

## STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-4

Study No.: 646

Title: Inland creel surveys

Period Covered: October 1, 2002 to September 30, 2003

**Study Objective:** To provide a consistent series of guidelines, data collection methods, and timely analysis to fisheries managers and research biologists conducting access point creel surveys on inland waters.

**Summary:** Surveys were conducted on lakes: Cisco-Thousand Island chain, Leelanau, Muskegon, Crystal and Green, Bond Falls Flowage, and Manistique lakes; and on rivers: Upper Grand, Lower Grand, Rogue, and Manistee rivers. Location (county) and survey period dates are given in Table 1. All lake and river sites were surveyed to estimate angling pressure, harvest, and catch by species. In addition, Cisco-Thousand Island chain, Leelanau, Bond Falls Flowage, Manistique lakes, and Muskegon lakes were surveyed to evaluate the walleye fishery. Crystal and Green lakes, Upper Grand, Lower Grand, Rogue, and Manistee rivers were surveyed to evaluate the trout fishery.

Effort and catch estimates were calculated for summer 2001 fisheries on Burt Lake, Crooked Lake, Higgins Lake, and Pickerel Lake and winter 2001 fisheries on Burt Lake, Crooked Lake, Higgins Lake, Michigamme Reservoir, and Pickerel Lake.

**Findings:** Jobs 1 through 7 were scheduled for 2002-03, and progress is reported below.

**Job 1. Title: Examine creel survey sites.**—Cisco-Thousand Island chain, Leelanau, and Muskegon lakes and Upper Grand, Lower Grand, and Rogue rivers were examined during previous segment (Lockwood 2002). Air flights were completed to field test counting techniques on Crystal and Green Lakes, and Manistique lakes. Global Positioning Satellites (GPS) coordinates for flight paths and section boundaries are presented in Figures 1.1 (Crystal and Green lakes) and 2.1 (Manistique lakes). Field personnel examined Bond Falls Flowage and Manistee River. Each site sampled during current segment was examined to determine appropriate locations for counting and interviewing anglers, and appropriate angler counting and interviewing methods.

For counting and interviewing, four of the current lakes were stratified into grids. Manistique lakes were stratified into 3 grids (Figures 2.1 and 2.2). The Cisco-Thousand Island chain of lakes was stratified into 10 grids (Figure 3). Bond Falls Flowage was stratified into 3 grids (Figure 4). Lake Leelanau was stratified into 2 grids (Figure 5).

**Job 2. Title: Sampling intensity, techniques, and proposed level of statistical significance.**—Statistical significance of 75% or greater was considered appropriate by all unit managers conducting surveys. Error bounds (2 SE) were calculated for each estimate and provided statistical significance, depending on distribution shape and  $N \geq 10$ , of 75% to 95% (Dixon and Massey 1957). Rates of precision (mean/2 SE) were not predetermined for any of the surveys. Unless otherwise noted, all estimates in this report were  $\pm 2$  SE.

Design and estimation methods used for surveys given in this report followed the multiple-day period (Lockwood et al. 1999). Survey planning in each instance followed general funding and

supervisory procedures given in Lockwood (2000a). Survey design naming conventions follow those given Lockwood (2000b).

*Cisco, Thousand Island Chain of Lakes, winter 2002*—Survey followed a progressive-roving design. All funding was provided through Fisheries Division. Both weekend days and 3 randomly selected weekdays were selected for sampling during each week of the survey season. No holidays were sampled. Counting and interviewing were done on the same days, and one instantaneous count of open-ice anglers and occupied shanties were made once per day. One of two shifts was selected each sample day (Table 2). Two clerks working from a snowmobile were used to collect angler-creel interview and count data. One clerk was assigned to interview and count anglers on lakes: Cisco, Lindsley and Fishawk, Thousand Island, and Little and Big African and Record (Figure 3). The other clerk was assigned to lakes: Big, West Bay, East Bay, Mamie Belle, Indian, and Poor (Figure 3). Starting location (lake) and direction of travel with their assigned lakes was randomized each sample day. Survey period for both counts and interviews was from December 2, 2002 through February 26, 2003. Estimates will be by month for each lake sampling unit.

*Lake Leelanau, winter 2002*—Survey followed a progressive-roving design. All funding was provided through Fisheries Division. One clerk working from a snowmobile collected angler-creel data. Both weekend days and 3 randomly selected weekdays were selected for sampling during each week of the survey season. No holidays were sampled. Clerk followed a randomized count and interview schedule. One of two shifts was selected each sample day (Table 3). Lake was divided into two sections -- North Lake Leelanau and South Lake Leelanau (Figure 5). Either North Lake Leelanau or South Lake Leelanau was sampled each day. Starting location within a section and direction of travel were randomized for both counting and interviewing. Instantaneous counts of open-ice anglers and occupied shanties were made once per day. Survey period for both counts and interviews was December 15, 2002 through March 31, 2003. Months will be estimated separately.

*Muskegon Lake, winter 2002*—Survey followed a progressive-access design. All funding was provided through Fisheries Division. One clerk working from a snowmobile collected angler count and interview data. Interviews and counts progressed along count path from markers 1 through 7; or from markers 7 through 1 (Figure 6). Starting location (Marker) and direction of travel were randomized for both counting and interviewing. Instantaneous counts of open-ice anglers and occupied shanties were made once per day. Time of count was randomized to cover daylight times within the sample period. Both weekend days and 3 randomly selected weekdays were selected for counting and interviewing during each week of the survey season. No holidays were sampled. Counting and interviewing were done on the same days, and one instantaneous count was made per day. One of two shifts was selected each sample day (Table 4). Survey period was January 4, 2003 through March 31, 2003. Months will be estimated separately.

