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

COMPLETION REPORT
LAKE SUPERIOR SUMMER CREEL SURVEY
2017

by
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Abstract

Minnesota-based anglers fished for 177,372 hours in the Minnesota waters of Lake Superior in 2017 as measured in the summer access-based creel survey. The effort in 2017 was 11.1% lower than in 2016. Angler effort was 97.7% from boats and 2.3% from shore. Boat fishing effort was greatest in the Duluth area in August and slightly less in the McQuade-Two Harbors area in July and the Duluth area in June. Shore fishing was greatest in the McQuade-Two Harbors area in September. Angling effort increased relatively quickly after June in areas North of Duluth, whereas the Duluth effort dipped in July. The McQuade-Two Harbors-based effort declined after July.

Anglers caught 42,684 salmonids, of which 36,925 were harvested. Anglers caught 5% fewer salmonids than in 2016, most of which were Lake Trout. Salmonid catch and harvest rates in 2017 were 0.2406 and 0.2082 fish per angler hour, respectively, which were about 7-11% higher than in 2016.

Anglers caught 32,111 lean and 2,484 siscowet Lake Trout and harvested 28,006 leans and 2,268 siscowets. Lake Trout accounted for 81% of all salmonids caught and 82% of all salmonids harvested. The harvested lean Lake Trout were 90% wild fish, down slightly from 92% in 2016. In MN-1 near Duluth, stocked fish comprised 14% of the harvest. Anglers kept 0.1579 and released 0.0231 lean Lake Trout per angler hour. The total catch rate for lean Lake Trout was 5% lower than in 2016. The harvested lean Lake Trout were 22.0 inches on average.

Anglers also caught Coho, Chinook, and Pink Salmon, and Rainbow Trout in 2017. Anglers harvested 4,563 Coho Salmon at 0.0257 fish per angler hour, which was 62% higher than the 2016 rate of 0.0159 fish per angler hour. Anglers harvested 397 Chinook Salmon at 0.0023 fish per angler hour, which 39% lower than in 2016. Chinook Salmon were 22.4 inches on average when harvested in 2017, which is 1.5 inch shorter than in 2016. Anglers caught fewer salmon in the Upper Shore than in the Lower Shore, as usual. Anglers caught 1,855 Pink Salmon which averaged 14.7 inches. Anglers also kept 46 and released 529 steelhead, and kept 51 and released 134 other salmonids which included Brook Trout, Brown Trout, and Kamloops Rainbow Trout. Anglers also kept 73 Northern Pike, 25 Walleye, and 111 Lake Herring and released 43 Northern Pike and 19 Lake Herring.

Wisconsin-based sport anglers who fished in the Minnesota Waters of Lake Superior, excluding Charter anglers, fished for an additional 3,597 hours and caught an additional 459 Lake Trout, 64 siscowet Lake Trout, 39 Coho Salmon, 6 Chinook Salmon, 1 Brown Trout, 3 Rainbow Trout, and 30 Walleyes.

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Introduction

Lake Superior and the portions of its tributaries available to anadromous fishes offer unique habitats that support fisheries, which contribute to the diversity of angling opportunities in Minnesota. Several salmonids, including Lake Trout *Salvelinus namaycush*, Rainbow Trout *Oncorhynchus mykiss*, Coho Salmon *O. kisutch*, and Chinook Salmon *O. tshawytscha*, provide recreational fisheries along the North Shore of Lake Superior throughout the year.

During the first half of the 20th century, Lake Trout was the mainstay of the Lake Superior sport fishery and, along with Cisco *Coregonus artedi*, supported an important commercial fishery. By the late 1940s the Lake Trout harvest began to decline as a result of overfishing (Hansen et al. 1995). During the 1950s the Sea Lamprey *Petromyzon marinus* became established in Lake Superior and preyed heavily on Lake Trout. Lake Trout could not withstand the additional mortality caused by Sea Lamprey, and both sport and commercial fisheries collapsed. By the early 1960s, effective control of Sea Lamprey had been achieved. Minnesota and other states and provinces began salmonid stocking programs to rehabilitate the depleted Lake Trout stocks and to introduce new strains of salmon species to diversify the fishery. Minnesota suspended stocking of Lake Trout in 2016. Creel surveys have been used to monitor the recreational fishery in Minnesota waters of Lake Superior for more than 40 years. Creel surveys have been conducted annually during late spring–early autumn since 1969. This report presents results from Minnesota's 2017 Lake Superior summer creel survey. All data are from anglers who fished in Minnesota waters and returned to a Minnesota access, unless noted otherwise.

Methods

The summer Lake Superior creel survey is access-based and follows a stratified random statistical design. The basic statistical method and formulas are described by Bindman and Mach (1997), and more detail of the design of the Lake Superior summer creel survey is described by Halpern (1995a, b). The survey included two types of anglers, which were boaters from charter docks, public accesses, and marinas, and also shore anglers at the public accesses and marinas. The survey included only anglers who fished in Lake Superior and excluded angling that occurred in the St Louis Estuary or in tributaries. The 2017 survey began on Memorial Day weekend (May 27) and ended when the Lake Trout season ended (October 8). May data are included in the June estimates

and October data are included in the September estimates. The creel clerks visited the stations and groups of stations, or Clusters, that are described in Table 1. Clusters 1 and 2 are to the South and comprise the Lower Shore, whereas Clusters 3 and 4 are to the North and comprise the Upper Shore. Halpern (2003) describes the general mechanics of the creel survey in more detail. Slight changes to the design occurred in 2016. One very small public access was dropped at Tofte in the Taconite Harbor area due to low use and high travel times to the access. Also, Harbor Cove was dropped from the Harbor Cove/Lakehead Marina station on 28 July 2016 due to the owner's removal of permission to use the property. The counts from the two stations, Taconite Harbor and Lakehead Marina, were adjusted based on previous estimates of effort at the dropped accesses. Taconite Harbor received 88% of the effort at Station 9 in 2014-2015 and Harbor Cove Marina received 50% of the effort at Station 2 from 2014 through 27 July 2016.

Age distribution of Lake Trout caught in the Lake Superior summer creel survey was determined using an age-length key based on all aged Lake Trout, both stocked and wild, captured in assessments from 2013 through May 2017. References to 2016 creel survey numbers are from Reeves (2017).

Results and Discussion

Fishing Effort

Recreational fishing effort (effort) from anglers who used Minnesota accesses or fished from the Minnesota shoreline was estimated from 573 activity counts for the Lower Shore and 524 activity counts for the Upper Shore (Table 2). Effort along the North Shore was measured on 112 out of 135 days during the season. The estimated total fishing effort for Minnesota waters of Lake Superior during the 2017 summer creel survey was 180,969 angler hours (AH: Table 3), which includes 177,372 AH from Minnesota-based anglers and 3,597 AH from Wisconsin-based anglers (WIDNR data). Effort decreased by 11.1% from 2016 to 2017 (Figure 1). Beginning in 1994, the survey did not include shoreline angling at select stations that produced few fish in most years. Since 1994, effort from Minnesota-based anglers has varied from 138,522 to 204,881 AH (Figure 1). Effort in the Lower Shore area in 2017 accounted for 70% of total Minnesota summer angling effort on Lake Superior (Table 3).

Lake Superior boat anglers accounted for 97.7% of the effort and shore anglers accounted for 2.3% of the effort. Overall summer boat effort was greatest in the Duluth area and equally low in the Twin Points-Tofte and

Grand Marais-Hovland areas (Table 4). Monthly effort from boats was greatest from the Duluth area in August, similar between the Duluth area in the June period and in McQuade-Two Harbors areas in July, and was low in the Upper shore areas in the June period and then again in September (Table 3).

Shoreline anglers fished for 4,157 AH in 2017 (Table 3), which is a 17% increase from 3,558 AH in 2016. Shore angling continues to comprise a small fraction of summer angling effort on Lake Superior. The highest shore angling effort (81%) was observed in the McQuade-Two Harbors area in Cluster 2 (Table 4).

