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LAKE SUPERIOR SPRING CREEL SURVEY

North Shore Streams

2022



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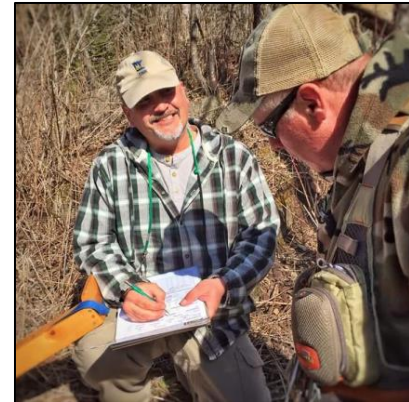
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BACKGROUND

The Minnesota DNRs fisheries assessments and creel surveys provide data required 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 ([GLFC 1997](#)) and other agencies who manage the Lake Superior fishery ([Horns et al. 2003](#)). Creel surveys collect information to supplement data collected in fisheries assessments. A creel survey (also known as an angler survey) is a type of in-person survey performed by resource managers where anglers are asked questions about their fishing experience such as the duration of the trip, how many fish they caught and harvested, and if they were satisfied with their experience. The interviewer may also ask about the angler's thoughts about a future management decision. Creel surveys are performed to gain insight about recreational angling perceptions, efforts, and harvests to inform future decision making. Creel surveys are a valuable tool for fisheries managers to use in understanding the systems they manage and how the public interacts with them.



The Minnesota DNRs Lake Superior spring creel survey is centered around sport fish caught in the spring in Lake Superior tributaries with a major focus on sustaining popular Rainbow Trout sport fishery in Minnesota waters. The Minnesota DNR has managed two types of Rainbow Trout in Lake Superior that were originally introduced from the west coast of North America in the late-1800s and mid-1900s. This includes steelhead, a migratory life-history form that is supported by limited natural reproduction and a supplemental stocking program, and Kamloops, a domesticated hatchery strain stocked to provide harvest opportunities during rehabilitation of wild-produced steelhead ([Close and Hassinger 1981](#)). The Kamloops stocking program was recently discontinued in 2018 and replaced with a genetically screened, clipped steelhead stocking program ([Krueger et al. 1994](#); [Miller et al. 2020](#)); very few Kamloops still exist in Lake Superior today.

The spring creel survey has provided useful information for many other species in Lake Superior. Brook Trout (*Salvelinus fontinalis*), one of only two native salmonids 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 ([Schreiner et al. 2008](#); [Miller et al. 2016](#)). 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 most of these species are caught at this time of year by anglers fishing in Lake Superior. All other non-native sport fish in Lake Superior return to rivers and spawn in the fall; therefore, few or none are caught in tributaries in the spring. Other species are also periodically caught in rivers and near river mouths in the spring such as Lake Trout (*Salvelinus namaycush*), White Sucker (*Catostomus commersoni*), Longnose Sucker (*Catostomus catostomus*), and Round Whitefish (*Prosopium cylindraceum*).

The Lake Superior spring creel survey begins once tributaries thaw and are fishable. 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. 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. Any angler fishing in a tributary is considered “stream” anglers and anglers shore fishing in Lake Superior at or near the tributary mouths are considered “lake” anglers. The term “lake” refers to Lake Superior waters near tributary mouths and includes McQuade Harbor (Figure 1).

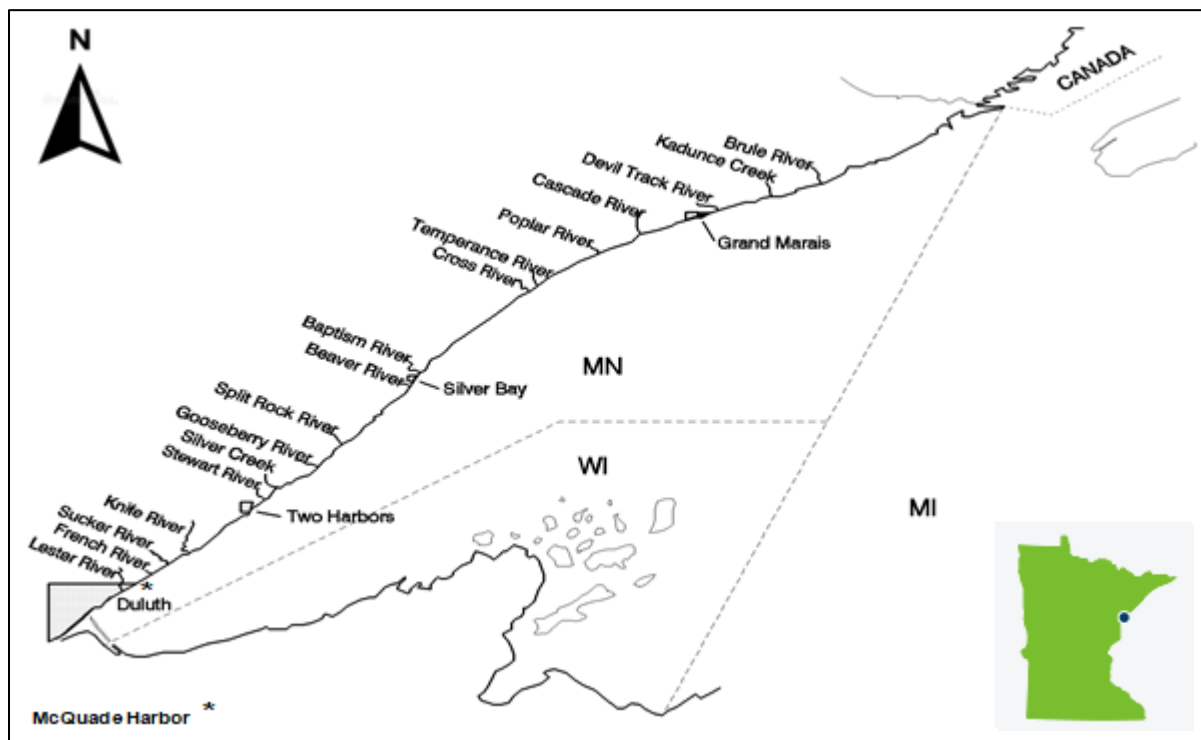


Figure 1: Map of sampling stations for the Lake Superior spring creel survey.

Separate estimates of catch and catch rate were made for Rainbow Trout that measured more and less than 16 inches to isolate the influence of juvenile steelhead parr and smolts 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 period from 1992 through the present year. Fish lengths reported in the creel surveys were estimated by anglers or measured by creel clerks. Individual fish weights were obtained using regression relationships derived from catches in Minnesota DNR fish surveys (i.e., Knife River adult trap data [Peterson 2022]). All other methods are summarized in Ostazeski (2004).

FISHING PRESSURE & TARGET SPECIES

The annual spring creel survey began on April 16 and ended on May 23, 2022. Creel clerks completed a total of 415 site visits (counts) and collected 689 angler interviews shore wide. The majority (81%) of angler interviews were collected in the lower shore, and most (90%) were fishing streams. Most interviews in the lower and upper shore were collected at the Sucker River (122) and the Kadunce Creek (45), respectively. Fishing pressure has gradually increased over time since 1992 but has remained relatively stable over the last decade except for a few years (e.g., 2014, 2015, and 2022). Total fishing pressure (angler-hours) in 2022 was 15,086, which was lower than the interquartile range of the historic average (30,872; Q1: 23,172, Q3: 38,164). (Table 1, Figure 2).