*Crystal and Green Lakes, summer 2003*—Survey followed an aerial-roving design. All funding was provided through Fisheries Division. Counts progressed along a flight path from Crystal Lake to Green Lake or from Green Lake to Crystal Lake (Figure 1.1). Flight took approximately 19 min to complete. This sequence was randomized. Time of count was randomized to cover sample period. Only fishing boats were counted. Both weekend days and 3 randomly selected weekdays were selected for counting and interviewing during each week of the survey season. No holidays were sampled. Counting and interviewing were done on the same days, and one instantaneous count of fishing boats was made per day. One of two shifts was selected each sample day for interviewing (Table 5). Two clerks working from boats collected angler interview data. One clerk was assigned to interview anglers on Crystal Lake (Figure 1.2). The other clerk was assigned to interview anglers on Green Lake (Figure 1.3). Starting location (GPS Marker) and direction of travel with their

assigned lakes was randomized each sample day. Survey period is from April 20 through September 30. Estimates will be by month for each lake sampling unit.

*Manistique lakes, summer 2003*—Survey followed an aerial-roving design. All funding was provided through Fisheries Division. Lakes consist of North, Big and South Manistique lake units. Counts were conducted by air flights for all three lake units. Counts progressed from North Manistique Lake to South Manistique Lake or from South Manistique Lake to North Manistique Lake (see flight path – Figure 2.1). This sequence was randomized. Only fishing boats were counted. Flight time was approximately 17 min. Time of count was randomized to cover daylight times within the sample period. Both weekend days and 3 randomly selected weekdays were selected for counting (for all three lake units) and interviewing for South and Big Manistique lakes during each week of the survey season. One weekend day and 2 weekdays were randomly selected for interviewing for North Manistique Lake. No holidays were sampled. One of two shifts was selected each sample day for interviewing (Table 6). Counting and interviewing of South and Big Manistique lakes were done on the same days, and one instantaneous count of fishing boats was made per day. One clerk working from a boat collected angler interview data for South or Big Manistique Lake. Each sample day one clerk was randomly assigned to one lake unit: South or Big Manistique Lake (North Manistique Lake was scheduled separately) (Figure 2.2). Starting location (GPS Marker) and direction of travel within the assigned lake was randomized each sample day. Another clerk collected interview data for North Manistique Lake in conjunction with Great Lake creel survey. Survey period is from May 8 through Oct. 15. Estimates will be by month for each lake sampling unit.

*Bond Falls Flowage, summer 2003*—Survey followed a progressive-roving design. All funding was provided through Fisheries Division. One clerk working from a boat collected angler count and interview data (Figure 5). Counts began from 1 of 3 GPS markers. Starting location and direction (clockwise or counter clockwise) from starting location were randomized. Time of count was randomized to cover times within the sample period. One instantaneous count of fishing boats was made per day. Both weekend days and 3 randomly selected weekdays were selected for counting and interviewing during each week of the survey season. No holidays were sampled. Counting and interviewing were done on the same days. One of two shifts was selected each sample day for interviewing (Table 7). All 3 lake sections were sampled each scheduled day. Direction of travel, clockwise or counter clockwise, was chose randomly. Survey period was from May 8 through October 15, 2003. Months will be estimated separately.

*Upper Grand River, summer 2003*—Survey followed a progressive-access design. Two sections were surveyed. Survey sections were: Grand Ledge (T.4N.,R.4W.,Sec. 2 and 3) to Moores Park (T.4N.,R.2W.,Sec.21 – downstream of Martin Luther King Jr. Blvd.), and Lyons (T.7N.,R.5W.,Sec.19) to Portland (T.6N.,R.5W.,Sec.28). All funding was provided by Fisheries Division. One clerk working from a vehicle collected angler count and interview data. Clerk worked 2 weekend days and 3 week days per week during survey period. Only one of the two sections was assigned for counting and interviewing during a sample day and section was chosen randomly. Two instantaneous counts of anglers were made per sample day. All anglers were visible from bridge crossings and access points. Shore and boat anglers were treated as a single mode when counting and interviewing. Each count began from either the upstream or downstream end of a section and progressed to the opposite end. Starting location was randomized. Time of count was randomized to cover times within the sample period. No holidays were scheduled for sampling. Counting and interviewing were done on the same days. One of two shifts was selected each sample day (Table 8). No predetermined interviewing route was used. Survey periods were from March 1 through April 30, 2003 and from September 1 through November 30, 2003. Sections and months will be estimated separately.

*Lower Grand River (6th Street Dam area) summer 2003*—Survey followed a roving-access design. 6th Street Dam area is located upstream of highway 196 in Grand Rapids. All funding was provided by Fisheries Division. Survey was done with the Rogue River survey. One clerk working from a vehicle collected angler count and interview data. Clerk worked 1 weekend day and 1-2 weekdays per week during survey period. Clerk was assigned to work either both of the Rogue River sections or the 6th Street Dam area during a sample day, and selection was made randomly. Two instantaneous counts of individual anglers (shore and wading) were made per sample day. Time of count was randomized to cover times within the sample period. No holidays were scheduled for sampling. Counting and interviewing were done on the same days. One of two shifts was selected each sample day (Table 9). No predetermined interviewing route was used. Survey periods were from March 1 through April 30, 2003 and from September 1 through November 30, 2003. Months will be estimated separately.

*Rogue River, summer 2003*—Survey followed a progressive-access design. Two sections were surveyed. Survey sections were: Rogue River – 10-Mile Road (T.9N.,R.11W.,Sec.32) to Rockford Dam (T.9N.,R.11W.,Sec.36); and Rogue River – 10-Mile Road (T.9N.,R.11W.,Sec.36) to West River Drive bridge (T.8N.,R.11W.,Sec.22). All funding was provided by Fisheries Division. Survey was done with the Lower Grand River survey. One clerk working from a vehicle collected angler count and interview data. Clerk worked 1 weekend day and 1-2 weekdays per week during survey period. Clerk was assigned to work either both of the Rogue River sections or the 6th Street Dam area during a sample day, and selection was made randomly. In the 10-Mile to Rockford Dam section individual anglers (shore and wading) were counted. In the 10-Mile to West River Drive bridge section angler vehicles were counted. Two instantaneous counts were made per sample day. At the Rogue River sites, each count began from either the upstream 10-Mile Road or the downstream West River Road and progressed to the opposite end. Starting location was randomized. Time of count was randomized to cover times within the sample period. No holidays were scheduled for sampling. Counting and interviewing were done on the same days. One of two shifts was selected each sample day (Table 9). No predetermined interviewing route was used. Survey periods were from March 1 through April 30, 2003 and from September 1 through November 30, 2003. Months will be estimated separately.