Catch and Catch Rates

Salmonids

Anglers caught 42,684 salmonids in 2017, which was 5% lower than the catch of 44,673 salmonids in 2016. Anglers released 13% of their catch (Table 5). Anglers caught 0.2406 salmonids per AH and they kept 0.2082 salmonids per AH (Table 6) in 2017. These rates were 7-11% higher than in 2016 (Figure 2). Wisconsin anglers kept an additional 572 salmonids (WIDNR data).

lean Lake Trout

Anglers caught 32,111 lean Lake Trout in 2017, an 18% decrease from 2016. Anglers caught 30% more Lake Trout in 2017 than the average of 24,681 fish in 2007-2016. Anglers also released 4,105 fish, or 13% of their catch of Lake Trout (Table 5). Anglers harvested 28,006 Lake Trout, which was 14% lower than in 2016 and was a moderately high harvest (Figure 3). Lake Trout accounted for 75% of all salmonids caught and 76% of all salmonids harvested. Sixty-two percent of the harvested Lake Trout were from the Lower Shore area. Anglers caught 0.1810 Lake Trout per AH and harvested 0.1579 fish per AH (Table 6). Among Minnesota boating parties, 54% caught one or more Lake Trout, 40% caught two or more, and 31% caught at least three Lake Trout per trip (Table 7).

Wisconsin-based anglers harvested an additional 459 lean Lake Trout in Minnesota waters in 2017 (WIDNR data) and these fish were harvested at a rate of 0.1276 fish per AH, which was 21% higher than the rate of 0.1056 fish per AH in 2016. Wisconsin-based anglers caught Lake Trout at a lower rate than Minnesota anglers fishing the same area, Cluster 1, which was 0.1440 fish per AH (Table 6). This may have occurred because Minnesota's creel survey includes charter boats, whereas Wisconsin's creel survey does not, and the catch rates from charter boats

are typically higher than for other boats.

Most harvested Lake Trout were between 17.5 and 24.4 inches in length, which is similar to 2016, and the clerks measured no fish longer than 37.4 inches. The average length of harvested Lake Trout in 2017 was 22.0 inches (Table 8) and the average length released was 19.8 inches (Table 9). Anglers released 13% of Lake Trout that were 25 inches or longer (Tables 8 & 9). The average harvested Lake Trout weighed 3.42 pounds (Table 10), which was a 9% increase from 2016. The average harvested Lake Trout on the Upper Shore weighed 3.45 pounds, which was similar to the average weight of 3.40 pounds on the Upper Shore (Table 10). Lake Trout yield in the sport fishery decreased by 9% from 104,997 pounds in 2016 to 95,839 pounds in 2017 (Table 11). The decreased yield was due to fewer but larger fish in 2017 than in 2016. The yield in 2017 was the sixth highest yield since estimates began in 1980.

The age distribution of harvested Lake Trout was determined for stocked and wild Lake Trout combined. Six, seven and eight year old fish made up about half (56%) of the Lake Trout that were harvested. Each age class from seven through nine years comprised at least 10% of the harvest (Table 12), which indicates a slight shift to older fish compared to results from 2014 through 2016. Older Lake Trout, at least nine years old, made up 42% of the harvest by number, which is similar to 39% in 2016. The presence of many adult year classes indicates that the Lake Trout population has been rehabilitated. However, the lower proportion of older age classes continues to warrant closer monitoring to ensure that spawner abundance is adequately sustained.

In 2017, creel clerks checked 1,141 Lake Trout and observed no fin clips on 90% of harvested fish, which indicates that the fish were wild and not stocked. By area, wild fish comprised 76% from the Duluth area, 96% from the McQuade-Two Harbors area, 93% from the Twin Points-Tofte area, and 99% of Lake Trout from the Grand Marais area. Overall, the proportion of wild fish in the summer creel survey remained well above the threshold of criteria to discontinue stocking, as established in the Lake Trout Rehabilitation Plan (Hansen 1996) and the Fisheries Management Plan for the Minnesota Waters of Lake Superior (Schreiner et al. 2006). Lake Trout were stocked in the Lower Shore area through 2015 and were not stocked in the Upper Shore area after 2003.

Siscowet

Siscowet Lake Trout, a deepwater form, have generally contributed little to the sport fishery; however,

anglers in 2015 through 2017 caught more siscowet than average. In 2017, anglers kept 2,268 siscowet, mostly (2,099) in the Lower Shore area, which is the highest harvest on record. Only 9.2% of boat angling parties caught at least one siscowet in 2017, compared to 12% of boating parties in 2015 (Table 7). Wisconsin anglers reported keeping 64 siscowet in 2017, which is an increase from 11 fish in 2016.

Coho Salmon

Anglers kept 4,563 and released 346 Coho Salmon in 2017 (Table 5). The catch increased by 44% from 2016. Anglers harvested 0.0257 Coho Salmon per AH in 2017 (Table 6), which was 62% higher than the rate of 0.0159 fish per AH in 2015 and slightly more than half of the maximum rate of 0.0428 Coho Salmon per AH in 2013. Catches were spread out more evenly across the McQuade-Two Harbors and Twin Points-Taconite Harbor areas than in the past. Generally, Coho Salmon are first caught in the Lower Shore area and then later in the Upper Shore; this pattern was repeated in 2017. Among boating parties, only 16% caught one or more Coho Salmon and only 3% caught two or more Coho Salmon (Table 7). Wisconsin anglers caught 39 Coho Salmon in Minnesota waters in 2017, which was only 1/2 of the catch from 2016. The average length of Coho Salmon harvested in Minnesota waters of Lake Superior in 2017 was 18.7 inches (Table 8), which was about 2.1 inches longer than in 2016, and the average weight decreased from 2.67 pounds in 2016 to 1.92 pounds in 2017 (Table 10). Anglers harvested 8,741 pounds of Coho Salmon in 2017 (Table 11), which is an increase of 4% from the yield of 8,430 pounds in 2016. The harvest of Coho Salmon has varied considerably among years (Figure 5). The variations reflect naturally fluctuating year-class strength. Coho Salmon were last stocked in 2006 by the Michigan DNR and last stocked in Minnesota waters in 1974; thus, all Coho Salmon caught in Lake Superior are the product of natural reproduction.

Chinook Salmon

Anglers kept 397 and released 168 Chinook Salmon in 2017 (Table 5). The catch decreased by 16% from the 676 fish in 2016 (Figure 6). The Lower Shore accounted for 65% of the catch of Chinook Salmon in 2017; within the Lower Shore, 58% of the fish were caught from the Duluth area. Creel clerks examined 24 fish for stocking clips and observed 4 clipped fish, which indicates that Chinook Salmon stocking in other jurisdictions contributes less than 20% of the fish to catches in Minnesota. The presence of clipped fish warrants attention in future surveys.

Anglers kept 0.0023 Chinook Salmon per AH in 2017, which is a noticeable decline from the harvest rates of about 0.009-0.0032 fish per AH in 2014-2016 (Figure 6). Chinook Salmon harvest rates in 2017 were greatest, at 0.0032 fish per AH, in the Duluth area. Wisconsin anglers harvested an additional 6 Chinook Salmon in Minnesota waters in 2017, a level that remains minimal. The 2017 Chinook Salmon harvest rate for Wisconsin anglers was 0.0017 fish per AH (WIDNR data). Among Minnesota boating parties, only 3.9% caught one or more Chinook Salmon per trip (Table 7).

The mean length of harvested Chinook Salmon in 2017 was 22.0 inches (Table 8), which was 1.9 inches shorter than in 2016. Their average weight decreased to 5.13 pounds (Table 10). Anglers kept 2,038 pounds of Chinook Salmon in 2017, which was 47% lower than the yield of 3,810 pounds in 2016.

Steelhead Rainbow Trout

Minnesota-based anglers caught 575 steelhead (anadromous Rainbow Trout) in 2017 (Table 5), which was 50% of the catch of 1,154 steelhead in 2016. The largest steelhead catches occurred in the Grand Marais-Hovland area; however, steelhead were caught throughout the Minnesota waters of the lake (Table 5). Anglers kept 46 steelhead in the summer of 2017, despite the ban on harvest of steelhead in the Minnesota waters of Lake Superior.

