

SECTION OF FISHERIES



COMPLETION REPORT:

LAKE SUPERIOR SPRING CREEL SURVEY

2017

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BACKGROUND

Minnesota Department of Natural Resources (MNDNR) fisheries assessments and creel surveys provide data needed to implement the MNDNR Fisheries Management Plan for the Minnesota Waters of Lake Superior (LSMP; Goldsworthy et al. 2017). The LSMP supplements joint strategic documents for lake wide management formed by the Great Lakes Fisheries Commission and other agencies who manage the Lake Superior fishery (GLFC 1997; Horns et al. 2003). Angler creel surveys collect information to supplement data collected in fisheries assessments. Spring creel surveys are used to monitor fishing pressure, catch, catch rates and harvest of fish species in Minnesota waters of Lake Superior, particularly Rainbow Trout.

The first spring creel survey was implemented in 1992 to monitor the rehabilitation of Rainbow Trout in Minnesota waters after the species declined in the 1960s. The survey was designed to target anglers who fished for Rainbow Trout as they migrated upstream in tributaries to spawn. The State of Minnesota currently manages two types of Rainbow Trout in Lake Superior that were introduced from the west coast of North America. This includes steelhead, a migratory life-history form, and Kamloops, a domesticated hatchery strain. Steelhead were first introduced to Lake Superior in the late 1800s (Krueger et al. 1994). Steelhead have naturalized to Lake Superior streams and now provide a sought-after sport fishery in Minnesota waters. Kamloops were originally introduced into Ontario waters of Lake Superior in 1946 (Krueger et al. 1994), and then were introduced in Minnesota waters in 1972 to provide harvest opportunities for Rainbow Trout while steelhead populations were rehabilitated (Close and Hassinger 1981).

The first creel surveys on the North Shore were conducted in 1961 through 1967 (Hassinger et al. 1974), and then in 1981 and 1982 (Close and Siesennop 1984). The MNDNR spring creel survey has been conducted annually since 1985, except in 1991. From 1985 to 1990, the spring creel surveys used a non-uniform probability design that provided good shorewide information but did not permit statistically valid estimates for individual tributaries. In 1992, the survey was changed to a stratified random design to also obtain information from specific tributaries (Ostazeski and Morse 2002). A modified bus-route format was implemented in 1995, 2002, and for part of 2003, to enable a survey with two clerks when three clerks were unavailable. Data in this report are summarized and compared from 1992 to 2016 based on the stratified random design used in the creel survey throughout this time period.

The annual spring creel survey typically begins once tributaries thaw and are fishable. The spring creel survey has provided useful information for many other species in Lake Superior. Brook Trout (*Salvelinus fontinalis*), one of two native sport fish to Lake Superior, are typically the second most reported species in the spring creel survey. Public interest in Brook Trout has increased as agencies around Lake Superior examined protection and restoration strategies for the species (Newman et al. 2003; Schreiner et al. 2008). Many non-native sport fish in Lake Superior also provide angling opportunities in the spring and fall. Brown Trout (*Salmo trutta*), Atlantic Salmon (*Salmo salar*), Chinook

Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), and Pink Salmon (*Oncorhynchus gorbuscha*) are targeted by some anglers fishing in the spring, but the majority of these species are caught by anglers fishing in Lake Superior near rivers. Other than steelhead, very few non-native sport fish are caught in tributaries in the spring because they return to spawn in the fall. Lake Trout (*Salvelinus namaycush*), White Sucker (*Catostomus commersoni*), Longnose Sucker (*Catostomus catostomus*), and Round Whitefish (*Prosopium cylindraceum*) are also periodically caught in rivers and near river mouths in the spring.

The MNDNR recognized that fishing pressure was often high in winter and early-spring prior to the start of the annual spring creel survey, particularly in years when sufficient ice formed in Lake Superior. An early-spring creel survey was initiated in 2013 to evaluate angling pressure and catch of some species, particularly adipose fin clipped Rainbow Trout (hereafter referred to as Kamloops). The early-spring creel surveys are completed during the period prior to ice-out when shore anglers fish exclusively in Lake Superior. This survey includes five creel locations in the lower shore because most of the pressure for Kamloops occurs along the lower shore, near Duluth. The early-creel survey has also provided useful information for other species (e.g., Coho Salmon). The early-spring creel survey was completed in 2013, 2015 and 2016. An early-spring creel survey was not completed in 2017 due to budget constraints.

The Minnesota shore of Lake Superior is divided into two geographic regions. The area from the Lester River to the Split Rock River is referred to as the “Lower Shore,” while the area from the Beaver River to the Brule River is referred to as the “Upper Shore.” The spring creel survey collects interviews from anglers at nine tributaries in the lower shore and nine tributaries in the upper shore (Figure 1). Estimates from the lower and upper shore are collectively referred to as “shorewide” estimates. Pressure, catch, and catch rates are determined for individual tributaries, and for the lower shore, upper shore, and shorewide. Anglers fishing in tributaries are considered “stream” anglers and anglers shore fishing in Lake Superior near the tributary mouths are considered “lake” anglers. The term “lake” refers to Lake Superior waters near tributary mouths and includes McQuade Harbor.

Separate estimates of catch and catch rate were made for Rainbow Trout 16 inches and greater and Rainbow Trout less than 16 inches to isolate the influence of juvenile steelhead from the analyses. Unless otherwise specified, estimates for Rainbow Trout are summarized and reported only for fish 16 inches or greater. References to a ‘long-term’ average in this report refer to the time period from 1992 to 2017.

Kamloops possess an adipose fin clip making them legal for anglers to harvest. No adipose-clipped steelhead should still exist in Lake Superior from stocking events in the early 2000s. The majority of unclipped steelhead caught were produced in the wild or were products of MNDNR steelhead fry stocking. Some stocked steelhead, including captive broodstock from French River Coldwater Hatchery released back into Lake Superior, possess a maxillary clip that is difficult for anglers to identify. These fish were reported by anglers as simply ‘steelhead’. Maxillary clipped steelhead could influence the catch and

catch-rate in the spring creel at the Knife River, which received all of the (maxillary clipped) steelhead stocked from 2003 to 2007. However, these fish are only rarely caught in the spring at the Knife River fish trap and very few (if any) likely still exist in Lake Superior.

Steelhead are currently maintained as a catch-and-release-only fishery. Kamloops ≥ 16 inches are allowed to be harvested, but 25-40% of Kamloops caught each spring are voluntarily released. Therefore, most fish lengths reported in the creel surveys were estimated by anglers or measured by creel clerks prior to release. Individual fish weights were obtained using regression relationships derived from Knife River adult trap data. All other methods are summarized in Ostazeski (2004).

Angler population estimates were determined using a cumulative total of the number of 'new' anglers (not previously interviewed this spring) and 'recap' anglers (previously interviewed this spring) that were interviewed each day. 'New' or 'Recap' anglers were determined by asking the question "Have you previously been interviewed by a creel clerk this spring?" This question was not asked in 1992 to 1995 creel surveys, so estimates could not be determined before 1996. The Schnabel modification of the Lincoln-Petersen estimator was used to calculate daily estimates of angler abundance and its variance. Angler population estimates generally increase throughout the first half of the survey period, and then stabilize. Therefore, the average of the last nine estimates was used to calculate final angler population estimates and confidence intervals.

All anglers interviewed were asked "How important to you is the opportunity to harvest a Rainbow Trout from Lake Superior or tributaries?" This question was added to better understand angler's opinions and attitudes toward having the opportunity to harvest a Rainbow Trout in Minnesota waters. Anglers were asked to respond on a scale of 1 to 5, with "1" being 'harvest opportunity is not important to me' and "5" being "harvest opportunity is very important to me." The "yes" and "no" responses to this question were summarized and stratified by shore zone (lower and upper shore), creel station (river or creel location), angling type (lake or stream), primary species sought, age group, and zip code (country, state and county). Steelhead harvest responses were summarized only for 'new' anglers interviewed to eliminate duplicate responses from anglers who were interviewed multiple times in 2017.

RESULTS

Fishing Pressure

The annual spring creel survey went from April 5 through May 19, 2017. A total of 1,577 interviews were collected shorewide, which was 397 more than the historic average (1,180). The majority (76%) of anglers interviewed in the annual spring creel were fishing in the lower shore, and most (82%) were fishing streams. The most interviews in the lower and upper shore were collected at the Stewart (171) and the Baptism (125) rivers, respectively. A total of 1,063 'new' (first time interviewed this year) anglers were interviewed in 2017.

