

Minnesota
F-29-R(P)-28
Study 3
Job 3

**Minnesota Department of Natural Resources
Fisheries Division, Lake Superior Area**

Status of Coaster Brook Trout in the Minnesota Waters of Lake Superior

2008

Matt Ward

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Introduction

Brook trout *Salvelinus fontinalis* are the only native anadromous salmonid in the Minnesota waters of Lake Superior. Brook trout that spend a portion of their life in Lake Superior are referred to as coasters (Becker 1983). Anecdotal angling reports indicate that larger brook trout were more frequently caught prior to the 1890's (Smith and Moyle 1944) and populations experienced precipitous declines thereafter due to overfishing and habitat degradation (Horns et al. 2003; Schreiner et al. 2008).

In early attempts to rehabilitate coasters in Minnesota, various life stages of brook trout were stocked from the mid to late 1900's with minimal success (Schreiner 2006). No stocking efforts to rehabilitate coasters have been made in Minnesota waters by the Minnesota Department of Natural Resources (MNDNR) since 1987; however, some stocking has occurred by the Grand Portage Band of Chippewa within reservation waters.

Despite adversities over the past 150 years, small self-sustaining populations of coasters continue to persist in many tributaries along the Minnesota shore. To assist in restoration efforts, regulations were enacted in 1997 that reduced the bag limit to one, increased the minimum length limit to 508 mm (20 in), and created a closed season from the last day of September to the second Saturday in April (Schreiner 2006). The MNDNR also initiated a fall electrofishing survey in 1997 to monitor coaster populations on the Minnesota shore, assess the effects of restrictive angling regulations, and collect genetic information. Fall electrofishing surveys were planned at five-year intervals (Schreiner 2006).

The objective of the fall 2007 survey was to continue to document the distribution, abundance, size and age structure, and genetic makeup of coasters along the Minnesota shore. Unfortunately, a total of 17.3 cm (6.8 in) of rain fell in October 2007, which resulted in all survey streams being too high to sample between October 8 and 15, 2007. Discharge remained high in the fall of 2007 on the eight largest study streams and sampling could not be completed. In

2008 we completed the survey on six of the eight largest study streams. Flow in the Cascade and Brule rivers remained too high for sampling in 2008. In 2008, 18.0 cm (7.1 in) of rain fell in late September and early October, which delayed sampling until late October. Four additional streams were sampled for the first time in 2008, which included the Lester River, Gooseberry River, Dragon Creek, and Little Manitou River. The 2007-2008 surveys were combined and compared to data from the 1997 and 2002 surveys to determine if regulation changes have influenced coaster population characteristics. Information gathered with these surveys may also contribute to management directions regarding coaster rehabilitation efforts in other portions of Lake Superior.

Methods

The study area consisted of 29 streams along the Minnesota shore of Lake Superior between Duluth and the Grand Portage Reservation (Figure 1, Table 1). Streams were sampled from late-September through early-November, when water temperatures ranged between 0 and 15° Celsius (°C). Streams were sampled from the lake to the first natural barrier, or to a known landmark if a barrier falls was not present. Fish were sampled using a Smith Root model 11-A backpack electrofishing unit (300-400 V, 60 Hz). The amount of time (seconds) electrofished was recorded for each pass on each sample. Multiple passes were conducted if all brook trout observed on the first pass were not netted, and time allowed. When multiple passes were conducted, catch per effort values in this report only include the number of brook trout sampled on the first pass. Second passes were not completed on any streams in 1997 or 2002, while a second pass was completed at three streams on multiple occasions in 2007 and at one stream on one occasion in 2008.

Sample crews consisted of three individuals on smaller to medium sized streams and six individuals on larger streams. A splitter was placed on the anode on the electrofishing unit,

which allowed a two anode, trailing cathode configuration. All individuals carried dip nets. The third or sixth individual followed behind with a five-gallon bucket and a net. Water temperature in °C was measured near the mouth of each stream, on each sample date. UTM coordinates were obtained at the upstream and downstream end of each electrofishing station.

All brook trout sampled were measured to the nearest millimeter (mm), weighed to the nearest gram (g), and sex was determined. Males and females were classified as either ripe, green, spent, or immature. Scale samples were collected for age determination and the mean length at the time of last annulus formation was determined. A piece of tissue was removed from the left rear pelvic fin for genetic analysis and marking purposes. Tissue samples were placed in individually numbered vials containing 90.5% ethyl alcohol for future genetic analysis. All other species were identified and released, and their abundance was generalized as present, common, or abundant.

Population estimates were determined in 1997, 2002, and 2007-2008 based on the modified Schnabel mark-recapture method, on streams where a large enough sample size was collected on multiple sample events (Ricker 1975). Estimates of the upper and lower 95% confidence intervals were made based on a Poisson distribution around the population estimate. An important assumption that could not be met in the mark-recapture method was that there was no migration in or out of the study streams.

Results and Discussion

2007-2008 Results

Twenty-five of the 29 survey streams were sampled, which included 59 sample events (Table 2). A total of 69.7 hours and 33.4 kilometers of electrofishing effort occurred. Three hundred and forty-four brook trout were sampled, of which 39 were recaptures, resulting in 305

different fish. The overall catch per effort (CPE) for brook trout was 8.8/km and 4.6/hr (Figure 2). Catch rates were highest at the Little Marais River, Poplar River, Spruce Creek, and Kadunce Creek (Tables 3 and 4).

Twenty-five percent of brook trout sampled were ≥ 250 mm (Figure 3). Fifty-one percent of brook trout were age-2 through age-4 (Figure 4). Brook trout sampled had growth increments of 67 mm between age-1 and age-2, 96 mm between age-2 and age-3, and 83 mm between age-3 and age-4 (Figure 5, Table 5). Of sexually mature brook trout sampled (≥ 130 mm), 39% were male (N=100) and 61% were female (N=156) (Figure 6). Ninety percent of brook trout were sampled after October 11 (Figure 7), while 93% of brook trout were sampled when water temperatures were ≤ 6.9 °C (Figure 8).

Three brook trout with fin clips were captured in 2007-2008. A 265 mm female with a right pelvic fin clip was sampled on two occasions at Kadunce Creek in 2007, a 326 mm female with a left pelvic fin clip was sampled once at Silver Creek in 2007, and a 285 mm male with a left pelvic fin clip was sampled once at Spruce Creek in 2008. These fish were likely stocked by the Grand Portage Band; however, their origin will be determined using microsatellite genetic analysis.

