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LAKE SUPERIOR SPRING CREEL SURVEY

North Shore Streams

2023



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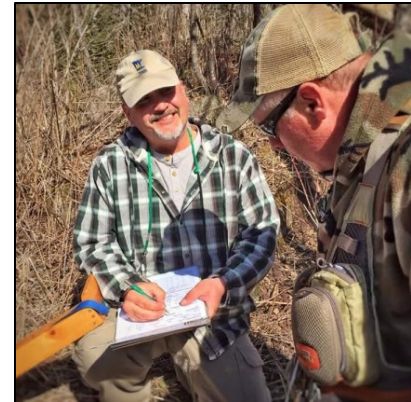
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BACKGROUND

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 the popular Rainbow Trout (*Oncorhynchus mykiss*) fishery in Minnesota waters. The Minnesota DNR has most recently managed two types of Rainbow Trout in Minnesota waters that were originally introduced to Lake Superior 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 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 few native salmonids to Lake Superior, are often the second most targeted 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](#); [Mamoozadeh et al. 2023](#)). Many non-native sport fish in Lake Superior also provide angling opportunities in the spring and fall. Brown Trout (*Salmo trutta*), 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 “shore wide” estimates. Pressure, catch, and catch rates are determined for individual tributaries, and for the lower shore, upper shore, and shore wide. Any anglers fishing in a tributary are 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).

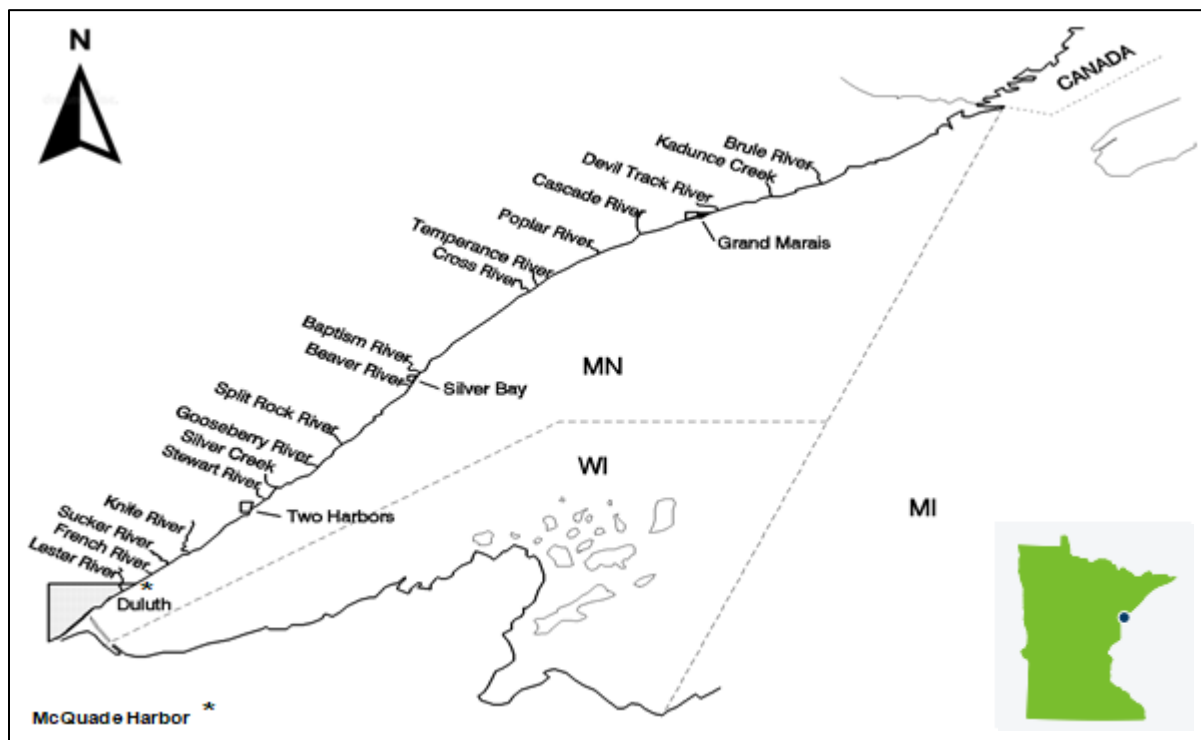


Figure 1: Map of sampling stations for the Lake Superior spring creel survey.

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 22 and ended on May 21, 2023. Creel clerks completed a total of 325 site visits (counts) and collected 638 angler interviews shore wide. The majority (76%) of angler interviews were collected in the lower shore, and most (97%) were fishing streams. Most interviews in the lower and upper shore were collected at the Stewart River (137) and the Baptism River (56), respectively. Total fishing pressure (angler-hours) in 2023 was 15,093, which was lower than the interquartile range of the historic average (30,363; Q1: 22,620, Q3: 38,029) (Table 1; Figure 2). Most of the annual fishing effort on the shore occurs in lower shore rivers that are closest to the metropolis of Duluth, therefore environmental and stream conditions, or management changes (e.g., changes to stocking programs), in this zone have the most impact on the total annual fishing effort shore wide.

