

Period: April 1, 2021-March 31, 2021 (Segment 35-1)

Federal Project Number: F21AF00978

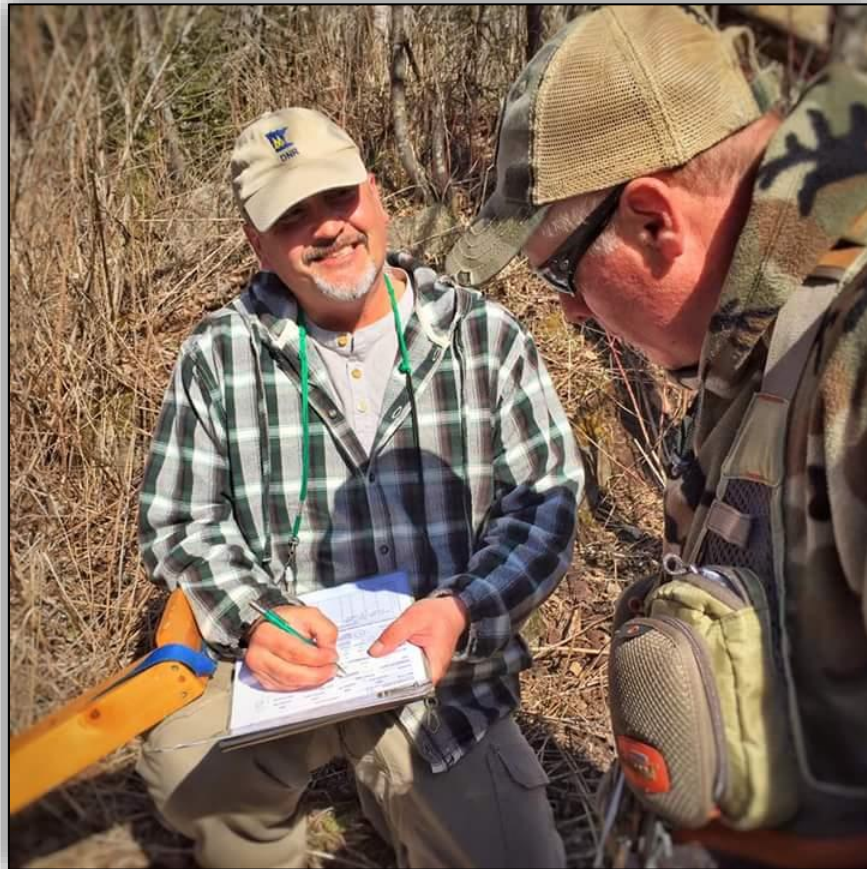
State Project Number: R29G60F29RP35

Study 4

Job 1068

LAKE SUPERIOR SPRING CREEL SURVEY

2021



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Reimbursed under Federal Aid by the Sport Fish Restoration Act to Minnesota F21AF00978

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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 introduced in Minnesota waters in 1972 to provide harvest opportunities for Rainbow Trout while steelhead populations were rehabilitated (Close and Hassinger 1981). The Kamloops stocking program was discontinued in 2018 and replaced with a genetically screened, clipped steelhead stocking program.

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 and 2000. The creel survey was cancelled in 2020 due to the COVID-19 pandemic and state shutdown. 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 2021 based on the stratified random design used in the creel survey throughout this 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, all other non-native sport fish spawn and return to rivers in fall; therefore, few or none are caught in tributaries in the spring. 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 before 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 before 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. A winter creel was completed on Lake Superior, from Duluth to Two Harbors, throughout

winter 2018. The winter creel was used to estimate fishing pressure, catch and catch-rates for Lake Trout, Salmon (Coho and Chinook), and Lake Herring (also called Cisco), and did not specifically target anglers who were specifically targeting Rainbow Trout (i.e., anglers fishing near shore at French River and in McQuade Harbor) ([Reeves 2019](#)).

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. 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.

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 period from 1992 to 2019.

Clipped (hatchery-produced, stocked) Kamloops and steelhead possess an adipose fin clip making them legal for anglers to harvest after they reach a minimum size of 16 inches. The Minnesota DNR initiated a clipped steelhead stocking program in the French and Lester rivers in 2018 and the first return of these fish as adults should be realized in 2021. Clipped Rainbow Trout (Kamloops or clipped steelhead) that are 16 inches or larger are allowed to be harvested.

Most unclipped steelhead caught before 2021 were either naturally produced or products of the MNDNR steelhead fry stocking program. The fry stocking program was suspended in 2018 so available gametes could be used in the development of the new clipped 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 2019](#)). Unclipped Rainbow Trout (steelhead) are currently maintained as a catch-and-release-only fishery. Most 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 Knife River adult trap data. All other methods are summarized in Ostazeski (2004).

Fishing Pressure & Target Species

The annual spring creel survey ran from April 3 through May 14, 2021. The lower and middle shore ended on May 9 and in the upper shore ended on May 14. A total of 1,081 interviews were collected shorewide. The majority (73%) of angler interviews were collected in the lower shore, and most (92%) were fishing streams. Most interviews in the lower and upper shore were collected at the Stewart (160) and the Baptism (114) rivers, respectively. Fishing pressure has gradually increased over time since 1992 but has remained relatively stable over the last decade. Total fishing pressure (angler-hours) in 2021 was 27,693, which was lower but within the interquartile range of the historic average (31,549; Q1: 23,765, Q3: 38,367). (Table 1, Figure 2).

The majority (64%) of the fishing pressure observed in 2021 was at lower shore rivers. As a percentage of the overall shorewide fishing pressure, this was the lowest pressure observed in the lower shore over the past 28 years. Fishing pressure in the lower shore in 2021 (17,825) was lower than the historic average (25,562) and ranged from 4,111 at the Stewart River to 359 at McQuade Harbor/Talmadge River. Compared to the historic average among the nine stations in the lower shore, fishing pressure was significantly lower than average at the four stations closest to Duluth (Lester, McQuade/Talmadge, French, and Sucker rivers), similar to the historic average at the Knife River, Silver Creek and Gooseberry River, and significantly higher than the historic averages at Stewart and Split Rock rivers. Fishing pressure at the Stewart River (4,111) was the third highest angling pressure ever recorded there and 48% higher than the historic average at this location (2,489). Angling pressure at McQuade Harbor/Talmadge River (359) and the French River (422) were the lowest ever observed at these locations (Table 1; Figure 3). Noticeable decreases in pressure at stations in the lower shore was expected due to changes to the Rainbow Trout stocking program and the lack of fish captured at French River and released into McQuade Harbor.

Angling pressure in the upper shore was above average and six of nine rivers experienced above-average angling pressure. Fishing pressure in the upper shore (9,868) was higher than the historic average (5,974) and ranged from 3,545 at the Baptism River to 175 at the Temperance River. The Baptism River experienced the second highest fishing pressure on record, and the Brule River experienced the third-highest angling pressure on record (Table 1, Figure 3). Rivers in the middle and upper shore provide much more accessible spawning habitat in rivers, as well as more water for anglers to fish below barriers (e.g., Stewart, Split Rock, and Baptism rivers) than lower shore rivers. The increased fishing pressure at rivers in the middle and upper shore near Two Harbors, Silver Bay and Grand Marais was likely influenced by changes to the Rainbow trout stocking program in recent years, or anglers drawn to those rivers by pictures and reports of fish caught and posted on social media.