Rainbow trout were the most common species sampled in each stream and were sampled in 25 of 25 streams sampled. A total of 12 species of gamefish and 14 species of non-gamefish were sampled during this survey (Figure 9, Table 6).

Comparisons among 1997, 2002, and 2007-2008

Twenty-five streams were sampled in 2007-2008 compared with twenty-two streams in 1997 and ten streams in 2002 (Pranckus and Ostazeski 2003, Tilma et al. 1999). The number of sample events completed in 1997, 2002, and 2007-2008 was 41, 24, and 59.

A total of 382, 126, and 344 brook trout were sampled, in 1997, 2002, and 2007-2008. The overall catch per effort (CPE, number/hour) was 17.7, 16.1, and 4.6/hr, in 1997, 2002, and 2007-2008. The overall catch per effort (CPE, number/kilometer) was 12.2, 6.7, and 8.8/km, in 1997, 2002, and 2007-2008. The discrepancy between the number per hour sampled and the number per kilometer in 2007-2008 was likely a result of the crew spending more time electrofishing per area than in previous surveys.

Of all streams sampled in 1997, 2002, and 2007-2008, Kadunce Creek and Kimball Creek were the only two streams at which more than 15 brook trout were sampled in all three surveys, while greater than 15 brook trout were sampled at Spruce Creek, the Cross, Devil Track, Little Marais, Onion, and Split Rock rivers, during one or two of the three surveys.

The size-structure of brook trout sampled in 2007-2008 was greater than that of the 1997 or 2002 sample, with 10 brook trout ≥ 400 mm being sampled in 2007-2008. Twenty-five percent of brook trout sampled in 2007-2008 were ≥ 250 mm, compared with 6% in 2002 and 10% in 1997 (Figure 3).

The age-structure of brook trout sampled in 2007-2008 was greater than the 1997 or 2002 sample. Age-4 brook trout were not sampled in 1997 or 2002, while 12 were sampled in 2007-2008. In both 1997 and 2002, 20% and 16% of brook trout were \geq age-2, while in 2007-2008 51% were \geq age-2 (Figure 4).

Brook trout growth rates from age-1 to age-2 were similar in the 1997 and 2007-2008 surveys; however, growth rates from age-2 to age-3 were greater in 2007-2008 (Figure 5). Brook trout condition was also greater in 2007-2008 compared with 1997 (Figure 10). Brook trout weights and growth rates were not measured in 2002. Growth rates of brook trout from the 1993 Isle Royale, Michigan sample (Slade 1994) were greater for all age-categories when compared to those collected in Minnesota.

Sample sizes were sufficient to determine population estimates on twelve occasions during the three surveys (Figure 11). Estimates ranged from 13.1 to 165 individuals per stream. Based on these estimates coaster populations along the Minnesota shore are relatively small when compared to other known populations in Lake Superior (Huckins 2008).

Ninety percent of brook trout were sampled after October 11 in 2007-2008, compared to 71% in 2002 and 91% in 1997 (Figure 7). When looking at data collectively from all three surveys, 88% of brook trout were sampled after October 11. Ninety-three percent of brook trout sampled in 2007-2008 were sampled when water temperatures were ≤ 9.72 °C, compared to 84% in 2002 and 80% in 1997 (Figure 8). Over all three surveys, 85% of brook trout were sampled when water temperatures were between 0.00 and 9.72 °C. These data indicate how close to ice-up and how small the spawning window is for brook trout.

Genetic analysis of the brook trout sampled in the 1997 survey by the MNDNR concluded that a substantial genetic diversity still exists within brook trout populations along Minnesota's shoreline, and native brook trout populations suffered no significant genetic impact from previous stockings (Burnham-Curtis 2000). Future genetic analysis of the 2007-2008 data should determine if the larger brook trout sampled in 2007-2008 were produced in Minnesota streams and resulted from conservative regulations, or if they were stocked fish that strayed into Minnesota waters.

Conclusions

Overall, a relatively high number of older and larger brook trout were sampled in 2007-2008, compared to 1997 and 2002. Sampling every five years is a minimal level and only provides a snapshot of the population. However, observing the same trend in both 2007 and 2008 indicates that multiple year-classes achieved greater size and age. If funding exists, future consideration should be given to annually sampling a subset of streams, while continuing to

sample all study streams every five years, or increasing the frequency of sampling all study streams to once every three years.

Current regulations allow anglers to fish for coasters below posted boundaries on the Minnesota shore from the second Saturday in April through the last day of September. However, anglers can continuously fish for salmon year round. Incidental hooking mortality associated with small concentrated populations of an aggressive species such as brook trout or noncompliance with the regulations may limit coaster recovery. During the 2002 and/or 2007-2008 surveys, anglers at Silver Creek, Kadunce Creek, Poplar River, Caribou River, and Gooseberry River stated to MNDNR personnel that they were brook trout fishing (out of season). Compliance is essential for regulations to be effective. Continuing to focus on public education of regulations appears necessary to increase the likelihood of this programs success.

Based on the results of the 2007-2008 survey, we are cautiously optimistic that coaster brook trout rehabilitation is progressing, but it will take time. Angler expectations must be reasonable, as wild coaster brook trout will never support a large harvest fishery in Minnesota.

Acknowledgements

I am especially indebted to Roger Peka, Phil Kunze, and Chris Palvere who spent numerous hours in tough field conditions collecting data, while maintaining a positive attitude and great work ethic. Duluth Research, Duluth, Lake Superior, Finland, and Grand Marais Area Fisheries provided equipment. Duluth Area Fisheries, the Forest Service, University of Minnesota Duluth, and MNDNR Research also provided personnel on several days. Completing this survey would not have been possible without the collective efforts of all fisheries management and research personnel in the four area offices along Lake Superior.