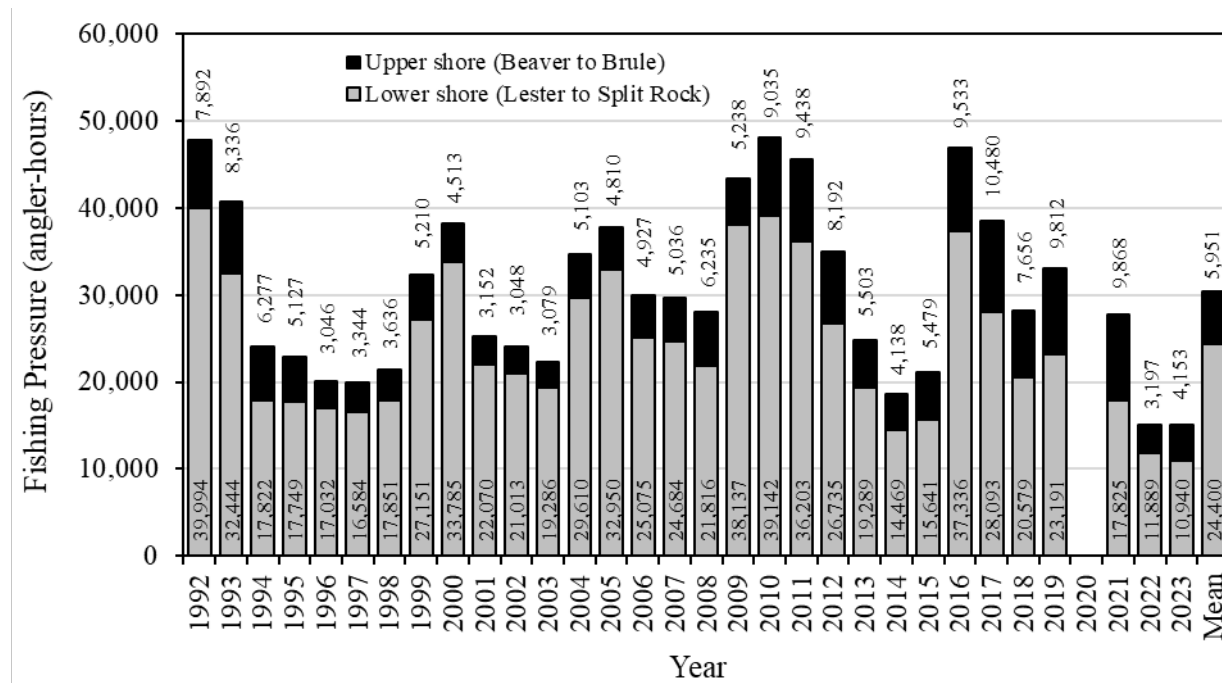


Figure 2: Fishing pressure (angler-hours) in the lower shore, upper shore, and shore wide from the Lake Superior spring creel survey by year and the historic average (Mean).

Fishing pressure was lower than the historic averages at 14 of 18 rivers shore wide in 2023 (Figure 3). This was somewhat expected given the harsh environmental and fishing conditions in 2023. For the second year in a row, the North Shore experienced a late spring thaw, floods, and high-water conditions, and winter extended into spring with ice off nearly one month later than average ([Peterson 2022](#)). A record amount of snow (146 total inches) throughout winter melted rather quickly leaving many rivers high, dirty, and unfishable for much of the spring. Water levels receded quickly in early-May at about the same time the inland (lake) fishing season opened, and many stream anglers likely left to fish lakes.

Fishing pressure in the lower shore (10,940) was much lower than the interquartile range of the historic average (24,400; Q1: 17,823, Q3: 31,027) and the lowest fishing pressure observed in the history of the spring creel survey in this area. The highest fishing pressure in the lower shore

was at the Stewart River (3,247) and Lester River (2,199), and lowest was at McQuade Harbor (196) and the French River (131) (Table 2). The French River and McQuade Harbor historically contributed an average of 6,000 angler-hours of effort per year but only contributed 327 angler-hours total in 2023. Angler effort and catch at these stations is basically non-existent today due to the recent switch from stocking Kamloops strain to Superior strain Rainbow Trout. The Kamloops strain tended to return to nearshore areas and be accessible to anglers in late-winter throughout the spring, whereas the new Superior strain likely returns to nearshore areas just before ice-out on rivers. The Superior strain is also more likely to run further up rivers and be caught most often in streams versus the lake (Miller et al. 2020). Most Rainbow Trout that were caught in McQuade Harbor were previously captured at the French River during MNDNR spawning operations and then released into the harbor after gamete collection. Annual fishing pressure and catch at McQuade Harbor was largely dependent on the number of Rainbow Trout captured by Minnesota DNR at the French River, which has been low in recent years (Hallam and Peterson 2019). The catch of Rainbow Trout at French River has been low in recent years because of an outbreak of bacterial kidney disease in wild adult broodstock that limited egg supply for hatchery production and stocking, poor egg and juvenile survival and excess mortality of juveniles during transport to stocking locations in the French River; all these issues have been resolved. Adult returns are expected to improve as adults from multiple stocked year-classes return in coming years.

Fishing pressure in the upper shore in 2023 (4,153) remained within the interquartile range of the historic average (5,951; Q1: 4,146, Q3: 8,042); the highest pressure was at the Baptism River (1,465) and the lowest at the Temperance River (30; Table 2; Figure 3). Like the lower shore, most of the large rivers in the upper shore remained high, dirty, and unfishable for much of April, and many were not fishable until early May, which concentrated most fishing effort at only a few rivers (i.e., Baptism River and Kadunce Creek) (Figure 3).

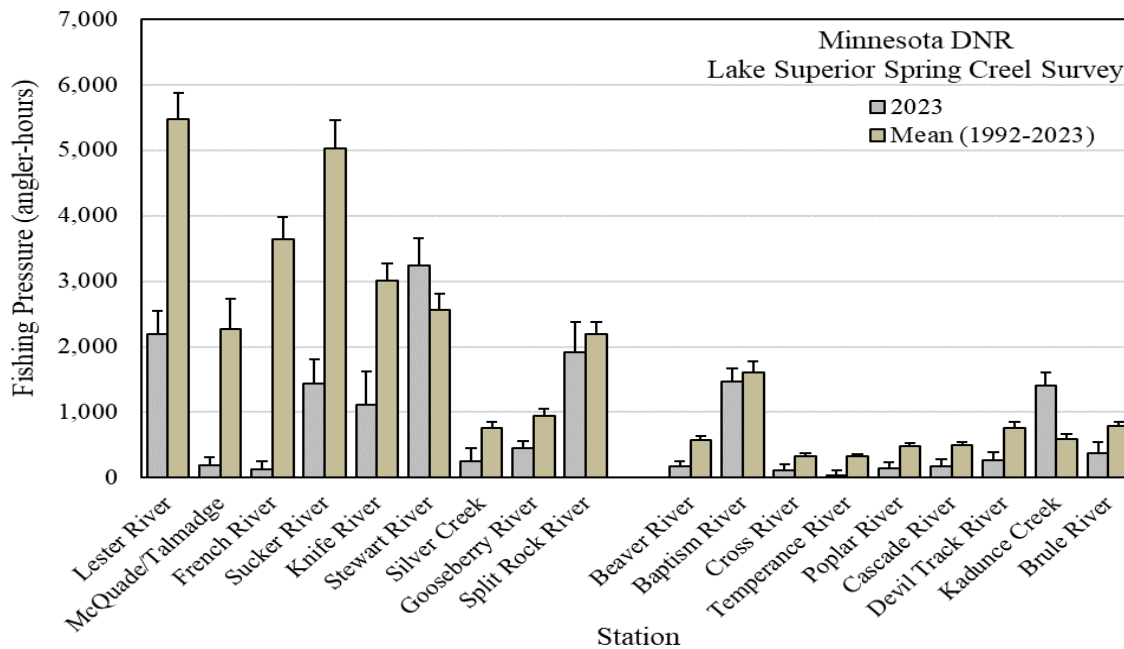


Figure 3: Fishing pressure estimates (angler-hours) in the Lake Superior Spring creel survey in 2023 and the historic average at each station.

