

## STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-1

Study No.: 646

Title: Inland creel surveys

Period Covered: October 1, 1999 to September 30, 2000

**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:** Angler creel surveys were conducted at Spider Lake (Grand Traverse County) during September 1999; on nine sections of the Au Sable River (Oscoda, Alcona and Iosco Counties) from April through September 1999 and from April through September 2000; three sections of the Au Sable River (Iosco County) near Lake Huron from March through December 1999 and 2000; one section of the Tahquamenon River near Strongs from May through September 2000; and Monocle Lake (Chippewa County) from May through September 2000. All river sections and the lakes were surveyed to estimate angling pressure, harvest and catch by species. In addition, Spider Lake was surveyed to evaluate the largemouth bass fishery; the nine Au Sable River sections during both years were surveyed to evaluate rainbow and brown trout stocking; the three lower Au Sable River sections were surveyed both years to evaluate the steelhead fishery; the Tahquamenon River was surveyed to evaluate the trout fishery; and Monocle Lake was surveyed to evaluate the walleye fishery.

### **Job 1. Title: Examine creel survey sites.**

**Findings:** Each site was examined to determine appropriate locations for counting and interviewing anglers, and to determine appropriate angler counting and interviewing methods.

Central Lake Michigan Management Unit personnel examined Spider Lake. The lake was sampled as a single unit.

The 9 Au Sable River sections were examined previously (Lockwood 1997a) and again during May 1999. These sections extend from Mio Pond to Loud Dam. Canoeing times were noted and count subsections for non-fishing watercraft determined using uncorrected GPS equipment. Section boundaries and similar descriptors are given in Table 1.

The 3 downstream sections of the Au Sable River were examined by Northern Lake Huron Management Unit personnel and section boundaries determined. A follow up examination was done during late winter 1999. These same sections and section boundaries were used in 2000 (Table 1).

Monocle Lake and the Tahquamenon River were both examined by Lake Superior Management Unit personnel. Monocle Lake was sampled in its entirety as a single unit. The Tahquamenon River section selected for sampling was from 0.75 miles below highway M-123 to the bridge at highway M-28.

**Job 2. Title: Sampling intensity, techniques, and proposed level of statistical significance.**

**Findings:** 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. 2000). Survey planning in each instance followed general funding and supervisory procedures given in Lockwood (2000a).

*Spider Lake, 1999*—Angler creel data were collected by members of the Spider Lake Association. Both weekend days and 3 randomly selected weekdays were selected for sampling during each week of the survey season. A randomized count and interview schedule covered the period 0700h – 1900h. Count and interview data were collected during 3-hour shifts each sample day. Daily expansion factor for the 21 weekdays and 9 weekend days (including Labor Day) was 16 (“F” in Lockwood et al. 2000).

One instantaneous count of fishing crafts and shore (including dock) anglers was made each sample day.

Most angler interviews were of incomplete fishing trips (66 incomplete trip, 7 complete trip, and 16 unmarked trip type). No complete-trip interviews were collected from shore anglers. Catch rates were estimated using the mean-of-ratios estimator regardless of interview type. Mean length of trip from boat anglers was used to estimate shore-angler trips from shore-angler hours.

*Au Sable River, Mio Pond to Loud Dam, 1999*—Funding for this project was provided through a grant from Michigan Habitat Improvement Fund. This funding covered data collection (creel clerks), transportation, and supervision of clerks. Two organizations were selected to collect these creel data, Affiliated Researchers (Oscoda, MI) and Huron Pines R.C.&D. Council (Grayling, MI). Affiliated Researchers collected creel data from sections 240, 250A, 250B, 251, and 252 (Table 1). Huron Pines R.C.&D. collected creel data from sections 254, 255, 256, and 257 (Table 1).

*Section 240 – Mio Pond*—Four locations around Mio Pond were sampled, County Camp Ground, State Forest Camp Ground, Camp Ten, and Rainbow Bend. One clerk collected all data. Both weekend days and three randomly selected weekdays were selected for sampling during each week of the survey season. Period of the day sampled varied with the season (Table 2). The clerk made instantaneous counts of trailers (or vehicles that transported watercraft) and shore anglers at randomly-selected times once per shift. Counts at each location were summed for a single count for each mode and each sampled day. Direction of count was not scheduled since all four locations were relatively near one another. When not counting, the clerk interviewed shore and boating anglers, and non-fishing boaters. Number of fish caught and released or harvested were recorded by angler (Lockwood 1997b). Specific locations for interviewing were not scheduled. Both complete-trip angler interviews and incomplete-trip angler interviews were collected. Most boat-angler interviews were

complete (99%) while 58% of shore-angler interviews were complete and 42% were incomplete. A mean-of-ratios catch rate estimator was used for all boat-angler interviews. For shore-angler catch data, when more than 80% of interviews within a time period (weekday or weekend day within a multiple-day period) were of an interview type, the appropriate catch-rate estimator for that interview type was used on all interviews. When less than 80% were of a single interview type, a weighted average  $R_w$  was used:

$$R_w = \frac{(\hat{R} \cdot n_1) \bullet (\bar{R} \cdot n_2)}{(n_1 + n_2)}, \quad (1)$$

where,  $\hat{R}$  is the ratio-of-means estimator for  $n_1$  interviews and  $\bar{R}$  the mean-of-ratios estimator for  $n_2$  interviews. Estimated variance  $s_w^2$  was calculated as:

$$s_w^2 = \frac{(s_{\hat{R}}^2 \cdot n_1^2) \bullet (s_{\bar{R}}^2 \cdot n_2^2)}{(n_1 + n_2)^2}, \quad (2)$$

where,  $s_{\hat{R}}^2$  is the estimated variance of  $\hat{R}$  and  $s_{\bar{R}}^2$  is the estimated variance of  $\bar{R}$ .