Rainbow Trout were by far the most sought-after fish species in spring 2021. Steelhead or Kamloops were the primary target species in 94% of all interviews collected in 2021 (88% targeted steelhead, 6% targeted Kamloops). Other primary species targeted were Coho Salmon at 1%, Brook Trout at 3%, and three other species at less than 1.0%. Sixty-eight percent of anglers listed steelhead or Kamloops as their secondary target species. Other secondary species included Brook Trout (16%), Coho Salmon (6%), Brown Trout at 5%, and six other species at 1% or less.

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 participating in the spring fishery appears to be consistent or slightly increasing over time. No creel was conducted in spring 2020 due to the COVID pandemic, however a higher-than-average number anglers, many high school or college age, were reported participating in the fishery. In 2021, an estimated 2,128 anglers participated in the Lake Superior spring fishery which was higher than the historic average (1,659). A total of 1,052 anglers were interviewed shore wide, of which 852 were 'new anglers' (first time interviewed this spring). Anglers were residents of 15 U.S. states; 93% were residents of Minnesota, 5% were from Wisconsin, and less than 1% were from other states. Only 6.7% (57) of anglers interviewed were female, which was slightly higher than 2019 (3.4%) (Figure 9; Table 5).

Catch, Catch-Rates and Harvest

Unclipped (wild-produced) Rainbow Trout

Shorewide catch of unclipped Rainbow Trout have continued to improve over the last decade. An estimated 3,657 unclipped Rainbow Trout were caught in 2021, which was higher than the historic average (2,904) (Table 3; Figure 4). Catch in the lower shore (2,679) and upper shore (978) were higher than the historic averages (lower shore: 2,025; upper shore: 879) (Table 3; Figure 5). The highest catches in the lower shore were at the Stewart River (837), Split Rock River (809) and Sucker River (345). The highest catches in the upper shore were at the Baptism River (321), Devil Track River (276) and Brule River (145). The estimated shorewide catch of small (<16 inches) Rainbow Trout in 2021 was 372, which was lower than the historic average (580); small sized fish were reported at 12 creel stations. An estimated 11 unclipped Rainbow Trout were illegally harvested in 2021 and illegal harvest was reported at only the Sucker River (Table 3). The average length of an adult steelhead reported by anglers was 23.9 inches and the average weight was 4.3 pounds (Table 4).

The shorewide catch-rate for unclipped Rainbow Trout in 2021 was 0.132 fish per angler-hour (7.6 angler-hours per fish) which was higher than the historic average (11.3 angler-hours per fish) (Figure 4). Catch rates in the lower shore were 0.150 fish per angler hour (6.7 angler-hours per fish), which was higher than the historic average of 0.081 fish per angler hour (12.3 angler-hours per fish). Catch rates in the upper shore was 0.099 fish per angler hour (10.1 angler-hours per fish), which was higher than the historic average of 0.141 fish per angler hour (7.1 angler-hours per fish) (Table 3; Figure 5). The best catch-rates in the lower shore were at the Split Rock River (0.228; 4.3 angler-hours per fish), Stewart River (0.203; 4.9 angler-hours per fish), and the Gooseberry River (0.165; 6.1 angler-hours per fish). The best catch-rates in the upper shore were at the Devil Track River (0.187; 5.3 angler-hours per fish), Kadunce Creek (0.134; 7.4 angler-hours per fish), and the Temperance River (0.120; 8.3 angler-hours per fish) (Table 3). Nearly all (99%; 3,638) unclipped Rainbow Trout were caught fishing in streams versus shore fishing Lake Superior (<1%; 19). The shorewide catch-rate in tributaries was 0.142 fish per angler-hour (7.0 angler-hours per fish) and in the lake was 0.009 fish per angler-hour (108.0 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). Consistently high catches over time could indicate that steelhead abundances have reached (or are close to reaching) equilibrium with total spawning and rearing habitat areas below Posted Boundaries 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 5), which is likely caused by the suspension of steelhead fry stocking in some upper shore rivers over the last decade (see Goldsworthy et al. 2017). 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. Preliminary results vary by river; some rivers that were the previous fry stocked saw reduced catch rates in previous years (e.g., Cascade River in 2019), but rebounded in 2021. The response to the suspension of fry stocking is still underway and will be thoroughly evaluated and presented during the next revision of the Fish Management Plan for Minnesota Waters of Lake Superior, which will begin 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.

The catch-and-release regulation for unclipped Rainbow Trout has been in effect since August 1997. Regulation compliance has been decent in recent years. 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. The vast majority of the LSAG supported a continuation of the catch-and-release regulation. 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.

Clipped (stocked) Rainbow Trout

The estimated shorewide catch of clipped (stocked) Rainbow Trout (includes Kamloops and clipped steelhead) was 285, which was significantly lower than the historic average (2,368) (Figure 4). Catch in both the lower shore (244) and the upper shore (41) were lower than the historic averages (Figures 5 & 6). In the lower shore, most clipped Rainbow Trout were caught at the Sucker River (76), Stewart River (56), and the Split Rock River (53). In the upper shore, clipped fish were only caught at the Baptism River (21) and Devil Track River (20). No small (<16 inches) clipped Rainbow Trout were reported caught in 2021. Only 31% (88) of all legal-sized clipped Rainbow Trout caught were harvested (Table 3). The average length of an adult steelhead reported by anglers was 25.2 inches and the average weight was 5.7 pounds (Table 4). More clipped Rainbow Trout were caught in streams (273) than in the lake (12), which is not unusual (Figure 7).

The shorewide catch rate for clipped Rainbow Trout was 0.010 fish per angler-hour (100.0 angler-hours per fish) (Figure 4). The catch rate in the lower shore was 0.014 fish per angler-hour (71.4 angling-hours per fish), which was significantly lower than the historic average (0.081; 12.3 angler-hours per fish) (Figure 6). The best catch rates in the lower shore were at the Sucker River (0.032; 31.3 angler-hours per fish) and the French River (0.028; 35.7 angler-hours per fish). The catch rate in the upper shore was 0.004 fish per angler-hour (250.0 angling-hours per fish), which was significantly lower than the historic average (0.026; 38.5 angler-hours per fish) (Table 3; Figure 5).

The low fishing pressure in the lower shore was largely influenced by the lack of angling pressure at the French River and McQuade Harbor in recent years, the locations where the most angling pressure typically occurred in the lower shore. The catch and catch rates of clipped Rainbow Trout at French River were the lowest ever on record in 2019, and again in 2021. This was expected given the relatively low angling effort and low overall return of clipped Rainbow Trout at French River in recent years (Peterson 2019). Angling pressure, catch, and catch rates of clipped Rainbow Trout were expected to decline in these years because Kamloops were no longer stocked in Minnesota waters of Lake Superior (explained in Miller et al. 2020). The low catch of clipped Rainbow Trout in recent years is a function of many variables, including environmental and lake conditions, intra- or interspecific competition for resources (prey), and changes to the hatchery production and stocking protocols.