Total angling pressure in 2017 was 38,573 angler-hours, which was 7,231 angler-hours higher than the historic average (Table 1, Figure 2). Most (80%) angling pressure was at lower shore rivers, which ranged from 4,955 angler-hours at the Lester River to 529 angler-hours at Silver Creek. Angling pressure was the highest ever observed in the upper shore (10,480 angler-hours), and ranged from 3,303 angler-hours at the Baptism River to 494 angler-hours at the Temperance River. The Cross and Devil Track rivers experienced the highest angling pressure on record (Table 2, Figure 3).

Rainbow Trout were by far the most sought after species in the spring 2016, and steelhead or Kamloops were the primary target species in 96% of all interviews (69% targeted steelhead, 27% targeted Kamloops). Other primary species included Coho Salmon at 2%, Brook Trout at 1%, and others at less than 1.0%. Twenty-three percent of anglers listed steelhead as their secondary target species and 56% listed Kamloops as their secondary species. Other secondary species included Coho Salmon at 10%, Brook Trout at 9%, and other species at <1%.

Catch, Catch-Rates and Harvest

Steelhead

An estimated 5,806 steelhead were caught in the annual spring creel survey, which was much higher than the historic average (2,864). Catch in the lower shore (3,741) and upper shore (2,065) were above their historic averages (Figure 4). The highest catch in the lower shore was at the Gooseberry River (820), followed by the Split Rock River (776) and the Stewart River (563). The highest catch in the upper shore was at the Baptism River (1,025), followed by the Devil Track River (236) and the Cascade River (213). No steelhead were reported as illegally harvested. Small steelhead (<16 inches) were reported at 14 creel stations with estimated shorewide catch of 773 (Table 3). The average length of adult steelhead was 24.3 inches and average weight was 4.6 pounds (Table 4).

The shorewide catch-rate for steelhead was 0.151 fish per angler-hour (6.6 angler-hours per fish) which was higher than the historic average (Figure 5). Catch-rates in the lower shore was 0.133 fish per angler-hour (7.5 angler-hours per fish) and upper shore was 0.197 fish per angler hour (5.1 angler-hours per fish) were both above historic averages (Figure 6). The highest catch-rates in the lower shore were at the Gooseberry River (0.617; 1.6 angler-hours per fish), Split Rock River (0.323; 3.1 angler-hours per fish), and the Stewart River (0.154; 6.5 angler-hours per fish). The highest catch-rates in the upper shore were at the Cascade River (0.355; 2.8 angler-hours per fish), Baptism River (0.310; 3.2 angler-hours per fish), and the Beaver River (0.199; 5 angler-hours per fish) (Table 3). Approximately 97% of all steelhead were caught fishing in tributaries. Catch-rates in tributaries was 0.189 fish per angler-hour (5.3 angler-hours per fish) and catch-rates in the lake was 0.018 fish per angler-hour (55.6 angler-hours per fish).

Kamloops

The estimated shorewide catch of Kamloops in the annual spring creel survey was 2,343, which was slightly lower than the long-term average (2,460). Catch of Kamloops was higher in the streams (1,523)

than in the lake (820) (Figure 7). Catch in both the lower shore (2,174) and the upper shore (169) were similar to the historic averages (lower shore average = 2,300; upper shore average = 159) (Figure 8). In the lower shore, most Kamloops were caught at McQuade/Talmadge River (582), Lester River (575), and the French River (497). In the upper shore, most Kamloops were caught at the Baptism River (43), Cross River (34), and the Beaver River (30). Twenty sub-legal Kamloops (<16 inches) were caught and released at the Lester and French rivers in the lower shore. Approximately 62% of all legal sized Kamloops caught in the annual spring creel were harvested (Table 3). Averaged length was 24.0 inches and average weight was 4.9 pounds (Table 4).

The shorewide catch-rate for Kamloops was 0.061 fish per angler-hour (16.4 angler-hours per fish) (Figure 5). The catch-rate in the lower shore was 0.077 fish per angler-hour (12.9 angling-hours per fish), was slightly lower than the historic average (0.088; 11.3 angler-hours per fish). Catch-rates were highest at McQuade Harbor/Talmadge River (0.161; 6.2 angler-hours per fish), French River (0.135; 7.4 angler-hours per fish), and the Lester River (0.116; 8.6 angler-hours per fish). Catch-rates at the Lester River has improved slightly over the last three years, from 35.8 angler-hours per fish in 2015, 18.9 angler-hours per fish in 2016, to 8.6 angler-hours per fish in 2017 (Table 3).

Brook Trout

An estimated 1,242 Brook Trout were caught in the spring creel survey, which was much higher than the historic average (443) (Figure 9). The shorewide catch-rate was 0.032 fish per angler-hour (31.0 angler-hours per fish), 0.019 (51.5 angler-hours per fish) in the lower shore and 0.067 (15.0 angler-hours per fish) in the upper shore. No Brook Trout were reported as illegally harvested. Average length was 10.4 inches and average weight was 0.8 pounds (Table 4).

Other Species

An estimated 125 Coho Salmon were caught during the annual spring creel survey with a shorewide catch-rate of 0.003 fish per angler-hour; no salmon were reported in the upper shore. The average length was 16.2 inches and average weight was 1.3 pounds. All Coho salmon were harvested. Other species reported in the annual spring creel survey included Brown Trout, Northern Pike, and suckers (White and Longnose suckers) (Table 4).

Angler Population Estimates and Demographics

An estimated 1,787 anglers participated in the Lake Superior spring fishery in 2017, which was slightly higher than the historic average (1,642) (Figure 10). The majority (93%) of all anglers interviewed were residents of Minnesota, 4% (50) were from Wisconsin, and <1% were from other states. Of all anglers interviewed in 2017, only 6% (63) were female, 59 were from Minnesota and four were from Wisconsin (Table 5).

Rainbow Trout Harvest Opportunity Response

Approximately 41% (442 of 1,063) of anglers interviewed in the 2017 Lake Superior spring creel survey responded that it was very important or somewhat important to have the opportunity to harvest a Rainbow Trout from Lake Superior or tributaries. A similar percentage (43%; 450 of 1,063) responded that harvest opportunities for Rainbow Trout were not important or somewhat unimportant. Sixteen percent (171 of 1,063) responded as neutral (Figure 11).

DISCUSSION

North Shore rivers experienced slightly above average fishing pressure in 2017. Similar to previous years, the lower shore saw much higher angling pressure than the upper shore. However, angling pressure in the upper shore was the highest ever surpassing the previous record set in 2016. The Cross and Devil Track rivers experienced their highest angling pressure in the history of the spring creel survey. The angler population estimate was lower than previous years, which was most likely driven by sporadic changes in fishing conditions throughout the spring with rain and snow bringing relatively less 'ideal' fishing conditions compared to spring 2016. Ice cleared rivers in early-April of 2016 and the lake and streams provided suitable fishing conditions for most of the spring season.

Shorewide catch and catch-rates for steelhead were above average in 2017 and have continued to improve over the last decade. Catch-rates in the upper shore have remained higher than lower shore rivers, and the upper shore catch-rate has now remained above 0.15 fish per angler-hour (6.6 hours per fish caught) in 16 of the last 20 years. Shorewide, the catch-rate of steelhead increased from the late 1990's until 2006. Since 2006, the shorewide catch-rate has remained consistently high but variable among years which could be an indication that steelhead abundances have reached (or are close to reaching) equilibrium with the available forage base and other predators in Lake Superior. Unlike many other limiting factors, such as prey availability or environmental conditions, stream habitat is something that can be addressed to improve steelhead populations. Poor spawning and rearing habitat in North Shore streams has long been a limitation to steelhead production (Smith and Moyle 1944). Future management strategies for steelhead will prioritize fish habitat restoration and enhancement, particularly spawning and nursery habitat in tributaries (Goldsworthy et al. 2017).

The catch-and-release regulation for steelhead has been in effect since August 1997. Regulation compliance was good in 2017, with no steelhead reported by creel clerks as illegally harvested. The catch-and-release regulation was discussed with the Lake Superior Advisory Group (LSAG) on February 15, 2015 during meetings to revise the 2006 Fisheries Management Plan for the Minnesota Waters of Lake Superior (Schreiner et al. 2006), and again on October 23, 2017 during a meeting to discuss results from the Steelhead Genetics Project. Overall, most groups on the LSAG supported continuation of the catch-and-release regulation.