Rainbow Trout were by far the most sought-after fish species in spring 2023. Ninety-seven percent ($N=622$) of all anglers interviewed targeted Rainbow Trout, 96% ($N=613$) primarily targeted steelhead and 1% ($N=9$) targeted Kamloops or clipped Steelhead. Twelve percent ($N=96$) of all anglers interviewed mentioned Brook Trout as their primary or secondary target species. Other target species mentioned at low percentages ($\leq 1\%$) 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.

In 2023, an estimated 825 anglers participated in the Lake Superior spring fishery which was lower than the historic average (1,609) and the lowest participation rate observed in the history of the spring creel survey. Lower participation was expected, as stream conditions were not conducive for fishing North Shore streams for most of the spring (explained above). A total of 637 anglers were interviewed shore wide, of which 473 were ‘new anglers’ (first time interviewed this spring). Anglers were residents of 9 U.S. states; 94% were residents of Minnesota, 4% were from Wisconsin, and less than 1% were from other states. Only 4.7% (22) of anglers interviewed were female, which was lower than 2021 (6.7%, $N=57$) and 2022 (5.5%, $N=29$) (Table 3; Figure 4).

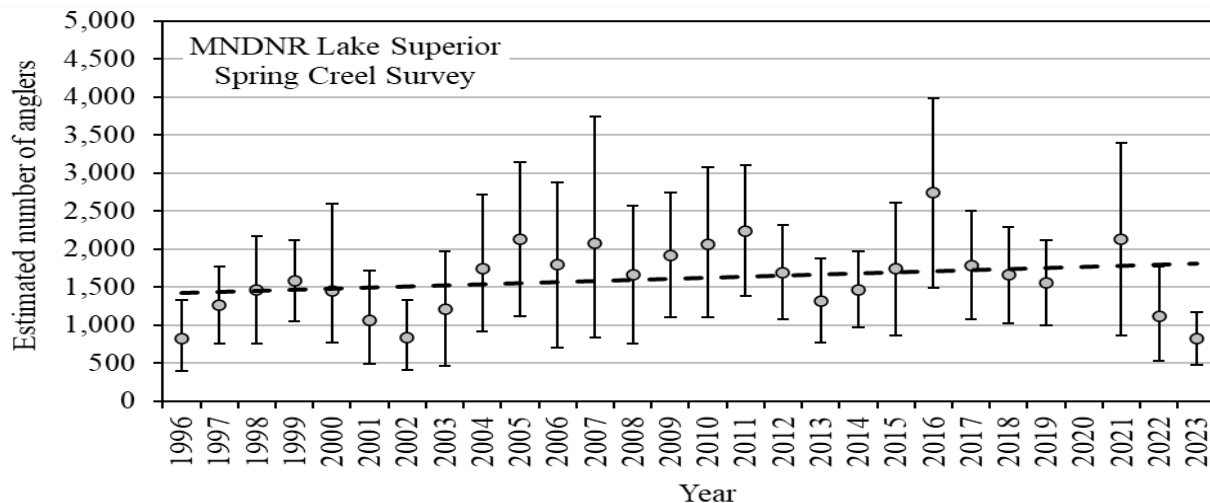


Figure 4: The estimated number of new (first time interviewed this spring) anglers who were interviewed in the Lake Superior spring creel survey by year. Error bars are upper and lower 95% confidence intervals.

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 had a maxillary clip that was often difficult for anglers to identify, so these fish were 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](#)).



The estimated number of unclipped Rainbow Trout caught shore wide has been relatively stable over the past two decades, however, has slightly declined over the past two years. An estimated 2,053 unclipped Rainbow Trout were caught in 2023, which was lower than the historic average (2,882, range: 403 to 7,184) (Table 4; Figure 5). The average length was 25 inches, and the average weight was 5.0 pounds; the largest unclipped Rainbow Trout reported in 2023 was 31 inches and 8.6 pounds (Table 5). Catches in both the lower shore (1,613) and upper shore (440) in 2023 were lower than the historic averages (lower shore: 2,029; upper shore: 853) (Table 4; Figure 6). The highest catches in the lower shore were at the Stewart River (570) and Split Rock River (443) and in the upper shore at Kadunce Creek (207) and the Baptism River (147). All unclipped Rainbow Trout were reported as caught in streams and no illegally harvested fish were observed (Table 4). Zero small (<16 inches) Rainbow Trout were captured shore wide in 2023, which has never happened in the history of the spring creel survey (historic average is 552).

Although the number of unclipped Rainbow Trout caught has declined in recent years, the catch-rate, which incorporates fishing effort with catch to standardize comparisons among years, has remained relatively stable over time. The shore wide catch-rate for unclipped

Rainbow Trout in 2023 was 0.136 fish per angler-hour (7.4 angler-hours per fish) which was better than the historic average (0.094 fish per angler-hour, 10.6 angler-hours per fish) (Figure 6). The lower shore catch rate was 0.147 fish per angler-hour (6.8 angler-hours per fish), which was better than the historic average of 0.084 fish per angler-hour (11.9 angler-hours per fish). The upper shore catch rate was 0.106 fish per angler-hour (9.4 angler-hours per fish), which was nearly half of the historic average of 0.2 fish per angler-hour (5.0 angler-hours per fish) (Table 4; Figure 6). The best catch-rates in the lower shore were at Silver Creek (0.357; 2.8 angler-hours per fish), the Split Rock River (0.231; 4.3 angler-hours per fish), and the Stewart River (0.176; 5.7 angler-hours per fish). Catch-rates in the upper shore were highest at the Poplar River (0.164; 6.1 angler-hours per fish), the Devil Track River (0.153; 6.5 angler-hours per fish), and Kadunce Creek (0.147, 6.8 angler-hours per fish) (Table 4).