The Minnesota DNR is not concerned with the low adult returns from the clipped steelhead stocking program in 2021. The first year-class of clipped Rainbow Trout were stocked in 2018 (2017 year-class) and would have been 4 years old in 2021. Most adult Rainbow Trout will not return to spawn until they are age-5 or-6 (Peterson 2021). Adult fish that return to rivers to spawn are comprised of fish from a multitude of year-classes (are not all the same age), and very few year-classes of clipped fish currently exist. Returns of clipped adult Rainbow Trout in future years will be dependent on several variables within (e.g., efficiencies in egg take, hatchery production and stocking), and outside of the DNRs control (e.g., disease outbreaks, survival of juveniles in streams and Lake Superior).

Brook Trout

Brook Trout are the second most caught species after Rainbow Trout every spring despite the lack of anglers that actively target them below barriers in the spring. An estimated 908 Brook Trout were caught in spring 2021, which was higher than the historic average of 503 (Figure 8). The shorewide catch-rate was 0.033 fish per angler-hour (30.5 angler-hours per fish), 0.030 (33.7 angler-hours per fish) in the lower shore, and 0.038 (26.0 angler-hours per fish) in the upper shore. The average length was 9.5 inches, and the average weight was 0.7 pounds (Table 4).

Compliance with the restrictive harvest regulation for Brook Trout (bag limit of 1, minimum size 20 inches) was good and zero illegally sized fish were reported as harvested in the spring creel in spring 2021. Coaster Brook Trout rehabilitation is a management priority for the MNDNR, and regulatory compliance is essential for this to occur. Anecdotal reports of Brook Trout illegally harvested in the summer months after the spring creel has been an issue in previous years. In response, the MNDNR partnered with local stakeholders (Greater Lake Superior Foundation, Trout Unlimited, and Minnesota Steelheader) to design and post educational Coaster Brook Trout signs at streams throughout the North Shore and to create more public outreach via social media in 2020 and 2021.

Other Species

Estimated catch of other fish species reported in 2021 were 10 Brown Trout, 18 Coho salmon, 11 Northern pike, and 284 suckers (includes White and Longnose suckers). All these fish were harvested. Yield (number caught, number harvested, and pounds harvested), average length and average weight 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. The vast majority of Coho Salmon caught in Minnesota waters 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). Unlike streams in many other jurisdictions, streams on Minnesota's North Shore provide limited spawning and rearing habitat for migratory fish. Furthermore, Minnesota's streams provide less than ideal spawning conditions 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. The production of salmon in Minnesota's tributaries to Lake Superior and whether fish captured in Minnesota waters were produced here remains unknown.

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MINNESOTA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISHERIES

COMPLETION REPORT:

LAKE SUPERIOR SPRING CREEL SURVEY

2021

Completed by:
Nick Peterson

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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	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	1992-2019		
													Mean	Minimum	Maximum
Lower Shore	Lester River	6,644	4,928	3,588	2,580	3,699	7,293	4,955	3,051	3,115	--	2,933	5,797	2,580	10,476
	McQuade/Talmadge	2,996	3,938	2,407	1,340	1,659	5,453	3,612	2,657	3,158	--	359	2,862	1,340	5,453
	French River	3,206	3,015	3,544	3,080	2,409	6,014	3,678	1,868	2,033	--	422	3,997	1,868	8,544
	Sucker River	4,620	6,008	3,566	2,880	2,265	4,914	4,713	4,131	3,613	--	2,342	5,346	2,265	12,990
	Knife River	3,565	3,308	1,903	1,540	1,629	6,597	3,215	3,363	3,461	--	2,574	3,137	1,225	6,597
	Stewart River	5,782	1,557	1,885	1,280	1,653	3,385	3,658	2,620	3,830	--	4,111	2,498	720	5,782
	Silver Creek	1,996	818	131	312	577	582	529	522	759	--	703	811	131	1,996
	Gooseberry River	1,994	1,076	325	257	532	1,105	1,330	612	778	--	837	990	257	2,475
	Split Rock River	5,400	2,087	1,940	1,200	1,217	1,993	2,402	1,756	2,444	--	3,545	2,167	1,145	5,400
Upper Shore	Beaver River	824	820	304	233	473	436	685	346	572	--	565	615	233	1,159
	Baptism River	2,771	2,662	866	630	1,173	2,285	3,303	2,370	2,918	--	3,545	1,567	448	3,570
	Cross River	900	383	525	339	338	700	1,004	549	381	--	518	338	53	1,004
	Temperance River	488	170	630	83	359	370	494	319	306	--	175	352	77	788
	Poplar River	888	383	420	330	357	645	508	299	803	--	488	508	168	1,347
	Cascade River	488	905	296	309	438	846	601	307	301	--	789	511	194	939
	Devil Track River	1,050	1,163	857	677	1,355	1,421	1,841	2,066	1,833	--	1,481	765	75	2,066
	Kadunce Creek	746	500	642	770	448	1,420	1,030	570	1,630	--	1,006	529	79	1,630
Brule River	1,283	1,206	963	767	539	1,410	1,015	829	1,069	--	1,302	801	207	1,505	
Lower Shore		36,203	26,735	19,289	14,469	15,641	37,336	28,093	20,579	23,191	--	17,825	25,562	14,469	39,994
Upper Shore		9,438	8,192	5,503	4,138	5,479	9,533	10,480	7,656	9,812	--	9,868	5,974	3,046	10,480
Shorewide		45,641	34,927	24,792	18,607	21,120	46,868	38,573	28,235	33,003	--	27,693	31,549	18,607	48,177

Table 2. Fishing pressure estimates (angler-hours \pm 1 standard error [SE]) from the 2021 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	2,659	576	274	94	2,933	578
	McQuade/Talmadge	106	53	253	103	359	123
	French River	0	0	422	155	422	155
	Sucker River	2,237	460	106	61	2,342	488
	Knife River	2,574	669	0	0	2,574	669
	Stewart River	3,963	969	148	89	4,111	1,026
	Silver Creek	675	235	28	28	703	233
	Gooseberry River	837	259	0	0	837	259
	Split Rock River	3,320	582	225	86	3,545	634
Upper Shore	Beaver River	488	202	77	42	565	233
	Baptism River	3,437	491	107	74	3,545	507
	Cross River	427	200	92	67	518	202
	Temperance River	175	96	0	0	175	96
	Poplar River	396	122	92	67	488	154
	Cascade River	671	237	118	86	789	283
	Devil Track River	1,481	320	0	0	1,481	320
	Kadunce Creek	905	293	101	73	1,006	290
	Brule River	1,302	366	0	0	1,302	366
Lower Shore		16,369	1,547	1,456	251	17,825	1,623
Upper Shore		9,282	851	586	170	9,868	886
Shorewide		25,651	1,766	2,042	303	27,693	1,849

Table 3. Estimated catch and catch rate (fish per angler-hour) for unclipped and clipped (stocked) Rainbow Trout in the 2021 Lake Superior spring creel survey by station.