Kamloops catch and catch-rates in 2017 were the highest observed since 2013, but still remained below the historic average. Catch and catch-rates have decreased over time but have remained relatively consistent since 2006 with no marked increase nor decrease. Similar to previous years, the majority of Kamloops were caught in the lower shore, with few reported in the upper shore. Stocking locations explain most of the catch distribution of Kamloops in the spring creel survey. The low catch of Kamloops in recent years is a function of environmental and lake conditions, intra- or interspecific competition for resources (prey), and changes to the hatchery production and stocking protocols. Spring creel survey data shows that the angling effort for Kamloops in the lake is very dependent on the daily lake conditions, whereas fishing is often not effective with strong northeast winds and/or floating ice. Catch could be a function of competition for resources (prey) with steelhead or other predators in Lake Superior. Recent diet analyses found that Kamloops had a higher percentage of fish in their diet than previously estimated by Negus et al. (2008), which indicated that competition for prey with other predators in Lake Superior might be more than previously assumed (Negus and Hoffman 2013). The survival of all fish species in Lake Superior, including Kamloops, is largely dictated by lake conditions (e.g., water temperature) that fluctuate from year-to-year and are impossible to control.

At the Lester River, Kamloops catch and catch-rates improved in 2017. The MNDNR and some anglers were concerned that the low catch and catch rates between 2014 and 2016 were influenced by recent changes to the hatchery production and stocking protocols that potentially increased straying and/or decreased survival in Lake Superior. Although some straying of stocked Kamloops has occurred, increased reports of straying and decreased catch and catch-rates have become more apparent in recent years. The MNDNR has had reports of adipose clipped Rainbow Trout caught in the St. Mary's River in Michigan, the Brule River in Wisconsin, and rivers both on the upper North Shore of Minnesota and into Canada. Recent genetic analyses found that Kamloops are successfully spawning with steelhead in the wild, both in Minnesota waters and other jurisdictions (Peterson et al. *in prep*). The increased reports of straying beyond the Lester and French rivers is a concern shared by MNDNR, agencies in other jurisdictions, and anglers. Particularly concerning is the impact of introgression of Kamloops genes into naturalized steelhead populations. Negus (1999) found poorer survival of eggs from Kamloops x steelhead crosses compared to steelhead x steelhead crosses in the hatchery and concluded that when Kamloops spawn with steelhead, steelhead gametes are essentially wasted. In the stream environment, Kamloops can successfully spawn with steelhead in the wild and produce juvenile hybrids (Close 1999; Peterson et al. *in prep*). However, Miller et al. (2004) found that juvenile hybrids survive significantly less well compared to juvenile steelhead in the stream environment. Cumulative relative survival of cross types combining hatch rates from Negus (1999) and juvenile survival from Miller et al (2004) indicates a 42-70% reduction in survival to age-1 of a hybrid compared to a STT x STT cross (Miller et al. 2004). If hybrids did survive to reproduce, genetic introgression could occur which would further increase the chance for introgression and decrease the fitness of wild steelhead populations. Continued stocking of

Kamloops will negatively influence the fitness and increase the risk of extinction of wild steelhead through non-introgressive hybridization (Page et al. 2011).

The catch of Brook Trout in spring 2017 was more than has been reported in the history of the spring creel survey. Brook Trout were the second most commonly caught species after Rainbow Trout, and have been reported in the spring creel survey every year since 1992. Though many Brook Trout are caught each year, very few anglers actively target them below barriers in the spring probably because shorewide catch and catch rates for Brook Trout are much lower than for steelhead at this time of year. Coaster Brook Trout rehabilitation is a management priority for the MNDNR, and regulation compliance is essential for this to occur. Compliance with the restrictive harvest regulation for Brook Trout (bag limit of 1, minimum size 20 inches) was good in spring 2017, and no Brook Trout were reported by the creel clerks as illegally harvested.

Catch and fishing pressure for Coho Salmon remains sporadic and is largely dependent on the fishing conditions of Lake Superior and year-class abundances. All Coho Salmon caught in Minnesota waters are naturally-produced because the last Coho Salmon stocking event in Lake Superior occurred in Michigan in 2006. Due to limited spawning habitat on Minnesota's North Shore, most Coho Salmon caught in Minnesota waters are likely wild fish that migrated from other jurisdictions (e.g., Wisconsin, Michigan, and Ontario, Canada).

Anglers' opinions about the opportunity to harvest a Rainbow Trout in Lake Superior or its tributaries was bimodal, whereas nearly half of anglers interviewed thought harvest opportunity was important versus not important. Approximately 82% of anglers interviewed in 2017 were fishing in a stream and most were primarily targeting steelhead. Although the 'catch-and-release' ethic seems to have increased over the last few decades, nearly half of the anglers interviewed while participating in the catch-and-release Rainbow Trout fishery responded that harvest opportunity for Rainbow Trout was important to them. We recognize that responses could have been influenced by the vague 'Rainbow Trout' wording (e.g., if clipped Rainbow Trout [Kamloops] were no longer available to harvest, would an angler have responded differently?). None the less, this survey showed that any changes to harvest opportunities for Rainbow Trout, no matter if it was more or less restrictive, would not satisfy nearly half of the anglers who fished the North Shore in 2017.

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Area Supervisor \ Date

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Regional Fisheries Approval \ Date

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Table 1. Fishing pressure estimates (angler-hours) from the Lake Superior spring creel survey by shore location, station and year.

Station	Year											Mean 1992-2017	Range 1992-2017
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		
Lester River	5,105	5,315	10,476	9,892	6,644	4,928	3,588	2,580	3,699	7,293	4,955	6,005	2,580 - 10,476
McQuade/Talmadge	--	--	--	1,399	2,996	3,938	2,407	1,340	1,659	5,453	3,612	2,850	1,340 - 5,453
French River	4,610	2,456	6,068	6,505	3,206	3,015	3,544	3,080	2,409	6,014	3,678	4,154	2,112 - 8,544
Sucker River	3,385	3,823	6,376	6,824	4,620	6,008	3,566	2,880	2,265	4,914	4,713	5,459	2,880 - 12,990
Knife River	2,635	2,508	6,253	4,885	3,565	3,308	1,903	1,540	1,629	6,597	3,215	3,116	1,225 - 6,597
Stewart River	2,808	3,991	3,957	4,079	5,782	1,557	1,885	1,280	1,653	3,385	3,658	2,442	720 - 5,782
Silver Creek	1,299	1,256	1,230	930	1,996	818	131	312	577	582	529	829	131 - 1,996
Gooseberry River	886	493	1,728	1,418	1,994	1,076	325	257	532	1,105	1,330	1,013	257 - 2,475
Split Rock River	3,956	1,973	2,050	3,212	5,400	2,087	1,940	1,200	1,217	1,993	2,402	2,173	1,145 - 5,400
Beaver River	594	362	481	776	824	820	304	233	473	436	685	627	233 - 1,159
Baptism River	1,046	1,506	1,198	3,570	2,771	2,662	866	630	1,173	2,285	3,303	1,485	448 - 3,570
Cross River	151	432	444	559	900	383	525	339	338	700	1,004	329	53 - 1,004
Temperance River	198	472	651	434	488	170	630	83	359	370	494	355	77 - 788
Poplar River	548	580	291	439	888	383	420	330	357	645	508	504	168 - 1,347
Cascade River	774	767	346	675	488	905	296	309	438	846	601	527	194 - 939
Devil Track River	1,089	818	447	1,264	1,050	1,163	857	677	1,355	1,421	1,841	674	75 - 1,841
Kadunce Creek	79	502	581	259	746	500	642	770	448	1,420	1,030	485	79 - 1,420
Brule River	557	796	800	1,059	1,283	1,206	963	767	539	1,410	1,015	789	207 - 1,505
Lower Shore	24,684	21,816	38,137	39,142	36,203	26,735	19,289	14,469	15,641	37,336	28,093	25,845	14,469 - 39,994
Upper Shore	5,036	6,235	5,238	9,035	9,438	8,192	5,503	4,138	5,479	9,533	10,480	5,762	3,046 - 10,480
Shorewide	29,719	28,051	43,375	48,177	45,641	34,927	24,792	18,607	21,120	46,868	38,573	31,620	18,607 - 48,177

Table 2. Fishing pressure estimates (angler-hours \pm standard error [SE]) from the 2017 Lake Superior spring creel survey by shore location and station.