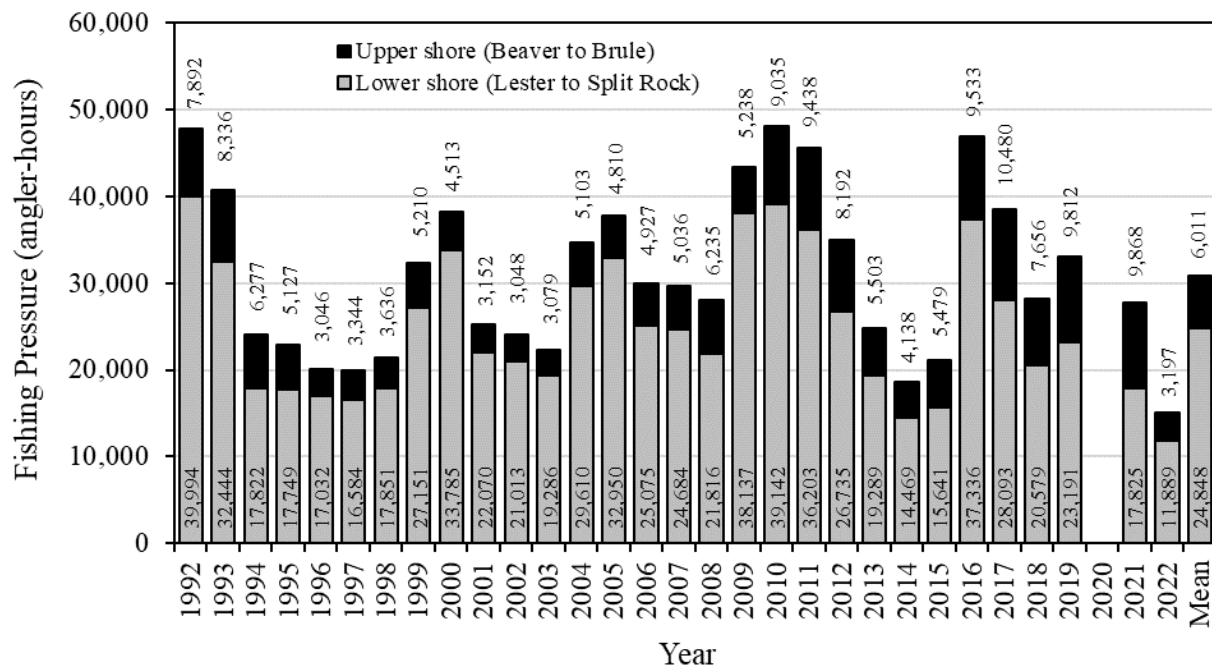


Figure 2: Fishing pressure (angler-hours) in the lower shore, upper shore, and shorewide from the Lake Superior spring creel survey by year and the historic average (Mean).

The majority (80%) of the fishing pressure observed in 2022 was at lower shore rivers. Fishing pressure was lower than the historic averages at all locations shore wide, except for Kadunce Creek. Fishing pressure (angler-hours) in the lower shore (11,889) was significantly lower than the historic average (24,848) and ranged from 2,469 at the Sucker River to 231 at the Gooseberry River. Fishing pressure in the upper shore (3,197) was nearly half the historic average (6,011) and ranged from 1,092 at Kadunce Creek to 91 at the Temperance River (Table 1; Figure 3).

Significant decreases in pressure in spring 2022 was expected due to a combination of high-water levels throughout spring, a shift in steelhead run timing due to an extended winter, recent changes to the Rainbow Trout stocking program, and the lack of fish captured at French River and released into McQuade Harbor. Winter extended into early-spring of 2022 with ice out nearly one month later than was observed in 2021 ([Peterson 2021](#)). Lots of snow in winter and

frequent rain events throughout the spring provided more than adequate stream flows for fish migration in spring 2022 (Peterson 2022). Moderate to high rain events occurred nearly every week throughout April and May which kept river levels high (often unfishable) throughout the spring steelhead run. Many rivers in the upper shore (Cross River-Brule River) experienced significant flooding in early-May and were not fishable.

Angling pressure in the lower shore is expected to be lower now compared to historic averages due to replacement of Rainbow Trout strains stocked by Minnesota DNR in recent years. The Kamloops strain tended to return and inhabit shoreline areas near rivers early in the season prior to ice-out on rivers. It is assumed that Superior steelhead strain stocked now will likely act more like naturalized steelhead strains and return to shoreline areas soon after ice-out on rivers and be caught most often in streams versus the lake; whether this assumption is true or not cannot yet be evaluated given that most year-classes of Superior strain steelhead have not returned as adults. Significantly less angling pressure occurs today at the French River and in McQuade Harbor than when the Kamloops strain were stocked. It will be interesting to see if lake fishing pressure increases or not, particularly at these two locations, as more clipped Superior strain steelhead return as adults in future years.

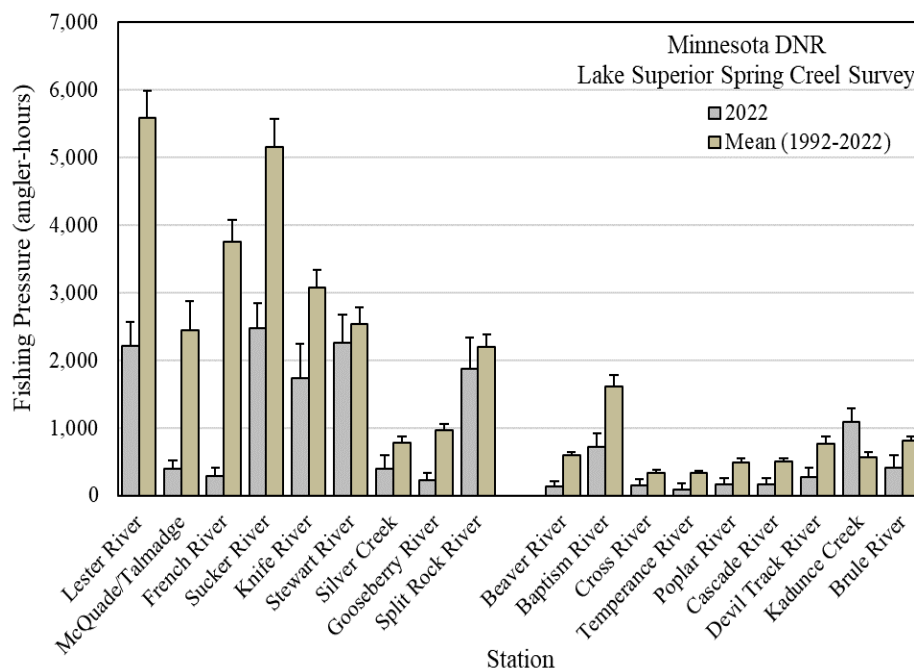


Figure 3: Fishing pressure estimates (angler-hours) in the Lake Superior Spring creel survey in 2022 and the historic average at each station.