Station		Unclipped Rainbow Trout						Clipped (stocked) Rainbow Trout					
		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	0	0	0	0.000	0.000	0.000
	Released	286	244	77	0.097	0.083	0.025	32	32	23	0.011	0.011	0.008
	Total	286	244	77	0.097	0.083	0.025	32	32	23	0.011	0.011	0.008
McQuade Harbor	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	10	10	10	0.028	0.028	0.052	0	0	0	0.000	0.000	0.000
	Total	10	10	10	0.028	0.028	0.052	0	0	0	0.000	0.000	0.000
French River	Harvested	0	0	0	0.000	0.000	0.000	12	12	8	0.028	0.028	0.014
	Released	12	6	5	0.028	0.014	0.010	0	0	0	0.000	0.000	0.000
	Total	12	6	5	0.028	0.014	0.010	12	12	8	0.028	0.028	0.014
Sucker River	Harvested	11	11	10	0.005	0.005	0.004	11	11	11	0.005	0.005	0.005
	Released	334	334	100	0.143	0.143	0.032	65	65	65	0.028	0.028	0.028
	Total	345	345	101	0.147	0.147	0.031	76	76	66	0.032	0.032	0.028
Knife River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	249	199	88	0.097	0.077	0.027	0	0	0	0.000	0.000	0.000
	Total	249	199	88	0.097	0.077	0.027	0	0	0	0.000	0.000	0.000
Stewart River	Harvested	0	0	0	0.000	0.000	0.000	34	34	25	0.008	0.008	0.006
	Released	848	837	251	0.206	0.203	0.036	22	22	17	0.005	0.005	0.004
	Total	848	837	251	0.206	0.203	0.036	56	56	30	0.014	0.014	0.007
Silver Creek	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	108	92	46	0.153	0.131	0.042	0	0	0	0.000	0.000	0.000
	Total	108	92	46	0.153	0.131	0.042	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	146	138	77	0.174	0.165	0.075	16	16	14	0.019	0.019	0.015
	Total	146	138	77	0.174	0.165	0.075	16	16	14	0.019	0.019	0.015
Split Rock River	Harvested	0	0	0	0.000	0.000	0.000	21	21	15	0.006	0.006	0.004
	Released	830	809	238	0.234	0.228	0.057	32	32	25	0.009	0.009	0.007
	Total	830	809	238	0.234	0.228	0.057	53	53	29	0.015	0.015	0.008
Lower Shore Total	Harvested	11	11	10	0.001	0.001	0.001	77	77	32	0.004	0.004	0.002
	Released	2,822	2,669	389	0.158	0.150	0.025	166	166	76	0.009	0.009	0.004
	Total	2,833	2,679	389	0.159	0.150	0.026	244	244	83	0.014	0.014	0.005

Table 3 continued. Estimated catch and catch rate (fish per angler-hour) for unclipped and clipped (stocked) Rainbow Trout in the 2021 Lake Superior spring creel survey by station.

Station		Unclipped Rainbow Trout						Clipped (stocked) Rainbow Trout					
		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	12	12	11	0.022	0.022	0.017	0	0	0	0.000	0.000	0.000
	Total	12	12	11	0.022	0.022	0.017	0	0	0	0.000	0.000	0.000
Baptism River	Harvested	0	0	0	0.000	0.000	0.000	11	11	11	0.003	0.003	0.003
	Released	353	321	117	0.100	0.091	0.031	11	11	11	0.003	0.003	0.003
	Total	353	321	117	0.100	0.091	0.031	21	21	15	0.006	0.006	0.004
Cross River	Harvested	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
	Total	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
	Released	42	21	21	0.240	0.120	0.089	0	0	0	0.000	0.000	0.000
	Total	42	21	21	0.240	0.120	0.089	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
	Released	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
Cascade River	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	67	67	67	0.085	0.085	0.093	0	0	0	0.000	0.000	0.000
	Total	67	67	67	0.085	0.085	0.093	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
	Released	355	276	122	0.240	0.187	0.072	20	20	19	0.013	0.013	0.012
	Total	355	276	122	0.240	0.187	0.072	20	20	19	0.013	0.013	0.012
Kadunce Creek	Harvested	0	0	0	0.000	0.000	0.000	0	0	0	0.000	0.000	0.000
	Released	173	135	88	0.172	0.134	0.081	0	0	0	0.000	0.000	0.000
	Total	173	135	88	0.172	0.134	0.081	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
	Released	193	145	75	0.148	0.111	0.049	0	0	0	0.000	0.000	0.000
	Total	193	145	75	0.148	0.111	0.049	0	0	0	0.000	0.000	0.000
Upper Shore Total	Harvested	0	0	0	0.000	0.000	0.000	11	11	11	0.001	0.001	0.001
	Released	1,197	978	217	0.121	0.099	0.024	30	30	22	0.003	0.003	0.002
	Total	1,197	978	217	0.121	0.099	0.024	41	41	24	0.004	0.004	0.002
Shorewide Total	Harvested	11	11	10	0.000	0.000	0.000	88	88	34	0.003	0.003	0.001
	Released	4,019	3,646	445	0.145	0.132	0.018	197	197	79	0.007	0.007	0.003
	Total	4,029	3,657	446	0.145	0.132	0.018	285	285	86	0.010	0.010	0.003

Table 4. Yield, average length (inches), and average weight (pounds) of fish species caught in the 2021 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	908	0	0	--	9.5	9.5	0.3	--	0.7	0.7	0.1
Brown Trout	10	10	8	10.0	--	10.0	--	0.8	--	0.8	--
Coho Salmon	18	18	25	16.5	--	16.5	0.5	1.4	--	1.4	0.1
Northern Pike	11	0	0	--	24.0	24.0	--	--	2.9	2.9	--
Sucker species	284	0	0	--	15.1	15.1	0.8	--	1.5	1.5	0.3
Unclipped Rainbow Trout ($\geq 16"$)	3,657	11	36	22.0	23.9	23.9	0.1	3.3	4.3	4.3	0.1
Unclipped Rainbow Trout ($< 16"$)	372	0	0	--	8.8	8.8	0.6	--	0.3	0.3	0.0
Clipped (stocked) Rainbow Trout ($\geq 16"$)	285	88	487	25.0	25.3	25.2	0.3	5.5	5.7	5.7	0.2