Station	Stream Pressure	(SE)	Lake Pressure	(SE)	Total Pressure	(SE)
Lester River	4,361	686	595	127	4,955	697
McQuade/Talmadge	903	219	2,709	658	3,612	693
French River	0	0	3,678	960	3,678	960
Sucker River	4,427	833	286	93	4,713	838
Knife River	3,215	698	0	0	3,215	698
Stewart River	3,373	777	285	159	3,658	793
Silver Creek	498	140	31	31	529	143
Gooseberry River	1,302	424	28	28	1,330	425
Split Rock River	2,283	451	119	92	2,402	461
Beaver River	654	214	31	31	685	216
Baptism River	3,276	598	27	27	3,303	599
Cross River	792	276	211	113	1,004	299
Temperance River	412	132	82	46	494	139
Poplar River	388	142	119	83	508	164
Cascade River	343	137	258	108	601	174
Devil Track River	1,841	466	0	0	1,841	466
Kadunce Creek	843	275	187	92	1,030	290
Brule River	985	255	30	30	1,015	256
Lower Shore	20,362	1,645	7,731	1,189	28,093	2,030
Upper Shore	9,534	945	946	211	10,480	968
Shorewide	29,896	1,897	8,677	1,208	38,573	2,249

Table 3. Rainbow Trout catch and catch-rate (fish per angler-hour) estimates in the 2017 Lake Superior spring creel survey by station.

Station		Unclipped Steelhead						Clipped Rainbow Trout (Kamloops)					
		Catch ≥16			Catch-rate ≥16			Catch ≥16			Catch-rate ≥16		
		All	inches	(SE)	All	inches	(SE)	All	inches	(SE)	All	inches	(SE)
Lester River	Harvested	0	0	0	0.000	0.000	0.000	308	308	80	0.062	0.062	0.026
	Released	623	559	140	0.126	0.113	0.029	277	267	140	0.056	0.054	0.029
	Total	623	559	140	0.126	0.113	0.029	585	575	182	0.118	0.116	0.041
McQuade Harbor	Harvested	0	0	0	0.000	0.000	0.000	397	397	128	0.110	0.110	0.045
	Released	35	0	0	0.010	0.000	0.000	185	185	129	0.051	0.051	0.042
	Total	35	0	0	0.010	0.000	0.000	582	582	223	0.161	0.161	0.074
French River	Harvested	0	0	0	0.000	0.000	0.000	362	362	122	0.098	0.098	0.021
	Released	18	18	13	0.005	0.005	0.003	145	136	50	0.039	0.037	0.010
	Total	18	18	13	0.005	0.005	0.003	506	497	163	0.138	0.135	0.027
Sucker River	Harvested	0	0	0	0.000	0.000	0.000	184	184	45	0.039	0.039	0.006
	Released	504	475	193	0.107	0.101	0.037	107	107	45	0.023	0.023	0.009
	Total	504	475	193	0.107	0.101	0.037	291	291	79	0.062	0.062	0.013
Knife River	Harvested	0	0	0	0.000	0.000	0.000	45	45	21	0.014	0.014	0.006
	Released	542	486	153	0.169	0.151	0.034	79	79	35	0.025	0.025	0.009
	Total	542	486	153	0.169	0.151	0.034	124	124	45	0.039	0.039	0.011
Stewart River	Harvested	0	0	0	0.000	0.000	0.000	44	44	26	0.012	0.012	0.007
	Released	581	563	203	0.159	0.154	0.045	35	35	20	0.010	0.010	0.005
	Total	581	563	203	0.159	0.154	0.045	79	79	38	0.022	0.022	0.009
Silver Creek	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	131	44	28	0.248	0.083	0.050	0	0	0	0.000	0.000	0.000
	Total	131	44	28	0.248	0.083	0.050	0	0	0	0.000	0.000	0.000
Gooseberry River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	912	820	380	0.685	0.617	0.196	0	0	0	0.000	0.000	0.000
	Total	912	820	380	0.685	0.617	0.196	0	0	0	0.000	0.000	0.000
Split Rock River	Harvested	0	0	0	0.000	0.000	0.000	25	25	17	0.010	0.010	0.007
	Released	926	776	259	0.386	0.323	0.089	0	0	0	0.000	0.000	0.000
	Total	926	776	259	0.386	0.323	0.089	25	25	17	0.010	0.010	0.007
Lower Shore Total	Harvested	0	0	0	0.000	0.000	0.000	1,365	1,365	203	0.049	0.049	0.008
	Released	4,272	3,741	578	0.152	0.133	0.023	828	808	206	0.029	0.029	0.008
	Total	4,272	3,741	578	0.152	0.133	0.023	2,194	2,174	346	0.078	0.077	0.014

Table 3 continued. Rainbow Trout catch and catch-rate (fish per angler-hour) estimates in the 2017 Lake Superior spring creel survey by station.

Station		Unclipped Steelhead						Clipped Rainbow Trout (Kamloops)					
		Catch ≥16			Catch-rate ≥16			Catch ≥16			Catch-rate ≥16		
		All	inches	(SE)	All	inches	(SE)	All	inches	(SE)	All	inches	(SE)
Beaver River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	166	136	63	0.243	0.199	0.070	30	30	24	0.044	0.044	0.034
	Total	166	136	63	0.243	0.199	0.070	30	30	24	0.044	0.044	0.034
Baptism River	Harvested	0	0	0	0.000	0.000	0.000	21	21	15	0.006	0.006	0.004
	Released	1,089	1,025	267	0.330	0.310	0.058	21	21	13	0.006	0.006	0.004
	Total	1,089	1,025	267	0.330	0.310	0.058	43	43	19	0.013	0.013	0.005
Cross River	Harvested	0	0	0	0.000	0.000	0.000	34	34	22	0.034	0.034	0.027
	Released	14	14	17	0.014	0.014	0.018	0	0	0	0.000	0.000	0.000
	Total	14	14	17	0.014	0.014	0.018	34	34	22	0.034	0.034	0.027
Temperance River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	40	20	21	0.080	0.040	0.045	20	20	21	0.040	0.040	0.046
	Total	40	20	21	0.080	0.040	0.045	20	20	21	0.040	0.040	0.046
Poplar River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	61	61	51	0.121	0.121	0.102	0	0	0	0.000	0.000	0.000
	Total	61	61	51	0.121	0.121	0.102	0	0	0	0.000	0.000	0.000
Cascade River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	213	213	110	0.355	0.355	0.240	0	0	0	0.000	0.000	0.000
	Total	213	213	110	0.355	0.355	0.240	0	0	0	0.000	0.000	0.000
Devil Track River	Harvested	0	0	0	0.000	0.000	0.000	18	18	17	0.010	0.010	0.009
	Released	272	236	90	0.148	0.128	0.037	0	0	0	0.000	0.000	0.000
	Total	272	236	90	0.148	0.128	0.037	18	18	17	0.010	0.010	0.009
Kadunce Creek	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	189	169	116	0.184	0.164	0.113	0	0	0	0.000	0.000	0.000
	Total	189	169	116	0.184	0.164	0.113	0	0	0	0.000	0.000	0.000
Brule River	Harvested	0	0	0	0.000	0.000	0.000	24	24	15	0.023	0.023	0.013
	Released	262	191	71	0.258	0.188	0.050	0	0	0	0.000	0.000	0.000
	Total	262	191	71	0.258	0.188	0.050	24	24	15	0.023	0.023	0.013
Upper Shore Total	Harvested	0	0	0	0.000	0.000	0.000	97	97	35	0.009	0.009	0.003
	Released	2,306	2,065	342	0.220	0.197	0.037	71	71	35	0.007	0.007	0.003
	Total	2,306	2,065	342	0.220	0.197	0.037	169	169	49	0.016	0.016	0.005
Shorewide Total	Harvested	0	0	0	0.000	0.000	0.000	1,463	1,463	205	0.038	0.038	0.006
	Released	6,579	5,806	671	0.171	0.151	0.019	899	880	209	0.023	0.023	0.006
	Total	6,579	5,806	671	0.171	0.151	0.019	2,362	2,343	349	0.061	0.061	0.010

Table 4. Yield, average length (inches) and average weight (pounds) of fish species caught in the 2017 Lake Superior spring creel survey.