Sections 250A, 250B, 251, and 252—Three clerks worked as a team to sample these sections. Two clerks canoed selected sections, counting and interviewing boat and shore anglers (including wading anglers). Counts were progressive type (Lockwood 2000b). The third clerk served as the spotter; and transported the other two clerks and their equipment, and interviewed anglers as they completed their fishing trips. Period of day sampled varied with season (Table 3). Three randomly selected weekdays and both weekend days were selected for sampling each week of the survey period. One count per section per day was made and order of count was randomized. Anglers (shore and wading) and fishing craft were counted as the canoeing clerks passed them.

Since non-fishing craft were traveling down river at approximately the same speed as the clerks, a different method was employed to estimate non-fishing craft effort in sections 250B, 251 and 252. Non-fishing craft effort was not estimated in section 250A. The access site in 250A was the exclusive launch site for recreation boaters (canoeists) entering section 250B, and no take-out points were located between the access site in 250A and the beginning of section 250B. Within each of sections 250B, 251, and 252 then, a smaller subsection was chosen for sampling. Subsection selection was based on length and straightness. That is, subsections were river stretches that were straight and relatively long where non-fishing craft could easily be observed and counted. All visible non-fishing craft within a subsection were counted when the clerks arrived at a predetermined location (Table 1) in the approximate center of the subsection. At that location the clerks recorded the number of non-fishing craft within the subsection. These subsections were assumed to be representative of the entire section. For some section  $f$  then, the subsection  $v_f$  was measured, as was the entire section  $l_f$ , using ArcView 3.1 (Environmental Systems Research Institute, Inc.). Each count was expanded by a constant  $K_f$ , which was the product of hours per sample day  $h$ , days  $d$  within the multiple-day period and subsections within the section:

$$K_f = \frac{l_f}{v_f} \cdot h \cdot d. \quad (3)$$

Estimated non-fishing effort  $\hat{e}_f$  for an entire section and multiple-day period was then estimated as:

$$\hat{e}_f = \frac{\sum_{i=1}^{m_f} c_{if} K_f}{m_f}, \quad (4)$$

for  $m_f$  counts of non-fishing craft  $c_f$  in the visible count subsection  $v_f$ . Variance of  $\hat{e}_f$  was estimated for independent samples as:

$$\text{Var}(\hat{e}_f) = \frac{\sum_{i=1}^{m_f} (c_{if} K_f - \hat{e}_f)^2}{m_f(m_f - 1)}. \quad (5)$$

While calculation of non-fishing effort was not completed during this segment, descriptions of data collection methods and equations have been included to ensure adequate documentation and understanding.

Interview data were collected by the clerks as they canoed and by the spotting clerk. The canoeing clerks both counted and interviewed, and no adjustments were made for shadowing (Wade et al. 1991). However, interviews were made as quickly and efficiently as possible and bias was assumed to be minor. Only persons fishing were interviewed, non-fishing persons were not interviewed. Species of fish caught and released, as well as harvested, were recorded by angler (Lockwood 1997b). Both complete-trip angler interviews and incomplete-trip angler interviews were collected. Most boat-angler interviews were incomplete (76%) as were shore (80%). Inclusion of each interview type and estimation of catch rate followed procedures given for Mio Pond (section 240) and equations (1) and (2).

Section 254 – Alcona Impoundment—One clerk was used to collect angler creel data at Alcona Impoundment, section 254. Both weekend days and three randomly selected weekdays were selected for sampling during each week of the survey season. Period of the day sampled varied with the season (Table 2). The clerk made two instantaneous counts of fishing craft, non-fishing craft and shore anglers at randomly selected times each shift.

When not counting, the clerk interviewed shore and boating anglers. Species of fish caught and released as well as harvested, were recorded by angler. Both complete-trip angler interviews and incomplete-trip angler interviews were collected. Most boat-angler interviews (95%) and shore-angler interviews were of complete trips (56%). Inclusion of each interview type and estimation of catch rate followed procedures given for Mio Pond (section 240), and equations (1) and (2).

Sections 255, 256, and 257 – Loud Impoundment—Two clerks were used to collect angler creel data at these three sections. Both weekend days and three randomly selected weekdays were selected for sampling each week of the survey season. Period of the day sampled varied with the season (Table 4).

The clerks counted only one of the sections each workday. Two counts per sample day were made in sections 255 and 257 – Loud Impoundment, and one count per sample day in section 256. Progressive counts of fishing crafts and shore anglers were made in sections 255 and 256 as the clerks canoed through the sections. In addition, instantaneous counts of non-fishing crafts were also made at sections 255 and 256 using the methods described for sections 250B, 251, and 252, and equations (3-5). Instantaneous counts of fishing crafts, shore anglers, and non-fishing crafts were made at section 257 – Loud Impoundment. Counts in section 257 – Loud Impoundment were made from numerous vantage points around the impoundment.

While canoeing through sections 255 and 256, the clerks interviewed any anglers they encountered. Interviews were made as quickly and efficiently as possible to minimize shadowing bias (Wade et al. 1991).

When not counting, the clerks interviewed shore and boating anglers. Number and species of fish caught and released as well as harvested were recorded by angler. Both complete-trip angler interviews and incomplete-trip angler interviews were collected. In section 255, most boat-angler interviews were incomplete trip (56%), while shore-angler interviews were mostly complete trip (52%). In section 256, most boat (56%) and most shore-angler interviews (87%) were incomplete trip. In section 257 – Loud Impoundment, most boat-angler interviews were complete trip (98%), while most shore-angler interviews were incomplete trip (78%). For each section, inclusion of each interview type and estimation of catch rate followed procedures given for Mio Pond (section 240) and equations (1) and (2).

When section 257 – Loud Impoundment was selected for sampling, one clerk made the counts and interviewed, while the second clerk drove along the river in sections 255 and 256 interviewing anglers.

*Au Sable River, Foote Dam to Lake Huron, 1999*—Funding for this project was provided through a grant from Michigan Habitat Improvement Fund. This funding covered data collection (creel clerks), transportation, and supervision of clerks. Huron Pines R.C.&D. Council collected creel data at all sections.

Sections 316A, 316B, and 316—One clerk collected count and interview data from these sections. Both weekend days and three randomly selected weekdays were selected for sampling each week of the survey season. Period of the day sampled varied with the season (Table 5).