Rainbow Trout were by far the most sought-after fish species in spring 2022. Ninety-eight percent ($N=645$) of all anglers interviewed were primarily targeting Rainbow Trout, 94% ($N=645$) targeted steelhead and 4% ($N=25$) targeted Kamloops. Six percent ($N=46$) of all anglers interviewed were also targeting Brook Trout, but less than 1% ($N=8$) of those anglers said Brook Trout were their primary target species. Other target species mentioned at low percentages ($\leq 3\%$) were Atlantic salmon, Brown Trout, Chinook Salmon, Coho Salmon, Lake Trout, Longnose Sucker, Walleye, and White Sucker.

ANGLER POPULATION ESTIMATES AND DEMOGRAPHICS

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.

The number of anglers who participated in the spring fishery has remained stable or slightly increased over time. The number of anglers who fish the North Shore in the spring is largely influenced by annual environmental and stream conditions and steelhead run timing, and particularly those conditions prior to the annual inland fishing opener. It is common for angler participation in the North Shore stream fishery to decline significantly after inland fishing opener. In 2022, an estimated 1,125 anglers participated in the Lake Superior spring fishery which was lower than the historic average (1,639) and the lowest participation rate observed since 2002. Lower participation was expected, as stream conditions were not conducive for fishing North Shore streams, particularly in the middle and upper shore, for most of the time prior to the inland fishing opener. A total of 689 anglers were interviewed shore wide, of which 527 were ‘new anglers’ (first time interviewed this spring). Anglers were residents of 15 U.S. states; 94% were residents of Minnesota, 3% were from Wisconsin, and less than 1% were from other states. Only 5.5% (29) of anglers interviewed were female, which was lower than 2021 (6.7%, N=57) and slightly higher than 2019 (3.4%, N=31) (Figure 4; Table 5).

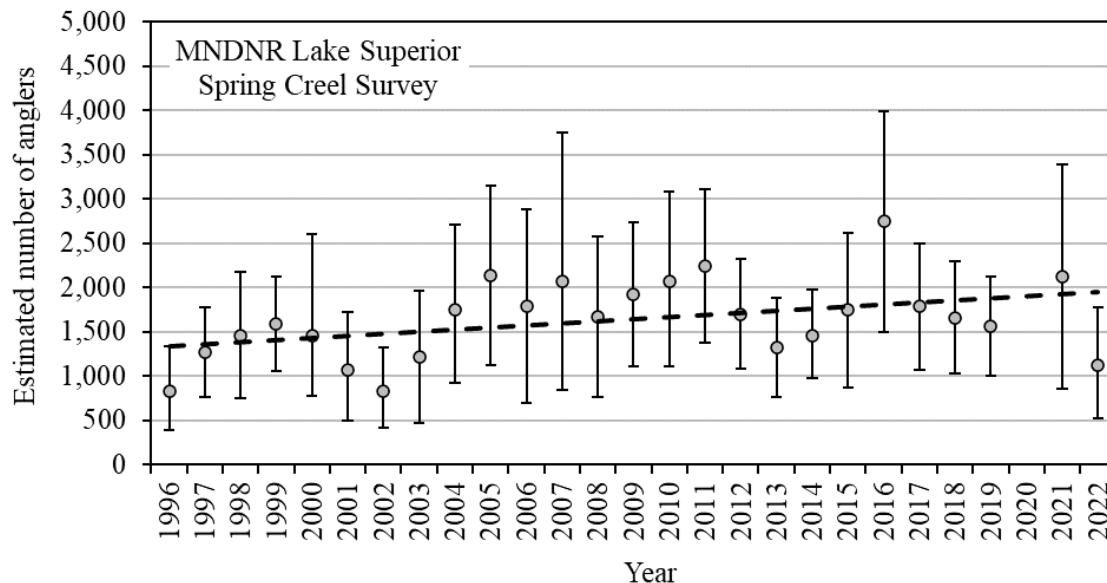


Figure 4: The estimated number of new (first time interviewed this spring) anglers who were interviewed in the Lake Superior spring creel survey by year. Error bars are upper and lower 95% confidence intervals.

CATCH, CATCH-RATES AND HARVEST

Unclipped Rainbow Trout

Unclipped steelhead are either naturally produced or products of the Minnesota DNRs steelhead fry stocking program; the fry stocking program was suspended in 2018 so available gametes could be used in the development of the Superior strain steelhead stocking program. Some stocked steelhead, including captive broodstock from French River Coldwater Hatchery released back into Lake Superior, still have an in-tact adipose fin and are not legal to harvest. Some of these fish possess a maxillary clip that is often difficult for anglers to identify. These fish are almost always reported by anglers as unclipped steelhead. Maxillary clipped steelhead could influence the catch and catch rate in the spring creel, particularly at the Knife River where maxillary clipped steelhead were stocked from 2003 to 2007. However, very few maxillary clipped steelhead are now captured in the spring at the Knife River fish trap and very few still exist in Lake Superior ([Peterson 2022](#)).

Shorewide catch of unclipped Rainbow Trout has continued to improve over the last decade. An estimated 2,307 unclipped Rainbow Trout were caught in 2022, which was slightly lower than the historic average (2,909, range: 403 to 7,184) (Table 3; Figure 5). Catch in the lower shore (1,901) and upper shore (406)



were lower than the historic averages (lower shore: 2,043; upper shore: 866) (Table 3; Figure 6). The highest catches in the lower shore were at the Stewart River (649), Sucker River (321), and Split Rock River (272). Unclipped Rainbow Trout were caught at only three stations in the upper shore during the spring creel survey: Kadunce Creek (253), Brule River (74) and the Baptism River (64). Forty-nine small (<16 inches) Rainbow Trout were captured shorewide in 2022, which was lower than the historic average (551); all these fish were caught at the Sucker River. No unclipped Rainbow Trout were illegally harvested in 2022 (Table 3). The average length of was 23.9 inches and the average weight was 4.3 pounds, and the largest fish reported was 30 inches and 8.2 pounds (Table 4).

The shorewide catch-rate for unclipped Rainbow Trout in 2022 was 0.153 fish per angler-hour (6.5 angler-hours per fish) which was much better than the historic average (0.092 fish per angler-hour, 10.8 angler-hours per fish) (Figure 5). Catch rates in the lower shore were 0.160 fish per angler hour (6.3 angler-hours per fish), which was better than the historic average of 0.082 fish per angler hour (12.2 angler-hours per fish). Catch rates in the upper shore was 0.127 fish per angler hour (7.9 angler-hours per fish), which was slightly lower than the historic average of 0.142 fish per angler hour (7.1 angler-hours per fish) (Table 3; Figure 6). The best catch-rates in the lower shore were at the Stewart River (0.287; 3.5 angler-hours per fish), Gooseberry River (0.253; 4.0 angler-hours per fish), and Silver Creek (0.163; 6.1 angler-hours per fish). Catch-rates in the upper shore were 0.231 at Kadunce Creek (4.3 angler-hours per fish), 0.178 at Brule River (5.6 angler-hours per fish), and 0.088 at the Baptism River (11.4 angler-hours per fish) (Table 3). Nearly all (96%; 2,221) unclipped Rainbow Trout were caught fishing in streams versus shore fishing Lake Superior (4%; 87). The shorewide catch-rate in

tributaries was 0.166 fish per angler-hour (6.0 angler-hours per fish) and in the lake was 0.063 fish per angler-hour (15.9 angler-hours per fish).