Species	Yield			Average Length (inches)				Average Weight (pounds)			
	Number Caught	Number Harvested	Pounds Harvested	Harvested	Released	All	(SE)	Harvested	Released	All	(SE)
Brook Trout	1,242	0	0	--	10.4	10.4	0.22	--	0.8	0.8	0.05
Brown Trout	21	0	0	--	15.5	15.5	0.50	--	1.8	1.8	0.12
Coho Salmon	125	125	161	16.2	--	16.2	0.26	1.3	--	1.3	0.06
Kamloops ($\geq 16"$)	2,343	1,463	6,979	23.8	24.4	24.0	0.14	4.8	5.1	4.9	0.09
Kamloops ($< 16"$)	20	0	0	--	9.5	9.5	3.50	--	0.4	0.4	0.33
Northern Pike	10	0	0	--	22.0	22.0	--	--	2.2	2.2	--
Sucker species	402	0	0	--	15.5	15.5	0.38	--	1.6	1.6	0.11
Unclipped Steelhead ($\geq 16"$)	5,806	0	0	--	24.3	24.3	0.14	--	4.6	4.6	0.07
Unclipped Steelhead ($< 16"$)	772	0	0	--	9.6	9.6	0.42	--	0.4	0.4	0.04

Table 5. The number of 'new' (first time interviewed in 2017) anglers who were interviewed in the 2017 Lake Superior spring creel survey by gender and state, including the percent of total interviews collected by state (Percent of Total).

State	Female	Male	Total	Percent of Total
Alaska	0	2	2	0.2%
Florida	0	1	1	0.1%
Iowa	0	3	3	0.3%
Michigan	0	1	1	0.1%
Minnesota	59	926	985	93.4%
Montana	0	1	1	0.1%
North Dakota	0	4	4	0.4%
New Jersey	0	1	1	0.1%
Ohio	0	1	1	0.1%
Pennsylvania	0	1	1	0.1%
South Dakota	0	1	1	0.1%
Texas	0	2	2	0.2%
Washington	0	1	1	0.1%
Wisconsin	4	46	50	4.7%
West Virginia	0	1	1	0.1%
Total	63	992	1055	100.0%

**Zip code not provided for 8 anglers.*

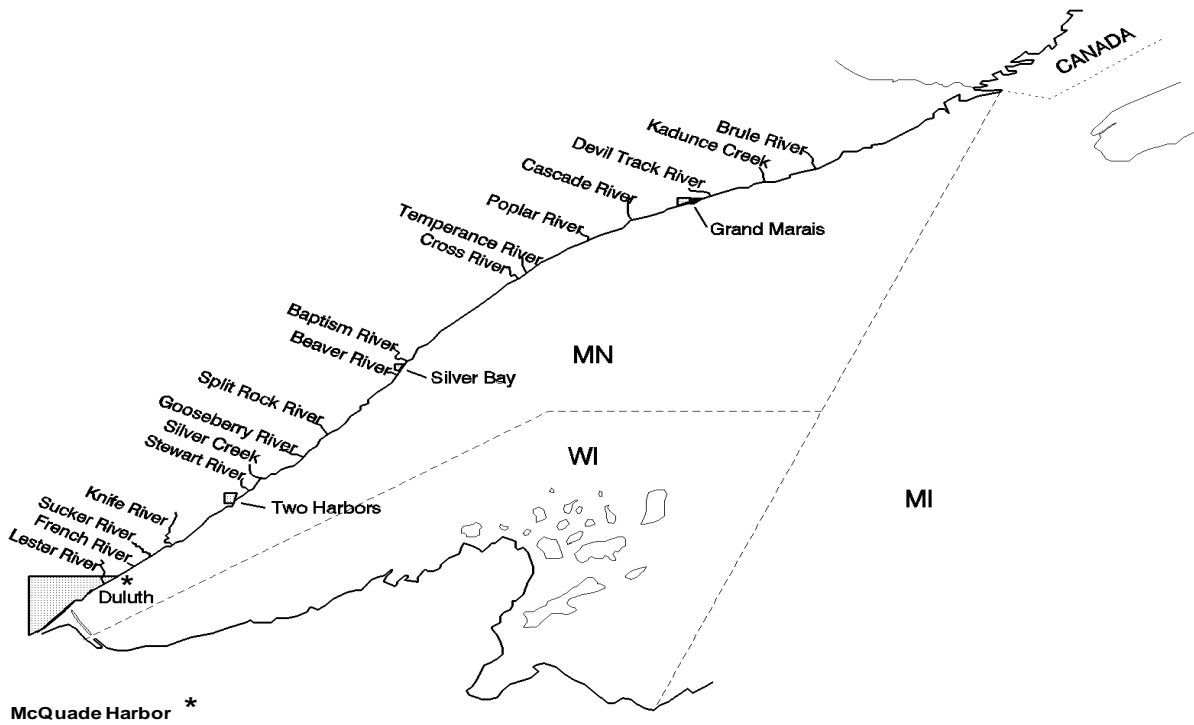


Figure 1. Sampling stations for the Lake Superior spring creel survey.

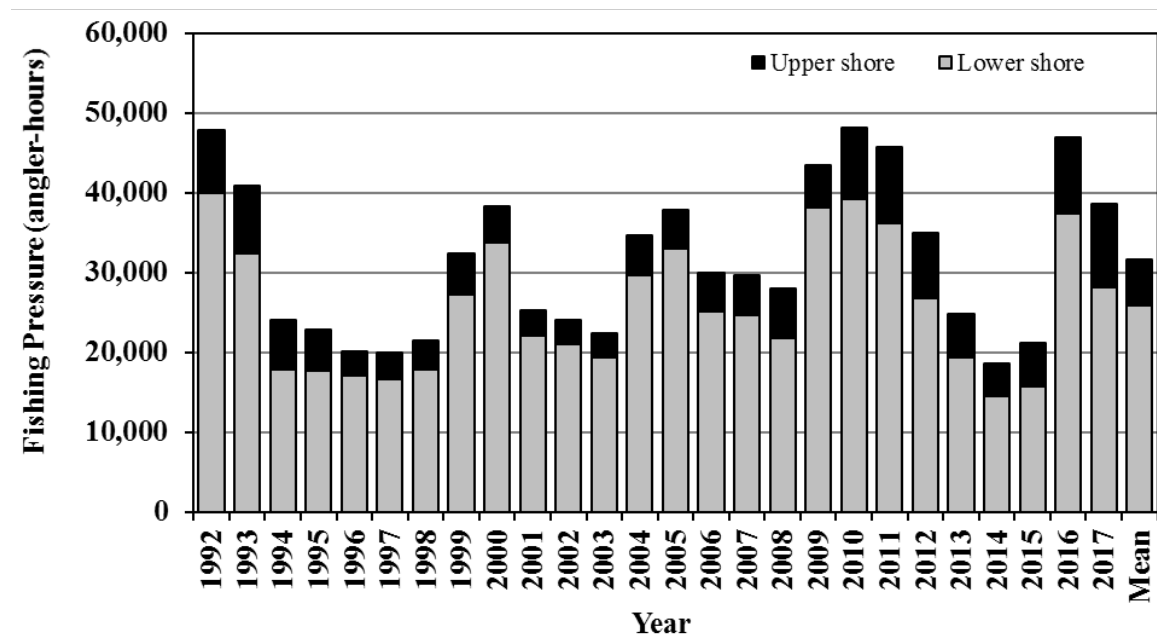


Figure 2. Fishing pressure (angler-hours) in the lower shore, upper shore, and shorewide from the Lake Superior spring creel survey by year, including the historic average (Mean) from 1992 to 2017.