Pink Salmon

Anglers caught 1,855 Pink Salmon *Oncorhynchus gorbuscha* in 2017 (Table 5). Pink Salmon catches have fluctuated considerably over time, ranging from 0 fish in the late 1980s to 4,139 fish in 2010. Pink Salmon reproduce naturally in Lake Superior (Schreiner et al. 2006) and the fluctuations in catch reflect the fluctuations in reproductive success of Pink Salmon along the North Shore. The fish were smaller than usual, averaging 0.94 lb. per fish, and anglers reported that they kept most of the Pink Salmon that they caught.

Other Species

Other species are generally caught in low numbers during the summer creel survey. In 2017, anglers reported keeping two Brown Trout *Salmo trutta* and one Kamloops Rainbow Trout and releasing six Brook Trout *Salvelinus fontinalis*. Catch data for the infrequently-caught salmonids were combined and reported as 185 other salmonids (Table 5). The combined catch rate for other salmonids was 0.0019 fish per AH. Minnesota anglers also

kept an estimated 25 Walleye *Sander vitreus*, 111 Cisco, and 73 Northern Pike (Table 5) and released 43 Northern Pike and 19 Cisco. Wisconsin-based anglers caught an estimated 1 Brown Trout, 3 Rainbow Trout, and 30 Walleyes.

Summary

The Lake Superior creel survey continues to provide essential information on the fishery in Minnesota waters of Lake Superior. This is vital to the future management of Lake Superior fish stocks and for coordinated management among Lake Superior fisheries management agencies. Effort and catch were relatively high in 2017, although catches of salmon were lower than in 2012 and 2013. The Lake Trout catches and catch rates were not as high as their maximum levels in 2011 or in 1983, and the salmon catches and catch rates were also not at their maximum levels, however the combination of high effort and decent fishing led to the highest catch rate for salmonids overall since accurate data collection began in 1980. The Lake Trout are now mostly (90%) wild, not clipped, and this is especially true in the Upper Shore where 98% of the harvested fish were wild. Salmon and nonnative trout are less adapted to the cold waters of Lake Superior than are native Lake Trout and their catch was lower overall than prior to 2013.

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Lake Superior Fisheries Office

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Regional Fisheries Approval Date

Literature Cited

Bindman, A. and D. Mach. 1997. GENCREEL, Version 2; General Angler Survey Analysis Program User's Guide. Minnesota Department of Natural Resources.

Halpern, T.N. 1995a. Design for Lake Superior Summer Creel Survey. Minnesota Department of Natural Resources.

Halpern, T.N. 1995b. Completion Report Lake Superior Creel Survey, 1994. Minnesota Department of Natural Resources, Study 4, Job 337.

Halpern, T.N. 2003. Completion Report Lake Superior Creel Survey, 2002. Minnesota Department of Natural Resources, Study 4, Job 615.

Hansen, M.J. (Editor). 1996. A Lake Trout restoration plan for Lake Superior. Great Lakes Fishery Commission. 34 pp.

Hansen, M.J. and 11 co-authors. 1995. Lake Trout (Salvelinus namaycush) populations in Lake Superior and their restoration in 1959-1993. Journal of Great Lakes Research 21 (Supplement 1):152-175.

Reeves, K.A. 2017. Completion Report Lake Superior Creel Survey, 2016. Minnesota Department of Natural Resources, Study 4, Job 1005.

Schreiner, D.R., J.J. Ostazeski, T.N. Halpern and S.A. Geving. 2006. Fisheries management plan for the Minnesota waters of Lake Superior. Minnesota Department of Natural Resources Special Publication 163. 89 pp.

Table 1. Creel survey clusters and stations, by shore area, in the 2017 Lake Superior summer creel survey.

Shore	Cluster	Station	Description
Lower	1-Duluth	1	Charter Dock
		2	Lakehead Boat Basin
		3	Rice's Point Landing
	2-McQuade to Two Harbors	4	McQuade Public Access
		5	Knife River-Knife River Marina
		6	Two Harbors-Agate Bay Access
Upper	3-Twin Points to Tofte	7	Twin Points Access
		8	Silver Bay Access and Marina
		9	Taconite Harbor, Tofte
	4-Grand Marais to Hovland	10	Grand Marais Access and Marina
		11	Devil Track and Brule Rivers, Hovland Access

Table 2. Frequency of visits and number of activity counts and interviews, by day type, cluster, shore area, and total area, for each cluster and day type in the 2017 Lake Superior summer creel survey.

Cluster	Day type	Days Visited	Activity Counts	Number of Days With Fishing Interviews		Number of Interviews[1]	
				Boat	Shore	Boat	Shore
1 – Duluth	Weekday	29	174	24	0	57	0
	Weekend	22	132	22	0	81	0
	Total	51	306	46	0	138	0
2 – McQuade to Two Harbors	Weekday	24	144	19	14	136	40
	Weekend	20	120	19	13	178	36
	Total	44	264	38	27	314	76
3 – Twin Points to Tofte	Weekday	28	162	19	1	46	5
	Weekend	23	132	15	3	54	4
	Total	51	942	34	4	100	9
4 – Grand Marais to Hovland	Weekday	25	125	21	14	118	27
	Weekend	21	105	16	15	101	27
	Total	46	230	37	29	219	54
Lower Shore	Weekday	53	321	43	14	193	40
	Weekend	42	252	41	13	259	36
	Total	95	573	84	27	452	76
Upper Shore	Weekday	53	287	40	15	164	32
	Weekend	44	237	31	18	155	31
	Total	97	524	71	33	319	63
Total	Weekday	69	608	59	27	357	72
	Weekend	43	489	43	24	414	67
	Total	112	1097	102	51	776	139

[1] 3 angling parties refused to be interviewed. Beginning on July 28, 2016, the clerk was excluded from ½ of Station 2, which reduced the number of interviews from Cluster 1.

Table 3. Fishing effort estimates by angler type, cluster, shore area, and total area, in angler-hours[1], in the 2017 Lake Superior summer creel survey[2]. SE in parentheses.

	Boat Anglers					Shore Anglers[2]					All Anglers				
Cluster	June	July	Aug	Sept	Summer	June	July	Aug	Sept	Summer	June	July	Aug	Sept	Summer
1-Duluth	18,549	12,828	21,023	15,361	67,761	0	0	0	0	0	18,549	12,828	21,023	15,361	67,761
	(3,139)	(2,072)	(2,858)	(1,899)	(5,091)						(3,139)	(2,072)	(2,858)	(1,899)	(5,091)
2-McQuade- Two Harbors	12,204	18,991	11,960	9,939	53,094	314	684	918	1,439	3,355	12,518	19,675	12,878	11,378	56,449
	(1,718)	(3,960)	(3,827)	(2,734)	(6,384)	(181)	(203)	(417)	(476)	(689)	(1,690)	(3,889)	(3,851)	(2,795)	(6,373)
3-Twin Points-Tofte	2,721	12,172	6,857	4,374	26,124	112	75	0	16	203	2,833	12,247	6,857	4,390	26,327
	(397)	(2,992)	(1,912)	(910)	(3,687)	(112)	(52)	(0)	(16)	(125)	(409)	(3,003)	(1,912)	(913)	(3,697)
4-Grand Marais-Hovland	2,312	8,103	10,271	5,550	26,236	125	169	213	92	599	2,437	8,272	10,484	5,642	26,835
	(570)	(1,523)	(3,149)	(1,044)	(3,695)	(73)	(60)	(74)	(48)	(129)	(559)	(1,551)	(3,192)	(1,039)	(3,740)
Lower Shore	30,753	31,819	32,983	25,300	120,855	314	684	918	1,439	3,355	31,067	32,503	33,901	26,739	124,210
	(3,578)	(4,469)	(4,776)	(3,329)	(8,165)	(181)	(203)	(417)	(476)	(689)	(3,565)	(4,406)	(4,795)	(3,379)	(8,157)
Upper Shore	5,033	20,275	17,128	9,924	52,360	237	244	213	108	802	5,269	20,520	17,341	10,032	53,162
	(695)	(3,357)	(3,684)	(1,385)	(5,220)	(134)	(79)	(74)	(51)	(179)	(693)	(3,379)	(3,720)	(1,383)	(5,259)
Total Shore	35,786	52,094	50,111	35,224	173,215	551	928	1,131	1,547	4,157	36,337	53,022	51,242	36,771	177,372
	(3,645)	(5,590)	(6,032)	(3,606)	(9,691)	(225)	(218)	(424)	(479)	(712)	(3,631)	(5,553)	(6,069)	(3,651)	(9,705)

[1] Estimates were rounded to the nearest whole number.