*Manistee River, Summer 2003*—Survey followed a progressive-access design. One river section was surveyed. Survey section was: Hodenpyl Dam (N44.36362, W085.82061) T23N, R13W, Sec. 25. to Red Bridge (N44.28379, W085.86059) T22N, R13W, Sec. 23. All funding was provided by Fisheries Division. Survey was done in conjunction with Great Lakes angler surveys. Two clerks collected count and interview data. Clerks worked 1 weekend day and 1-2 week days per week during survey period. Instantaneous counts were made by kayak in the survey section each sample day. The section count always started at Hodenpyl Dam and went down to Red Bridge. The count generally took about 2 ½ to 3 ½ hours to complete, depending on the number of anglers that were interviewed during the count. While one clerk counted (and interviewed ) anglers, the other clerk interviewed anglers as they exited the river. Shore wading and boat anglers were interviewed. All anglers, regardless of mode were pooled for counts and interviews. Time of count was randomized to cover times within the sample period. No holidays were scheduled for sampling. Counting and interviewing were done on the same days. One of two shifts was selected each sample day (Table 10). No predetermined interviewing route was used. Survey period was from May 17 through Aug 31, 2003. Months will be estimated separately.

**Job 3. Title: Prepare stratified-random schedules.**—Schedules were prepared and distributed to appropriate personnel. Random numbers used in schedule preparation were derived from the dBase IV (software) random number function or tables of random numbers found in Arkin and Colton (1962).

**Job 4. Title: Train creel clerks.**—Written instructions were prepared for Cisco, Thousand Island chain, Lake Leelanau, and Muskegon surveys conducted during current segment. Management Unit personnel provided additional on-site training for clerks. Training descriptions for surveys conducted during previous segment are given in Lockwood (2002).

**Job 5. Title: Supervise count and interview data processing, and quality control.**—Count and interview data from current segment surveys were processed at the Institute for Fisheries Research. Additional range checking of all data is done at the Institute for Fisheries Research.

**Job 6. Title: Calculate and distribute catch and pressure estimates.**—Effort and catch estimates were calculated summer 2001 fisheries on Burt Lake, Crooked Lake, Higgins Lake, and Pickerel Lake and winter 2001 fisheries on Burt Lake, Crooked Lake, Higgins Lake, Michigamme Reservoir, and Pickerel Lake.

*Burt Lake, summer 2001*—Anglers fished a total of  $85,149 \pm 7,467$  hours. A total of  $28,672 \pm 8,005$  fish were harvested. Yellow perch were the predominant fish harvested ( $22,747 \pm 7,943$ ) followed by walleye ( $5,128 \pm 944$ ).

*Burt Lake, winter 2001*—Anglers fished a total of  $48,815 \pm 10,301$  hours. A total of  $40,537 \pm 9,714$  fish were harvested. Yellow perch were the predominant fish harvested ( $37,857 \pm 9,581$ ), followed by walleye ( $2,385 \pm 981$ ).

*Crooked Lake, summer 2001*—Anglers fished a total of  $26,442 \pm 3,407$  hours. A total of  $6,095 \pm 1,490$  fish were harvested. Yellow perch were the predominant fish harvested ( $2,373 \pm 1,098$ ), followed by walleye ( $1,834 \pm 568$ ) and bluegill ( $1,101 \pm 747$ ).

*Crooked Lake, winter 2001 through 2002*—Anglers fished a total of  $8,027 \pm 3,125$  hours. A total of  $2,132 \pm 865$  fish were harvested. Yellow perch were the predominant fish harvested ( $1,961 \pm 843$ ).

*Higgins Lake, summer 2001*—Anglers fished a total of  $16,363 \pm 3,287$  hours. A total of  $78,313 \pm 13,074$  fish were harvested. Yellow perch were the predominant fish harvested ( $57,689 \pm 10,046$ ), followed by rock bass ( $14,414 \pm 8,064$ ). Anglers harvested  $5,550 \pm 2,226$  smallmouth bass.

*Higgins Lake, winter 2001 through 2002*—Anglers fished a total of  $134,045 \pm 33,532$  hours. A total of  $224,752 \pm 68,008$  fish were harvested. Yellow perch were the predominant fish harvested ( $217,423 \pm 67,953$ ), followed by lake trout ( $2,133 \pm 1,312$ ).

*Michigamme Reservoir, winter 2001 through 2002*—Anglers fished a total of  $18,303 \pm 3,464$  hours. A total of  $2,039 \pm 348$  fish were harvested. Walleye were the predominant fish harvested ( $1,013 \pm 264$ ), followed by black crappie ( $482 \pm 188$ ) and yellow perch ( $317 \pm 117$ ).

*Pickerel Lake, summer 2001*—Anglers fished a total of  $18,946 \pm 3,348$  hours. A total of  $4,095 \pm 1,097$  fish were harvested. Bluegill were the predominant fish harvested ( $2,112 \pm 942$ ) followed by yellow perch ( $691 \pm 337$ ). Anglers harvested  $343 \pm 179$  walleye.