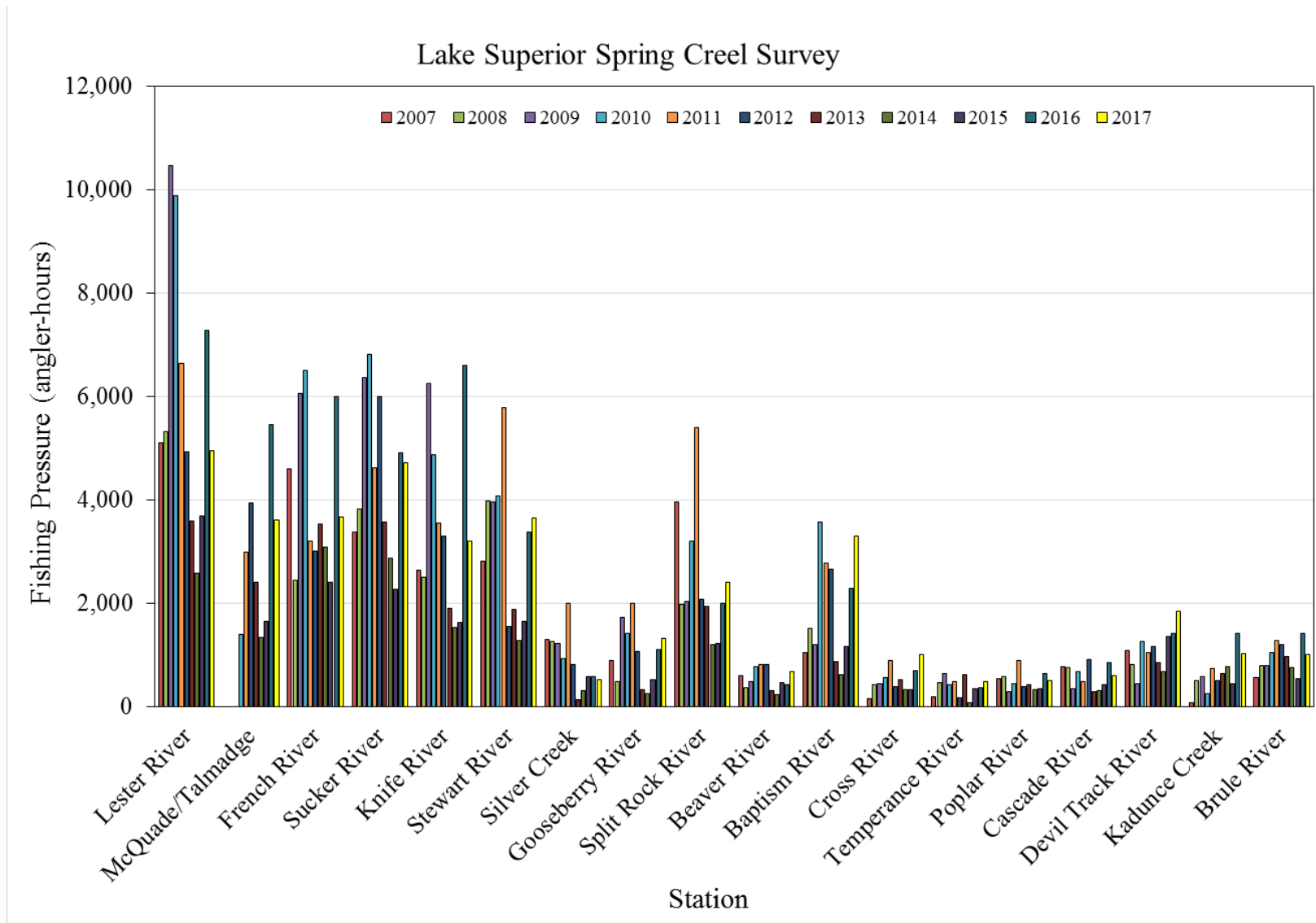


Figure 3. Fishing pressure (angler-hours) by station in the Lake Superior spring creel survey from 2007 to 2017.

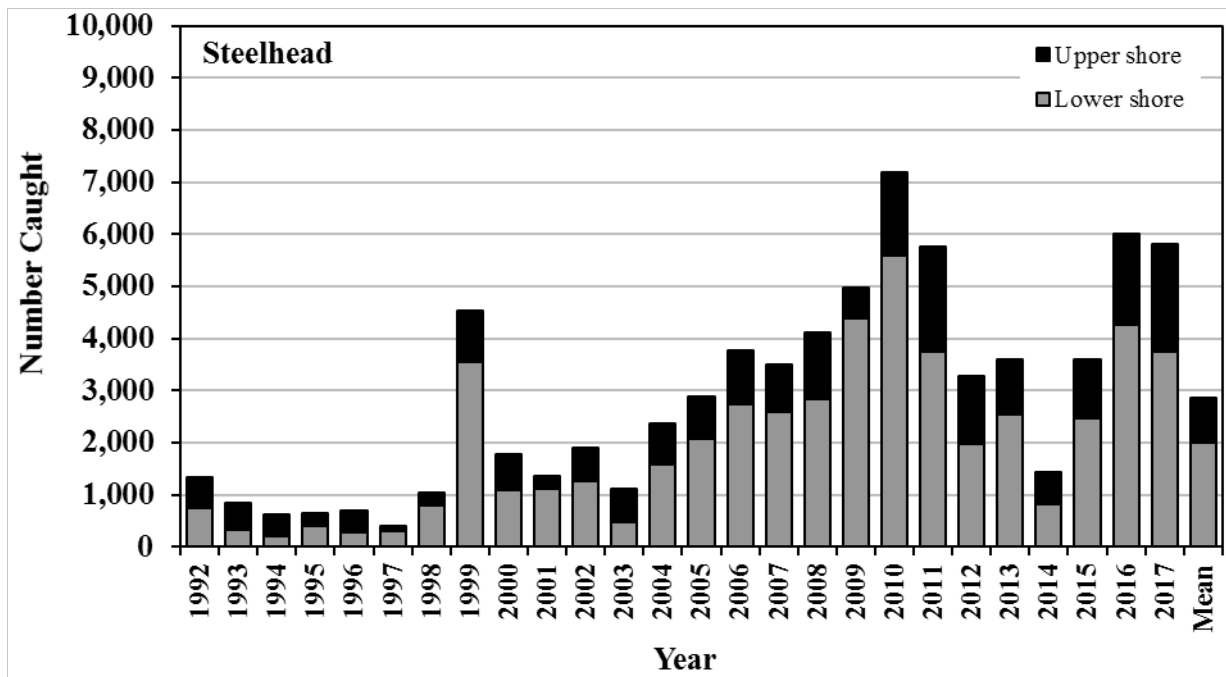


Figure 4. Number of steelhead ≥ 16 inches caught in the lower shore, upper shore, and shorewide from the Lake Superior spring creel survey by year, including the historic average (Mean) from 1992 to 2017.

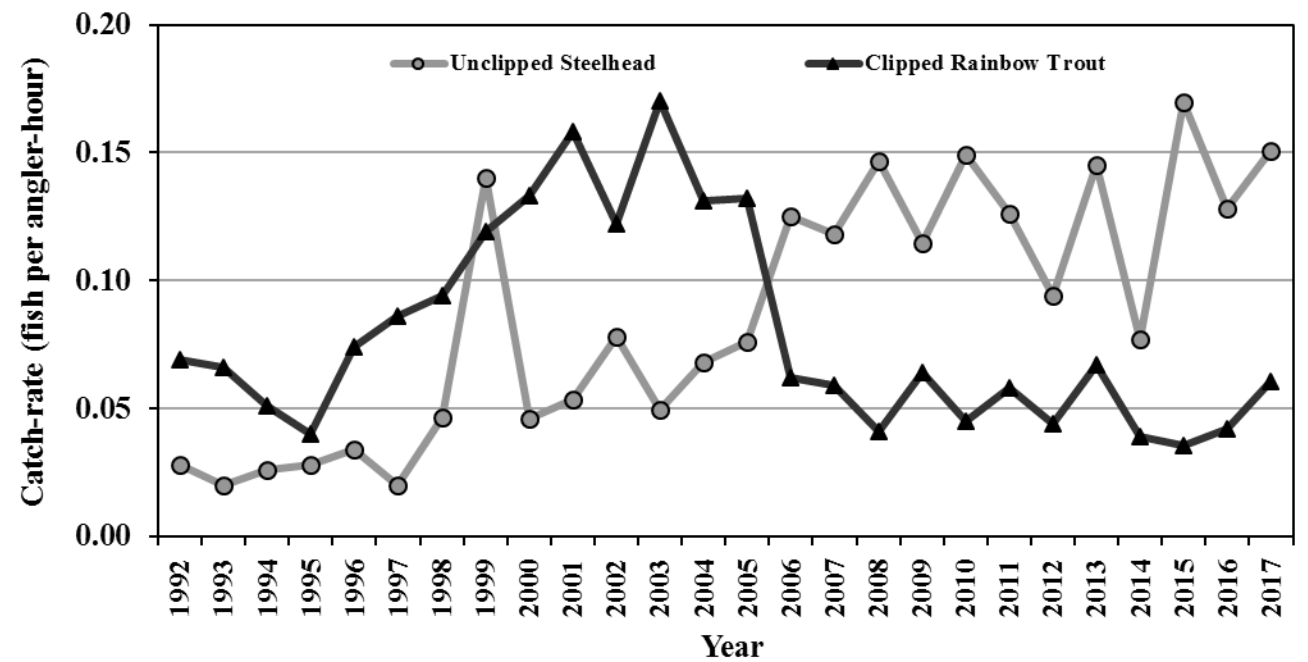


Figure 5. Shorewide catch-rate (fish per angler-hour) of steelhead and clipped Rainbow Trout (Kamloops and clipped steelhead) ≥ 16 inches from the Lake Superior spring creel survey by year.