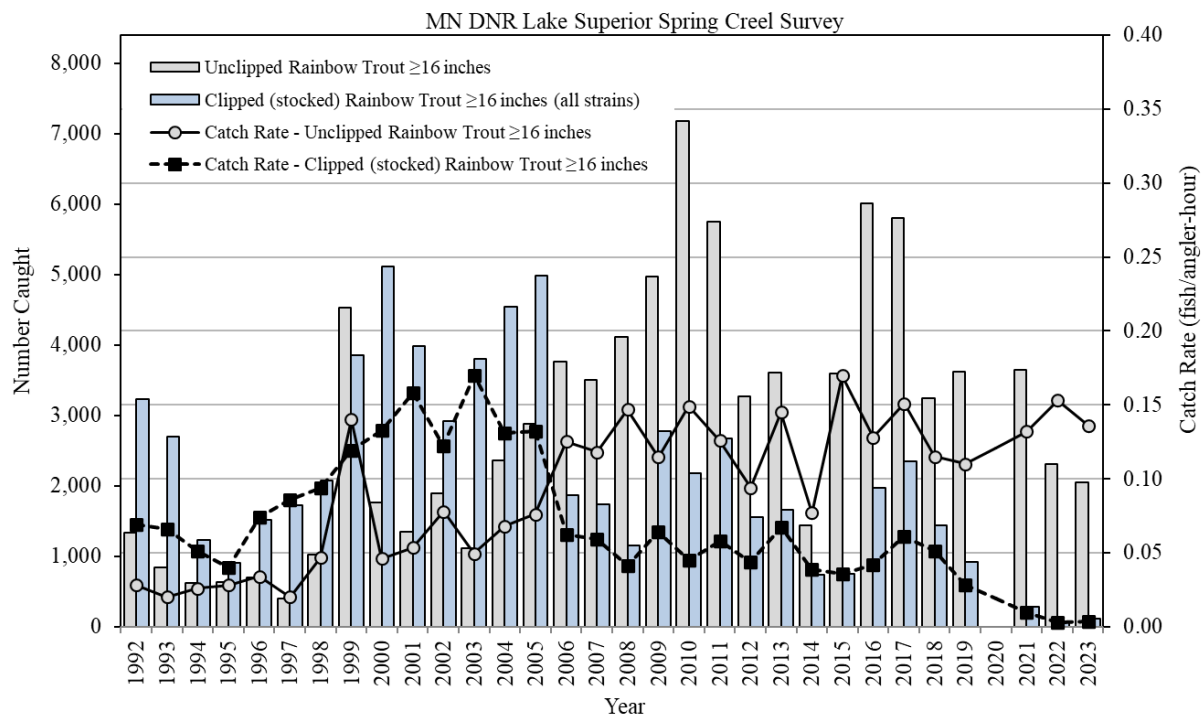


Figure 5: Shore wide estimated catch and catch-rate (fish per angler-hour) of unclipped and clipped (stocked) Rainbow Trout from the Lake Superior spring creel survey by year. Totals in 2022 are combined for Kamloops and clipped Superior strain steelhead.

Catch and catch-rates for unclipped Rainbow Trout have improved over the past 30 years largely due to stocking programs and restrictive harvest regulations implemented by the Minnesota DNR. Shore wide catch-rates of unclipped Rainbow Trout increased from 1992 until 2006 and since then has remained above 0.10 fish per hour (10 hours per fish caught) nearly every year, except for 2012 and 2014 (Figure 5). Catch-rates in the lower shore have consistently improved over time and three of the highest catch-rates have occurred in the past three years (2021-2023). Catch-rates in the lower shore have commonly remained lower than in the upper shore. Catch-rates in the upper shore improved quickly in the first 10 years of the creel survey (1992-2002); they remained above 0.15 fish per hour (6.7 hours per fish caught) for nearly every year between 2002 and 2018, and exceeded 0.20 fish per hour (5 hours per fish

caught) in 6 years (2002-2003, 2006, 2008, 2011, and 2015). Catch-rates in the lower shore surpassed and remained better than catch-rates in the upper shore beginning in 2018. Rainbow Trout fry stocking was suspended in upper shore rivers in the mid-2010s and lower shore rivers in 2018 to evaluate the contributions of fry stocking and to utilize those gametes to initiate the new clipped Superior strain steelhead stocking program ([Goldsworthy et al. 2017](#)). Since 2018, catch-rates in the upper shore have remained around 0.10 fish per hour (10 hours per fish caught), which probably represents what catch-rates can be expected from natural reproduction and lack of stocking in this region. Some lower shore rivers were stocked with fry through 2016 (i.e., Stewart, Silver, and Split Rock rivers) and adults from those year-classes still exist in nature; therefore, the catch-rates that can be expected from natural reproduction (or absence of fry stocking) in the lower shore will not be realized for a couple more years (Figure 6).