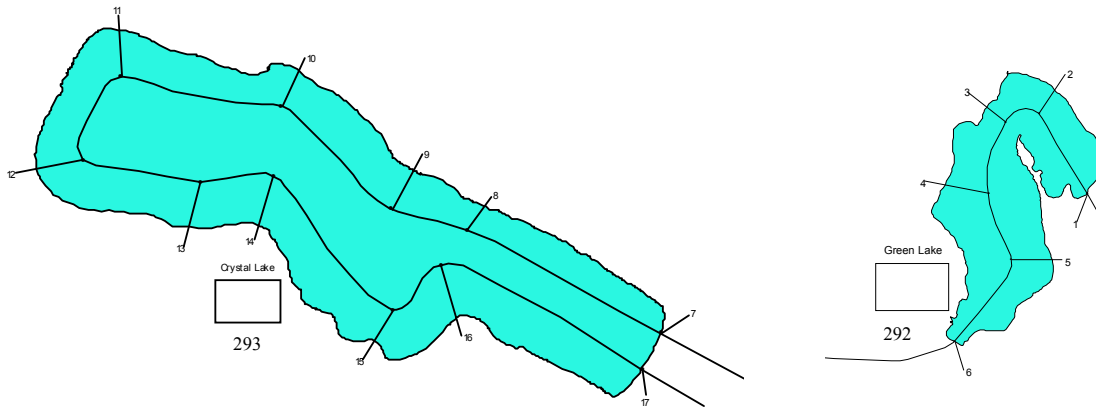
*Pickerel Lake, winter 2001 through 2002*—Anglers fished a total of  $2,469 \pm 1,118$  hours. A total of  $1,301 \pm 1,300$  fish were harvested. Yellow perch were the predominant fish harvested ( $1,285 \pm 1,300$ ). Anglers harvested few walleye, ( $3 \pm 7$ ).

**Job 7. Title: Prepare annual report.**—This report was prepared on schedule.

**Literature Cited:**

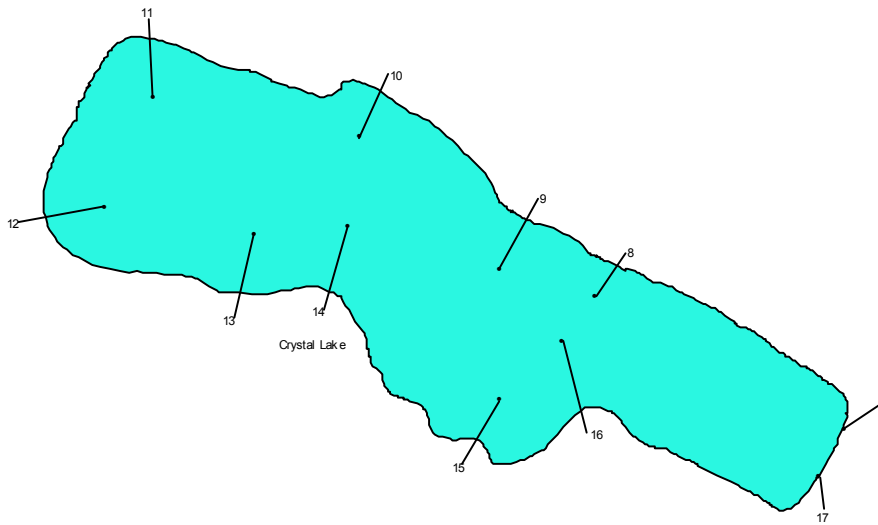
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- Dixon, W. J., and F. J. Massey, Jr. 1957. Introduction to statistical analysis, second edition. McGraw-Hill Book Company, Inc., New York, New York.
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- Lockwood, R. N. 2002. Inland creel surveys, progress report, study 646. Michigan Department of Natural Resources, Federal Aid in Sport Fish Restoration, Annual Reports for Projects F-81-R-2, F-80-R-2, and F-80-R-3. [http://www.michigandnr.com/PUBLICATIONS/PDF/IFR/IFRHOME/FEDERALAID/FRI\\_F81R1/Study%20646.pdf](http://www.michigandnr.com/PUBLICATIONS/PDF/IFR/IFRHOME/FEDERALAID/FRI_F81R1/Study%20646.pdf)
- Lockwood, R. N., D. M. Benjamin, and J. R. Bence. 1999. Estimating angling effort and catch from Michigan roving and access site angler survey data. Michigan Department of Natural Resources, Fisheries Research Report 2044, Ann Arbor.

**Prepared by:** Zhenming Su and Roger N. Lockwood  
**Date:** September 30, 2003



Marker	Latitude	Longitude
1	44.61263°N	85.76460°W
2	44.62583°N	85.77542°W
3	44.62428°N	85.78291°W
4	44.61265°N	85.78680°W
5	44.60178°N	85.78169°W
6	44.58844°N	85.79457°W
7	44.63897°N	86.08874°W
8	44.65777°N	86.13798°W
9	44.66156°N	86.15717°W
10	44.68025°N	86.18514°W
11	44.68568°N	86.22593°W
12	44.67033°N	86.23569°W
13	44.66648°N	86.20575°W
14	44.66747°N	86.18740°W
15	44.64300°N	86.15699°W
16	44.65129°N	86.14460°W
17	44.63236°N	86.09355°W