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Approved by: *Donald R. Schreiner* Date: 2/20/09
Area Supervisor

Approved by: *John R. H.* Date: 3/04/09
Regional Supervisor

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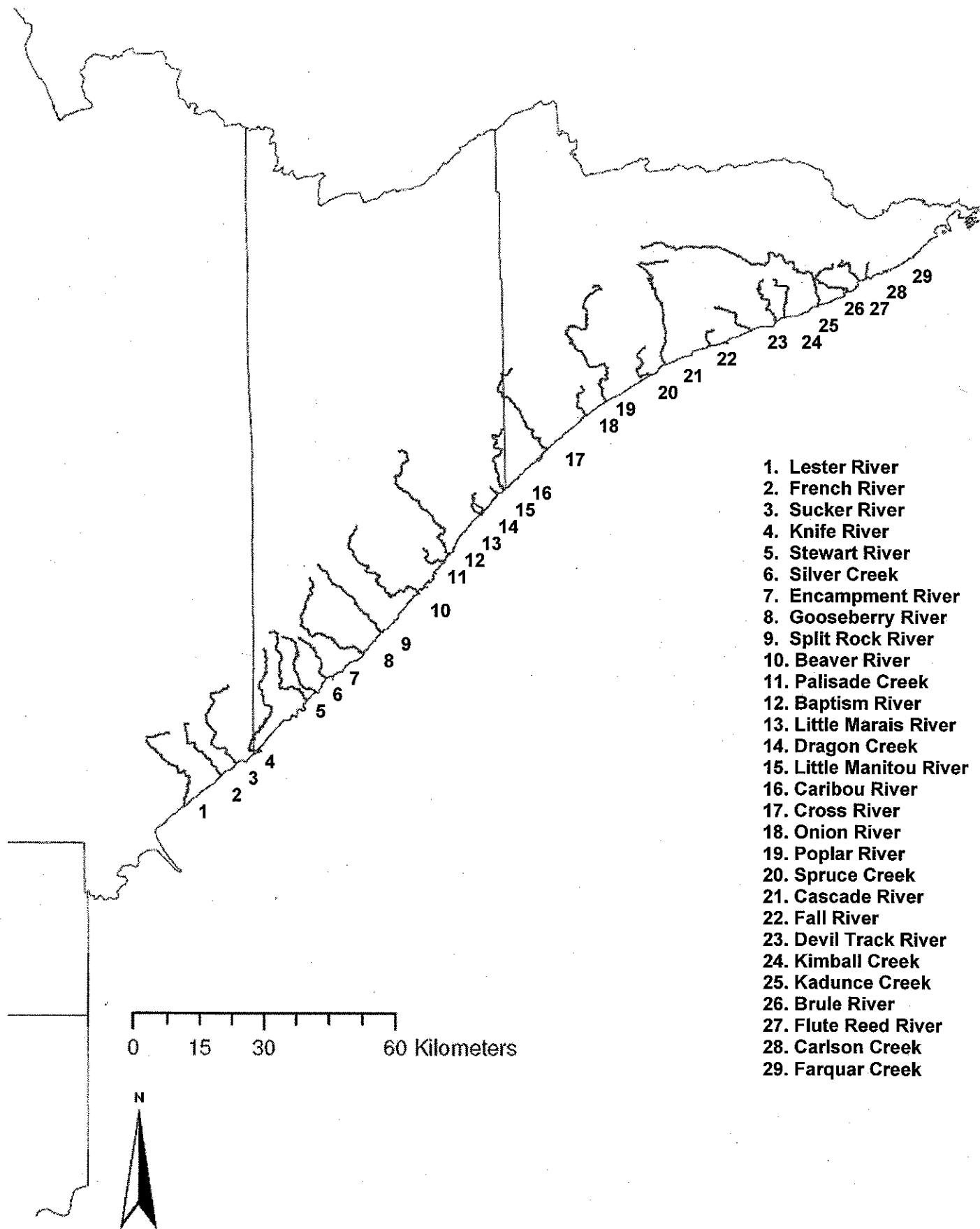


Figure 1. Streams sampled on the Minnesota shore of Lake Superior for brook trout in either the 1997, 2002, or 2007-2008 samples.

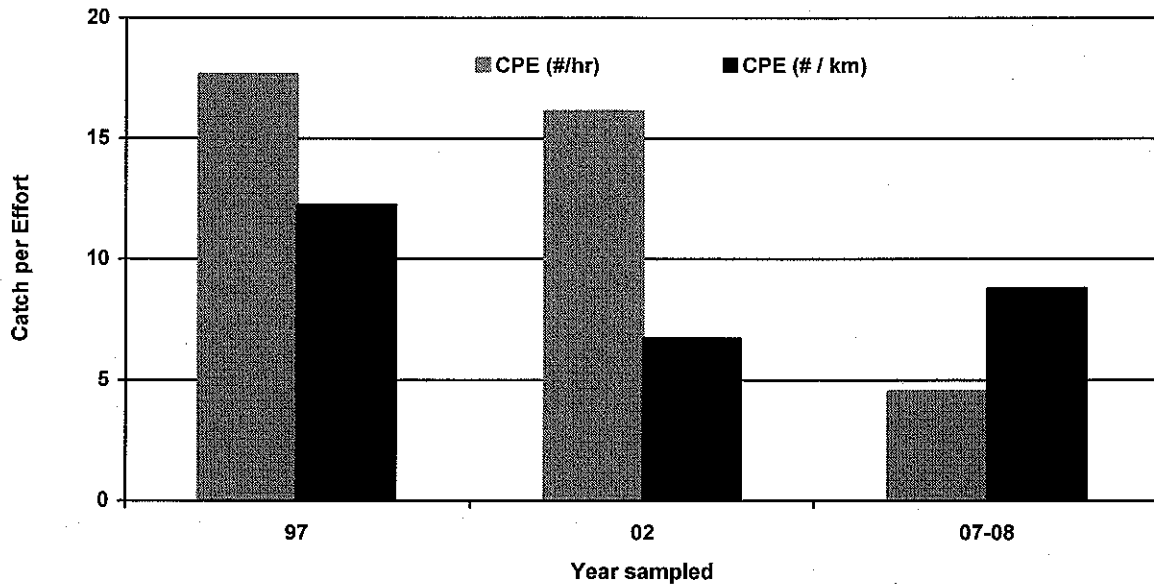


Figure 2. Shorewide catch per effort (number per kilometer) of brook trout in the 1997, 2002, and 2007-2008 samples.