The clerk made two progressive counts of fishing craft, trailers, and shore anglers at randomly selected times each sample day. Direction of count varied randomly and the clerk began the count at the upper end of 316A (Foote Dam) and proceeded downstream, or began at the river mouth at Lake Huron and proceeded upstream.

The clerk collected angler interviews when not counting and no interviews were collected during counts. In 316A, all boat-angler interviews were complete trip and 97% of shore-angler interviews were complete trip. In 316B, all boat-angler interviews were complete trip and 93% of shore-angler interviews were complete trip. Only four boat anglers were interviewed in section 316 and all were complete-trip interviews. There was no shore fishery

in 316 and no shore-angler interviews were collected. Presence or absence of fin clips were recorded by species. All catch estimates were made using ratio-of-means estimator for complete-trip interviews.

*Au Sable River, Mio Pond to Loud Dam, 2000*—Funding for this project was provided through a grant from Michigan Habitat Improvement Fund. This funding covered data collection (creel clerks), transportation, and supervision of clerks. Two organizations were selected to collect these creel data, Affiliated Researchers (Oscoda, MI) and Huron Pines R.C.&D. Council (Grayling, MI). Affiliated Researchers collect creel data at sections 240, 250A, 250B, 251, and 252 (Table 1). Huron Pines R.C.&D. collect creel data from sections 254, 255, 256, and 257 (Table 1).

Angler surveys at these sections are currently ongoing and estimates have not been completed. Methods similar to those reported for 1999 are being used in 2000.

*Au Sable River, Foote Dam to Lake Huron, 2000*—Funding for this project was provided through a grant from Michigan Habitat Improvement Fund. This funding covered data collection (creel clerks), transportation, and supervision of clerks. Huron Pines R.C.&D. Council collected creel data at all sections.

Angler surveys at these sections are currently ongoing and estimates have not been completed. Methods similar to those reported for 1999 are being used in 2000.

*Tahquamenon River and Monocle Lake, 2000*—Funding for this project was provided by the U.S. Forest Service and the Bay Mills Indian Community. This funding covered data collection (creel clerks), transportation, and supervision of clerks. This angler survey is currently ongoing and estimates have not been completed.

One clerk covered both river and lake sites. Three randomly-selected weekdays and both weekend days were selected for sampling during the survey period. Approximately equal numbers of days were spent at each site.

One progressive count of vehicles was made at the Tahquamenon River each sample day. Direction of counts varied randomly. Three instantaneous counts of fishing craft and shore anglers were made at Monocle Lake each day. At river and lake locations the clerk was instructed to collect both complete and incomplete-trip angler interviews.

**Job 3. Title: Prepare stratified-random schedules.**

**Findings:** 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.**

**Findings:** Written instructions were prepared for all surveys noted in this report. Central Lake Michigan Management Unit personnel provided direct contact training for Spider Lake Association members involved in the survey. Additional on-site training was provided for

clerks in 1999 and 2000 survey sections on the Au Sable River. Lake Superior Management Unit fisheries personnel provided additional training for the clerk surveying Tahquamenon River and Monocle Lake.

**Job 5. Title: Supervise count and interview data processing, and quality control.**

**Findings:** Count and interview data from the Spider Lake survey were processed at the Institute for Fisheries Research. All Spider Lake data were visually checked and range checked. Count and interview data processing from the 1999 and 2000 Au Sable River survey sections was done by Affiliated Researchers and Huron Pines R.C.&D. Council. Additional range checking of these data has been done (1999 data) or will be done (2000 data) at the Institute for Fisheries Research. Tahquamenon River and Monocle Lake data are being processed by the Lake Superior Basin unit. These data will be range checked following arrival at the Institute for Fisheries Research.

**Job 6. Title: Calculate and distribute catch and pressure estimates.**

**Findings:** Multiple-day estimates for each inland creel survey were calculated using the expansion factors given in Tables 2-5, referred to as "F" by Lockwood et al. (2000). These expansion factors are the daily hours sampled over multiple-day periods at each river section or lake.

*Spider Lake, 1999*—Anglers fished a total of  $3,112 \pm 1,276$  hours (Table 6). A total of  $4,016 \pm 1,951$  fish were harvested and  $4,155 \pm 1,998$  were caught and released. Bluegill were the predominate fish harvested ( $3,663 \pm 1,931$ ) and caught and released by anglers ( $2,348 \pm 1,687$ ).

*Au Sable River, 1999, section 240 – Mio Pond*— Anglers fished a total of  $28,429 \pm 3,094$  hours (Table 7). A total of  $5,694 \pm 4,587$  fish were harvested and  $11,538 \pm 3,914$  fish were caught and released (Tables 7-8). Sunfish spp. were the predominate fish harvested ( $2,975 \pm 4,183$ ) and caught and released by anglers ( $4,835 \pm 3,765$ ).

*Au Sable River, 1999, section 250A*— Anglers fished a total of  $8,033 \pm 1,990$  hours (Table 9). A total of  $1,150 \pm 574$  fish were harvested and  $9,185 \pm 5,732$  fish were caught and released (Tables 9-10). Rainbow trout were the predominate fish harvested by anglers ( $906 \pm 554$ ). Similar numbers of brown trout ( $4,610 \pm 5,386$ ) and rainbow trout ( $3,559 \pm 1,892$ ) were caught and released by anglers.

*Au Sable River, 1999, section 250B*— Anglers fished a total of  $10,410 \pm 1,705$  hours (Table 11). A total of  $255 \pm 196$  fish were harvested and  $9,040 \pm 2,415$  fish were caught and released. Brown trout and rainbow trout were the only observed fish harvested by anglers. Anglers harvested  $77 \pm 151$  brown trout and  $178 \pm 126$  rainbow trout. Brown trout and rainbow trout were the predominant species caught and released by anglers. Anglers caught and released  $1,811 \pm 1,136$  brown trout and  $6,703 \pm 2,102$  rainbow trout.