[2] Wisconsin anglers fished an additional 3,597 hours on the Minnesota waters of Lake Superior.

[3] All shore fishing in Cluster 1 occurs in the St. Louis Estuary, not in Lake Superior, and is not included.

Table 4. Monthly distribution of fishing effort by angler type, cluster, shore area, and total area, as a percentage of angler-hours, in the 2017 Lake Superior summer creel survey. SE in parentheses.

		Boat Anglers					Shore Anglers[1]					All Anglers				
Cluster	Station	June	July	Aug	Sept	Summer	June	July	Aug	Sept	Summer	June	July	Aug	Sept	Summer
1-Duluth		51.8	24.6	41.9	43.6	39.1	0	0	0	0	0	51.0	24.2	41.0	41.8	38.2
	1	31.0	17.9	24.5	31.7	25.3	0	0	0	0	0	30.5	17.6	24.0	30.3	24.7
	2	16.4	4.8	15.9	8.5	11.2	0	0	0	0	0	16.2	4.7	15.5	8.2	10.9
	3	4.4	1.9	1.5	3.4	2.6	0	0	0	0	0	4.3	1.9	1.5	3.2	2.6
2-McQuade-Two Harbors		34.1	36.4	23.8	28.2	30.6	57.0	73.7	81.2	93.1	80.7	34.5	37.1	25.1	30.9	31.8
	4	22.9	13.9	10.2	10.2	13.9	48	15	8.6	28.9	22.8	23.2	13.9	10.2	11.0	14.1
	5	9.0	11.9	6.2	6.6	8.6	0	0	2.2	0	0.6	8.9	11.7	6.1	6.3	8.4
	6	2.3	10.6	7.4	11.4	8.1	9	58.7	70.4	64.2	57.3	2.4	11.5	8.8	13.6	9.3
3-Twin Points-Tofte		7.6	23.4	13.8	12.4	15.1	20.3	8.1	0	1	4.9	7.8	23.1	13.4	11.9	14.9
	7	0.3	3.8	1.6	1.4	1.9	20.3	0	0	0	2.7	0.6	3.8	1.5	1.3	2.0
	8	3.4	13.5	5.8	6.6	7.8	0	0	0	0	0	3.4	13.2	5.7	6.3	7.6
	9	3.9	6.1	6.4	4.4	5.4	0	8.1	0	1	2.2	3.8	6.1	6.2	4.3	5.3
4-Grand Marais-Hovland		6.5	15.6	20.5	15.8	15.2	22.7	18.2	18.8	5.9	14.4	6.7	15.6	20.5	15.4	15.1
	10	5.4	12.7	18.3	13.8	13.1	13.2	13.5	18.8	3	11.0	5.5	12.7	18.4	13.4	13.0
	11	1.0	2.9	2.2	2.0	2.1	9.5	4.7	0	2.9	3.4	1.2	2.9	2.1	2.0	2.1
Lower Shore		85.9	61.0	65.7	71.8	69.7	57.0	73.7	81.2	93.1	80.7	85.5	61.3	66.1	72.7	70.0
Upper Shore		14.1	39.0	34.3	28.2	30.3	43.0	26.3	18.8	6.9	19.3	14.5	38.7	33.9	27.3	30.0

[1] All shore fishing in Cluster 1 occurs in the St. Louis Estuary and not in Lake Superior.

Table 5. Catch estimates[1] by species, cluster, shore area, and total area, for boat and shore angling combined, in the 2017 Lake Superior summer creel survey. SE in parentheses.

		Lake Trout	Coho Salmon	Chinook Salmon	Steelhead	Siscowet	Pink Salmon	Other[2] Salmonids	Total Salmonids	Walleye
1-Duluth	Harvested	9,445	1,302	215	9	1,593	0	38	12,612	25
		(1,758)	(407)	(72)	(10)	(516)	(0)	(29)	(1,878)	(24)
	Released	313	0	0	105	0	0	0	418	0
		(221)	(0)	(0)	(54)	(0)	(0)	(0)	(227)	(0)
	Total	9,758	1,302	215	114	1,593	0	38	13,020	25
		(1,771)	(407)	(72)	(55)	(516)	(0)	(29)	(1,892)	(24)
2-McQuade-Two Harbors	Harvested	7,901	1,227	126	14	506	103	0	9,877	0
		(2,058)	(423)	(53)	(13)	(266)	(89)	(0)	(2,121)	(0)
	Released	1,039	41	27	126	41	0	0	1,274	0
		(329)	(26)	(32)	(56)	(29)	(0)	(0)	(338)	(0)
	Total	8,940	1,268	153	140	547	103	0	11,151	0
		(2,084)	(424)	(62)	(58)	(268)	(89)	(0)	(2,148)	(0)
3-Twin Points – Tofte	Harvested	5,294	1,180	0	0	34	950	13	7,471	0
		(1,361)	(465)	(0)	(0)	(47)	(353)	(11)	(1,482)	(0)
	Released	970	239	113	147	127	40	73	1,709	0
		(417)	(125)	(104)	(77)	(144)	(33)	(62)	(481)	(0)
	Total	6,264	1,419	113	147	147	990	86	9,180	0
		(1,424)	(482)	(104)	(77)	(77)	(355)	(63)	(1,559)	(0)
4-Grand Marais-Hovland	Harvested	5,366	854	56	23	135	541	0	6,975	0
		(1,189)	(355)	(44)	(17)	(54)	(204)	(0)	(1,259)	(0)
	Released	1,783	66	28	151	48	221	61	2,358	0
		(521)	(39)	(28)	(52)	(53)	(109)	(55)	(542)	(0)
	Total	7,149	920	84	174	174	762	61	9,333	0
		(1,298)	(357)	(52114	(54)	(54)	(231)	(55)	(1,371)	(0)
Lower Shore	Harvested	17,346	2,529	341	23	2,099	103	38	22,479	25
		(2,707)	(588)	(89)	(16)	(581)	(89)	(29)	(2,833)	(24)
	Released	1,352	41	27	231	41	0	0	1,692	0
		(396)	(26)	(32)	(78)	(29)	(0)	(0)	(407)	(0)
	Total	18,698	2,570	368	254	2,140	103	38	24,171	25
		(2,736)	(588)	(95)	(80)	(582)	(89)	(29)	(2,862)	(24)
Upper Shore	Harvested	10,660	2,034	56	23	169	1,491	13	14,446	0
		(1,807)	(585)	(44)	(17)	(71)	(408)	(11)	(1,945)	(0)
	Released	2,753	305	141	298	175	261	134	4,067	0
		(667)	(131)	(107)	(93)	(153)	(114)	(82)	(725)	(0)
	Total	13,413	2,339	197	321	334	1,752	147	18,513	0
		(1,927)	(600)	(116)	(94)	(169)	(424)	(83)	(2,076)	(0)
Total	Harvested	28,006	4,563	397	46	2,268	1,594	51	36,925	25
		(3,255)	(829)	(99)	(23)	(585)	(418)	(31)	(3,436)	(24)
	Released	4,105	346	168	529	216	261	134	5,759	0
		(776)	(133)	(112)	(121)	(156)	(156)	(82)	(832)	(0)
	Total	32,111	4,909	565	575	2,484	1,855	185	42,684	25
		(3,346)	(840)	(150)	(123)	(606)	(433)	(139)	(3,536)	(24)

[1] Wisconsin anglers who fished Minnesota waters of Lake Superior also caught an estimated 459 Lake Trout, 64 Siscowet, 39 Coho Salmon, 6 Chinook Salmon, 1 Brown Trout, 3 Rainbow Trout, and 30 Walleyes.