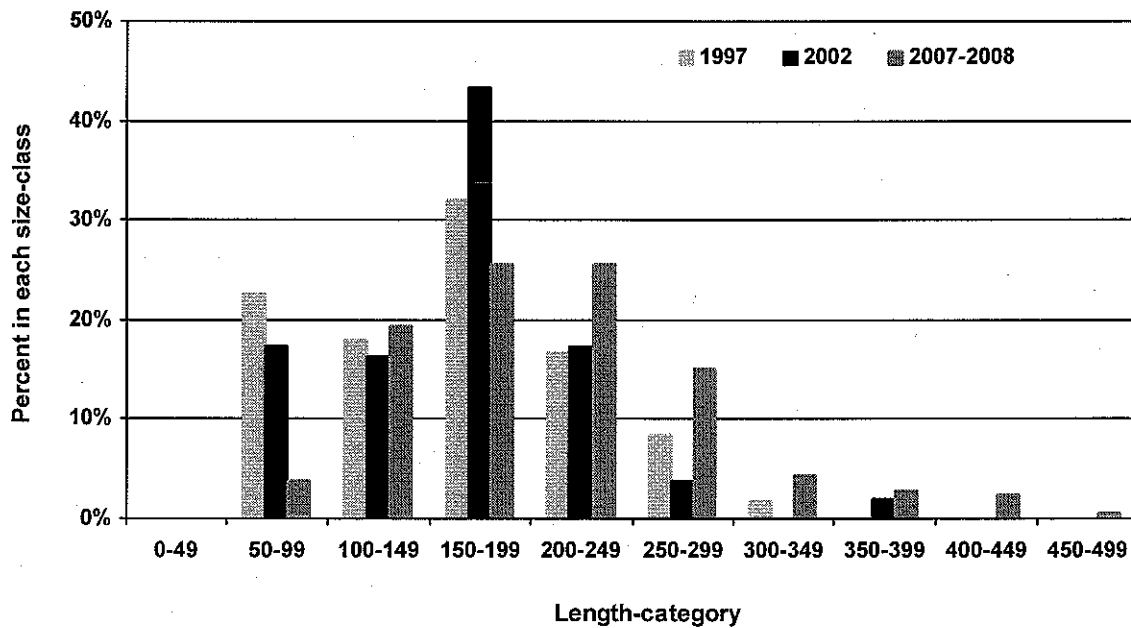


Figure 3. Comparison of brook trout size-structure between 1997, 2002, and 2007-2008.

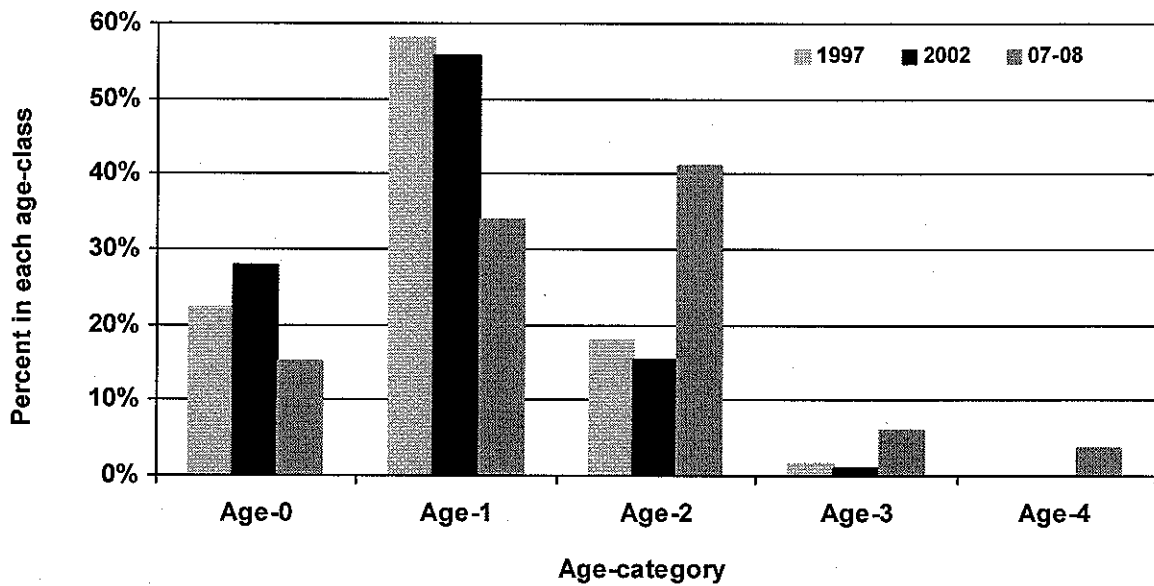


Figure 4. Comparison of brook trout age-structure between 1997, 2002, and 2007-2008.

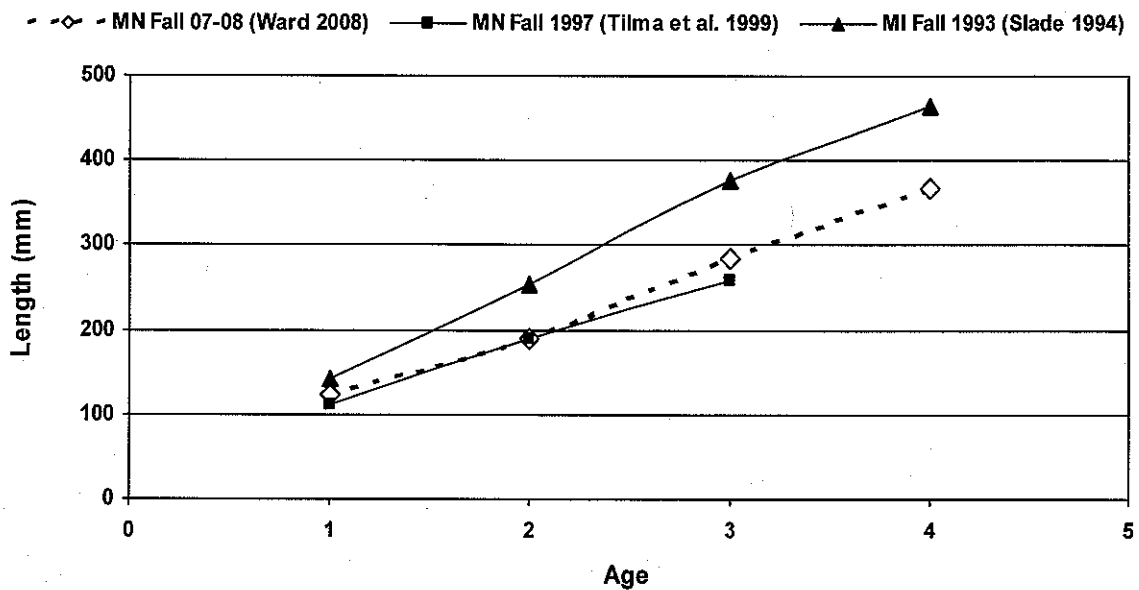


Figure 5. Comparison of mean back-calculated length at age for brook trout in Minnesota in the fall of 1997 and 2007-2008, and Isle Royale, Michigan fall 1993.