*Au Sable River, 1999, section 251*— Anglers fished a total of  $6,865 \pm 1,591$  hours (Table 12). A total of  $353 \pm 356$  fish were harvested and  $5,323 \pm 1,658$  fish were caught and released. Anglers harvested three species of trout, brown trout ( $24 \pm 34$ ), rainbow trout ( $281 \pm 347$ ), and brook trout ( $32 \pm 67$ ). These same three species were caught and released by anglers. Anglers caught and released  $371 \pm 190$  brown trout,  $4,597 \pm 1,637$  rainbow trout, and  $49 \pm 66$  brook trout.

*Au Sable River, 1999, section 252*—Anglers fished a total of  $5,287 \pm 1,104$  hours (Table 13). A total of  $1,402 \pm 474$  fish were harvested and  $2,858 \pm 1,126$  fish were caught and released. Anglers harvested three species of trout, brown trout ( $216 \pm 181$ ), rainbow trout ( $1,035 \pm 415$ ), and brook trout ( $10 \pm 15$ ). These same three species were caught and released by anglers. Anglers caught and released  $512 \pm 691$  brown trout,  $2,093 \pm 876$  rainbow trout, and  $97 \pm 110$  brook trout.

*Au Sable River, 1999, section 254 – Alcona Impoundment*—Anglers fished a total of  $30,692 \pm 3,600$  hours (Table 14). A total of  $7,567 \pm 2,420$  fish were harvested and  $27,802 \pm 11,717$  fish were caught and released (Tables 14-15). Bluegill were the predominant species harvested ( $4,630 \pm 2,044$ ) as well as caught and released ( $8,350 \pm 3,473$ ).

*Au Sable River, 1999, sections 255, 256, and 257 – Loud Impoundment*—Estimates of angling effort, harvest, and catch and release have not been completed.

*Au Sable River, 1999, section 316A*—Anglers fished a total of  $231,456 \pm 11,013$  hours (Table 16). A total of  $32,436 \pm 4,657$  fish were harvested and  $88,566 \pm 14,068$  fish were caught and released (Tables 16-17). Included in the harvest were  $4,232 \pm 1,146$  unclipped and  $10,930 \pm 2,212$  clipped rainbow trout and  $12,202 \pm 2,821$  unclipped and  $2,483 \pm 980$  clipped chinook salmon. Included in the catch and release were  $5,403 \pm 1,842$  unclipped and  $2,728 \pm 1,214$  clipped rainbow trout and  $7,353 \pm 3,751$  unclipped chinook salmon.

*Au Sable River, 1999, section 316B*—Anglers fished a total of  $48,264 \pm 4,684$  hours (Table 18). A total of  $4,155 \pm 1,290$  fish were harvested and  $22,260 \pm 5,514$  fish were caught and released (Tables 18-19). Included in the harvest were  $192 \pm 219$  unclipped and  $1,068 \pm 562$  clipped rainbow trout. Included in the catch and release were  $795 \pm 638$  unclipped and  $170 \pm 411$  clipped rainbow trout.

*Au Sable River, 1999, section 316*—Only a boat fishery existed in this section of the Au Sable River. Boat anglers fished a total of  $431 \pm 368$  hours during the months of March and April (Table 20). No angling was observed during the remaining months of the survey. A total of  $97 \pm 99$  fish were harvested and  $48 \pm 59$  fish were caught and released. Included in the harvest were  $12 \pm 26$  unclipped,  $6 \pm 13$  clipped and  $73 \pm 94$  clip-not-reported rainbow trout. Included in the catch and release were  $18 \pm 39$  unclipped rainbow trout.

**Job 7. Title: Prepare annual report.**

**Findings:** This report was prepared on schedule.

**Literature Cited:**

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**Date:** September 30, 2000

Table 1.—Au Sable River angler survey sections, 1999-2000. Canoe time for section 250A is from launch site in the approximate middle of the section to the downstream end of the section.

Section code	Boundaries	Name	Length (miles)	Section canoe times (hours)	Non-fishing craft count location
240	End of riverine stretch to Mio Dam	Mio Pond	-	-	-
250A	M-33 to Power Line	-	0.46	0.03	-
250B	Power Line to Comins Flats	-	6.96	1.78	44°39.34N 84°04.96W
251	Comins Flats to McKinley Bridge	-	7.58	1.67	44°38.83N 83°57.44W
252	McKinley Bridge to 4001 Bridge	-	7.09	1.77	44°37.80N 83°51.60W
254	1.65 miles below 4001 Bridge to Alcona Dam	Alcona Impoundment	-	-	-
255	Alcona Dam to Hoppy Creek	-	6.57	1.75	44°32.91N 83°47.70W
256	Hoppy Creek to end of riverine stretch above Loud Impoundment	-	5.50	1.50	44°29.40N 83°46.80W
257	End of Riverine stretch to Loud Dam	Loud Impoundment	-	-	-
316A	Foote Dam to Whirlpool	-	-	-	-
316B	Whirlpool to US-23	-	-	-	-
316	US-23 to Lake Huron	-	-	-	-

Table 2.—Beginning and ending period dates, daily sampling times and expansion factors used to estimate angling effort, catch and harvest at Au Sable River sections 240 – Mio Pond, and 254 – Alcona Impoundment, 1999.

Period dates	Daily hours	Expansion factor “F”
April 24 – May 31	0600-2100	16
June 1-30	0600-2200	17
July 1-31	0600-2200	17
August 1-31	0600-2200	17
September 1-30	0700-2000	14

Table 3.—Beginning and ending period dates, daily sampling times and expansion factors used to estimate angling effort, catch and harvest at Au Sable River sections 250A, 250B, 251, and 252, 1999.

Period dates	Daily hours	Expansion factor “F”
April 24 – June 7	0600-2130	16
June 8 – July 15	1430-2400	9.5
July 16 – August 24	0600-2200	16.5
August 25 – September 7	1430-2400	9.5
September 8-30	0600-2130	16

Table 4.—Beginning and ending period dates, daily sampling times and expansion factors used to estimate angling effort, catch and harvest at Au Sable River sections 255, 256, and 257 – Loud Impoundment, 1999.