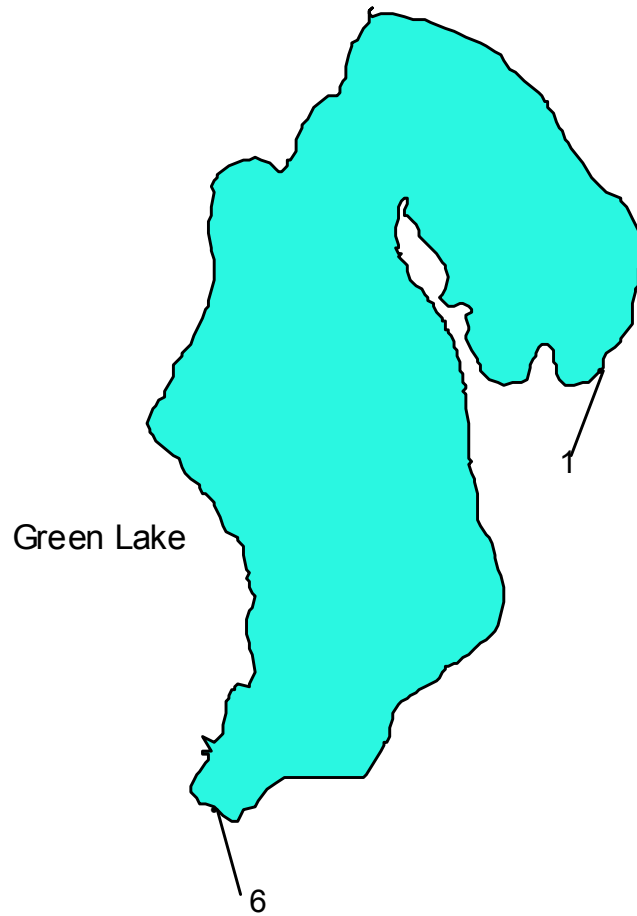
Figure 1.1–Crystal and Green Lake map with flight path, markers and GPS latitude-longitude coordinates.



Marker	Latitude	Longitude
7	44°38.33'N	86°05.32'W
8	44°39.46'N	86°08.27'W
9	44°39.69'N	86°09.43'W
10	44°40.81'N	86°11.10'W
11	44°41.14'N	86°13.55'W
12	44°40.21'N	86°14.14'W
13	44°39.98'N	86°12.34'W
14	44°40.04'N	86°11.24'W
15	44°38.58'N	86°09.41'W
16	44°39.07'N	86°08.68'W
17	44°37.94'N	86°05.61'W

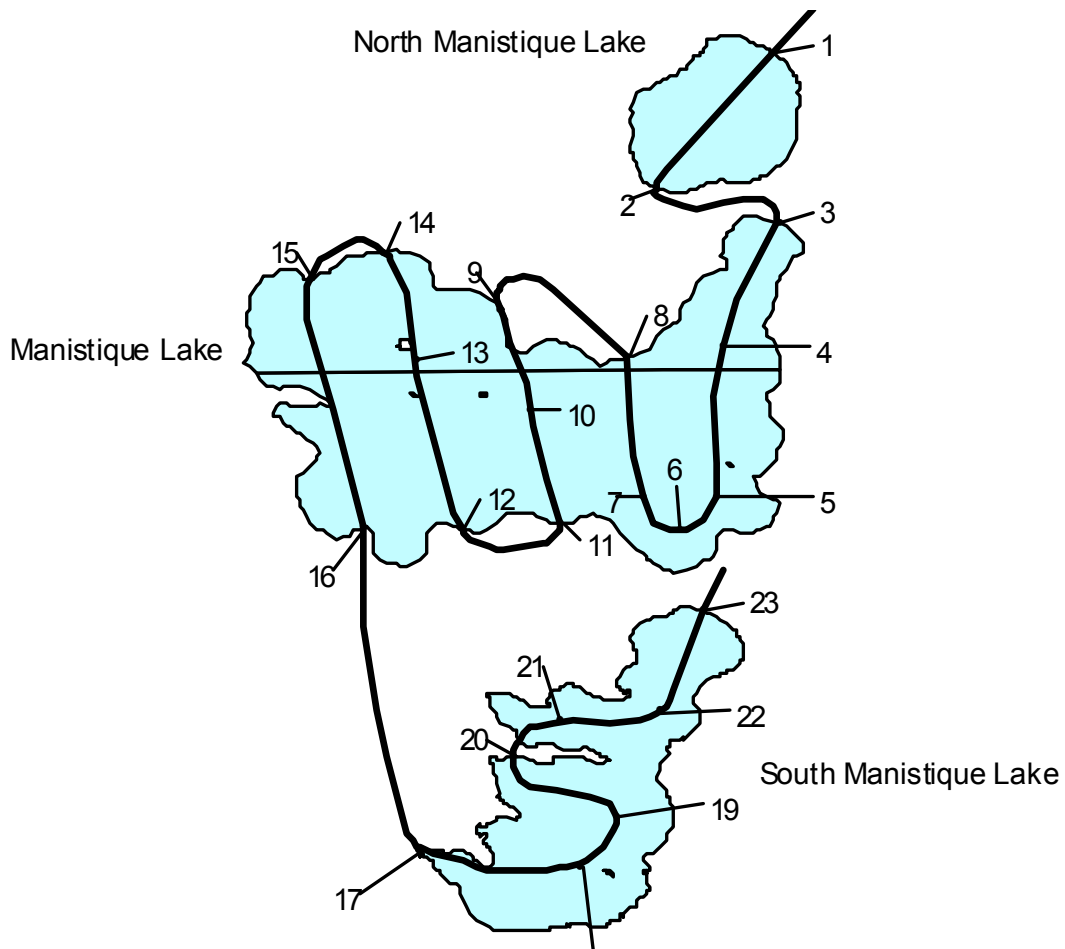
Figure 1.2.—Crystal Lake interview markers and their GPS latitude-longitude coordinates used during summer 2003 creel survey. Site code is 293.





