*
Stocked	36,474	33,337	38,589	61,032	43,870	11,214	39,712
Returned	417	676	1369	876	236	50	0
% return <sup>1</sup>	1.14%	2.03%	3.55%	1.44%	0.54%	0.45%	-

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

(\*) denotes incomplete year-class returns

Table 5. Length-frequency distribution of all species captured in the spring at the French River in 2013.

Length group (10-mm)	Kamloops	Steelhead	Brown Trout
300			
310			
320			
330	1		
340		1	
350			
360	5	1	
370	7		
380	5	1	
390	9		1
400	12		
410	6	1	
420	3		
430	1	1	
440	4		
450	7	1	
460	16		2
470	27		
480	36	1	
490	39	1	
500	27	2	
510	17	5	
520	18	7	
530	18	4	
540	20	6	
550	33	6	
560	49	3	
570	83	10	
580	82	2	
590	137	14	
600	116	9	
610	113	11	
620	94	7	
630	86	10	
640	67	8	
650	37	7	
660	27	8	
670	25	2	
680	14	3	
690	12		
700	6	3	
710	2	1	
720	1	3	
730	2	2	
740			
750			
760		1	
770		1	
780		1	
790			
800			
<b>Total</b>	<b>1264</b>	<b>144</b>	<b>3</b>

Table 6. Annual spring returns by age, number of repeat spawners, and year-class strength for unclipped steelhead Rainbow Trout at the French River from 2000 to 2013. The average for 1993 to 2013 (N=21) is also provided.

Year	Year of Sampling																													
	2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		Mean (93-13)	
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
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
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	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	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	18	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	17	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	8	6
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	2	2
9	0	4	0	0	0	0	0	0	1	1	2	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
Sex total	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	53	40
Total	69		45		47		101		186		144		74		102		66		73		94		85		106		141		93	

Complete year-classes																
Year-class	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Mean (90-04)
Stocked	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	131,439
Returned	34	88	124	132	85	74	56	84	143	133	100	44	42	139	131	94
% return <sup>1</sup>	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%	0.09%
1x repeat	3	5	6	9	5	1	7	7	7	6	4	0	3	5	5	5
2x repeat	0	0	1	1	0	0	0	0	2	0	2	0	0	1	0	0
3x repeat	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Incomplete year-classes									
Year-class	2005*	2006*	2007*	2008*	2009*	2010*	2011*	2012*	2013*
Stocked	135,202	122,776	121,740	109,324	53,214	0	55,013	55,032	55,596
Returned	42	63	110	69	20	6	--	--	--
% return <sup>1</sup>	0.03%	0.05%	0.09%	0.06%	0.04%	--	--	--	--
1x repeat	1	6	7	4	1	0	--	--	--
2x repeat	0	0	2	1	0	0	--	--	--
3x repeat	0	0	0	0	0	0	--	--	--

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

\*denotes incomplete year class returns

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 <sup>1</sup>	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>	0	3,140	0.0%	76	1,338	5.7%	0	18	0.0%
2009 <sup>1</sup>	1	1,844	0.1%	17	333	5.1%	0	11	0.0%
2010 <sup>2</sup>	2			4			0		
<b>Cumulative total 94-05</b>	<b>116</b>	<b>36116</b>		<b>906</b>	<b>9469</b>		<b>44</b>	<b>370</b>	
<b>Weighted mean 94-05</b>	<b>0.3%</b>			<b>9.6%</b>			<b>11.9%</b>		
<b>Annual mean 94-03</b>	<b>0.6% (0.2%)</b>			<b>11.1% (1.2%)</b>			<b>19.7% (7.5%)</b>		

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

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





Table 9. Total catch by date for all species, Brown Trout, steelhead Rainbow Trout, Kamloops Rainbow Trout and uncertain Rainbow Trout species (Unk Kam/Stt) collected during the French River adult trap operations in 2013.

Total Catch					
Date	All Species	Brown Trout	Steelhead	Kamloops	Unk Kam/Stt
5/6	266	1	34	229	2
5/9	152	0	7	145	0
5/13	468	0	26	438	4
5/15	228	1	42	184	1
5/16	40	0	5	35	0
5/17	35	0	4	31	0
5/20	60	0	12	48	0
5/28	91	0	7	84	0
5/30	15	1	1	13	0
5/31	1	0	0	1	0
6/3	46	0	5	41	0
6/5	15	0	1	14	0
6/6	1	0	0	1	0
Total	1418	3	144	1264	7