Shorewide catch-rate of steelhead increased most from the late 1990s until 2006, and since then has remained consistently above 0.10 fish per hour (Figure 5). A target catch-rate of 0.10 fish per angler-hour for three consecutive years was previously considered a target for progress in rehabilitation and begin discussion about limited harvest of unclipped steelhead (Schreiner et al. 2006). Although this goal was appropriate at the time, discussions with the Lake Superior Advisory Group and other stakeholders today do not support harvest of unclipped steelhead but were very supportive of harvest opportunities in the Rainbow Trout fishery coming from the Minnesota DNRs clipped steelhead stocking program. Consistently high catches over time could indicate that steelhead abundances have reached (or are close to reaching) equilibrium with accessible spawning and rearing habitat in streams and available forage in Lake Superior. The total catch and catch rates in the upper shore has slightly, consistently declined over the past four years (Figure 6), which is likely caused by the suspension of steelhead fry stocking in some upper shore rivers over the last decade.

Fry stocking was suspended in 2018 to better evaluate of the contributions of fry stocking at stocked rivers and so that gametes were available to initiate the clipped steelhead stocking program ([Goldsworthy et al. 2017](#)). Preliminary results vary by river; catch and catch-rates initially declined in some rivers where fry stocking was suspended but then improved in subsequent years (e.g., Cascade River in 2019 and then 2021; [Peterson 2019](#), [Peterson 2021](#)). The response of North Shore rivers to the suspension of fry stocking is ongoing and will be thoroughly evaluated and shared during the next revision of the Fish Management Plan for Minnesota Waters of Lake Superior (scheduled to begin data analysis and plan revisions in 2024). More years of creel data are needed to account for potential influences of natural produced year-class abundances and environmental conditions that could influence angling success at stocked rivers.

Current regulations require that all unclipped Rainbow Trout with an intact adipose fin must be immediately released ([MN DNR Fishing Regulations](#)). The catch-and-release regulation for unclipped Rainbow Trout has been in effect since August 1997 and regulation compliance has been (for the most part) good over time. Compliance with the catch-and-release regulation will continue to be monitored in the spring creel survey, and increased enforcement action will be called for if compliance standards are not met.

The Minnesota DNRs catch-and-release regulations have been largely successful in protecting natural produced Rainbow Trout in Minnesota waters of Lake Superior. Catch and catch rates for unclipped steelhead has continued to improve over time and target catch-rates that would initiate harvest of these fish have been met ([Goldsworthy et al. 2017](#)). Modifications to the catch-and-release regulation for unclipped Rainbow trout was discussed with the Lake Superior Advisory Group (LSAG) on February 15, 2015 at the LSMP revision meeting, and again on October 23, 2017, during a meeting to discuss results from the [Steelhead Genetics Project](#). The vast majority of the LSAG supported a continuation of the catch-and-release regulation for unclipped Rainbow Trout. The goals for unclipped Rainbow Trout will be discussed again with stakeholders in the next revision of the LSMP.

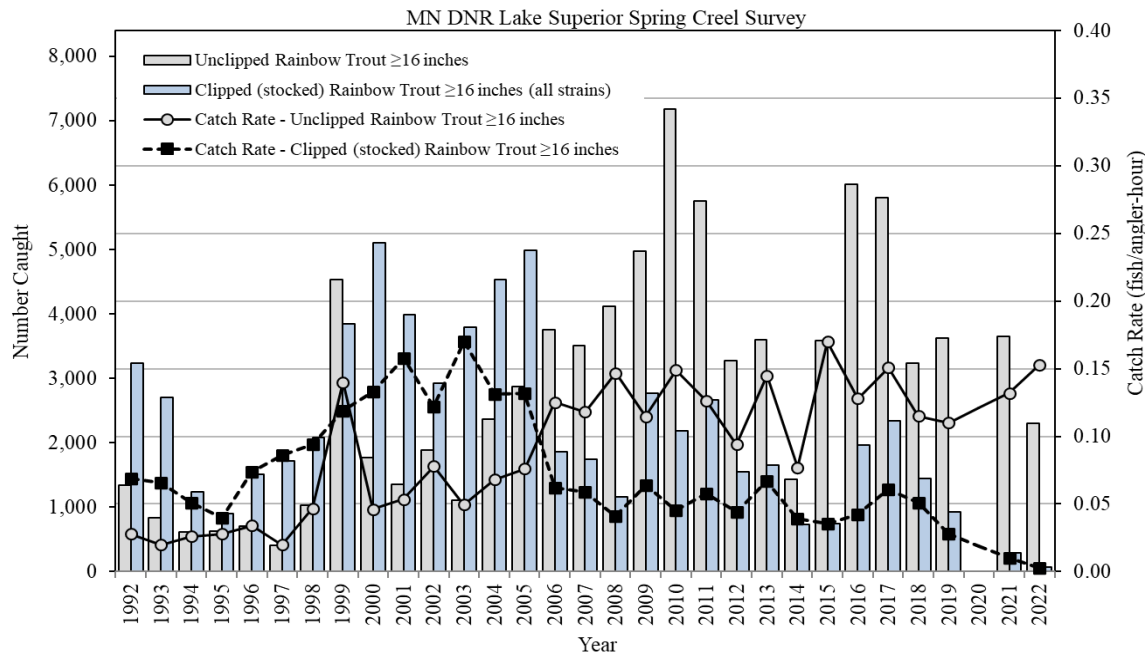


Figure 5: Shorewide estimated catch and catch-rate (fish per angler-hour) of unclipped and clipped (stocked) Rainbow Trout from the Lake Superior spring creel survey by year. Totals in 2022 are combined for Kamloops and clipped Superior strain steelhead.