Period dates	Daily hours	Expansion factor “F”
May 20-31	0600-2100	16
June 1-30	0600-2200	17
July 1-31	0600-2200	17
August 1-31	0600-2200	17
September 1-30	0700-2000	14

Table 5.—Beginning and ending period dates, daily sampling times, and expansion factors used to estimate angling effort, catch and harvest at Au Sable River sections 316A, 316B, and 316, 1999.

Period dates	Daily hours	Expansion factor “F”
March 15-31	0600-1900	13
April 1-30	0600-2000	15
May 1-31	0600-2100	16
June 1-31	0600-2200	18
July 1-31	0600-2200	18
August 1-31	0600-2100	17
September 1-30	0700-2000	16
October 1-31	0700-1900	15
November 1-30	0700-1800	14
December 1-15	0700-1800	13

Table 6.—Total harvest, catch and release, fishing pressure, and catch per hour at Spider Lake, September 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Catch
<b>Harvest</b>		
Bluegill	1.1771 (0.7861)	3,663 (1,931)
Pumpkinseed	0.0318 (0.0493)	99 (148)
Largemouth bass	0.0501 (0.0720)	156 (215)
Yellow perch	0.0177 (0.0237)	55 (70)
Black crappie	0.0138 (0.0229)	43 (69)
<b>Catch and release</b>		
Bluegill	0.7545 (0.6242)	2,348 (1,687)
Pumpkinseed	0.0141 (0.0288)	44 (88)
Rock bass	0.0328 (0.0363)	102 (105)
Largemouth bass	0.5132 (0.4004)	1,597 (1,060)
Smallmouth bass	0.0129 (0.0191)	40 (57)
Yellow perch	0.0045 (0.0095)	14 (29)
Black crappie	0.0032 (0.0050)	10 (15)
Total harvest	1.2905 (0.8204)	4,016 (1,951)
Total catch and release	1.3352 (0.8438)	4,155 (1,998)
Angler hours		3,112 (1,276)
Angler trips		1,478 (958)

Table 7.—Total harvest, fishing pressure, and catch per hour at Au Sable River – section 240 Mio Pond, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-May	June	Jul	Aug	Sep	Season
Walleye	0.0075 (0.0037)	53 (62)	42 (47)	34 (37)	80 (58)	5 (8)	214 (104)
Northern pike	0.0059 (0.0032)	59 (63)	22 (34)	32 (34)	27 (28)	27 (31)	167 (90)
Rock bass	0.0150 (0.0106)	40 (48)	241 (272)	81 (91)	38 (42)	27 (57)	427 (299)
Yellow perch	0.0583 (0.0654)	60 (59)	188 (237)	1,118 (1,827)	248 (139)	42 (64)	1,656 (1,850)
Largemouth bass	0.0019 (0.0019)	0 (0)	40 (51)	0 (0)	9 (15)	5 (8)	54 (54)
Smallmouth bass	0.0021 (0.0019)	0 (0)	0 (0)	23 (39)	21 (22)	15 (27)	59 (52)
Brown trout	0.0008 (0.0013)	23 (37)	0 (0)	0 (0)	0 (0)	0 (0)	23 (37)
Rainbow trout	0.0010 (0.0010)	23 (29)	4 (8)	0 (0)	0 (0)	2 (5)	29 (30)
Brook trout	0.0005 (0.0008)	15 (23)	0 (0)	0 (0)	0 (0)	0 (0)	15 (23)
Sucker spp.	0.0014 (0.0012)	15 (26)	5 (12)	0 (0)	19 (19)	0 (0)	39 (34)
Sunfish spp.	0.1046 (0.1475)	40 (60)	640 (632)	147 (144)	2,148 (4,132)	0 (0)	2,975 (4,183)
Catfish spp.	0.0006 (0.0010)	0 (0)	13 (28)	4 (8)	0 (0)	0 (0)	17 (29)
Tiger musky	0.0004 (0.0008)	0 (0)	0 (0)	10 (20)	0 (0)	0 (0)	10 (20)
Bowfin	0.0003 (0.0005)	0 (0)	9 (14)	0 (0)	0 (0)	0 (0)	9 (14)
Total harvest	0.2003 (0.1628)	328 (144)	1,204 (733)	1,449 (1,836)	2,590 (4,135)	123 (96)	5,694 (4,587)
Angler hours		6,020 (1,278)	6,899 (2,058)	7,460 (1,463)	5,831 (1,088)	2,219 (616)	28,429 (3,094)
Angler trips		1,804 (396)	1,833 (543)	1,844 (375)	1,521 (304)	591 (173)	7,593 (845)

Table 8.—Total angler catch and release, fishing pressure, and catch per hour at Au Sable River – section 240 Mio Pond, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-May	June	Jul	Aug	Sep	Season
Walleye	0.0091 (0.0040)	44 (56)	31 (36)	75 (53)	78 (62)	30 (32)	258 (110)
Northern pike	0.0649 (0.0186)	540 (297)	455 (265)	395 (181)	301 (182)	154 (120)	1,845 (489)
Rock bass	0.0466 (0.0173)	104 (90)	298 (231)	559 (278)	161 (112)	202 (266)	1,324 (471)
Yellow perch	0.0421 (0.0192)	51 (49)	40 (45)	572 (478)	431 (206)	102 (67)	1,196 (529)
Largemouth bass	0.0065 (0.0042)	25 (52)	84 (89)	26 (41)	35 (32)	15 (20)	185 (117)
Smallmouth bass	0.0523 (0.0217)	320 (344)	269 (209)	547 (414)	242 (129)	109 (65)	1,487 (595)
Brown trout	0.0013 (0.0018)	0 (0)	0 (0)	23 (47)	8 (17)	7 (12)	38 (51)
Sucker spp.	0.0126 (0.0059)	181 (130)	29 (36)	0 (0)	95 (75)	53 (50)	358 (162)
Sunfish spp.	0.1701 (0.1337)	12 (26)	157 (308)	2,213 (2,477)	966 (932)	1,487 (2,660)	4,835 (3,765)
Catfish spp.	0.0002 (0.0005)	7 (17)	0 (0)	0 (0)	0 (0)	0 (0)	7 (17)
Bowfin	0.0002 (0.0005)	0 (0)	5 (12)	0 (0)	0 (0)	0 (0)	5 (12)
Total catch	0.4059 (0.1446)	1,284 (491)	1,368 (524)	4,410 (2,579)	2,317 (992)	2,159 (2,678)	11,538 (3,914)
Angler hours		6,020 (1,278)	6,899 (2,058)	7,460 (1,463)	5,831 (1,088)	2,219 (616)	28,429 (3,094)
Angler trips		1,804 (396)	1,833 (543)	1,844 (375)	1,521 (304)	591 (173)	7,593 (845)