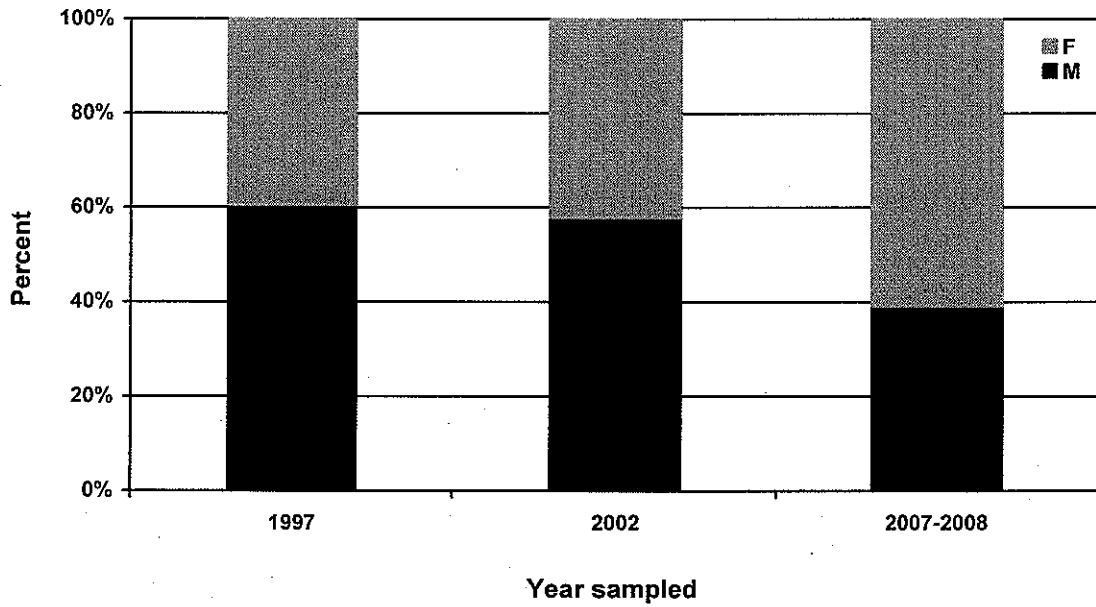


Figure 6. Comparison of brook trout sex ratio sampled in 1997, 2002, and 2007-2008.

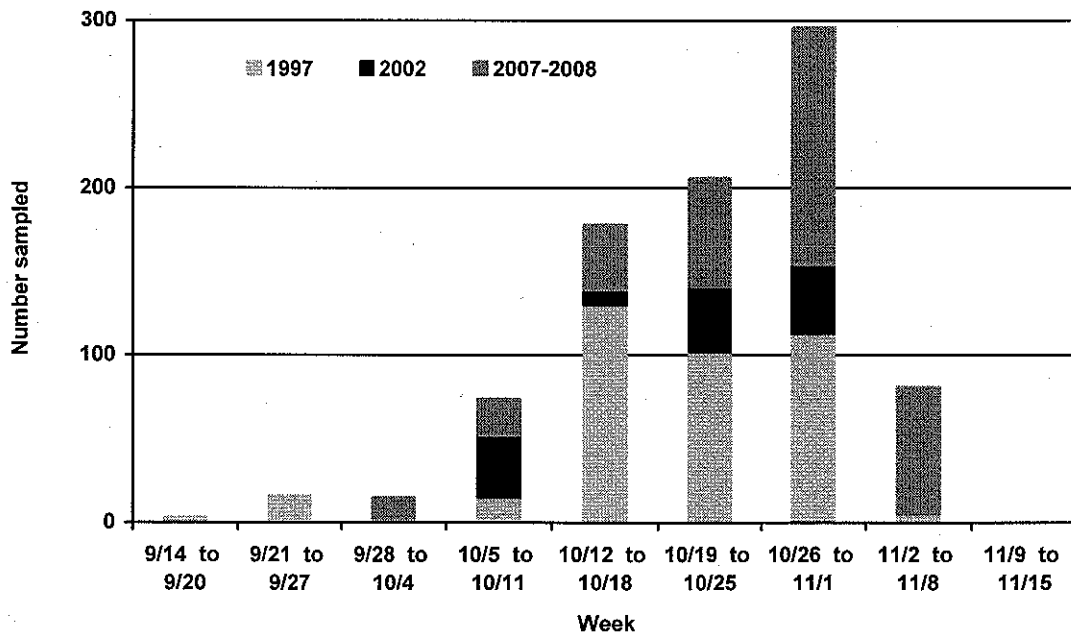


Figure 7. Comparison of the time period when brook trout were sampled in 1997, 2002, and 2007-2008. These numbers include recaptures from earlier sample dates.

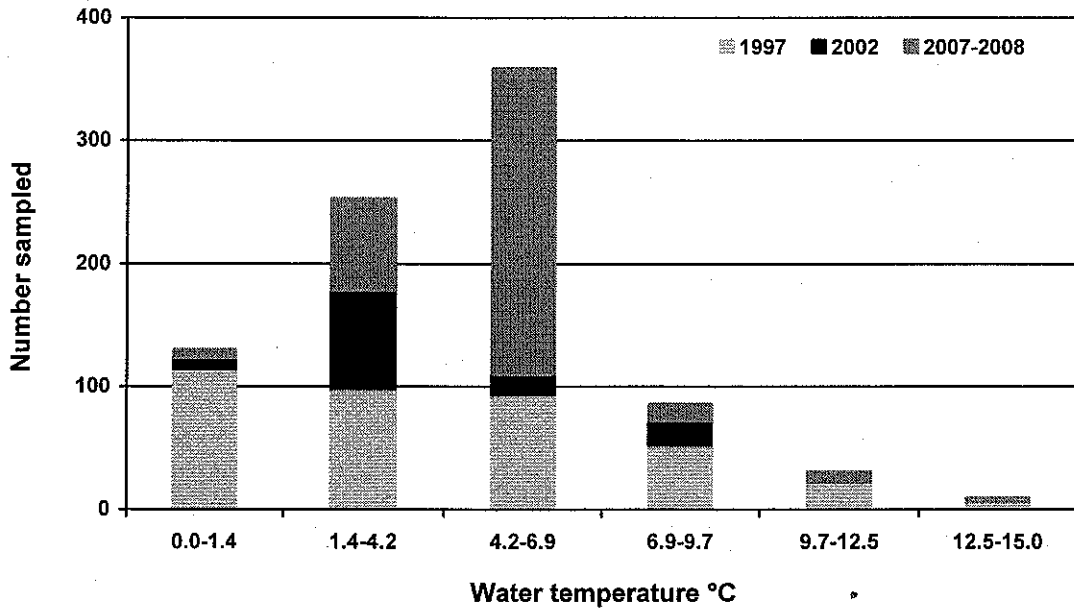


Figure 8. Comparison of water temperature when brook trout were sampled in the 1997, 2002, and 2007-2008 samples. Numbers include recaptures from earlier sample dates.