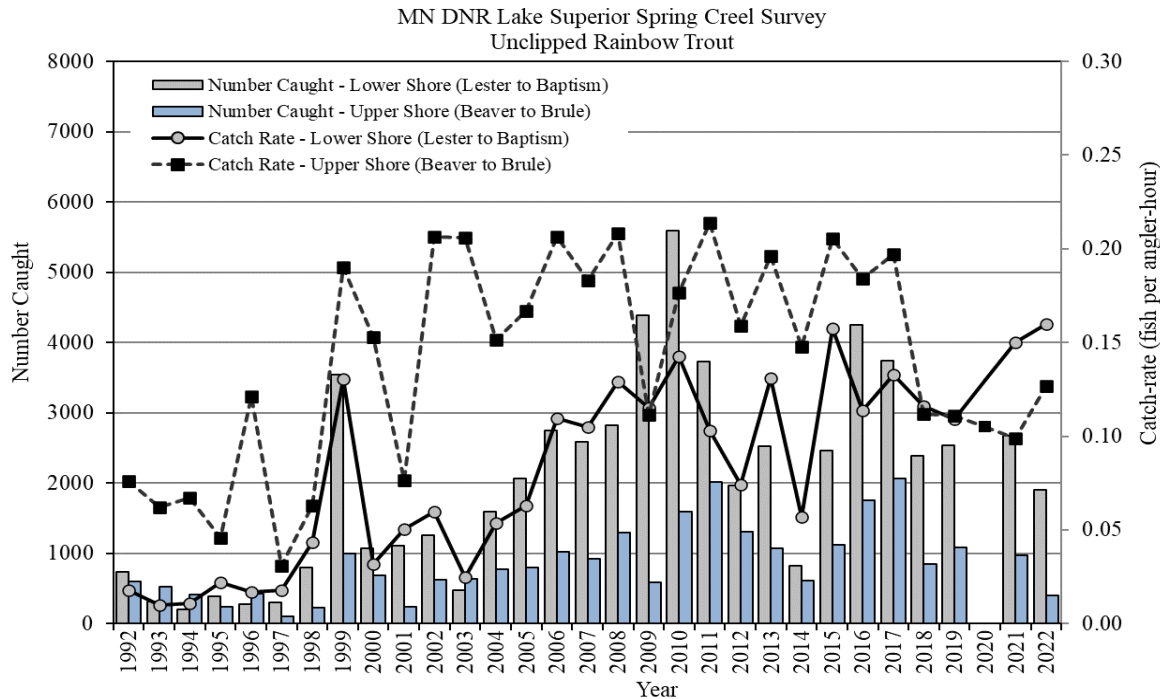


Figure 6: Estimated catch and catch rate (fish per angler-hour) of unclipped Rainbow Trout in the lower and upper shore from the Lake Superior spring creel survey by year.

Clipped Rainbow Trout (Kamloops and Superior strain steelhead)

Clipped Rainbow Trout are stocked by the Minnesota DNR and have an adipose fin clip making them legal for anglers to harvest after they reach a minimum size of 16 inches ([MN DNR Fishing Regulations](#)). There has been a lot of changes in the stocking and production of clipped Rainbow Trout over the past decade. The Minnesota DNR had previously stocked Kamloops strain Rainbow Trout but that program was eliminated in 2018; for more information about Kamloops see [Miller et al. \(2020\)](#) and the [Steelhead Genetics Project](#) website. The Minnesota DNR initiated a clipped steelhead stocking program in the French and Lester rivers in 2018. Steelhead captured at the French and Knife rivers were used to develop hatchery broodstock for the new clipped stocking program; fish from this program will be referred to as Superior strain steelhead. Catches of clipped Kamloops and Superior strain steelhead were difficult to classify in previous years. Kamloops caught by anglers in 2022 were larger than clipped Superior strain steelhead (Table 4), and the same was apparent at the Knife River fish trap ([Peterson 2022](#)). Therefore, separate catch and catch-rates for clipped Superior strain steelhead and Kamloops (if they still exist) will be reported this year and beyond.

Kamloops Rainbow Trout

Forty Kamloops were captured by anglers in spring 2022 which was significantly lower than the historic average for clipped Rainbow Trout (2,221) (Figure 5). All Kamloops were caught in the lower shore at the Lester River (11), French River (10), Sucker River (10), and the Knife River (9). No small (<16 inches) Kamloops were caught in 2022. Thirty of forty (75%) Kamloops caught were harvested (Table 3). The average length reported by anglers was 26.2 inches and the average weight was 6.5 pounds (Table 4). More clipped Rainbow Trout were caught in streams (30) than in the lake (10) (Figure 7). The shorewide catch rate for Kamloops was 0.003 fish per angler-hour (333.3 angler-hours per fish), which was significantly lower than the historic average for clipped Rainbow Trout (0.072; 13.9 angler-hours per fish) (Table 3; Figure 8). All Kamloops caught in 2022 were at least 6 years old.



The low catch and catch rates of Kamloops in 2022 was expected because no stocking has occurred since 2017. These fish would be 6+ years old in 2022 (from the 2016 year-class) and are beyond their average life expectancy (4 years old; [Hallam and Peterson 2019](#)). The low catches of Kamloops in the lower shore between 2018 and 2021 was largely influenced by the lack of angling effort at the French River and McQuade Harbor, two popular locations where anglers would primarily target Kamloops, which was likely correlated to low returns of clipped Rainbow Trout (Kamloops and clipped Superior strain steelhead) in recent years. Catch of clipped (harvestable) Rainbow Trout will remain low until multiple year-classes of clipped Superior strain steelhead become established and return as adults.

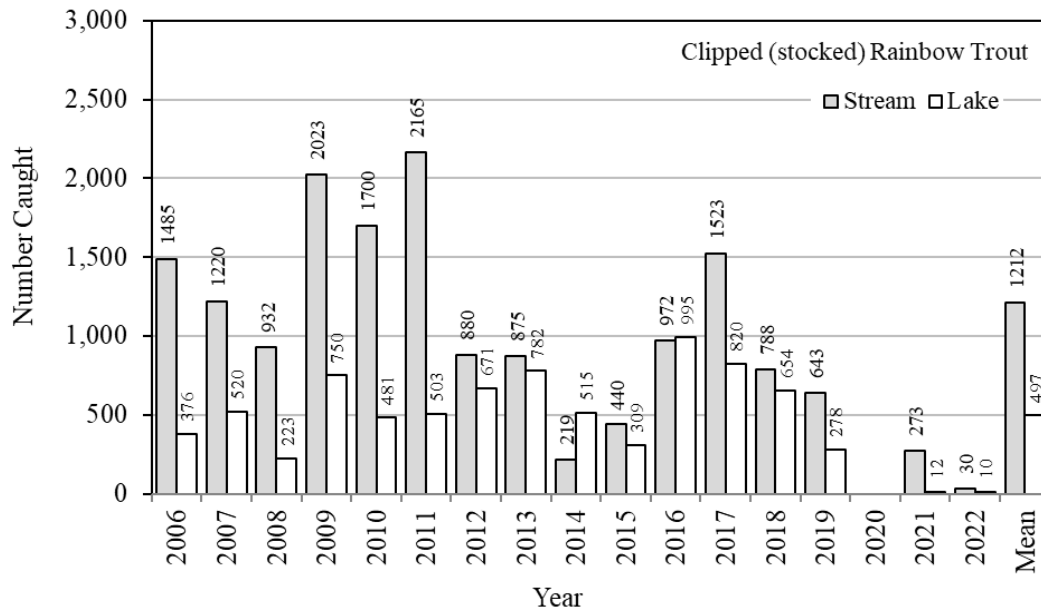


Figure 7: Estimated number of clipped (stocked) Rainbow Trout ≥16 inches caught in the lake and stream and the historic average (Mean). Totals in 2022 are for Kamloops strain Rainbow trout and do not include clipped Superior strain steelhead.