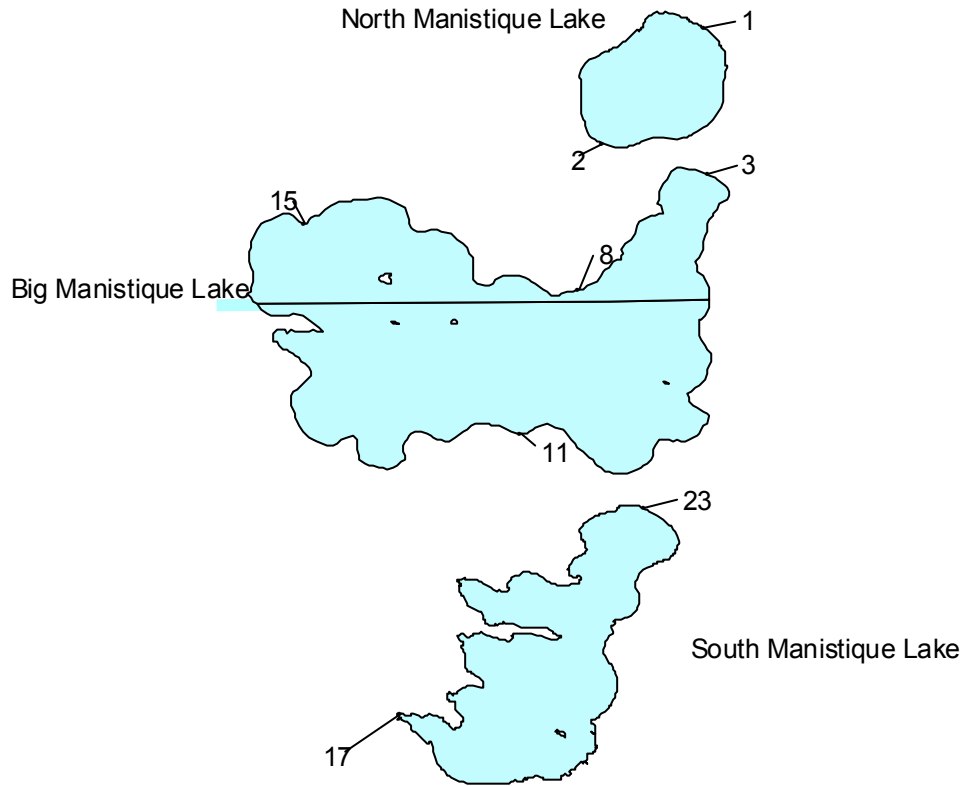
Marker	Latitude	Longitude
1	44°36.75'N	85°45.87'W
6	44°36.30'N	85°47.67'W

Figure 1.3.—Green Lake interview markers and their GPS latitude-longitude coordinates used during summer 2003 creel survey. Site code is 292.



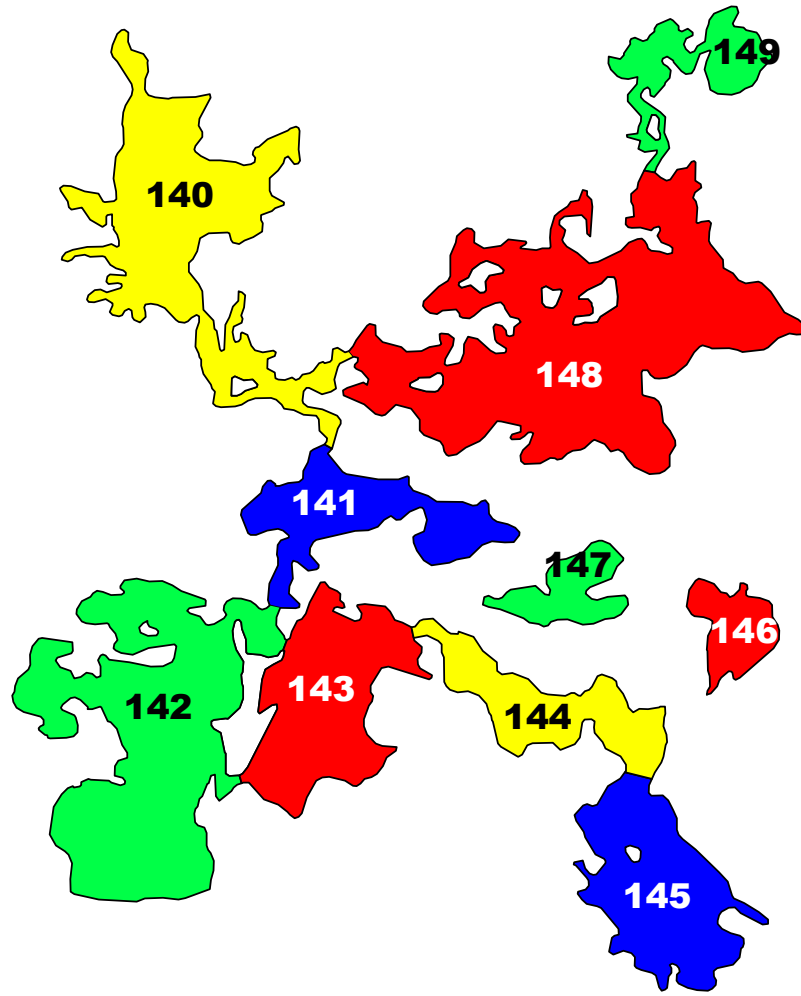
Marker	Latitude	Longitude	Marker	Latitude	Longitude
1	46.29826°N	85.72318°W	13	46.24675°N	85.81025°W
2	46.27573°N	85.75184°W	14	46.26507°N	85.81756°W
3	46.26972°N	85.72218°W	15	46.26044°N	85.83568°W
4	46.24910°N	85.73583°W	16	46.21878°N	85.82295°W
5	46.22357°N	85.73731°W	17	46.16479°N	85.80901°W
6	46.22964°N	85.76630°W	18	46.16196°N	85.77076°W
7	46.22364°N	85.75542°W	19	46.17020°N	85.76226°W
8	46.24733°N	85.75889°W	20	46.18036°N	85.78676°W
9	46.25511°N	85.78970°W	21	46.18611°N	85.77577°W
10	46.23839°N	85.78221°W	22	46.18764°N	85.75160°W
11	46.21930°N	85.77548°W	23	46.20462°N	85.74061°W
12	46.21846°N	85.79896°W			

Figure 2.1.–Manistique lake map with flight path, markers and GPS latitude-longitude coordinates used during summer 2003 angler survey.