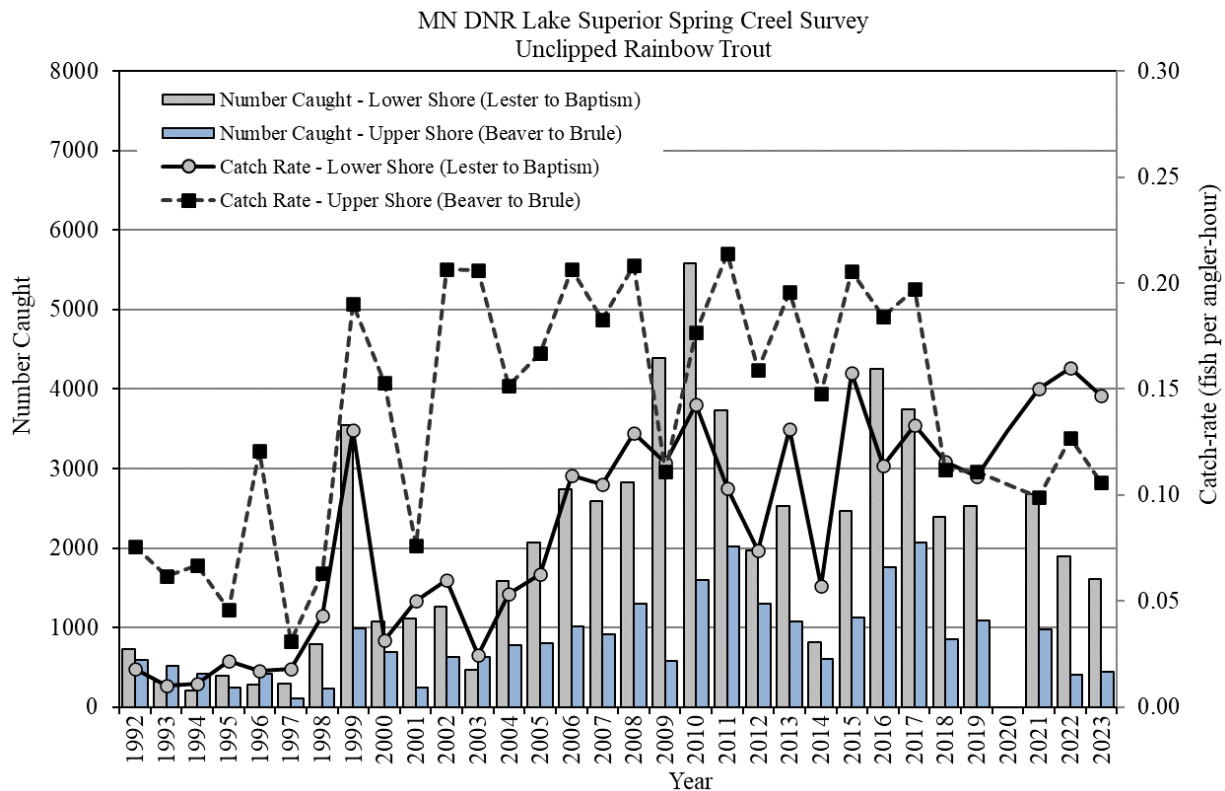


Figure 6: Estimated catch and catch rate (fish per angler-hour) of unclipped Rainbow Trout in the lower and upper shore from the Lake Superior spring creel survey by year.

Catch and catch-rates in the upper shore in recent years should now indicate where Rainbow Trout abundances have reached (or are close to reaching) equilibrium with accessible spawning and rearing habitat in streams. Natural reproduction of Rainbow Trout will not be the same for all streams in Minnesota waters. As expected, preliminary results comparing catch rates before and after the suspension of stocking varies by river. 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](#)). Some streams may require supplemental stocking above barriers to support a Rainbow Trout fishery below barriers. For example, catch-rates consistently declined in the Cross River after fry stocking was suspended

in 2013, and zero fish were reported caught there in 2023. Conversely, catch-rates remained stable or improved at many other rivers (e.g., Baptism, Temperance, and Poplar rivers) after suspension of fry stocking. More years of creel data at these rivers will help account for potential influences of natural produced year-class abundances and variable environmental conditions that could influence angling success at stocked rivers. 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 2025).

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 needed. 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 have continued to improve over time and target catch-rates that would initiate harvest of these fish have been met ([Schreiner et al. 2006](#); [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.

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 prior to 2022. Kamloops caught by anglers in 2022 were older and larger than clipped Superior strain steelhead (Table 5), and the same was apparent at the Knife River fish trap ([Peterson 2022](#)), therefore catch and catch-rates for clipped Superior strain steelhead and Kamloops (if they still exist) are reported separately beginning in 2022.

Kamloops Rainbow Trout

Fifty Kamloops were captured by anglers in spring 2023 which was significantly lower than the historic average for clipped Rainbow Trout (1,617) (Figure 5). All Kamloops were caught in streams in the lower shore; 21 at the Lester River, 8 at the Talmadge River (McQuade Harbor creel station), and 20 at the Split Rock River. Thirty-six percent (18) of all Kamloops caught were harvested (Table 4; Figure 7). The average length reported by anglers was 28.2 inches and the average weight was 7.9 pounds (Table 5). The shore wide 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 (0.070; 14.3 angler-hours per fish) (Table 4; Figure 8). All Kamloops caught in 2023 were at least 7 years old.



The low catch and catch-rates of Kamloops in 2023 was expected because no stocking has occurred since 2017. The last stocked year-class of Kamloops would be 7 years old in 2023 (from the 2016 year-class), which has surpassed their average life expectancy (4 years old; [Hallam and Peterson 2019](#)). The low catches of Kamloops in the lower shore between 2018 and 2023 was largely influenced by the combined effects from declining Kamloops abundances over time and a lack of angling effort at the French River and McQuade Harbor (explained above). Catch of clipped (harvestable) Rainbow Trout, which includes any remaining Kamloops plus recently stocked clipped Superior strain steelhead strains, is expected to remain low over the next few years; multiple year-classes of clipped Superior strain steelhead need to become established and return as adults before we can expect catch, catch-rates, and harvest opportunities to improve.