Table 9.—Total harvest, fishing pressure, and catch per hour at Au Sable River section 250A, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-Jun7	Jun8-Jul15	Jul16-Aug24	Aug25-Sep7	Sep8-30	Season
Walleye	0.0010 (0.0014)	0 (0)	0 (0)	0 (0)	4 (8)	4 (8)	8 (11)
Rock bass	0.0019 (0.0033)	0 (0)	5 (12)	0 (0)	0 (0)	10 (23)	15 (26)
Largemouth bass	0.0010 (0.0024)	0 (0)	0 (0)	0 (0)	8 (19)	0 (0)	8 (19)
Brown trout	0.0182 (0.0155)	106 (107)	21 (30)	0 (0)	0 (0)	19 (43)	146 (119)
Rainbow trout	0.1128 (0.0744)	540 (518)	127 (84)	46 (97)	63 (79)	130 (128)	906 (554)
White sucker	0.0042 (0.0090)	34 (72)	0 (0)	0 (0)	0 (0)	0 (0)	34 (72)
Sunfish spp.	0.0026 (0.0041)	0 (0)	14 (29)	0 (0)	7 (15)	0 (0)	21 (33)
Redhorse spp.	0.0015 (0.0033)	0 (0)	0 (0)	0 (0)	12 (26)	0 (0)	12 (26)
Total harvest	0.1432 (0.0798)	680 (534)	167 (95)	46 (97)	94 (87)	163 (137)	1,150 (574)
Angler hours		4,380 (1,788)	1,367 (421)	1,022 (448)	733 (512)	531 (348)	8,033 (1,990)



Table 10.—Total angler catch and release, fishing pressure, and catch per hour at Au Sable River section 250A, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-Jun7	Jun8-Jul15	Jul16-Aug24	Aug25-Sep7	Sep8-30	Season
Walleye	0.0009 (0.0018)	0 (0)	6 (14)	0 (0)	0 (0)	1 (2)	7 (14)
Rock bass	0.0346 (0.0259)	61 (91)	62 (65)	0 (0)	22 (42)	133 (155)	278 (196)
Yellow perch	0.0010 (0.0021)	8 (17)	0 (0)	0 (0)	0 (0)	0 (0)	8 (17)
Largemouth bass	0.0055 (0.0090)	31 (67)	0 (0)	0 (0)	13 (24)	0 (0)	44 (71)
Smallmouth bass	0.0769 (0.0610)	41 (72)	128 (262)	0 (0)	297 (280)	152 (254)	618 (466)
Brown trout	0.5739 (0.6854)	4,455 (5,385)	78 (93)	0 (0)	0 (0)	77 (85)	4,610 (5,386)
Rainbow trout	0.4430 (0.2598)	2,661 (1,805)	597 (434)	186 (347)	13 (20)	102 (117)	3,559 (1,892)
Brook trout	0.0019 (0.0041)	0 (0)	15 (32)	0 (0)	0 (0)	0 (0)	15 (32)
Sunfish spp.	0.0034 (0.0056)	0 (0)	0 (0)	0 (0)	9 (20)	18 (39)	27 (44)
White sucker	0.0024 (0.0055)	0 (0)	0 (0)	0 (0)	0 (0)	19 (43)	19 (43)
Total catch	1.1434 (0.7677)	7,257 (5,681)	886 (521)	186 (347)	354 (286)	502 (336)	9,185 (5,732)
Angler hours		4,380 (1,788)	1,367 (421)	1,022 (448)	733 (512)	531 (348)	8,033 (1,990)

Table 11.—Total harvest, catch and release, fishing pressure, and catch per hour at Au Sable River section 250B, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-Jun7	Jun8-Ju15	Jul16-Aug24	Aug25-Sep7	Sep8-30	Season
Harvest							
Brown trout	0.0074 (0.0146)	77 (151)	0 (0)	0 (0)	0 (0)	0 (0)	77 (151)
Rainbow trout	0.0171 (0.0124)	53 (51)	41 (40)	21 (29)	57 (103)	6 (10)	178 (126)
Catch and release							
Walleye	0.0011 (0.0017)	0 (0)	8 (16)	3 (7)	0 (0)	0 (0)	11 (17)
Northern pike	0.0011 (0.0026)	0 (0)	0 (0)	0 (0)	11 (26)	0 (0)	11 (26)
Rock bass	0.0026 (0.0051)	0 (0)	0 (0)	25 (53)	2 (5)	0 (0)	27 (53)
Yellow perch	0.0005 (0.0011)	0 (0)	5 (11)	0 (0)	0 (0)	0 (0)	5 (11)
Largemouth bass	0.0011 (0.0026)	0 (0)	0 (0)	0 (0)	11 (26)	0 (0)	11 (26)
Smallmouth bass	0.0092 (0.0092)	0 (0)	7 (11)	33 (33)	8 (15)	48 (87)	96 (95)
Brown trout	0.1740 (0.1128)	393 (228)	954 (1,086)	182 (140)	41 (33)	241 (197)	1,811 (1,136)
Rainbow trout	0.6439 (0.2278)	2,958 (1,302)	2,504 (1,548)	820 (524)	140 (116)	281 (202)	6,703 (2,102)
Brook trout	0.0328 (0.0316)	34 (33)	188 (267)	109 (179)	10 (23)	0 (0)	341 (324)
White sucker	0.0016 (0.0019)	0 (0)	5 (10)	7 (12)	5 (13)	0 (0)	17 (20)
Sunfish spp.	0.0007 (0.0014)	0 (0)	7 (14)	0 (0)	0 (0)	0 (0)	7 (14)
Total harvest	0.0245 (0.0193)	130 (159)	41 (40)	21 (29)	57 (103)	6 (10)	255 (196)
Total catch and release	0.8684 (0.2721)	3,385 (1,322)	3,678 (1,910)	1,179 (575)	228 (130)	570 (295)	9,040 (2,415)
Angler hours		3,674 (1,073)	3,026 (863)	2,061 (829)	490 (255)	1,159 (510)	10,410 (1,705)
Angler trips		1,130 (425)	1,057 (370)	767 (355)	150 (101)	323 (187)	3,427 (699)