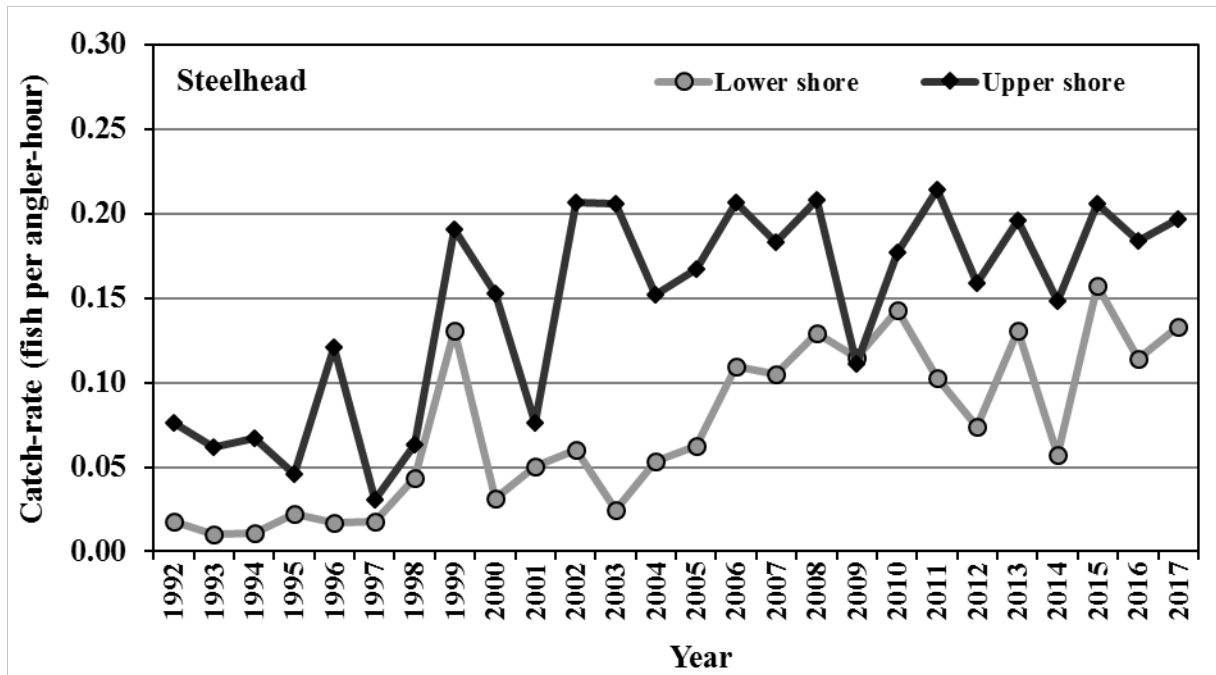


Figure 6. Catch-rate (fish per angler-hour) of steelhead ≥ 16 inches from the Lake Superior spring creel survey by year.

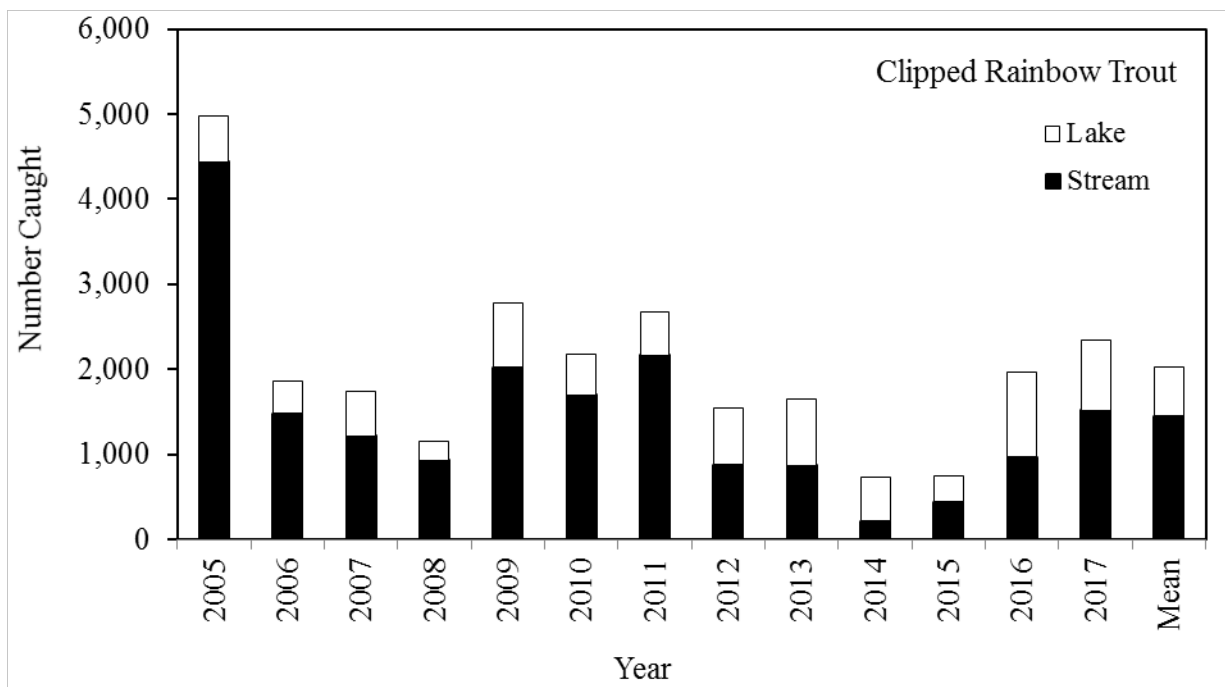


Figure 7. The number of clipped Rainbow Trout (Kamloops) ≥ 16 inches caught in the lake and stream, including the average (Mean) from 2005 to 2017.

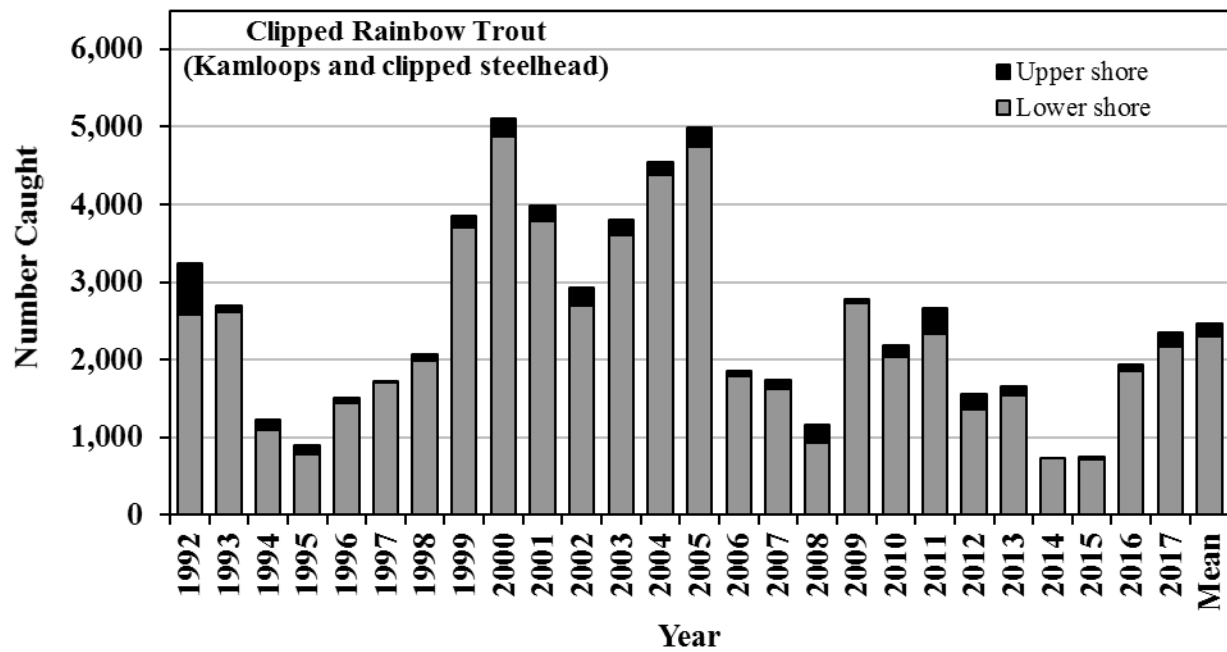


Figure 8. Number of clipped Rainbow Trout (Kamloops and clipped steelhead) ≥ 16 inches caught in the lower shore, upper shore, and shorewide from the Lake Superior spring creel survey by year, including the historic average (Mean) from 1992 to 2017.