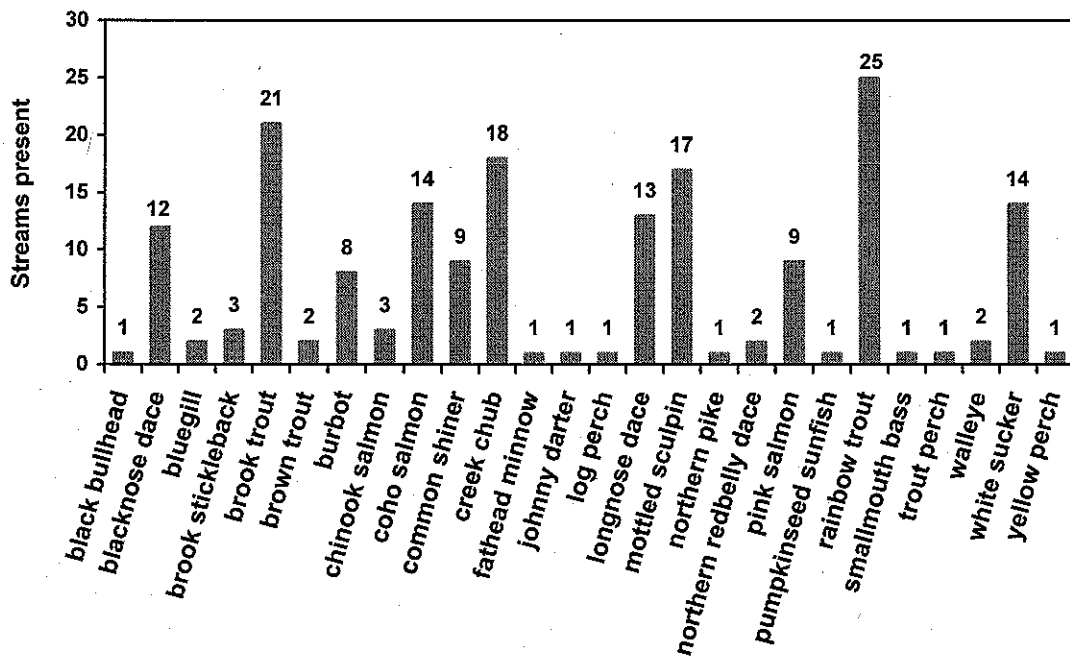


Figure 9. Number of streams where species were sampled in 2007-2008.

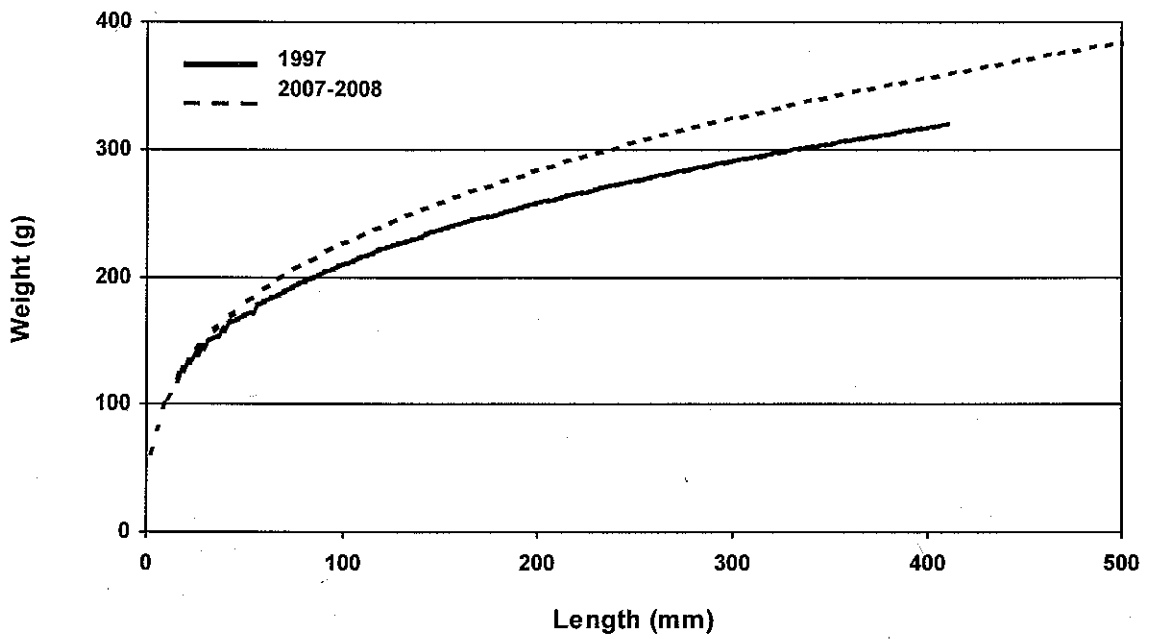


Figure 10. Comparison of brook trout condition between 1997 and 2007-2008.

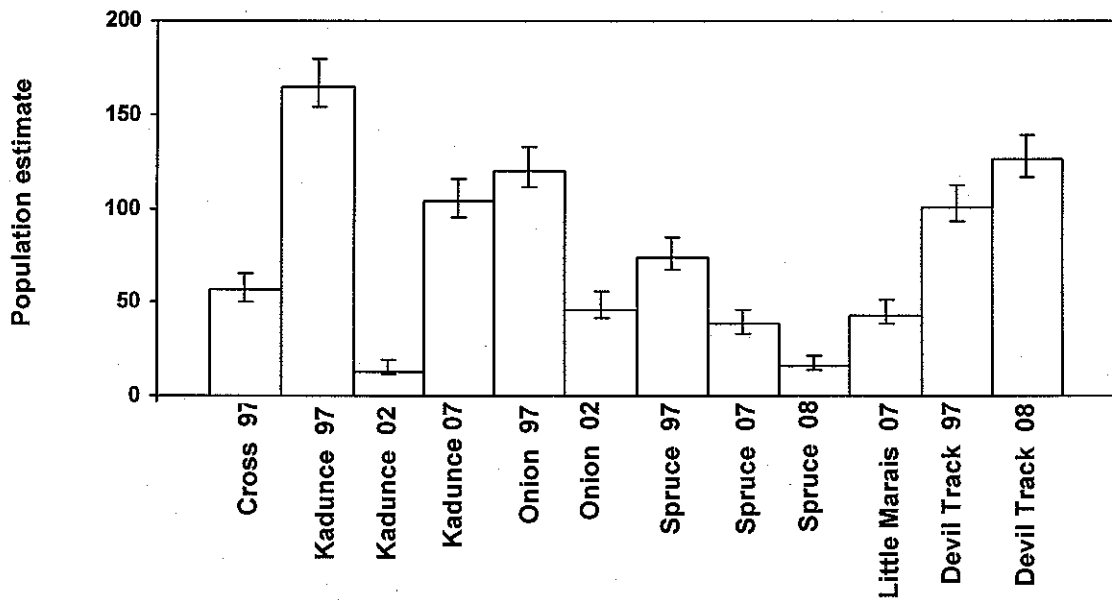


Figure 11. Brook trout population estimates determined in 1997, 2002, 2007, and 2008.