Marker	Latitude	Longitude
1	46°17.89'N	85°43.39'W
2	46°16.54'N	85°45.11'W
3	46°16.18'N	85°43.33'W
8	46°14.83'N	85°45.53'W
11	46°13.15'N	85°46.52'W
15	46°15.62'N	85°50.14'W
17	46°09.88'N	85°48.54'W
23	46°12.27'N	85°44.43'W

Figure 2.2.—Manistique lake map with markers and GPS latitude-longitude coordinates used during summer 2003 angler interviews.



Lake name	Lake code
Cisco	140
Lindsley and Fishhawk	141
Big	142
West Bay	143
East Bay	144
Mamie Belle	145
Indian	146
Poor	147
Thousand Island	148
Little and Big African, and Record	149

Figure 3.–Lake names and codes for the Cisco-Thousand Island Chain of Lakes used during winter 2002 angler survey.

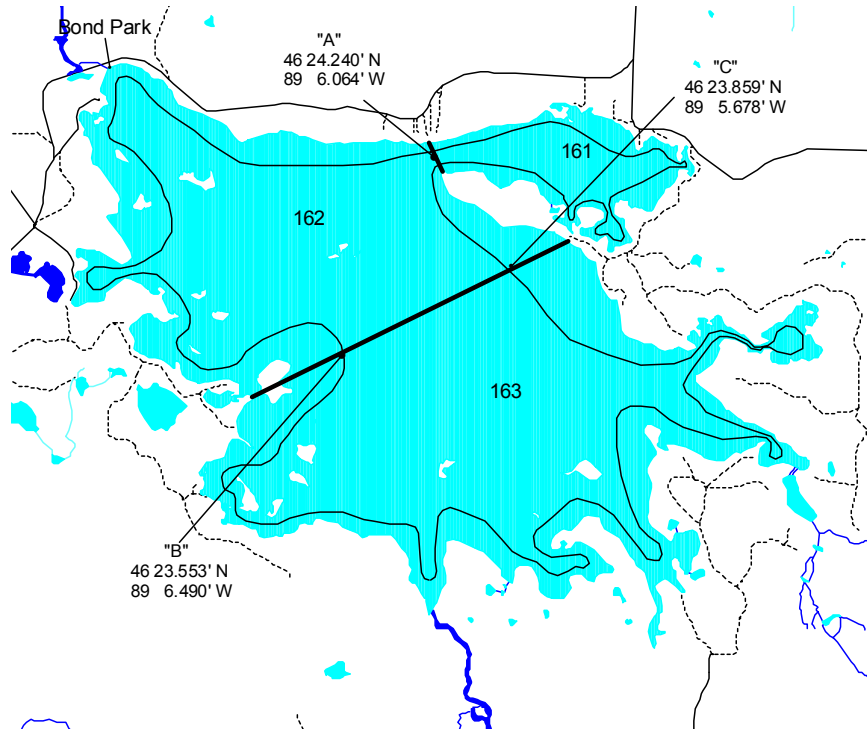
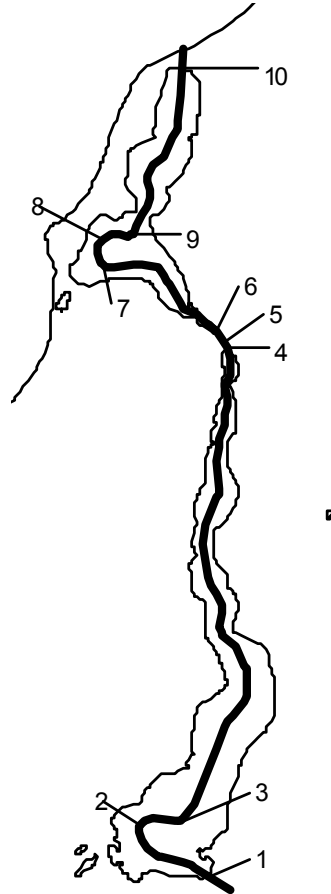


Figure 4.—Bond Falls Flowage count and interview grids used during 2003 summer angler survey.



Marker	Latitude	Longitude	Marker	Latitude	Longitude
1	44°50.20'	85°43.13'	6	44°59.03'	85°42.93'
2	44°51.03'	85°44.67'	7	45°00.12'	85°45.53'
3	44°51.08'	85°43.84'	8	45°00.52'	85°45.54'
4	44°58.77'	85°42.64'	9	45°00.60'	85°44.84'
5 Lake separation	44°58.87'	85°42.72'	10	45°03.30'	85°43.66'

Figure 5.—Lake Leelanau map with flight path, markers and GPS latitude-longitude coordinates. Marker 5 is the boundary between North Lake Leelanau and South Lake Leelanau.