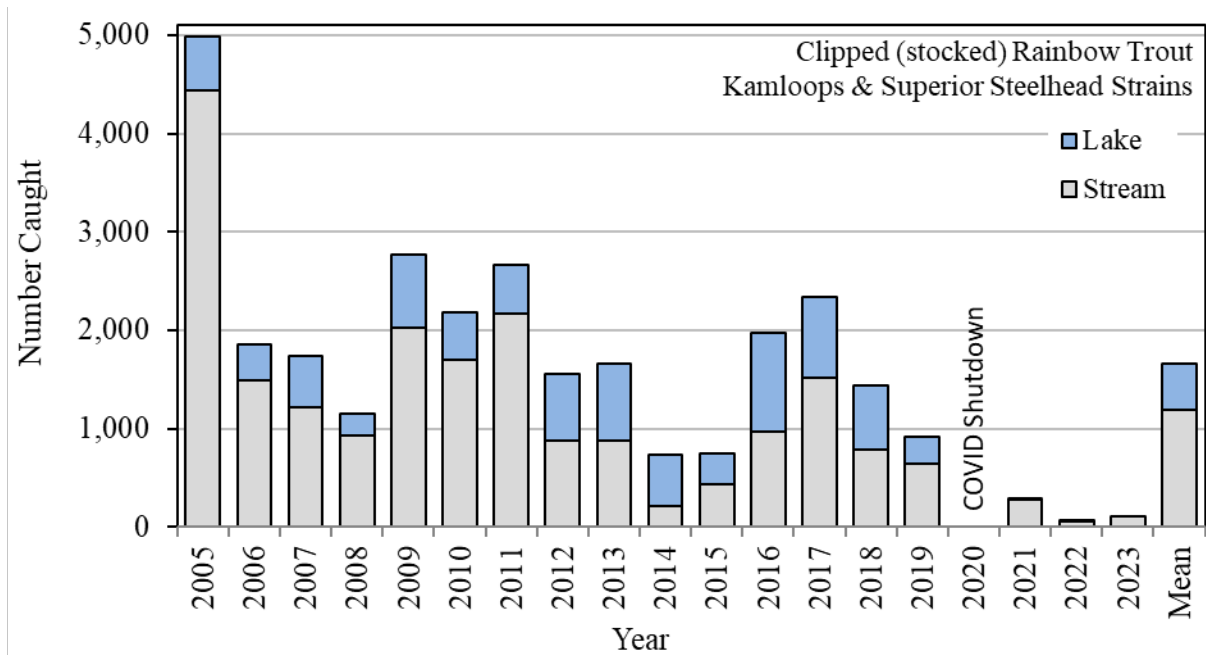


Figure 7: Estimated number of clipped (stocked) Rainbow Trout ≥ 16 inches caught in the lake and stream and the historic average (Mean) since 2005.

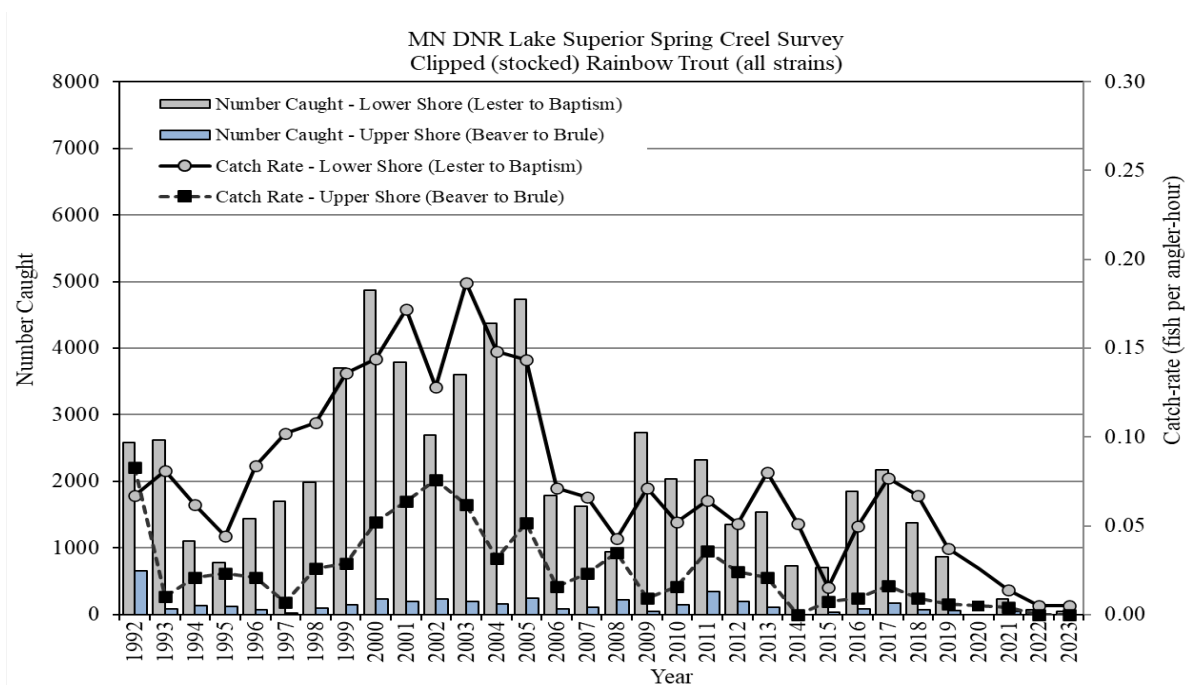


Figure 8: Estimated catch and catch rate (fish per angler-hour) of clipped (stocked) Rainbow Trout in the lower and upper shore from the Lake Superior spring creel survey by year. Totals in 2022 are combined for Kamloops and clipped Superior strain steelhead.

Superior Strain Steelhead

Eighty-four clipped Superior strain steelhead were captured by anglers in spring 2023; 62 were legal-sized (≥ 16 inches) and 22 were sub-legal sized (< 16 inches). The shore wide catch-rate was 0.004 fish per angler-hour (250 angler-hours per fish), which was better than the catch-rate from 2022 (0.002, 500 angler-hours per fish). Clipped steelhead adults that were legal size to harvest (≥ 16 inches) were caught in only four rivers shore wide: at the Lester River (11), Stewart River (24), and Split Rock River (10), and Kadunce Creek (17). All sub-legal sized fish and most (58%) of all legal-sized clipped steelhead caught were released (Table 4). Average size of clipped steelhead adults was 24.2 inches and 4.5 pounds; sub-legal sized fish averaged 11.5 inches and 0.6 pounds (Table 5). No clipped steelhead were reported caught in the lake during the creel survey; however, pictures of clipped fish caught in the lake before rivers were free of ice and prior to the start of the spring creel survey exist on social media.



The first year-class of clipped Superior strain steelhead were stocked in 2018 (2017 year-class, 6 years old in 2023). The average length-at-age for fish from this year class that returned to the French River trap over the past three years has been 16.9 inches at age-3, 20.4 inches at age-4, and 25.0 inches at age-5. The average growth rate observed between age-4 and age-5 (5 inches) is great compared to traditional growth-rates for naturalized steelhead (2-3 inches) in Minnesota waters, which indicates these fish had ample forage and growing conditions in Lake Superior over the last year. The initial number of fish that returned from this stocked year class was poor and less than 60 fish from this year-class have been captured in traps or creel surveys over the past three years. We would assume that most adults from this year-class should have returned to spawn in 2022 and 2023 (Figure 7), as most naturalized steelhead year-classes typically return when they are age-5 or age-6 (Peterson 2022). Adult steelhead populations that return to rivers to spawn are comprised of a multitude of year-classes (not all the same age). Only two year-classes of clipped Superior strain steelhead were expected to return as adults in 2023, so catch rates should improve as more year-classes return in coming years. The return of adult steelhead from individual stocked year-classes is dependent on several variables within (e.g., efficiencies in egg take, hatchery production and stocking) and outside (e.g., disease outbreaks, survival of juveniles in streams and Lake Superior) of the Minnesota DNRs control.