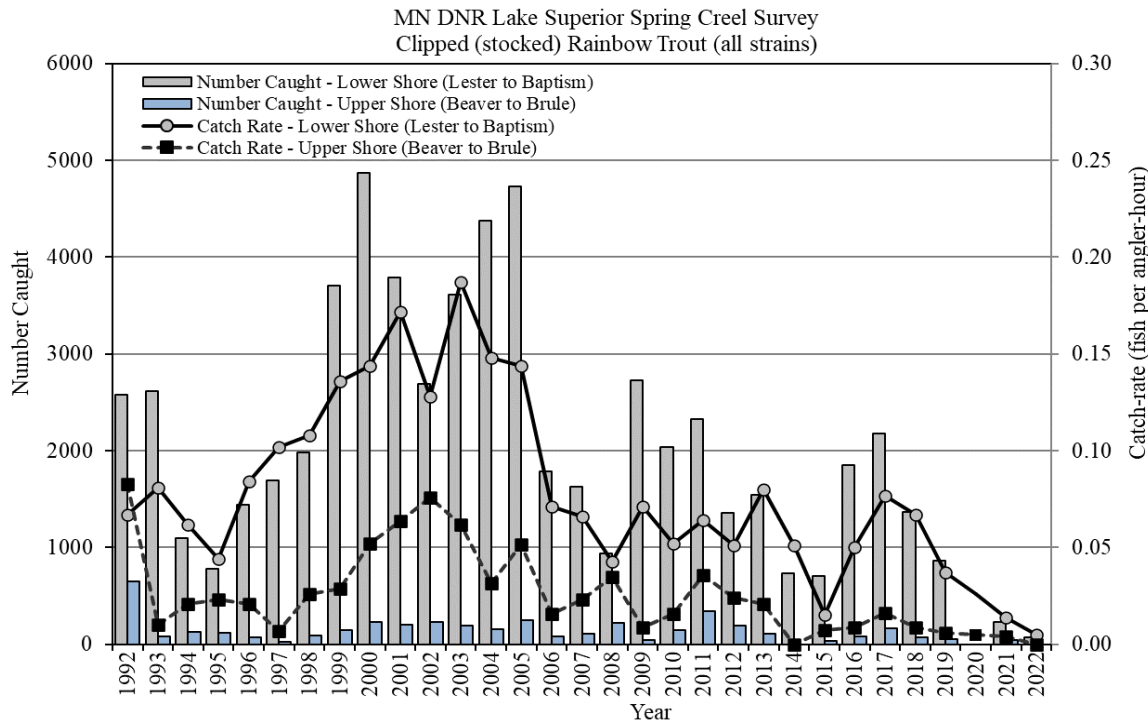


Figure 8: Estimated catch and catch rate (fish per angler-hour) of clipped (stocked) Rainbow Trout in the lower and upper shore from the Lake Superior spring creel survey by year. Totals in 2022 are combined for Kamloops and clipped Superior strain steelhead.

Superior Strain Steelhead

Twenty-nine Superior strain steelhead were captured by anglers in spring 2022. All were caught in the lower shore in the Lester River (11) and Stewart River (18), and all were harvested by anglers. No small (<16 inches) clipped steelhead were caught in 2022 (Table 3). No clipped steelhead were caught in the lake. The shorewide catch rate was 0.002 fish per angler-hour (500 angler-hours per fish) (Table 3). The average length and weight of clipped steelhead in 2022 was 20.8 inches 2.8 pounds, respectively (Table 4). One fish was reported with an adipose-only clip that was 22 inches and 3.3 pounds; this fish likely had another fin clip and was probably from the 2017 year-class (5 years old) that was stocked in the Lester or French River in 2018. One fish was reported with an adipose plus questionable pelvic fin clip (clerk not certain about the clip) that was 20.5 inches and 2.7 pounds, and one was reported with an adipose plus right pelvic fin clip that was 20 inches and 2.8 pounds; both fish were likely from the 2018 year-class (4 years old) that was stocked in the Lester or French River in 2019.



The low returns from the clipped steelhead stocking program to date is not concerning. The first year-class of clipped Superior strain steelhead were stocked in 2018 (2017 year-class, 5 years old in 2022), and most adult steelhead will not return to spawn until they are age-5 or age-6 ([Peterson 2022](#)). Populations of adult steelhead that return to rivers to spawn are comprised of a multitude of year-classes (not all the same age). Only one year-class of clipped Superior strain steelhead were expected to return as adults in 2022, and all other stocked year-classes are sub-adults (ages younger than 5) that should return in the years to come. The return of adult steelhead from the clipped steelhead program in future years will be dependent on several variables within (e.g., efficiencies in egg take, hatchery production and stocking) and outside of the Minnesota DNRs control (e.g., disease outbreaks, survival of juveniles in streams and Lake Superior).

Brook Trout

Brook Trout are the second most common species caught in the spring creel. An estimated 55 Brook Trout were caught in spring 2022, which was much lower than the historic average of 501 (Figure 9). The average length and weight were 10.2 inches and 0.9 pounds, respectively (Table 4). The shorewide catch-rate was also very low (0.004 fish per angler-hour; 250 angler-hours per fish). The low catches of Brook Trout in spring 2022 is not concerning; catches in the spring do not correlate to abundances of Brook Trout below barriers at other times of the year ([Peterson 2018](#)).



Compliance with the restrictive harvest regulation for Brook Trout (bag limit of 1, minimum size 20 inches) was good with no harvest reported in 2022. Coaster Brook Trout rehabilitation is a management priority for the Minnesota DNR and regulatory compliance is essential for this to occur. Anecdotal reports of sub-legal sized Brook Trout harvest, particularly in the summer months, has been an issue in previous years. In response, the Minnesota DNR partnered with



local stakeholders ([The Greater Lake Superior Foundation](#), [Minnesota Trout Unlimited](#), and [Minnesota Steelheader](#)) to design and post educational Coaster Brook Trout signs at streams throughout the North Shore and to increase public outreach and interest in the fishery via social media. More information about Brook Trout in Minnesota waters of Lake Superior is available online (follow links to: Minnesota DNRs [Lake Superior Area Fisheries website](#) & Minnesota Steelheaders [Coaster Genetics Project website](#)).

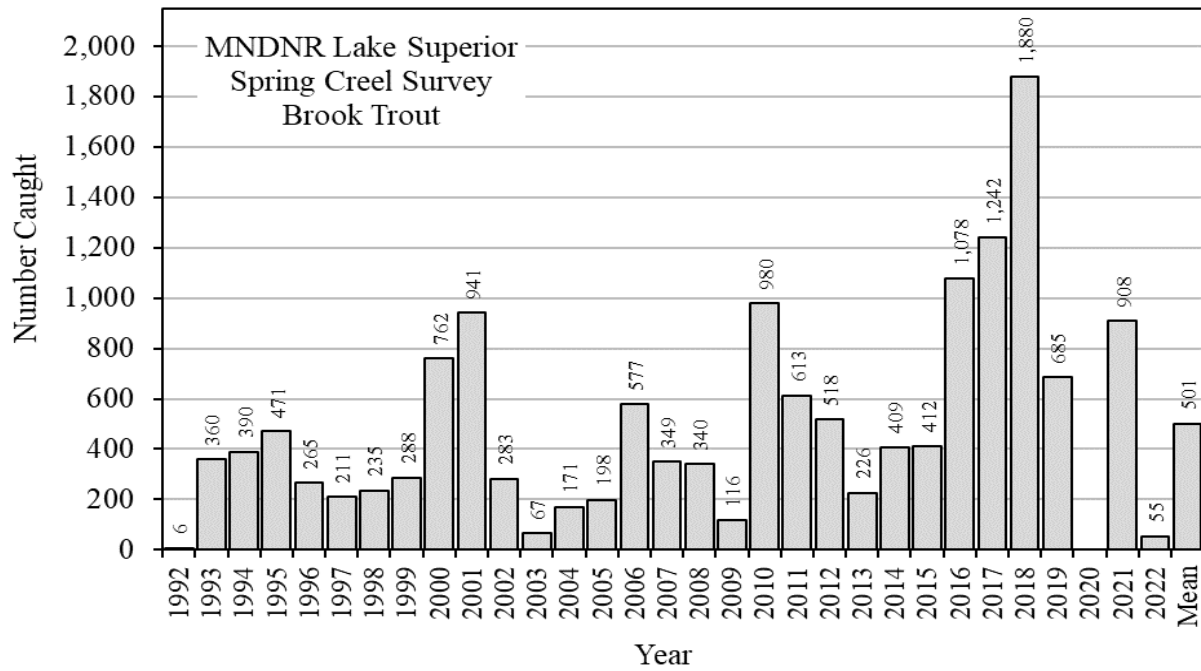


Figure 9: The estimated number of Brook Trout caught by year during the Lake Superior spring creel survey and the historic average (Mean).