[2] Other Salmonids include Brown Trout (38), Brook Trout (134), and Kamloops Rainbow Trout (13). Anglers also kept an estimated 73 Northern Pike and 111 Lake Herring and released 43 Northern Pike and 19 Lake Herring.

Table 6. Catch rate (number of fish per hour) estimates by species, cluster, shore area, and total area, for boat and shore angling combined, in the 2017 Lake Superior summer creel survey. SE in parentheses.

		Lake Trout	Coho Salmon	Chinook Salmon	Steelhead	Siscowet	Pink Salmon	Other[2] Salmonids	Total Salmonids	Walleye
1-Duluth	Harvested	0.1394	0.0192	0.0032	0.0001	0.0235	0	0.0006	0.1860	0.0002
		(0.0280)	(0.0061)	(0.0011)	(0.0015)	(0.0078)	(0)	(0.0004)	(0.0310)	(0.0002)
	Released	0.0046	0	0	0.0015	0	0	0	0.0061	0
		(0.0033)	(0)	(0)	(0.0008)	(0)	(0)	(0)	(0.0034)	(0)
	Total	0.1440	0.0192	0.0032	0.0016	0.0235	0	0.0006	0.1921	0.0002
		(0.0283)	(0.0062)	(0.0011)	(0.0008)	(0.0078)	(0)	(0.0004)	(0.0314)	(0.0002)
2-McQuade-Two Harbors	Harvested	0.1400	0.0218	0.0022	0.0002	0.0090	0.0018	0	0.1750	0
		(0.0398)	(0.0079)	(0.0010)	(0.0002)	(0.0048)	(0.0016)	(0)	(0.0425)	(0)
	Released	0.0184	0.0007	0.0005	0.0022	0.0007	0	0	0.0225	0
		(0.0061)	(0.0005)	(0.0006)	(0.0010)	(0.0005)	(0)	(0)	(0.0065)	(0)
	Total	0.1584	0.0225	0.0027	0.0024	0.0097	0.0018	0	0.1975	0
		(0.0411)	(0.0079)	(0.0011)	(0.0011)	(0.0022)	(0.0016)	(0)	(0.0442)	(0)
3-Twin Points – Tofte	Harvested	0.2011	0.0448	0	0	0.0013	0.0361	0.0005	0.2838	0
		(0.0589)	(0.0188)	(0)	(0)	(0.0018)	(0.0143)	(0.0004)	(0.0689)	(0)
	Released	0.0368	0.0091	0.0043	0.0056	0.0048	0.0015	0.0028	0.0649	0
		(0.0167)	(0.0049)	(0.0040)	(0.0030)	(0.0055)	(0.0013)	(0.0024)	(0.0204)	(0)
	Total	0.2379	0.0539	0.0043	0.0056	0.0061	0.0376	0.0033	0.3487	0
		(0.0635)	(0.0198)	(0.0040)	(0.0030)	(0.0008)	(0.0027)	(0.0024)	(0.0768)	(0)
4-Grand Marais-Hovland	Harvested	0.2000	0.0318	0.0021	0.0009	0.0050	0.0202	0	0.2600	0
		(0.0522)	(0.0139)	(0.0017)	(0.0006)	(0.0021)	(0.0081)	(0)	(0.0590)	(0)
	Released	0.0664	0.0025	0.0010	0.0056	0.0018	0.0082	0.0023	0.0878	0
		(0.0215)	(0.0015)	(0.0010)	(0.0021)	(0.0020)	(0.0042)	(0.0021)	(0.0236)	(0)
	Total	0.2664	0.0343	0.0031	0.0065	0.0068	0.0284	0.0023	0.3478	0
		(0.0607)	(0.0141)	(0.0020)	(0.0022)	(0.0008)	(0.0036)	(0.0021)	(0.0700)	(0)
Lower Shore	Harvested	0.1396	0.0204	0.0028	0.0002	0.0169	0.0008	0.0003	0.1810	0.0002
		(0.0237)	(0.0049)	(0.0007)	(0.0001)	(0.0048)	(0.0007)	(0.0002)	(0.0257)	(0.0002)
	Released	0.0109	0.0003	0.0002	0.0019	0.0003	0	0	0.0136	0
		(0.0033)	(0.0002)	(0.0003)	(0.0006)	(0.0002)	(0)	(0)	(0.0034)	(0)
	Total	0.1505	0.0207	0.0030	0.0021	0.0172	0.0008	0.0003	0.1946	0.0002
		(0.0242)	(0.0049)	(0.0008)	(0.0007)	(0.0048)	(0.0007)	(0.0002)	(0.0264)	(0.0002)
Upper Shore	Harvested	0.2005	0.0383	0.0011	0.0004	0.0032	0.0280	0.0002	0.2717	0
		(0.0393)	(0.0116)	(0.0007)	(0.0003)	(0.0014)	(0.0082)	(0.0002)	(0.0453)	(0)
	Released	0.0518	0.0057	0.0027	0.0056	0.0033	0.0049	0.0025	0.0765	0
		(0.0135)	(0.0025)	(0.0020)	(0.0018)	(0.0029)	(0.0022)	(0.0016)	(0.0156)	(0)
	Total	0.2523	0.0440	0.0038	0.0060	0.0065	0.0329	0.0027	0.3482	0
		(0.0439)	(0.0121)	(0.0022)	(0.0019)	(0.0032)	(0.0086)	(0.0016)	(0.0519)	(0)
Total	Harvested	0.1579	0.0257	0.0022	0.0003	0.0128	0.0090	0.0003	0.2082	0.0001
		(0.0203)	(0.0049)	(0.0006)	(0.0001)	(0.0034)	(0.0024)	(0.0002)	(0.0225)	(0.0001)
	Released	0.0231	0.0020	0.0009	0.0029	0.0012	0.0015	0.0008	0.0324	0
		(0.0046)	(0.0008)	(0.0006)	(0.0007)	(0.0009)	(0.0006)	(0.0005)	(0.0050)	(0)
	Total	0.1810	0.0277	0.0031	0.0032	0.0140	0.0105	0.0011	0.2406	0.0001
		(0.0213)	(0.0050)	(0.0009)	(0.0007)	(0.0035)	(0.0025)	(0.0005)	(0.0239)	(0.0001)

[1] Wisconsin anglers who fished Minnesota waters of Lake Superior also caught an estimated 459 Lake Trout, 64 Siscowet, 39 Coho Salmon, 6 Chinook Salmon, 1 Brown Trout, 3 Rainbow Trout, and 30 Walleyes.

[2] Other Salmonids include Brown Trout (38), Brook Trout (134), and Kamloops Rainbow Trout (13). Anglers also kept an estimated 73 Northern Pike and 111 Lake Herring and released 43 Northern Pike and 19 Lake Herring.

Table 7. Percent of angling parties, by angler type, that caught specific numbers of fish in the 2017 Lake Superior summer creel survey.

	Lake Trout		Coho Salmon		Chinook Salmon		Steelhead		Siscowet		Pink Salmon		Total Salmonids	
	Boat	Shore	Boat	Shore	Boat	Shore	Boat	Shore	Boat	Shore	Boat	Shore	Boat	Shore
0	38.8	100	83.7	100	96.1	97.1	95.9	100	92.8	100	94.0	97.1	32.4	94.3
1	15.7		8.8		3.4	2.9	3.7		4.1		2.7	2.9	13.9	5.7
2	14.5		4.2		0.4		0.3		1.6		2.2		12.4	
3	9.3		1.0				0.1		0.8		0.5		12.2	
4	5.5		1.2		0.1				0.3		0.1		6.4	
5	2.7		0.3										3.8	
6	4.2		0.4						0.3		0.3		5.8	
7	2.5		0.1						0.1		0.1		1.8	
8	1.4		0.3										2.4	
9	1.8												2.2	
10	0.7										0.1		1.7	
11	0.3												0.9	
>=12	2.6												4.1	

Table 8. Length-frequency distribution (inches) and sample size of harvested salmonids, by boat and shore angling combined, in the 2017 Lake Superior summer creel survey.