Brook Trout

Brook Trout are the second most common species caught in the spring creel. An estimated 49 Brook Trout were caught in spring 2023, which was much lower than the historic average of 487 (Figure 9). The average length and weight were 12.8 inches and 1.5 pounds, respectively (Table 5). The shore wide catch-rate was also very low (0.003 fish per angler-hour; 333.3 angler-hours per fish). The low catches of Brook Trout in spring 2023 is not concerning as 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 observed in 2023. 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 at the Minnesota DNRs [Lake Superior Area Fisheries website](#) & the Minnesota Steelheader [Coaster Genetics Project website](#).

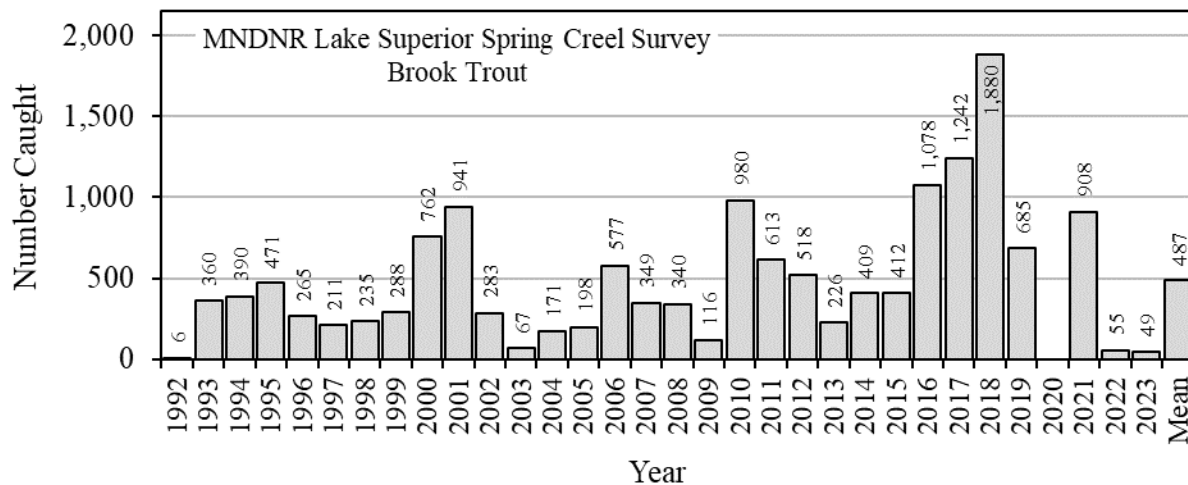
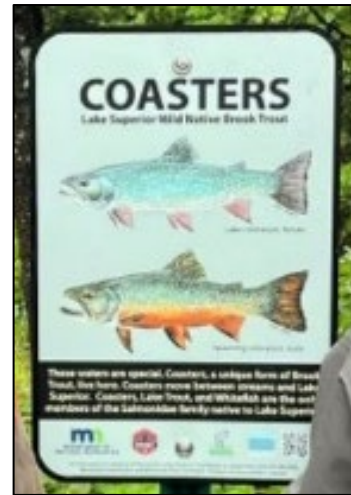


Figure 9: The estimated number of Brook Trout caught during the Lake Superior spring creel survey by year and the historic average (Mean).

Other Species

Estimated catch of other fish species in 2023 was 303 suckers (White and Longnose suckers). All suckers were caught in streams, and all were released (Table 5).

No Coho salmon were reported caught in the 2023 spring creel survey; however, online reports show Coho were captured shore fishing prior to the spring creel. 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, the contributions of natural reproduction below barriers in Minnesota remains largely unknown. 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 all fish species that spawn in the fall (Brook Trout, Brown Trout, and all salmon). 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:

LAKE SUPERIOR SPRING CREEL SURVEY

North Shore Streams

2023

Report Completed By:
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Area Supervisor \ Date

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	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	1992-2023		
													Mean	Minimum	Maximum
Lower Shore	Lester River	3,588	2,580	3,699	7,293	4,955	3,051	3,115	--	2,933	2,215	2,199	5,473	2,199	10,476
	McQuade/Talmadge	2,407	1,340	1,659	5,453	3,612	2,657	3,158	--	359	401	196	2,275	196	5,453
	French River	3,544	3,080	2,409	6,014	3,678	1,868	2,033	--	422	295	131	3,637	131	8,544
	Sucker River	3,566	2,880	2,265	4,914	4,713	4,131	3,613	--	2,342	2,469	1,437	5,030	1,437	12,990
	Knife River	1,903	1,540	1,629	6,597	3,215	3,363	3,461	--	2,574	1,730	1,110	3,008	1,110	6,597
	Stewart River	1,885	1,280	1,653	3,385	3,658	2,620	3,830	--	4,111	2,265	3,247	2,566	720	5,782
	Silver Creek	131	312	577	582	529	522	759	--	703	403	254	766	131	1,996
	Gooseberry River	325	257	532	1,105	1,330	612	778	--	837	231	451	943	231	2,475
	Split Rock River	1,940	1,200	1,217	1,993	2,402	1,756	2,444	--	3,545	1,880	1,916	2,194	1,145	5,400
Upper Shore	Beaver River	304	233	473	436	685	346	572	--	565	134	169	584	134	1,159
	Baptism River	866	630	1,173	2,285	3,303	2,370	2,918	--	3,545	725	1,465	1,601	448	3,570
	Cross River	525	339	338	700	1,004	549	381	--	518	145	120	331	53	1,004
	Temperance River	630	83	359	370	494	319	306	--	175	91	30	328	30	788
	Poplar River	420	330	357	645	508	299	803	--	488	160	150	484	150	1,347
	Cascade River	296	309	438	846	601	307	301	--	789	160	180	498	160	939
	Devil Track River	857	677	1,355	1,421	1,841	2,066	1,833	--	1,481	276	266	756	75	2,066
	Kadunce Creek	642	770	448	1,420	1,030	570	1,630	--	1,006	1,092	1,405	591	79	1,630
Brule River	963	767	539	1,410	1,015	829	1,069	--	1,302	415	369	791	207	1,505	
Lower Shore		19,289	14,469	15,641	37,336	28,093	20,579	23,191	--	17,825	11,889	10,940	24,400	10,940	39,994
Upper Shore		5,503	4,138	5,479	9,533	10,480	7,656	9,812	--	9,868	3,197	4,153	5,951	3,046	10,480
Shorewide		24,792	18,607	21,120	46,868	38,573	28,235	33,003	--	27,693	15,086	15,093	30,363	15,086	48,177