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
Mean	1,659	889	2,484

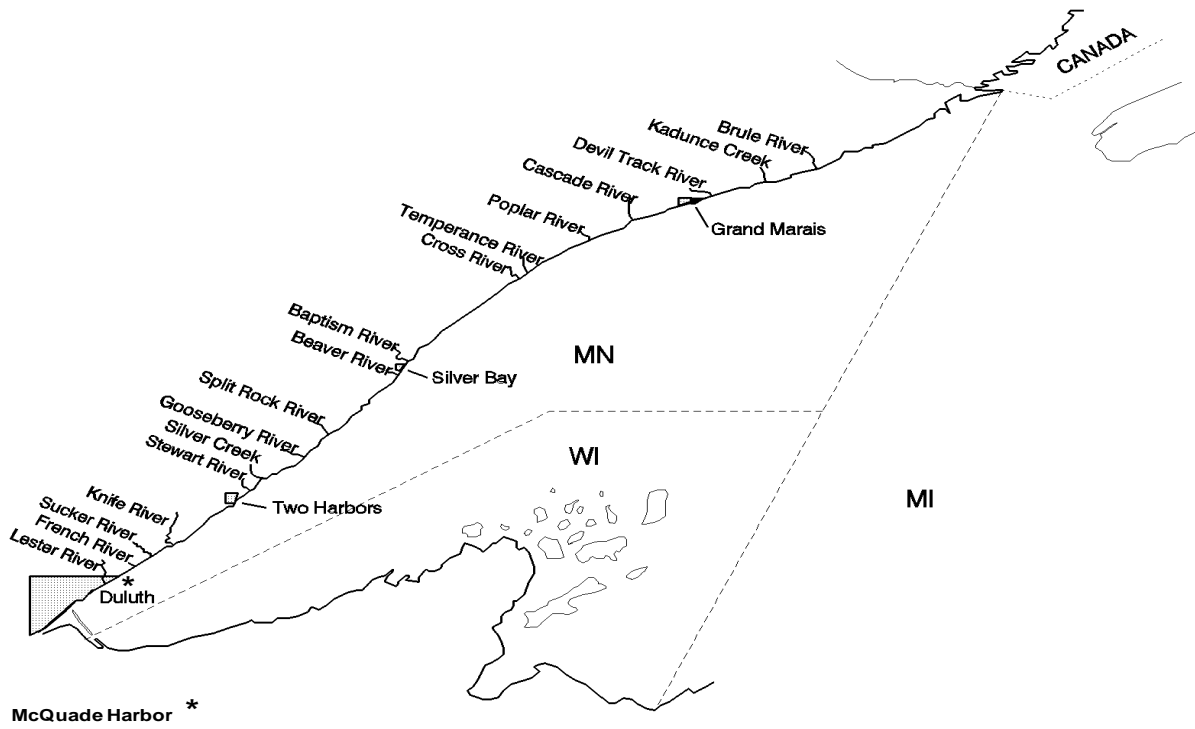


Figure 1. Map of sampling stations for the Lake Superior spring creel survey.

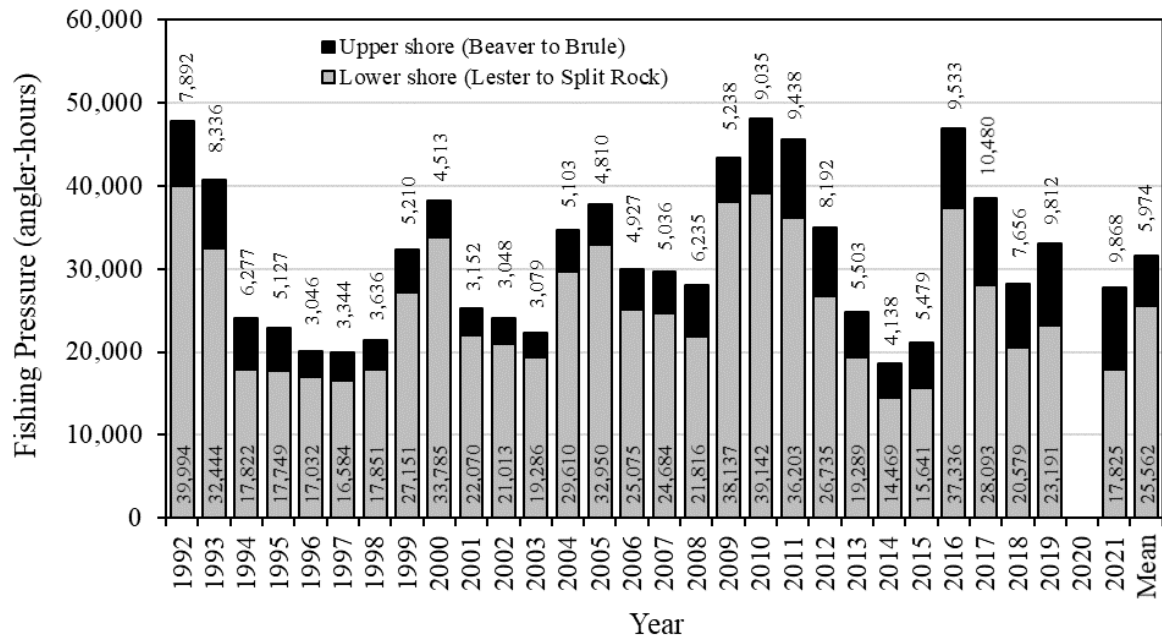


Figure 2. Fishing pressure (angler-hours) in the lower shore, upper shore, and shorewide from the Lake Superior spring creel survey by year and the historic average (Mean).

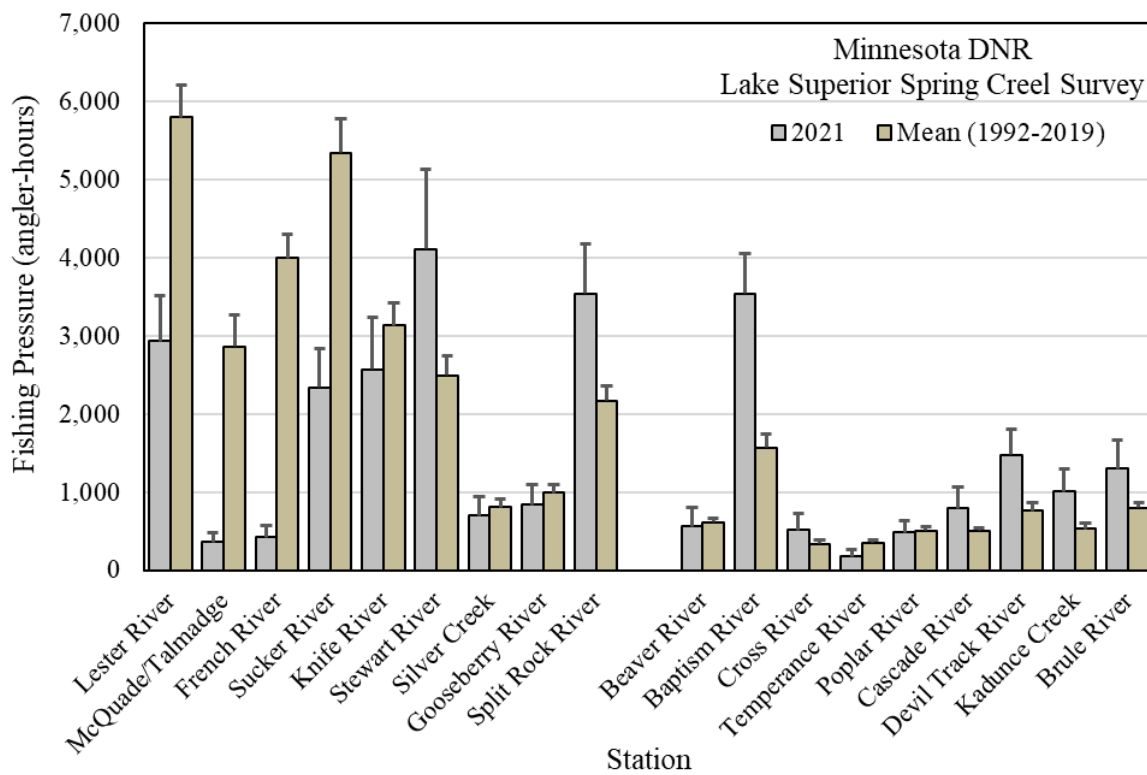


Figure 3. Fishing pressure estimates (angler-hours) in the Lake Superior Spring creel survey in 2021 and the historic average at each station.