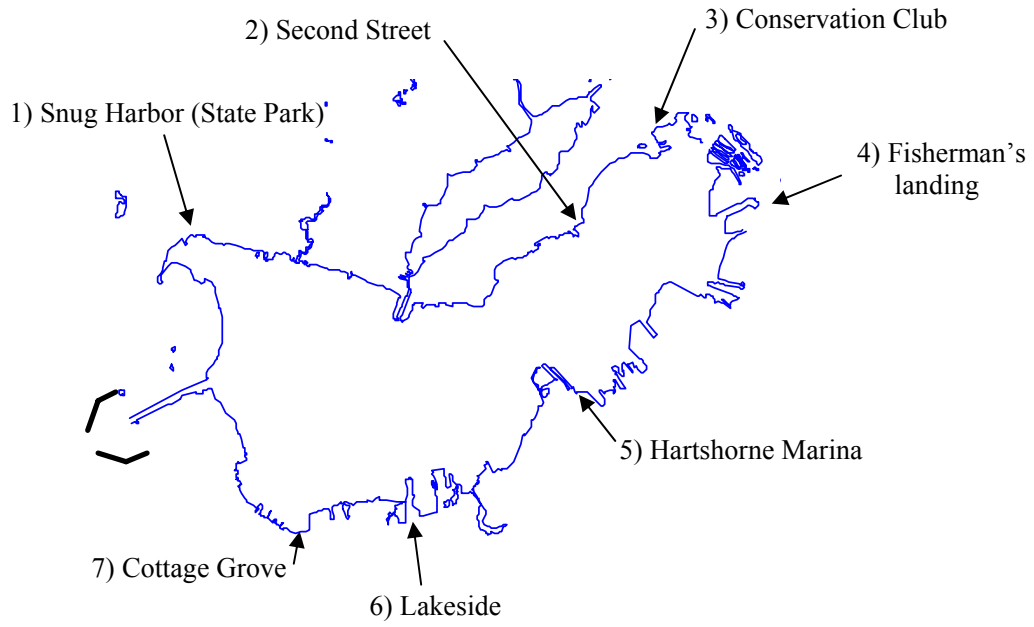


Figure 6.–Muskegon Lake map used for winter 2002 counts and interviews with markers.

Table 1.—Inland creel surveys scheduled and conducted October 1, 2001 through September 30, 2002.

Site	County	Start	End
<b>Lakes</b>			
Cisco, Thousand Island Chain	Gogebic	December 2, 2002	February 26, 2003
Leelanau	Leelanau	December 15, 2002	March 31, 2003
Muskegon	Muskegon	January 4, 2002	March 31, 2003
Manistique Lakes	Mackinac and Luce	May 8, 2003	October 15, 2003
Crystal Lake	Benzie	April 20, 2003	September 31, 2003
Green Lake	Grand Traverse	April 20, 2003	September 31, 2003
Bond Falls Flowage	Oshtemo	May 8, 2003	October 15, 2003
<b>Rivers</b>			
Upper Grand	Ingham, Ionia	March 1, 2003	April 30, 2003
		September 1, 2003	November 30, 2003
Lower Grand	Kent	March 1, 2003	April 30, 2003
		September 1, 2003	November 30, 2003
Rogue	Kent	March 1, 2003	April 30, 2003
		September 1, 2003	November 30, 2003
Manistee	Wexford	May 17, 2003	August 31, 2003



Table 2.–Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Cisco, Thousand Island chain of lakes, winter 2002.

Month	Shift		Expansion values
	Early	Late	
December 2 – 31	0700 h – 1530 h	1100 h – 1930 h	14
January	0700 h – 1530 h	1100 h – 1930 h	14
February 1 – 26	0700 h – 1530 h	1100 h – 1930 h	14

Table 3.–Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Lake Leelanau, winter 2002.

Month	Shift		Expansion values
	Early	Late	
December 15 – 31	0700 h – 1530 h	1100 h – 1930 h	14
January	0700 h – 1530 h	1100 h – 1930 h	14
February	0700 h – 1530 h	1100 h – 1930 h	14
March	0700 h – 1530 h	1100 h – 1930 h	14

Table 4.–Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Muskegon Lake, winter 2002.

Month	Shift		Expansion values
	Early	Late	
January 4 – 31	0700 h – 1530 h	1100 h – 1930 h	14
February	0700 h – 1530 h	1100 h – 1930 h	14
March	0700 h – 1530 h	1100 h – 1930 h	14

Table 5.—Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Crystal and Green lakes, summer 2003.

Month	Shift		Expansion values
	Early	Late	
April 20 – May 31	0600 h – 1430 h	1330 h – 2200 h	17
June	0600 h – 1430 h	1330 h – 2200 h	17
July	0600 h – 1430 h	1300 h – 2130 h	17
August	0630 h – 1500 h	1230 h – 2100 h	16
September	0630 h – 1500 h	1200 h – 2030 h	15

Table 6.—Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Manistique Lakes , summer 2003.

Month	Shift		Expansion values
	Early	Late	
May 8 – 31	0600 h – 1430 h	1330 h – 2200 h	17
June	0600 h – 1430 h	1330 h – 2200 h	17
July	0600 h – 1430 h	1300 h – 2130 h	17
August	0630 h – 1500 h	1230 h – 2100 h	16
September	0630 h – 1500 h	1200 h – 2030 h	15
October	0630 h – 1500 h	1030 h – 1900 h	14

Table 7.—Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Bond Falls Flowage, summer 2003.

Month	Shift		Expansion values
	Early	Late	
May 8 – 31	0600 h – 1430 h	1330 h – 2200 h	17
June	0600 h – 1430 h	1330 h – 2200 h	17
July	0600 h – 1430 h	1300 h – 2130 h	17
August	0630 h – 1500 h	1230 h – 2100 h	16
September	0630 h – 1500 h	1200 h – 2030 h	15
October 1 – 15	0630 h – 1500 h	1030 h – 1900 h	14

Table 8.—Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Upper Grand River, summer 2003.

Month	Shift		Expansion values
	Early	Late	
March	0630 h – 1500 h	1100 h – 2130 h	16
April	0600 h – 1430 h	1230 h – 2100 h	16
September	0600 h – 1430 h	1200 h – 2030 h	16
October	0700 h – 1530 h	1100 h – 1930 h	13

Table 9.—Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Lower Grand and Rogue rivers, summer 2003.

Month	Shift		Expansion values
	Early	Late	
March	0630 h – 1500 h	1100 h – 2130 h	16
April	0600 h – 1430 h	1230 h – 2100 h	16
September	0600 h – 1430 h	1200 h – 2030 h	16
October	0700 h – 1530 h	1100 h – 1930 h	13

Table 10.—Work shifts and expansion values (referred to as “*F*” in Lockwood et al. 1999) used to estimate catch and effort, Manistee River, summer 2003.

Month	Shift		Expansion values
	Early	Late	
May 17 – 31	0600 h – 1430 h	1230 h – 2100 h	16
June	0600 h – 1430 h	1330 h – 2200 h	17
July	0600 h – 1430 h	1300 h – 2130 h	17
August	0600 h – 1430 h	1230 h – 2100 h	16