Table 12.—Total angler harvest, catch and release, fishing pressure, and catch per hour at Au Sable River section 251, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-Jun7	Jun8-Ju15	Jul16-Aug24	Aug25-Sep7	Sep8-30	Season
<b>Harvest</b>							
Walleye	0.0017 (0.0031)	0 (0)	0 (0)	12 (22)	0 (0)	0 (0)	12 (22)
Smallmouth bass	0.0006 (0.0015)	0 (0)	0 (0)	4 (10)	0 (0)	0 (0)	4 (10)
Brown trout	0.0035 (0.0050)	20 (34)	3 (5)	0 (0)	1 (3)	0 (0)	24 (34)
Rainbow trout	0.0409 (0.0514)	185 (331)	5 (12)	89 (104)	2 (6)	0 (0)	281 (347)
Brook trout	0.0047 (0.0099)	32 (67)	0 (0)	0 (0)	0 (0)	0 (0)	32 (67)
<b>Catch and release</b>							
Walleye	0.0102 (0.0113)	6 (12)	11 (14)	28 (49)	25 (55)	0 (0)	70 (76)
Northern pike	0.0004 (0.0007)	3 (5)	0 (0)	0 (0)	0 (0)	0 (0)	3 (5)
Yellow perch	0.0001 (0.0003)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	1 (3)
Smallmouth bass	0.0109 (0.0116)	0 (0)	39 (71)	12 (15)	18 (25)	6 (16)	75 (78)
Brown trout	0.0540 (0.0304)	179 (133)	57 (40)	55 (51)	0 (0)	80 (120)	371 (190)
Rainbow trout	0.6696 (0.2845)	2,574 (1,337)	1,147 (689)	575 (524)	60 (68)	241 (373)	4,597 (1,637)
Brook trout	0.0071 (0.0097)	0 (0)	7 (8)	34 (63)	8 (18)	0 (0)	49 (66)
Chub spp.	0.0185 (0.0173)	0 (0)	0 (0)	78 (91)	47 (70)	2 (6)	127 (115)
White sucker	0.0034 (0.0045)	0 (0)	0 (0)	15 (24)	8 (18)	0 (0)	23 (30)
Tiger musky	0.0010 (0.0024)	0 (0)	0 (0)	0 (0)	7 (17)	0 (0)	7 (17)

Table 12.–continued.

Species	Catch/hour	Apr24-Jun7	Jun8-Ju15	Jul16-Aug24	Aug25-Sep7	Sep8-30	Season
Total harvest	0.0514 (0.0532)	237 (339)	8 (13)	105 (107)	3 (7)	0 (0)	353 (356)
Total catch and release	0.7754 (0.3010)	2,762 (1,344)	1,261 (694)	798 (541)	173 (119)	329 (392)	5,323 (1,658)
Angler hours		3,005 (987)	1,529 (560)	1,553 (1,027)	383 (237)	395 (364)	6,865 (1,591)
Angler trips		894 (560)	417 (177)	387 (238)	103 (103)	86 (77)	1,887 (647)

Table 13.—Total angler harvest, catch and release, fishing pressure, and catch per hour at Au Sable River section 252, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-Jun7	Jun8-Ju15	Jul16-Aug24	Aug25-Sep7	Sep8-30	Season
Harvest							
Walleye	0.0030 (0.0040)	0 (0)	14 (21)	2 (3)	0 (0)	0 (0)	16 (21)
Rock bass	0.0076 (0.0155)	40 (81)	0 (0)	0 (0)	0 (0)	0 (0)	40 (81)
Largemouth bass	0.0013 (0.0030)	0 (0)	7 (16)	0 (0)	0 (0)	0 (0)	7 (16)
Smallmouth bass	0.0002 (0.0004)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	1 (2)
Brown trout	0.0409 (0.0353)	170 (169)	3 (7)	10 (21)	1 (2)	32 (62)	216 (181)
Rainbow trout	0.1958 (0.0885)	857 (396)	78 (55)	78 (102)	0 (0)	22 (46)	1,035 (415)
Brook trout	0.0019 (0.0029)	3 (1)	7 (15)	0 (0)	0 (0)	0 (0)	10 (15)
White sucker	0.0144 (0.0207)	46 (94)	7 (16)	23 (50)	0 (0)	0 (0)	76 (108)
Bowfin	0.0002 (0.0004)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	1 (2)
Catch and release							
Walleye	0.0059 (0.0073)	5 (12)	7 (14)	8 (10)	0 (0)	11 (32)	31 (38)
Northern pike	0.0036 (0.0074)	19 (39)	0 (0)	0 (0)	0 (0)	0 (0)	19 (39)
Rock bass	0.0011 (0.0024)	0 (0)	0 (0)	6 (13)	0 (0)	0 (0)	6 (13)
Smallmouth bass	0.0061 (0.0064)	0 (0)	5 (8)	21 (29)	6 (14)	0 (0)	32 (33)
Brown trout	0.0968 (0.1322)	16 (23)	43 (41)	451 (689)	2 (5)	0 (0)	512 (691)
Rainbow trout	0.3959 (0.1852)	1,345 (573)	333 (530)	413 (397)	2 (5)	0 (0)	2,093 (876)
Brook trout	0.0183 (0.0211)	8 (16)	7 (9)	7 (16)	75 (107)	0 (0)	97 (110)

Table 13.—continued.