MN DNR Lake Superior Spring Creel Survey

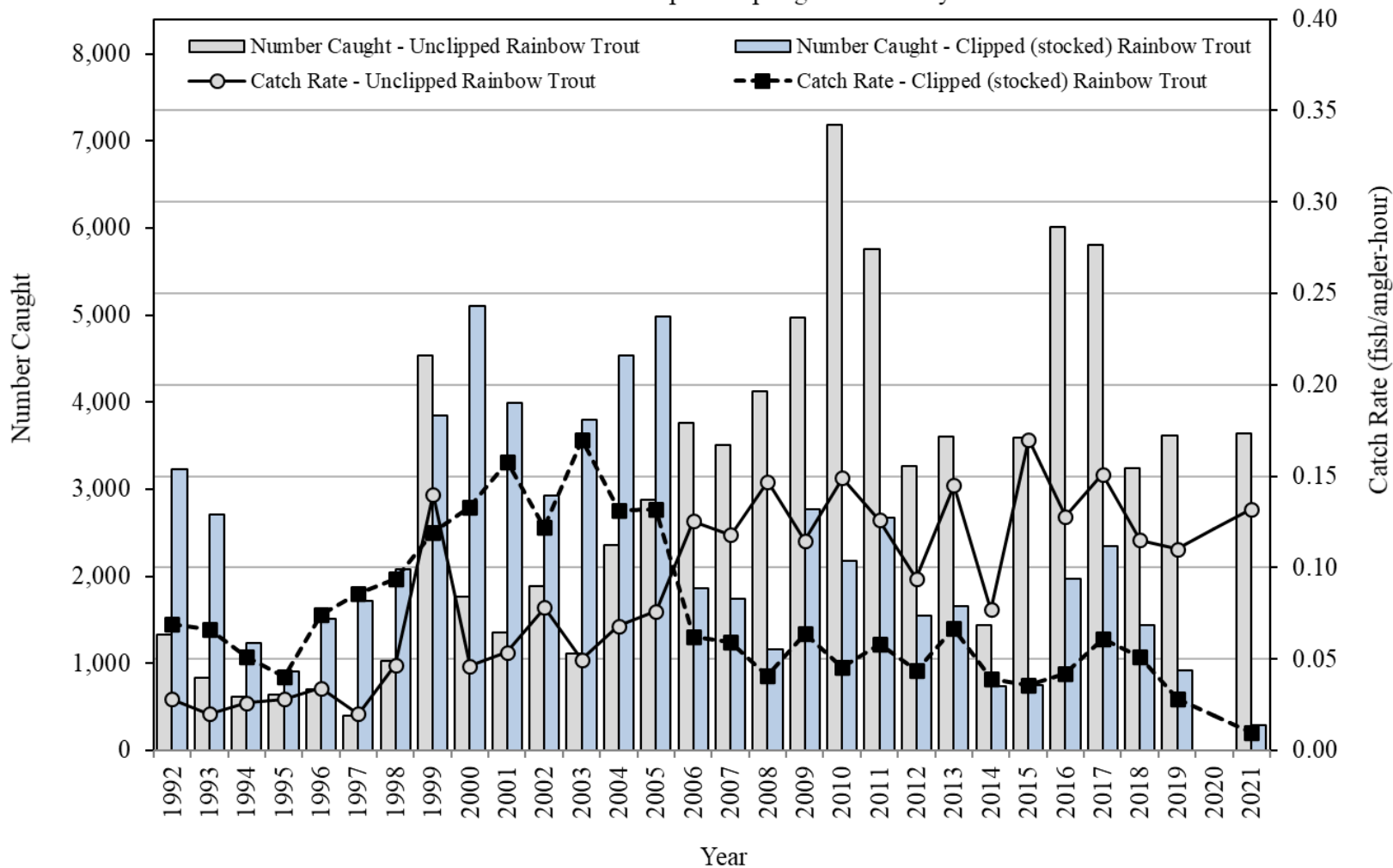


Figure 4. Shorewide estimated catch and catch-rate (fish per angler-hour) of unclipped and clipped (stocked) Rainbow Trout from the Lake Superior spring creel survey by year.