Table 1. Study site descriptions for the 1997, 2002, 2007-2008 below-barrier brook trout station locations.

Stream	Kittle number	Site description	Station length (m)	Fisheries Area	County	Highway mile number	Downstream		Upstream	
							Eastings	Northing	Eastings	Northing
Lester River	S-05	Lake to barrier falls in park	1,060	Duluth	St. Louis	5.8	575800	5187457	575967	5188347
French River	S-11	fish captured in adult trap	93	Duluth	St. Louis	11.9	584367	5194584	584316	5194842
Sucker River	S-15	Lake to barrier downstream of Hwy. 61	712	Duluth	St. Louis	14.5	587728	5197133	587250	5197478
Knife River	S-17	fish captured in adult trap	902	Duluth	Lake	17.9	592613	5200190	591799	5199926
Stewart River	S-19	Lake to barrier falls below powerline	1,562	Duluth	Lake	28.5	604026	5211375	603134	5212110
Silver Creek	S-21	Lake to barrier falls	403	Duluth	Lake	30.2	605933	5213130	605759	5213410
Encampment River	S-22	Partial barrier at first falls by cabin	360	Duluth	Lake	32.8	608426	5216296	608262	5216471
Gooseberry River	S-26	Upstream end of lagoon to falls at park	427	Duluth	Lake	39.3	616307	5221832	616194	5222175
Split Rock River	S-29	Upstream end of Hwy 61 culvert to falls	1,209	Finland	Lake	43.5	620699	5226668	619884	5227453
Beaver River	S-35	Upstream end of lagoon to barrier falls	200	Finland	Lake	51.2	629055	5235430	628894	5235516
Palisade Creek	S-37	Lake to slides at Hwy 61	718	Finland	Lake	57.1	635391	5242825	634840	5242557
Baptism River	S-38	Under Hwy 61 bridge to barrier falls	1,190	Finland	Lake	58.3	636200	5244098	635475	5244772
Little Marais River	S-44	Lake to barrier falls	160	Finland	Lake	65.8	643395	5252959	643266	5253019
Dragon Creek	S-44.1	Lake to falls downstream of highway	543	Finland	Lake	66.6	643454	5252979	643589	5253457
Little Manitou River	S-46	Lake to Hwy 61	255	Finland	Lake	69.5	647181	5257598	647017	5257794
Caribou River	S-47	Lake to barrier falls	155	Finland	Lake	70.5	648611	5258373	648499	5258431
Cross River	S-52	Lake to barrier falls/Hwy 61	468	Finland	Cook	79.0	658611	5267664	658304	5267757
Onion River	S-56	Lake to barrier falls	295	Grand Marais	Cook	86.5	667540	5275151	667412	5275386
Poplar River	S-58	Lake to barrier falls by Lutsen Resort	150	Grand Marais	Cook	90.0	672197	5278391	672214	5278520
Spruce Creek (Deer Yard)	S-62	Lake to barrier falls	166	Grand Marais	Cook	97.7	682558	5284293	682495	5284431
Cascade River	S-64	Lake to falls	244	Grand Marais	Cook	100.0	685831	5286704	685747	5286879
Fall River (Rosebush)	S-66	Lake to barrier falls	72	Grand Marais	Cook	106.9	695798	5290809	695780	5290871
Devil Track River	S-67	Lake upstream end of fish sanctuary	2,253	Grand Marais	Cook	113.4	705201	5294213	703939	5295231
Kimball Creek	S-70	Lake to slides	1,635	Grand Marais	Cook	117.3	711077	5296144	710869	5297194
Kadunce Creek	S-72	Lake to barrier falls	428	Grand Marais	Cook	118.9	713093	5297256	712926	5297612
Brule River	S-75	Lake to falls	2,324	Grand Marais	Cook	124.0	720723	5299860	720785	5301585
Flute Reed River	S-77	Lake to Hwy 61	570	Grand Marais	Cook	128.8	727007	5302855	727256	5303343
Carlson Creek	S-79	Lake to barrier falls	854	Grand Marais	Cook	131.0	729975	5305452	729501	5305977
Farquar Creek	S-80	Lake to Hwy 61	181	Grand Marais	Cook	132.0	731537	5305987	731486	5306144

Table 2. Dates rivers were sampled in 1997, 2002, and 2007-2008.

Stream	1997 Samples						2002 Samples				2007 Samples				2008 Samples	
	#1	#2	#3	#4	#5	#6	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2
Lester River															11/5	
Sucker River	9/17	10/3													10/31	
Stewart River	9/24	10/15														
Silver Creek	9/17	10/14														
Encampment River	10/7															
Gooseberry River															10/31	
Split Rock River	9/24	10/10	10/21	10/28											10/24	10/30
Beaver River	9/26															
Palisade Creek																
Baptism River	9/26	10/22														
Little Marais River	10/14						10/7								10/23	
Dragon Creek															10/28	
Little Manitou River															10/28	
Caribou River	10/7	10/21													10/24	
Cross River	9/23	10/8	10/15	10/22	10/28	11/4	10/7	10/16	10/24						10/20	11/3
Onion River	10/14	10/26	10/31				10/9	10/16	10/24	10/30						
Poplar River							10/10	10/16	10/24							
Spruce Creek	10/17	10/31					10/21								10/20	11/3
Cascade River	10/19	10/25					10/21									
Fall River																
Devil Track River	10/18	10/24	10/29				10/10	10/22							10/22	11/4
Kimball Creek	10/18	10/25					10/11	10/22	10/25	10/30					10/29	
Kadunce Creek	10/18	10/25					10/11	10/21	10/25	10/30					10/21	
Brule River							10/22									
Flute Reed River	10/17	10/19													10/21	
Carlson Creek	10/17															
Farquar Creek	10/17															

Table 3. Effort (seconds electrofishing) and catch per effort (number of brook trout per hour and per kilometer) in the 2007 survey.