	Lake Trout	Coho Salmon	Chinook Salmon	Kamloops	Steelhead	Siscowet	Pink Salmon
	1133	196	24	1	4	87	54
6.5 to 7.4							
7.5 to 8.4							
8.5 to 9.4							
9.5 to 10.4							
10.5 to 11.4		2					
11.5 to 12.4		7					
12.5 to 13.4		2	2				7
13.5 to 14.4		1					14
14.5 to 15.4	5		2				20
15.5 to 16.4	22	3	1				12
16.5 to 17.4	49	13	2			1	1
17.5 to 18.4	81	49				3	
18.5 to 19.4	110	51				12	
19.5 to 20.4	108	39	1			13	
20.5 to 21.4	176	21	1	1	1	25	
21.5 to 22.4	135	4	1			14	
22.5 to 23.4	126	4	1			12	
23.5 to 24.4	93		2		1	5	
24.5 to 25.4	65		5			1	
25.5 to 26.4	61		1				
26.5 to 27.4	30		1		2	1	
27.5 to 28.4	18		1				
28.5 to 29.4	18		1				
29.5 to 30.4	12						
30.5 to 31.4	5						
31.5 to 32.4	1		1				
32.5 to 33.4	5		1				
33.5 to 34.4	5						
34.5 to 35.4	4						
35.5 to 36.4	3						
36.5 to 37.4	1						
37.5 to 38.4							
38.5 to 39.4							
39.5 to 40.4							
>40.4							
Average Length (in)	22.0	18.7	22.4	21.3	24.8	21.1	14.7

Table 9. Length-frequency distribution (inches) and sample size of released salmonids, by boat and shore angling combined, in the 2017 Lake Superior summer creel survey.

	Lake Trout	Coho Salmon	Chinook Salmon	Pink Salmon	Brook Trout	Steelhead	Siscowet
	248	16	7	19	6	31	8
6.5 to 7.4							
7.5 to 8.4	2	3	2				
8.5 to 9.4							
9.5 to 10.4	1	2	1		2	1	
10.5 to 11.4	1						
11.5 to 12.4	6	8	2			2	
12.5 to 13.4		1	2				
13.5 to 14.4	10			6	3	2	
14.5 to 15.4	11			10		1	
15.5 to 16.4	46			3	1		
16.5 to 17.4	28						
17.5 to 18.4	23	2					1
18.5 to 19.4	18						
19.5 to 20.4	29					2	1
20.5 to 21.4	7					1	
21.5 to 22.4	13					3	3
22.5 to 23.4	7						1
23.5 to 24.4	13					2	
24.5 to 25.4	13					2	1
25.5 to 26.4	4					2	
26.5 to 27.4	1					5	
27.5 to 28.4	3					6	1
28.5 to 29.4	1					2	
29.5 to 30.4	5						
30.5 to 31.4	1						
31.5 to 32.4	1						
32.5 to 33.4							
33.5 to 34.4	2						
34.5 to 35.4							
35.5 to 36.4	1						
36.5 to 37.4	1						
37.5 to 38.4							
38.5 to 39.4							
39.5 to 40.4							
>40.4							
Average Length (in)	19.8	11.4	10.5	14.9	13.0	23.7	22.7

Table 10. Average weight (pounds) by species, cluster, shore area, and total area, of harvested fish in the 2017 Lake Superior summer creel survey. SE in parentheses.

	Lake Trout	Coho Salmon	Chinook Salmon	Pink Salmon	Siscowet
Sample Size (n)	1141	204	24	54	87
1 – Duluth	3.56	1.91	4.87	-	2.74
	(0.11)	(0.08)	(1.02)	-	(0.13)
2 - McQuade - Two Harbors	3.22	1.86	6.13	1.06	2.84
	(0.09)	(0.06)	(1.65)	(0.08)	(0.14)
3 - Twin Points - Tofte	3.95	1.97	-	0.90	3.62
	(0.24)	(0.10)	-	(0.05)	(1.90)
4 - Grand Marais - Hovland	2.96	1.93	3.93	0.99	3.14
	(0.12)	(0.12)	(2.17)	(0.03)	(0.27)
Lower Shore	3.40	1.88	5.33	1.06	2.76
	(0.14)	(0.10)	(1.94)	(0.08)	(0.19)
Upper Shore	3.45	1.96	3.93	0.93	3.24
	(0.27)	(0.16)	(2.17)	(0.06)	(1.92)
Total Shore	3.42	1.92	5.13	0.94	2.80
	(0.30)	(0.19)	(2.91)	(0.10)	(1.93)

Table 11. Yield (pounds) estimates[1] by species, cluster, shore area, and total area, for boat and shore angling combined, in the 2017 Lake Superior summer creel survey. SE values are in parentheses.

	Lake Trout	Coho Salmon	Chinook Salmon	Steelhead	Siscowet	Pink Salmon	Other Salmonids[2]	Total Salmonids	Non-Salmonids[3]
1-Duluth	33,606	2,484	1,046	23	4,358	0	171	41,688	150
	(3,180)	(245)	(273)	(29)	(504)	(0)	(135)	(3,244)	(150)
2-McQuade-Two Harbors	25,454	2,279	772	83	1,439	110	0	30,137	386
	(2,828)	(241)	(241)	(84)	(260)	(56)	(0)	(2,862)	(238)
3-Twin Points-Tofte	20,889	2,322	0	0	123	853	0	24,187	0
	(2,798)	(303)	(0)	(0)	(183)	(101)	(0)	(2,822)	(0)
4-Grand Marais–Hovland	15,890	1,656	220	100	424	534	0	18,824	0
	(1,842)	(257)	(172)	(51)	(76)	(56)	(0)	(1,871)	(0)
Lower Shore	59,060	4,763	1,818	106	5,797	110	171	71,825	536
	(4,256)	(344)	(364)	(89)	(567)	(56)	(135)	(4,327)	(281)
Upper Shore	36,779	3,978	220	100	547	1,387	0	43,011	0
	(3,350)	(397)	(172)	(51)	(198)	(115)	(0)	(3,386)	(0)
Total Shore	95,839	8,741	2,038	206	6,344	1,497	171	114,836	536
	(5,416)	(525)	(403)	(102)	(601)	(128)	(135)	(5,494)	(281)

[1] Estimates are rounded to the nearest pound.

[2] Other Salmonines included Brown Trout (171 lb.).

[3] Anglers harvested Walleye (102 lb.), Northern Pike (220 lb.), and Herring (214 lb.).

Table 12. Age distribution, in percent, of harvested lake trout (wild and stocked), 2016 Lake Superior summer creel survey. n=1133.

Age	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI+
%	0	1.68	8.21	27.10	21.27	13.42	9.00	4.77	4.15	2.47	1.50	1.15	5.12