MN DNR Lake Superior Spring Creel Survey Unclipped Rainbow Trout

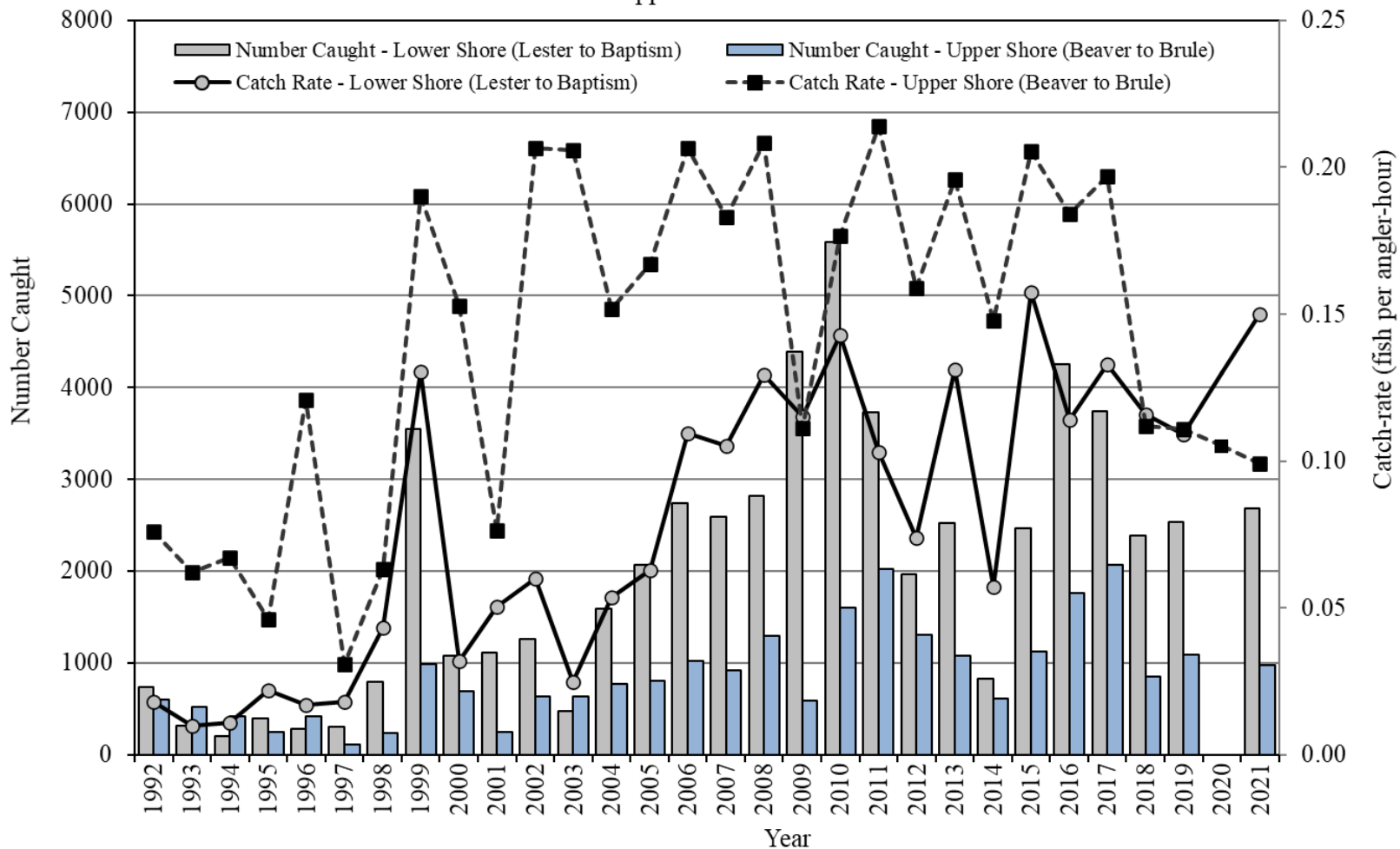


Figure 5. Estimated catch and catch rate (fish per angler-hour) of unclipped Rainbow Trout in the lower and upper shore from the Lake Superior spring creel survey by year.

MN DNR Lake Superior Spring Creel Survey
Clipped (stocked) Rainbow Trout

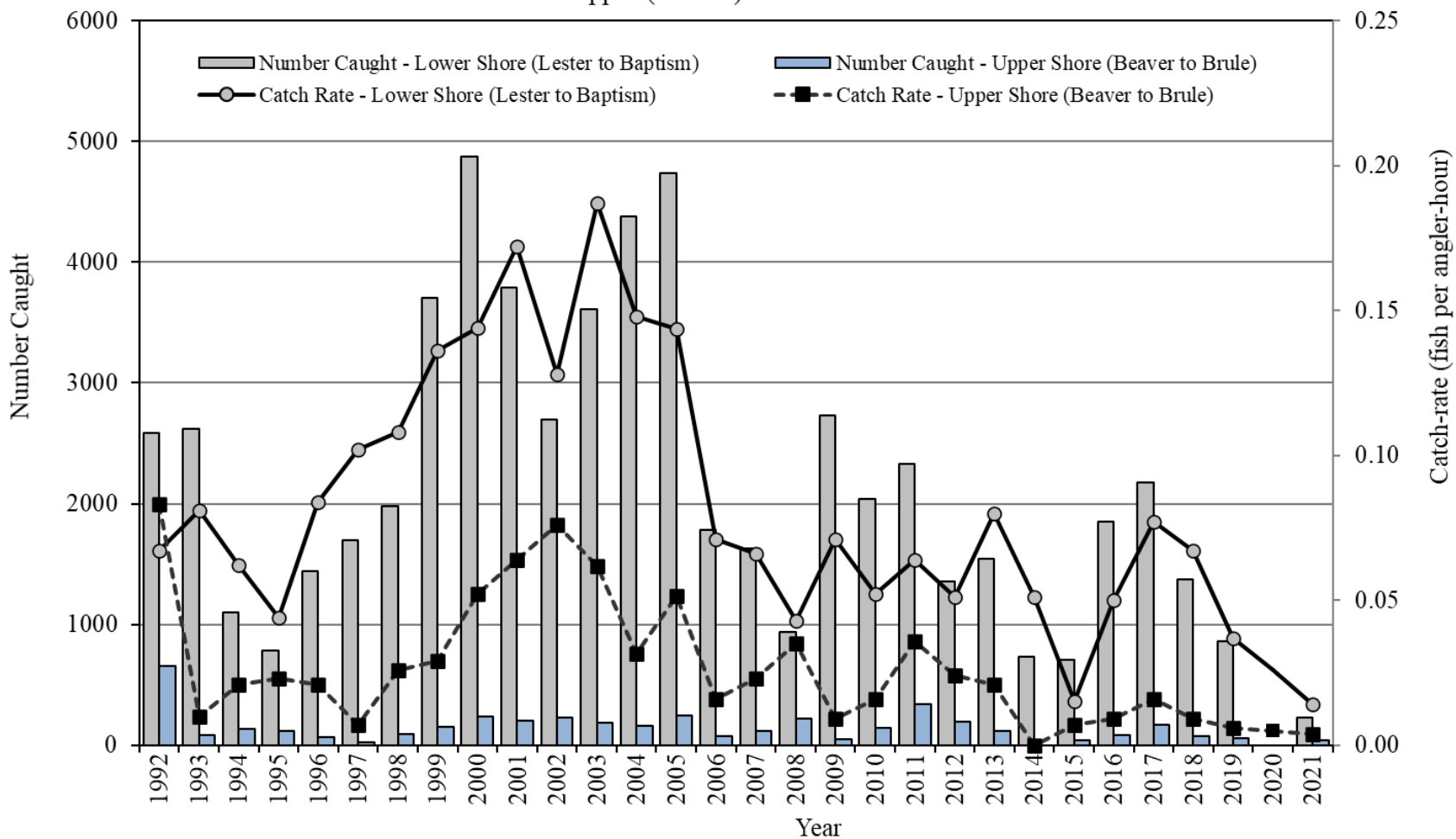


Figure 6. Estimated catch and catch rate (fish per angler-hour) of clipped (stocked) Rainbow Trout in the lower and upper shore from the Lake Superior spring creel survey by year.