Other Species

Estimated catch of other fish species in 2022 was 10 Coho salmon and 278 suckers (White and Longnose suckers). All Coho salmon were caught shore fishing in Lake Superior at the French River, and all were harvested by anglers. All suckers were caught in streams and released. Yield (number caught, number harvested, and pounds harvested), average lengths and average weights are reported in Table 4.

Catch and fishing pressure for Coho Salmon remains sporadic and is largely dependent on the conditions of Lake Superior and year-class abundances. Coho Salmon caught in Minnesota waters are naturally produced fish; the last Coho Salmon were stocked in Michigan waters of Lake Superior in 2006 ([Goldsworthy et al. 2017](#)). It is assumed that the vast majority of Coho Salmon caught in Minnesota waters of Lake Superior likely migrated from other jurisdictions where stream habitat is more conducive for reproduction and survival of fall-run fish (e.g., Wisconsin, Michigan, and Ontario, Canada); however, contributions of natural reproduction below barriers in Minnesota has yet to be quantified. Unlike streams in many other jurisdictions, streams on Minnesota's North Shore provide significantly less access to spawning and rearing habitat for migratory fish, and stream conditions are often less than ideal for fall spawning fish. Stream conditions on the North Shore in the fall are often characterized by low water levels, excessive ice formation, and lack of stream access due to gravel bars that block off access for fish from Lake Superior.



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MINNESOTA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISHERIES

COMPLETION REPORT:

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North Shore Streams

2022

Report Completed By:
Nick Peterson

Cory Goldsworthy Digitally signed by Cory Goldsworthy
Date: 2023.03.07 16:25:13 -06'00'

Area Supervisor \ Date

Leslie George Digitally signed by Leslie George
Date: 2023.03.16 12:41:41 -05'00'

Regional Fisheries Approval \ Date

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

Shore Zone	Station	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	1992-2022		
													Mean	Minimum	Maximum
Lower Shore	Lester River	4,928	3,588	2,580	3,699	7,293	4,955	3,051	3,115	--	2,933	2,215	5,582	2,215	10,476
	McQuade/Talmadge	3,938	2,407	1,340	1,659	5,453	3,612	2,657	3,158	--	359	401	2,448	359	5,453
	French River	3,015	3,544	3,080	2,409	6,014	3,678	1,868	2,033	--	422	295	3,754	295	8,544
	Sucker River	6,008	3,566	2,880	2,265	4,914	4,713	4,131	3,613	--	2,342	2,469	5,150	2,265	12,990
	Knife River	3,308	1,903	1,540	1,629	6,597	3,215	3,363	3,461	--	2,574	1,730	3,072	1,225	6,597
	Stewart River	1,557	1,885	1,280	1,653	3,385	3,658	2,620	3,830	--	4,111	2,265	2,544	720	5,782
	Silver Creek	818	131	312	577	582	529	522	759	--	703	403	789	131	1,996
	Gooseberry River	1,076	325	257	532	1,105	1,330	612	778	--	837	231	959	231	2,475
	Split Rock River	2,087	1,940	1,200	1,217	1,993	2,402	1,756	2,444	--	3,545	1,880	2,204	1,145	5,400
Upper Shore	Beaver River	820	304	233	473	436	685	346	572	--	565	134	597	134	1,159
	Baptism River	2,662	866	630	1,173	2,285	3,303	2,370	2,918	--	3,545	725	1,605	448	3,570
	Cross River	383	525	339	338	700	1,004	549	381	--	518	145	338	53	1,004
	Temperance River	170	630	83	359	370	494	319	306	--	175	91	338	77	788
	Poplar River	383	420	330	357	645	508	299	803	--	488	160	495	160	1,347
	Cascade River	905	296	309	438	846	601	307	301	--	789	160	509	160	939
	Devil Track River	1,163	857	677	1,355	1,421	1,841	2,066	1,833	--	1,481	276	772	75	2,066
	Kadunce Creek	500	642	770	448	1,420	1,030	570	1,630	--	1,006	1,092	564	79	1,630
Brule River	1,206	963	767	539	1,410	1,015	829	1,069	--	1,302	415	805	207	1,505	
Lower Shore		26,735	19,289	14,469	15,641	37,336	28,093	20,579	23,191	--	17,825	11,889	24,848	11,889	39,994
Upper Shore		8,192	5,503	4,138	5,479	9,533	10,480	7,656	9,812	--	9,868	3,197	6,011	3,046	10,480
Shorewide		34,927	24,792	18,607	21,120	46,868	38,573	28,235	33,003	--	27,693	15,086	30,872	15,086	48,177

Table 2. Fishing pressure estimates (angler-hours \pm 1 standard error [SE]) from the 2022 Lake Superior spring creel survey by shore zone and station.

Shore Zone	Station	Stream Pressure	(SE)	Lake Pressure	(SE)	Total Pressure	(SE)
Lower Shore	Lester River	2,047	350	169	109	2,215	353
	McQuade/Talmadge	211	82	190	101	401	126
	French River	0	0	295	116	295	116
	Sucker River	2,405	366	63	47	2,469	369
	Knife River	1,730	508	0	0	1,730	508
	Stewart River	2,117	408	148	73	2,265	408
	Silver Creek	403	192	0	0	403	192
	Gooseberry River	231	110	0	0	231	110
	Split Rock River	1,370	372	510	157	1,880	464
Upper Shore	Beaver River	134	77	0	0	134	77
	Baptism River	618	167	107	63	725	198
	Cross River	87	63	58	40	145	93
	Temperance River	91	91	0	0	91	91
	Poplar River	96	70	64	64	160	91
	Cascade River	96	96	64	44	160	102
	Devil Track River	276	131	0	0	276	131
	Kadunce Creek	1,032	197	61	42	1,092	205
	Brule River	415	180	0	0	415	180
Lower Shore		10,513	935	1,375	260	11,889	989
Upper Shore		2,844	386	354	115	3,197	415
Shorewide		13,357	1,012	1,729	285	15,086	1,073

Table 3. Estimated catch and catch rate (fish per angler-hour) for unclipped (wild-produced) and clipped (stocked) Rainbow Trout in the 2022 Lake Superior spring creel survey by station.