River/Stream	2007 Dates sampled				Total number sampled				Catch per effort pass 1 (number/hour)				Catch per effort pass 1 (number/kilometer)						
	#1	#2	#3	#4	#1	#2	#3	#4	Total	#1	#2	#3	#4	Mean	#1	#2	#3	#4	Mean
Beaver River	10/2	11/6			0	1			1	0.0	0.9			0.5	0.0	5.0			2.5
Caribou River	10/4	10/31			0	2			2	0.0	4.5			2.3	0.0	12.9			6.4
Carlson Creek	10/1	10/25			2	1			3	1.2	0.8			1.0	2.3	1.2			1.8
Encampment River	9/28	10/29			0	0			0	0.0	0.0			0.0	0.0	0.0			0.0
Fall River	10/16	10/25	11/1		0	1	2		3	0.0	6.1	10.6		5.6	0.0	13.8	27.7		13.8
Farquar Creek	10/8	10/25			0	0			0	0.0	0.0			0.0	0.0	0.0			0.0
Flute Reed River	10/26	11/7			2	2			4	1.6	1.1			1.3	3.5	3.5			3.5
Kadunce Creek	10/1	10/16	10/30	11/5	7	26	30	21	84	4.9	15.0	22.1	10.6	20.4	16.3	35.0	49.0	18.7	29.8
Kimball Creek	10/15	11/1			3	13			16	1.7	5.6			4.0	1.8	7.9			4.9
Little Marais River	10/2	10/17	10/31	11/6	4	0	12	5	21	5.3	0.0	44.2	12.6	12.4	25.0	0.0	62.6	31.3	29.7
Onion River	10/15	10/31			0	4			4	0.0	5.4			1.7	0.0	13.6			6.8
Palisade Creek	10/4	11/7			0	0			0	0.0	0.0			0.0	0.0	0.0			0.0
Poplar River	11/2				5				5	14.8				14.8	33.4				33.4
Silver Creek	9/28	10/29			0	5			5	0.0	5.7			2.8	0.0	12.4			6.2
Spruce Creek	10/17	10/26	11/6		10	17	4		31	14.0	42.4	15.6		32.0	36.1	72.1	24.0		44.1
Stewart River	10/29	11/8			0	0			0	0.0	0.0			0.0	0.0	0.0			0.0
Sucker River	11/8				2				2	1.9				1.9	2.8				2.8

Table 4. Effort (hours electrofishing) and catch per effort (number of brook trout per hour and number per kilometer) in the 2008 survey.

River/Stream	2008 Dates sampled		Total number sampled				Catch per effort pass 1 (number/hour)				Catch per effort pass 1 (number/kilometer)			
	#1	#2	#1	#2	Total	#1	#2	Mean	Mean	#1	#2	Mean	Mean	
Lester River	11/5		0		0	0.0				0.0				
Sucker River	10/31		1		1	0.6				1.4				
Gooseberry River	10/31		4		4	2.0				9.4				
Split Rock River	10/24	10/30	0	1	1	0.0	0.5	0.2	0.2	0.0	0.8	0.4	0.4	
Baptism River	10/23		0		0	0.0				0.0				
Little Marais River	10/28		6		6	27.5				37.6				
Dragon Creek	10/28		3		3	5.1				5.5				
Little Manitou River	10/28		1		1	3.7				3.9				
Caribou River	10/24		2		2	3.5				12.9				
Cross River	10/20	11/3	1	1	2	0.6	0.7	0.6	0.6	2.1	2.1	2.1	2.1	
Poplar River	10/20	11/3	0	5	5	0.0	6.7	3.1	3.1	0.0	33.4	16.7	16.7	
Spruce Creek	10/28	11/3	13	12	25	46.5	48.1	47.3	47.3	78.1	72.1	75.1	75.1	
Devil Track River	10/22	11/4	21	18	39	6.5	5.1	5.8	5.8	9.3	8.0	8.7	8.7	
Kimball Creek	10/29		26		26	10.5				15.9				
Kadunce Creek	10/21		55		55	25.8				86.4				
Flute Reed River	10/21		5		5	2.9				8.8				

Table 5. Back-calculated length at age for brook trout sampled in fall 2007-2008.

Age	Sample size	Age-1	Age-2	Age-3	Age-4
1	116	116.03			
2	148	123.78	183.77		
3	19	129.58	204.18	274.57	
4	14	143.29	219.06	298.07	367.40
Weighted mean	297	122.06	188.63	284.48	367.40

Table 6. Species sampled by river in the 2007-2008 brook trout assessment.

River/Creek	black bullhead	blacknose dace	bluegill	brook stickleback	brook trout	brown trout	burbot	chinook salmon	coho salmon	common shiner	creek chub	fathhead minnow	johnny darter	log perch	longnose dace	mottled sculpin	northern pike	northern redbelly dace	pink salmon	pumpkinseed sunfish	rainbow trout	smallmouth bass	trout perch	walleye	white sucker	yellow perch
Lester River		X					X	X	X	X	X		X			X					X				X	
Sucker River		X		X				X	X		X					X					X				X	
Stewart River		X									X					X					X				X	
Silver Creek		X			X			X	X	X	X					X				X	X				X	
Encampment River		X			X		X	X	X	X	X			X		X				X	X		X		X	
Gooseberry River		X		X	X		X	X	X	X	X	X				X				X	X				X	
Split Rock River		X		X	X		X	X	X	X	X	X				X				X	X				X	
Beaver River	X	X	X	X	X		X	X	X	X	X					X				X	X				X	
Palisade Creek								X	X	X	X					X				X	X				X	
Baptism River				X	X		X	X	X	X	X					X				X	X				X	
Little Marais River					X		X	X	X	X	X					X				X	X				X	
Dragon Creek					X																X					
Little Manitou River				X	X															X	X					
Caribou River				X	X			X	X	X	X									X	X					
Cross River				X	X			X	X	X	X									X	X					
Onion River				X	X			X	X	X	X									X	X					
Poplar River			X	X	X		X	X	X	X	X									X	X					
Spruce Creek		X		X	X			X	X	X	X									X	X					
Fall River				X	X			X	X	X	X									X	X					
Devil Track River		X		X	X		X	X	X	X	X									X	X					
Kimball Creek				X	X	X		X	X	X	X									X	X					
Kadunce Creek		X		X	X	X		X	X	X	X									X	X					
Flute Reed River		X		X	X			X	X	X	X									X	X					
Carlson Creek				X	X			X	X	X	X									X	X					
Farquar Creek				X	X			X	X	X	X									X	X					