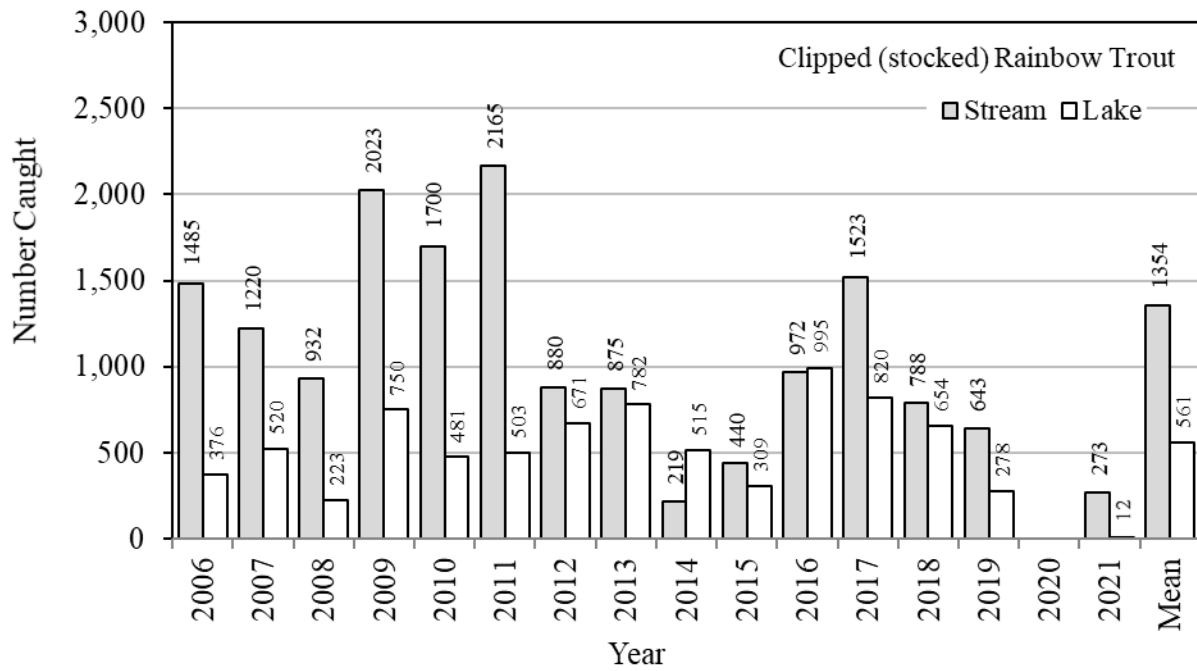


Figure 7. Estimated number of clipped (stocked) Rainbow Trout ≥16 inches caught in the lake and stream and the historic average (Mean).

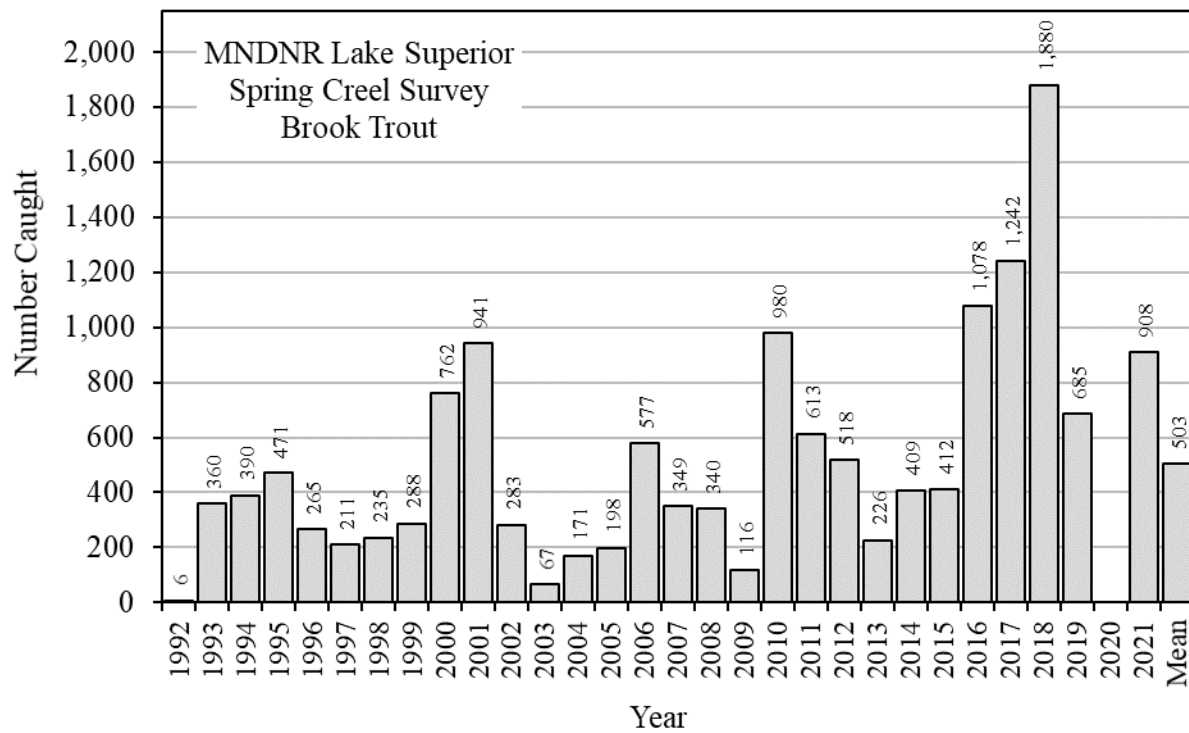


Figure 8. The estimated number of Brook Trout caught by year during the Lake Superior spring creel survey and the historic mean (Mean).

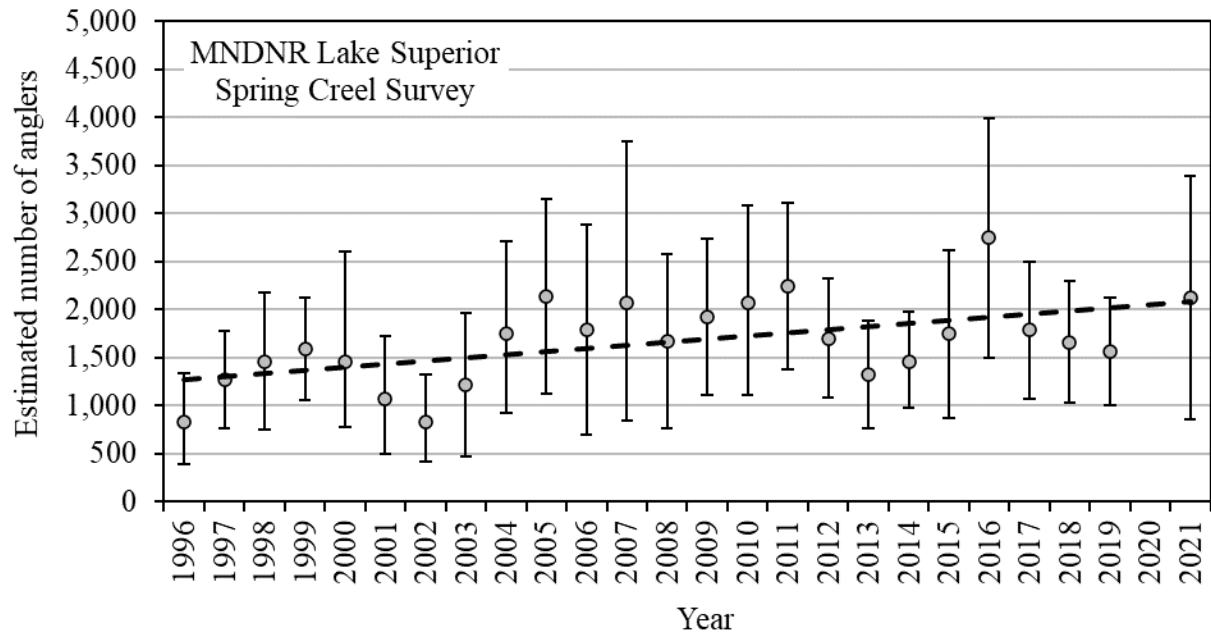


Figure 9. The estimated number of new (first time interviewed this spring) anglers who were interviewed in the Lake Superior spring creel survey by year. Error bars are upper and lower 95% confidence intervals.