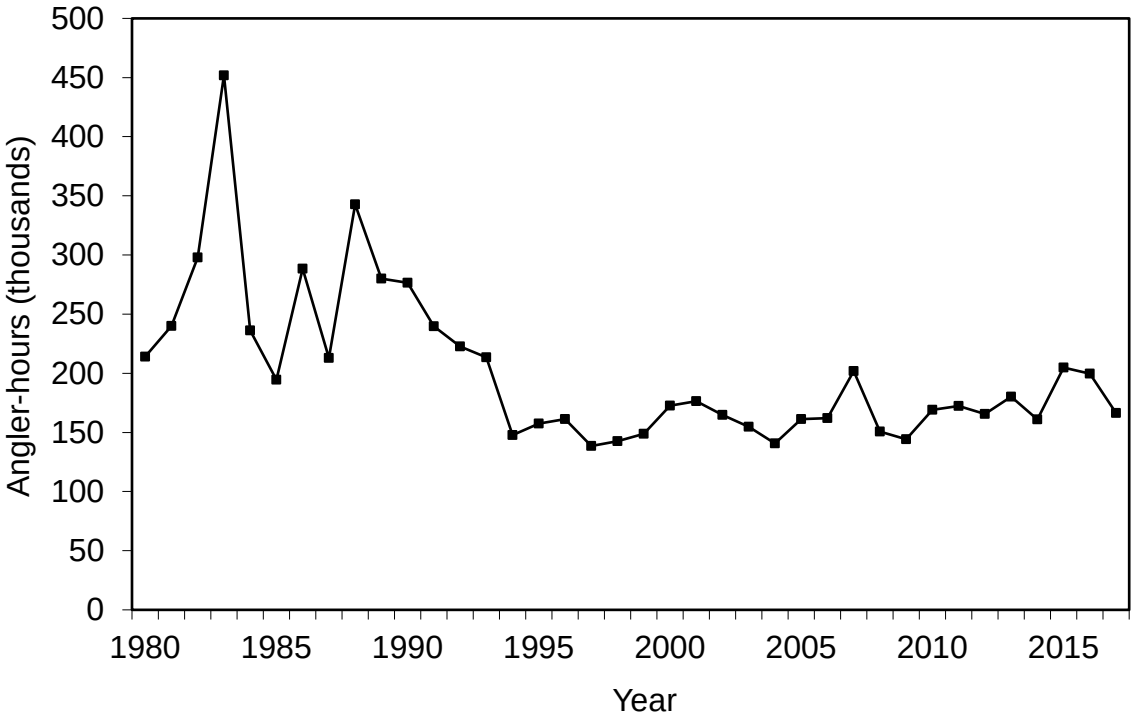

Figure 1. Angling effort in the Lake Superior summer creel survey, 1980-2017. The design of the summer Lake Superior creel survey was changed in 1994 (Halpern 1995a,b).

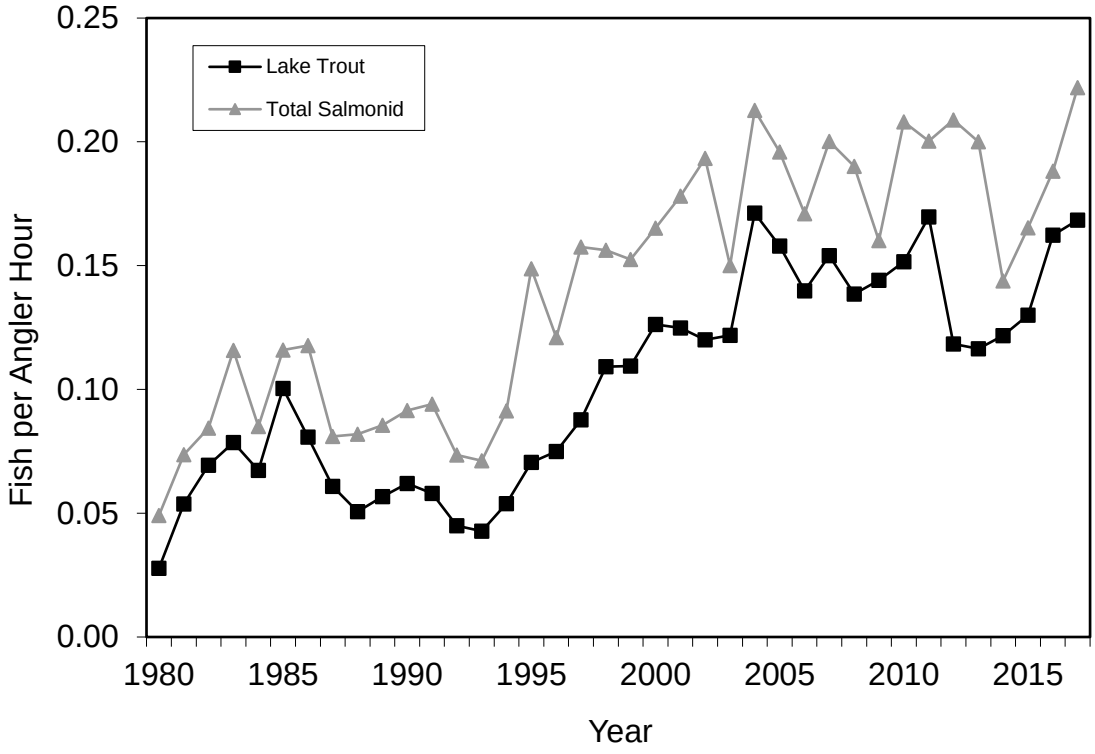

Figure 2. Harvest rate for Lake Trout and all Salmonids combined in the Lake Superior summer creel survey, 1980-2017.

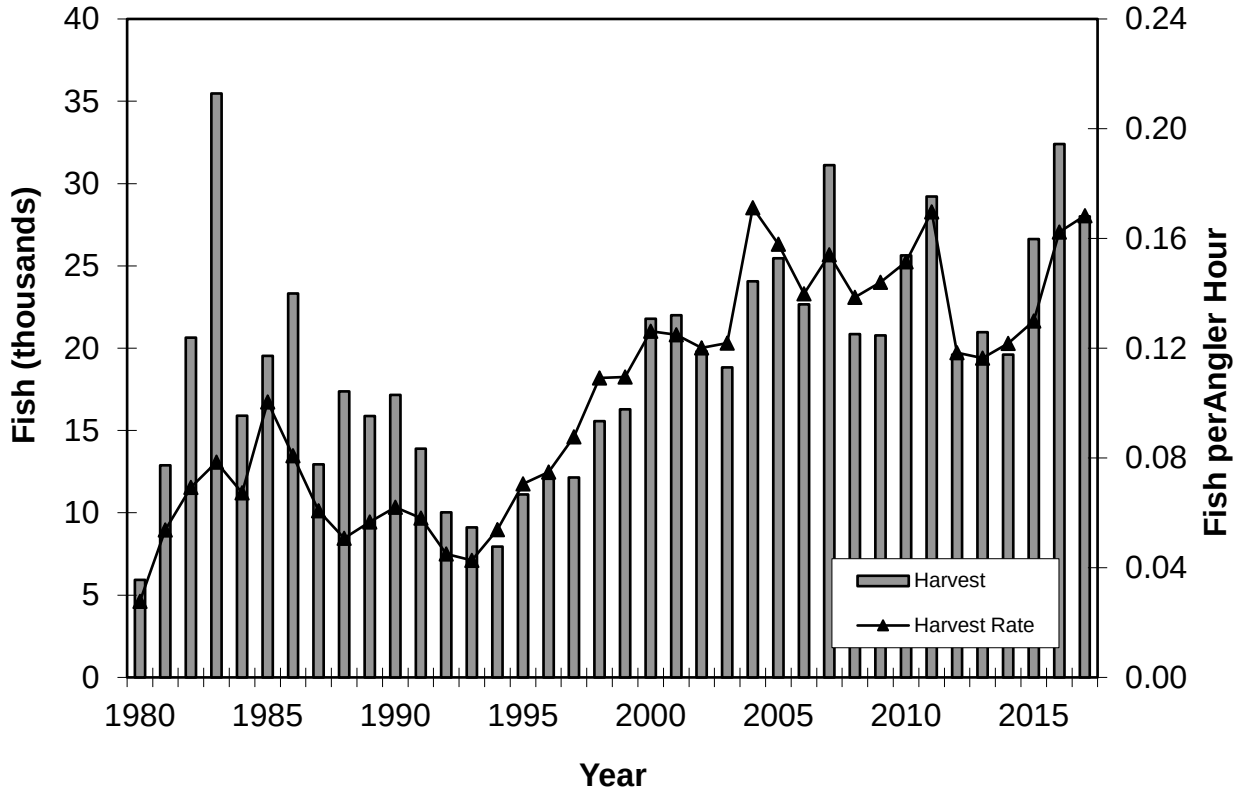

Figure 3. Lake Trout harvest and harvest rate in the Lake Superior summer creel survey, 1980-2017.