Table 2. Fishing pressure estimates (angler-hours \pm 1 standard error [SE]) from the 2023 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	2,090	389	109	63	2,199	413
	McQuade/Talmadge	196	108	0	0	196	108
	French River	0	0	131	64	131	64
	Sucker River	1,415	303	22	22	1,437	301
	Knife River	1,110	301	0	0	1,110	301
	Stewart River	3,247	619	0	0	3,247	619
	Silver Creek	254	149	0	0	254	149
	Gooseberry River	451	181	0	0	451	181
	Split Rock River	1,815	373	101	46	1,916	368
Upper Shore	Beaver River	169	91	0	0	169	91
	Baptism River	1,465	364	0	0	1,465	364
	Cross River	90	65	30	30	120	69
	Temperance River	30	30	0	0	30	30
	Poplar River	150	72	0	0	150	72
	Cascade River	150	95	30	30	180	97
	Devil Track River	266	130	0	0	266	130
	Kadunce Creek	1,405	329	0	0	1,405	329
	Brule River	369	197	0	0	369	197
Lower Shore		10,578	961	362	103	10,940	970
Upper Shore		4,093	569	60	42	4,153	570
Shorewide		14,671	1,117	422	112	15,093	1,125

Table 3. 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
2023	825	473	1,178
Mean	1,609	860	2,409

Table 4. 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	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	171	171	61	0.078	0.078	0.024	21	21	15	0.010	0.010	0.007	32	11	11	0.015	0.005	0.005
	Total	171	171	61	0.078	0.078	0.024	21	21	15	0.010	0.010	0.007	32	11	11	0.015	0.005	0.005
McQuade Harbor	Harvested	0	0	0	0.000	0.000	0.000	8	8	5	0.043	0.043	0.030	0	0	0	0.000	0.000	0.000
	Released	8	8	12	0.043	0.043	0.048	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	8	8	12	0.043	0.043	0.048	8	8	5	0.043	0.043	0.030	0	0	0	0.000	0.000	0.000
French 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
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	191	191	78	0.133	0.133	0.047	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	191	191	78	0.133	0.133	0.047	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
Knife 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	90	90	34	0.081	0.081	0.023	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	90	90	34	0.081	0.081	0.023	0	0	0	0.000	0.000	0.000	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	16	16	11	0.005	0.005	0.003
	Released	570	570	171	0.176	0.176	0.041	0	0	0	0.000	0.000	0.000	8	8	8	0.002	0.002	0.003
	Total	570	570	171	0.176	0.176	0.041	0	0	0	0.000	0.000	0.000	24	24	14	0.008	0.008	0.004
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	91	91	94	0.357	0.357	0.461	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	91	91	94	0.357	0.357	0.461	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	49	49	34	0.109	0.109	0.063	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	49	49	34	0.109	0.109	0.063	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	10	10	9	0.005	0.005	0.005	10	10	9	0.005	0.005	0.005
	Released	443	443	161	0.231	0.231	0.071	10	10	10	0.005	0.005	0.005	0	0	0	0.000	0.000	0.000
	Total	443	443	161	0.231	0.231	0.071	20	20	12	0.010	0.010	0.006	10	10	9	0.005	0.005	0.005
Lower Shore Total	Harvested	0	0	0	0.000	0.000	0.000	30	30	10	0.002	0.002	0.001	26	26	15	0.002	0.002	0.001
	Released	1,613	1,613	276	0.147	0.147	0.028	32	32	18	0.003	0.003	0.002	40	19	14	0.004	0.002	0.001
	Total	1,613	1,613	276	0.147	0.147	0.028	50	50	20	0.005	0.005	0.002	67	45	20	0.006	0.004	0.002

Table 4 *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	147	147	90	0.100	0.100	0.056	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	147	147	90	0.100	0.100	0.056	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	25	25	24	0.164	0.164	0.165	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	25	25	24	0.164	0.164	0.165	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	41	41	31	0.153	0.153	0.082	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	41	41	31	0.153	0.153	0.082	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	207	207	79	0.147	0.147	0.044	0	0	0	0.000	0.000	0.000	17	17	17	0.012	0.012	0.012
	Total	207	207	79	0.147	0.147	0.044	0	0	0	0.000	0.000	0.000	17	17	17	0.012	0.012	0.012
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	21	21	20	0.056	0.056	0.064	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Total	21	21	20	0.056	0.056	0.064	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	440	440	127	0.106	0.106	0.034	0	0	0	0.000	0.000	0.000	17	17	17	0.004	0.004	0.004
	Total	440	440	127	0.106	0.106	0.034	0	0	0	0.000	0.000	0.000	17	17	17	0.004	0.004	0.004
Shorewide Total	Harvested	0	0	0	0.000	0.000	0.000	30	30	10	0.001	0.001	0.001	26	26	15	0.002	0.002	0.001
	Released	2,053	2,053	304	0.136	0.136	0.023	32	32	18	0.002	0.002	0.001	57	36	22	0.004	0.002	0.001
	Total	2,053	2,053	304	0.136	0.136	0.023	50	50	20	0.003	0.003	0.001	84	62	26	0.006	0.004	0.002

Table 5. Yield, average length (inches), and average weight (pounds) of fish species caught in the 2023 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	--	49	0	0	--	12.8	12.8	1.3	--	1.5	1.5	0.4
Coho Salmon	--	0	0	0	--	--	--	--	--	--	--	--
Sucker species	--	303	0	0	--	14.9	14.9	0.8	--	1.7	1.7	0.3
Unclipped Steelhead Rainbow Trout ($\geq 16"$)	Wild	2,053	0	0	--	25.0	25.0	0.2	--	5.0	5.0	0.1
Unclipped Steelhead Rainbow Trout ($< 16"$)	Wild	0	0	0	--	--	--	--	--	--	--	--
Clipped Steelhead Rainbow Trout ($\geq 16"$)	Superior	62	26	137	25.8	22.7	24.2	1.0	5.3	3.7	4.5	0.5
Clipped Steelhead Rainbow Trout ($< 16"$)	Superior	22	0	0	--	11.5	11.5	3.5	--	0.6	0.6	0.4
Clipped Kamloops Rainbow Trout ($\geq 16"$)	Kamloops	50	19	147	28.0	28.3	28.2	0.5	7.7	8.1	7.9	0.4

*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.