Station		Unclipped Steelhead Rainbow Trout						Clipped Rainbow Trout (Kamloops strain)						Clipped Steelhead Rainbow Trout (Superior strain)					
		Catch ≥16			Catch-rate ≥16			Catch ≥16			Catch-rate ≥16			Catch ≥16			Catch-rate ≥16		
		All	inches	(SE)	All	inches	(SE)	All	inches	(SE)	All	inches	(SE)	All	inches	(SE)	All	inches	(SE)
Lester River	Harvested	0	0	0	0.000	0.000	0.000	11	11	11	0.005	0.005	0.005	11	11	11	0.005	0.005	0.005
	Released	237	237	137	0.107	0.107	0.063	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	248	248	147	0.112	0.112	0.068	11	11	11	0.005	0.005	0.005	11	11	11	0.005	0.005	0.005
McQuade Harbor	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	13	13	11	0.031	0.031	0.032	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	13	13	11	0.031	0.031	0.032	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
French River	Harvested	0	0	0	0.000	0.000	0.000	10	10	10	0.034	0.034	0.034	0	0	0	0.000	0.000	0.000
	Released	20	20	13	0.068	0.068	0.051	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	20	20	13	0.068	0.068	0.051	10	10	10	0.034	0.034	0.034	0	0	0	0.000	0.000	0.000
Sucker River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	370	321	89	0.150	0.130	0.031	10	10	9	0.004	0.004	0.004	0	0	0	0.000	0.000	0.000
	Total	370	321	89	0.150	0.130	0.031	10	10	9	0.004	0.004	0.004	0	0	0	0.000	0.000	0.000
Knife River	Harvested	0	0	0	0.000	0.000	0.000	9	9	9	0.005	0.005	0.005	0	0	0	0.000	0.000	0.000
	Released	254	254	85	0.147	0.147	0.023	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	254	254	85	0.147	0.147	0.023	9	9	9	0.005	0.005	0.005	0	0	0	0.000	0.000	0.000
Stewart River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	18	18	11	0.008	0.008	0.005
	Released	631	631	151	0.279	0.279	0.068	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	649	649	155	0.287	0.287	0.069	0	0	0	0.000	0.000	0.000	18	18	11	0.008	0.008	0.005
Silver Creek	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	66	66	48	0.163	0.163	0.087	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	66	66	48	0.163	0.163	0.087	0	0	0	0.000	0.000	0.000	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	0	0	0	0.000	0.000	0.000
	Released	59	59	67	0.253	0.253	0.253	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	59	59	67	0.253	0.253	0.253	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Split Rock River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	272	272	123	0.145	0.145	0.067	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	272	272	123	0.145	0.145	0.067	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Lower Shore Total	Harvested	0	0	0	0.000	0.000	0.000	30	30	18	0.003	0.003	0.001	29	29	15	0.002	0.002	0.001
	Released	1,920	1,872	281	0.162	0.157	0.027	10	10	9	0.001	0.001	0.001	0	0	0	0.000	0.000	0.000
	Total	1,950	1,901	288	0.164	0.160	0.028	40	40	20	0.003	0.003	0.002	29	29	15	0.002	0.002	0.001

Table 3 *continued*. Estimated catch and catch rate (fish per angler-hour) for unclipped (wild-produced) and clipped (stocked) Rainbow Trout in the 2022 Lake Superior spring creel survey by station.

Station		Unclipped Steelhead Rainbow Trout						Clipped Rainbow Trout (Kamloops strain)						Clipped Steelhead Rainbow Trout (Superior strain)					
		Catch ≥16			Catch-rate ≥16			Catch ≥16			Catch-rate ≥16			Catch ≥16			Catch-rate ≥16		
		All	inches	(SE)	All	inches	(SE)	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	0	0	0	0.000	0.000	0.000
	Released	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Baptism River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	64	64	32	0.088	0.088	0.039	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	64	64	32	0.088	0.088	0.039	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Cross River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Temperance River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Poplar River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	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	0	0	0	0.000	0.000	0.000
	Released	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Devil Track River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	16	16	16	0.057	0.057	0.057	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	16	16	16	0.057	0.057	0.057	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Kadunce Creek	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	253	253	92	0.231	0.231	0.073	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	253	253	92	0.231	0.231	0.073	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Brule River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	74	74	38	0.178	0.178	0.039	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	74	74	38	0.178	0.178	0.039	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Upper Shore Total	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	406	406	106	0.127	0.127	0.037	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	406	406	106	0.127	0.127	0.037	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Shorewide Total	Harvested	0	0	0	0.000	0.000	0.000	30	30	18	0.002	0.002	0.001	29	29	15	0.002	0.002	0.001
	Released	2,327	2,278	300	0.154	0.151	0.023	10	10	9	0.001	0.001	0.001	0	0	0	0.000	0.000	0.000
	Total	2,356	2,307	307	0.156	0.153	0.023	40	40	20	0.003	0.003	0.001	29	29	15	0.002	0.002	0.001

Table 4. Yield, average length (inches), and average weight (pounds) of fish species caught in the 2022 Lake Superior spring creel survey.

Species	*Strain	Yield			Average Length (inches)				Average Weight (pounds)			
		Number Caught	Number Harvested	Pounds Harvested	Harvested	Released	All	(SE)	Harvested	Released	All	(SE)
Brook Trout	--	55	0	0	--	10.2	10.2	1.6	--	0.9	0.9	0.4
Coho Salmon	--	10	10	10	15.0	--	15.0	--	1.0	--	1.0	--
Sucker species	--	278	0	0	--	14.2	14.2	0.7	--	1.2	1.2	0.2
Unclipped Steelhead Rainbow Trout ($\geq 16"$)	Wild	2,307	0	0	--	23.9	23.9	0.2	--	4.3	4.3	0.1
Unclipped Steelhead Rainbow Trout ($< 16"$)	Wild	49	0	0	--	8.1	8.1	1.0	--	0.2	0.2	0.1
Clipped Steelhead Rainbow Trout ($\geq 16"$)	Superior	29	29	81	20.8	--	20.8	0.6	2.8	--	2.8	0.2
Clipped Steelhead Rainbow Trout ($< 16"$)	Superior	0	0	0	--	--	--	--	--	--	--	--
Clipped Kamloops Rainbow Trout ($\geq 16"$)	Kamloops	40	31	199	26.2	27.0	26.4	0.9	6.4	6.9	6.5	0.7

*Strain descriptions: Wild strain are an unclipped, wild-produced strain; Superior strain are a clipped (stocked) hatchery strain derived from steelhead captured at French and Knife rivers; Kamloops strain is a clipped (stocked) hatchery strain originally sourced from a hatchery in Montana, USA.

Table 5. The number of new (first time interviewed the spring) anglers who were interviewed in the Lake Superior spring creel survey by year.

Year	Estimate	Lower C.I.	Upper C.I.
1996	832	393	1,336
1997	1,269	764	1,775
1998	1,463	756	2,170
1999	1,587	1,051	2,122
2000	1,454	775	2,601
2001	1,069	494	1,725
2002	833	416	1,329
2003	1,218	468	1,968
2004	1,752	923	2,712
2005	2,133	1,122	3,145
2006	1,794	703	2,885
2007	2,073	840	3,744
2008	1,664	757	2,571
2009	1,923	1,106	2,741
2010	2,070	1,112	3,080
2011	2,243	1,379	3,107
2012	1,698	1,078	2,318
2013	1,325	769	1,882
2014	1,459	978	1,970
2015	1,744	872	2,616
2016	2,743	1,496	3,991
2017	1,787	1,074	2,500
2018	1,660	1,026	2,295
2019	1,561	1,002	2,121
2020	--	--	--
2021	2,128	862	3,394
2022	1,125	527	1,773
Mean	1,639	875	2,457