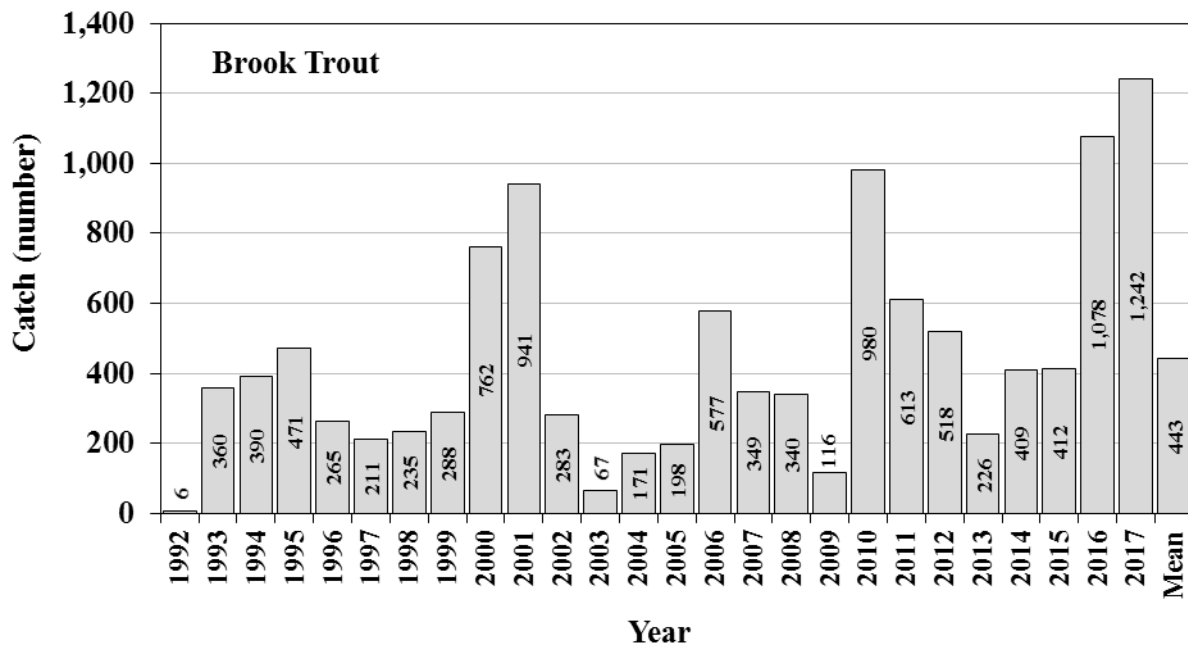


Figure 9. Number of Brook Trout caught by year during the Lake Superior spring creel survey by year, including the historic mean (Mean) from 1992 to 2017.

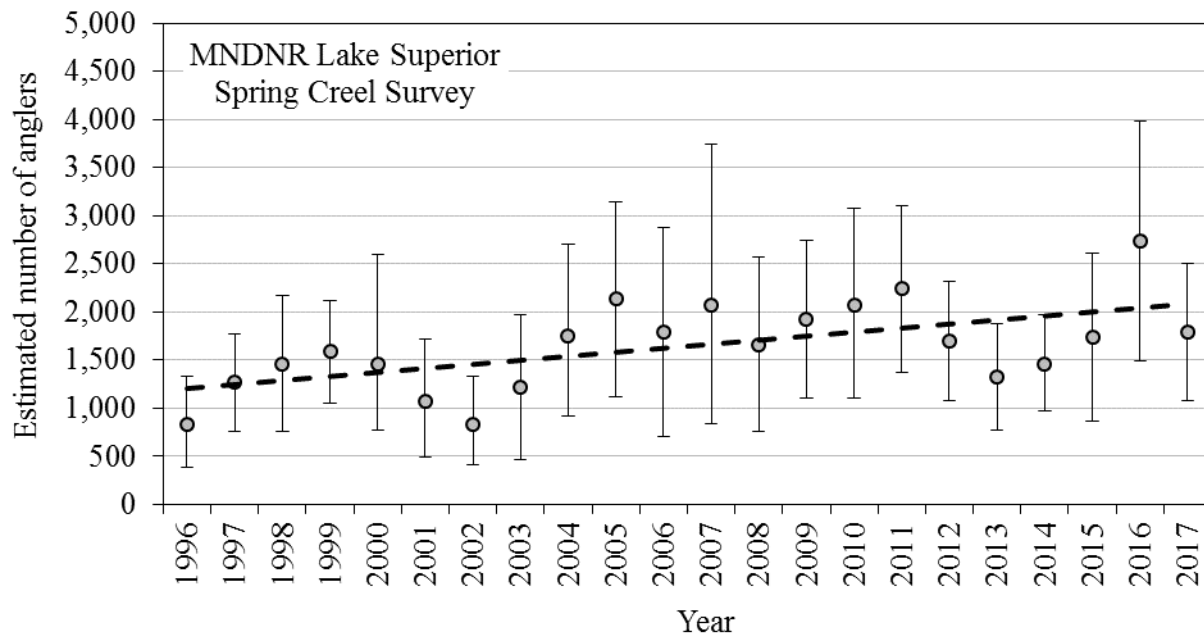


Figure 10. The estimated number of anglers that have participated in the Lake Superior spring fishery by year from 1996 to 2017. The dashed line shows the linear trendline for all years.

"How important to you is the opportunity to harvest a Rainbow trout from Lake Superior or tributaries?"

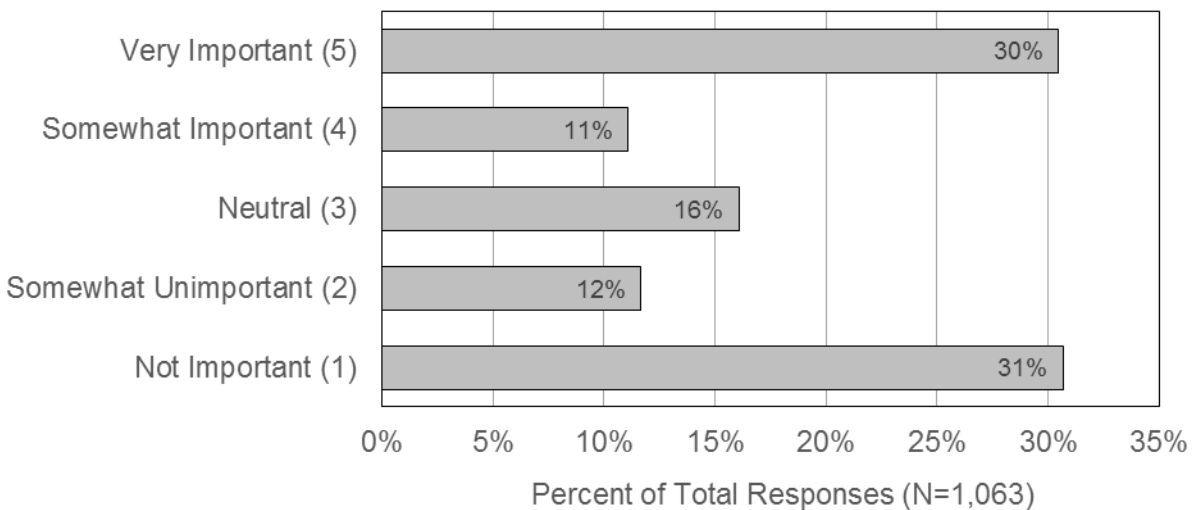


Figure 11. Summary of responses to "How important to you is the opportunity to harvest a Rainbow trout (steelhead or Kamloops) from Lake Superior or tributaries?" This includes only responses from 1,063 'new' (first time interviewed this spring) anglers interviewed during the Lake Superior spring creel survey in 2017.