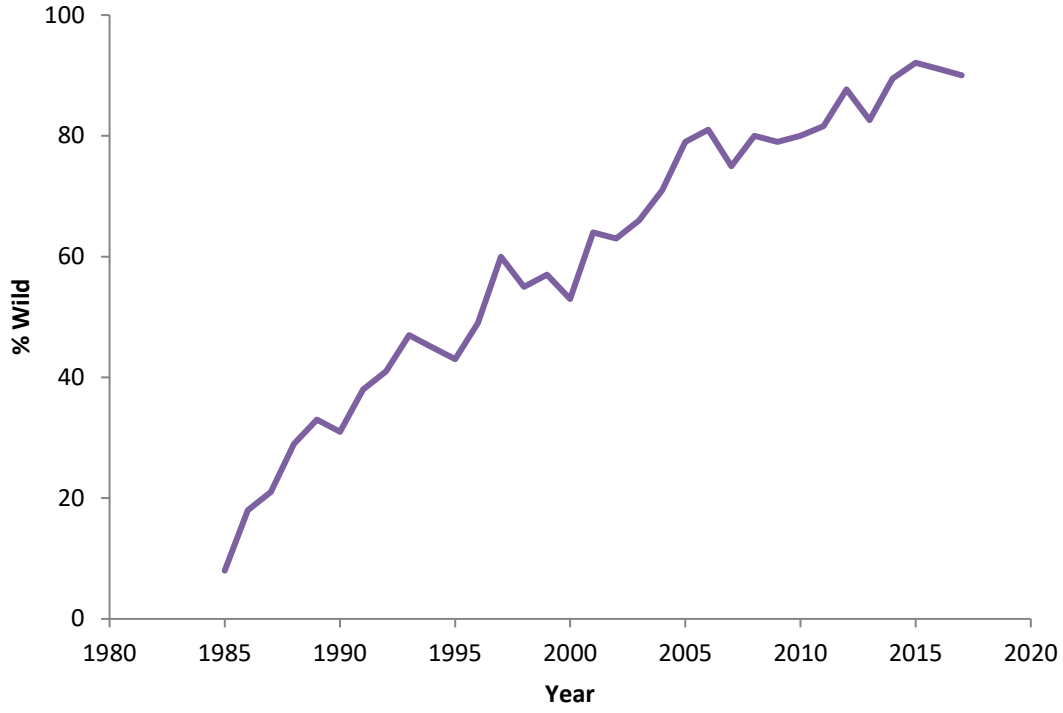

Figure 4. Percent wild Lake Trout observed by creel clerks in the Lake Superior summer creel survey, 1985-2017.

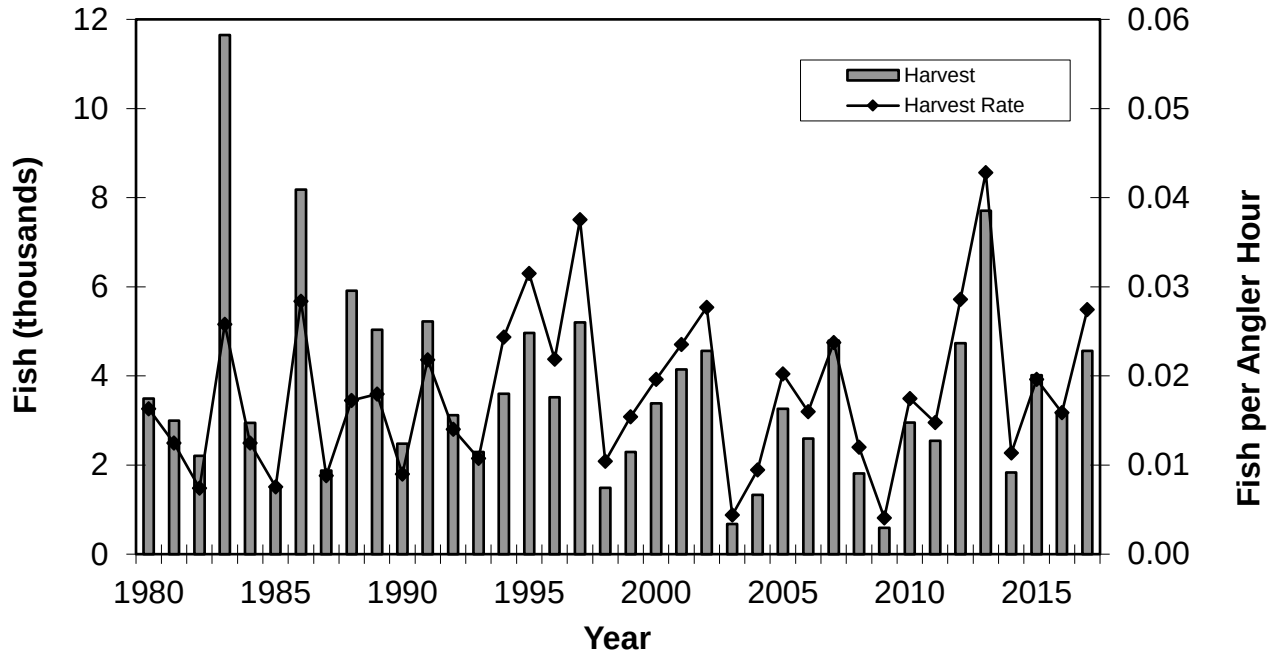

Figure 5. Coho Salmon harvest and harvest rate in the Lake Superior summer creel survey, 1980-2017.

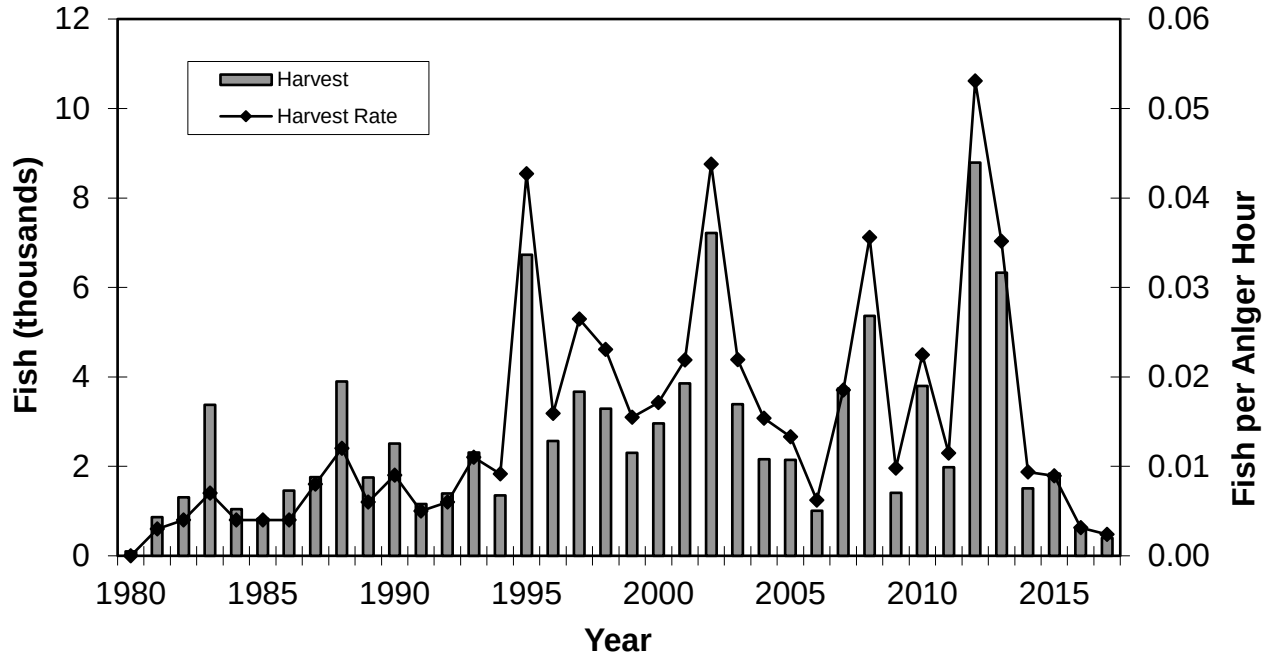

Figure 6. Chinook Salmon harvest and harvest rate in the Lake Superior summer creel survey, 1980-2017.