Species	Catch/hour	Apr24-Jun7	Jun8-Ju15	Jul16-Aug24	Aug25-Sep7	Sep8-30	Season
White sucker	0.0078 (0.0087)	0 (0)	18 (30)	23 (34)	0 (0)	0 (0)	41 (45)
Chub spp.	0.0070 (0.0143)	0 (0)	0 (0)	35 (75)	2 (5)	0 (0)	37 (75)
Total harvest	0.2652 (0.1054)	1,116 (448)	116 (65)	113 (116)	3 (3)	54 (77)	1,402 (474)
Total catch and release	0.5425 (0.2412)	1,393 (575)	413 (533)	964 (800)	87 (108)	11 (32)	2,868 (1,126)
Angler hours		2,922 (709)	799 (341)	1,109 (713)	207 (224)	250 (205)	5,287 (1,104)
Angler trips		1,094 (624)	343 (173)	423 (283)	48 (71)	139 (146)	2,047 (725)

Table 14.—Total angler harvest, fishing pressure, and catch per hour at Au Sable River section 254 – Alcona Impoundment, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-May	June	July	August	September	Season
Walleye	0.0051 (0.0056)	0 (0)	0 (0)	109 (143)	48 (96)	0 (0)	157 (172)
Northern pike	0.0056 (0.0040)	0 (0)	33 (68)	77 (93)	48 (32)	15 (30)	173 (123)
Rock bass	0.0198 (0.0264)	0 (0)	95 (135)	45 (68)	468 (795)	0 (0)	608 (809)
Yellow perch	0.0280 (0.0244)	0 (0)	31 (64)	347 (451)	0 (0)	481 (586)	859 (742)
Smallmouth bass	0.0241 (0.0179)	0 (0)	33 (69)	425 (341)	217 (397)	64 (122)	739 (542)
Rainbow trout	0.0072 (0.0095)	0 (0)	159 (276)	62 (91)	0 (0)	0 (0)	221 (291)
Bluegill	0.1509 (0.0689)	0 (0)	560 (600)	1,750 (887)	1,093 (1,311)	1,227 (1,145)	4,630 (2,044)
Sunfish spp.	0.0020 (0.0042)	0 (0)	0 (0)	0 (0)	0 (0)	60 (127)	60 (127)
White sucker	0.0020 (0.0042)	0 (0)	0 (0)	0 (0)	0 (0)	60 (127)	60 (127)
Redhorse spp.	0.0020 (0.0042)	0 (0)	0 (0)	0 (0)	0 (0)	60 (127)	60 (127)
Total harvest	0.2465 (0.0840)	0 (0)	911 (684)	2,815 (1,072)	1,874 (1,587)	1,967 (1,311)	7,567 (2,420)
Angler hours		2,856 (527)	5,231 (1,611)	10,519 (2,323)	8,822 (1,895)	3,264 (1,048)	30,692 (3,600)
Angler trips		764 (154)	1,436 (475)	3,553 (797)	2,815 (842)	1,208 (423)	9,776 (1,331)

Table 15.–Total angler catch and release, fishing pressure, and catch per hour at Au Sable River section 254 – Alcona Impoundment, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Apr24-May	June	July	August	September	Season
Walleye	0.0292 (0.0225)	148 (298)	0 (0)	254 (265)	313 (471)	180 (287)	895 (681)
Northern pike	0.0585 (0.0226)	444 (310)	292 (336)	649 (390)	321 (261)	91 (83)	1,797 (660)
Rock bass	0.1281 (0.1323)	6 (11)	646 (820)	631 (444)	2,644 (3,926)	6 (13)	3,933 (4,035)
Yellow perch	0.1983 (0.3247)	0 (0)	354 (225)	308 (361)	5,310 (9,929)	113 (150)	6,085 (9,939)
Largemouth bass	0.0062 (0.0055)	0 (0)	33 (67)	94 (113)	62 (101)	0 (0)	189 (166)
Smallmouth bass	0.1911 (0.1000)	11 (24)	391 (349)	2,410 (1,391)	1,490 (1,170)	1,564 (2,350)	5,866 (2,991)
Carp	0.0001 (0.0002)	0 (0)	0 (0)	0 (0)	0 (0)	4 (9)	4 (9)
Rainbow trout	0.0040 (0.0060)	0 (0)	0 (0)	123 (183)	0 (0)	0 (0)	123 (183)
Brook trout	0.0006 (0.0013)	0 (0)	0 (0)	19 (40)	0 (0)	0 (0)	19 (40)
Bluegill	0.2721 (0.1176)	0 (0)	1,393 (1,533)	4,330 (2,213)	1,943 (2,077)	684 (706)	8,350 (3,473)
Sunfish spp.	0.0141 (0.0154)	0 (0)	123 (233)	309 (408)	0 (0)	0 (0)	432 (470)
White sucker	0.0015 (0.0021)	0 (0)	0 (0)	47 (66)	0 (0)	0 (0)	47 (66)
Redhorse spp.	0.0020 (0.0042)	0 (0)	62 (130)	0 (0)	0 (0)	0 (0)	62 (130)
Total catch	0.9058 (0.3963)	609 (431)	3,294 (1,839)	9,174 (2,757)	12,083 (10,954)	2,642 (2,476)	27,802 (11,717)
Angler hours		2,856 (527)	5,231 (1,611)	10,519 (2,323)	8,822 (1,895)	3,264 (1,048)	30,692 (3,600)
Angler trips		764 (154)	1,436 (475)	3,553 (797)	2,815 (842)	1,208 (423)	9,776 (1,331)



Table 16.—Total harvest, fishing pressure, and catch per hour at Au Sable River section 316A, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow trout No clip	0.0183 0.0050	522 (308)	2,403 (936)	636 (323)	0 (0)	0 (0)	0 (0)	0 (0)	308 (274)	271 (379)	92 (143)	4,232 (1,146)
Rainbow trout Clipped	0.0472 0.0098	1,302 (613)	6,928 (1,724)	1,138 (558)	0 (0)	0 (0)	0 (0)	0 (0)	860 (1,007)	594 (432)	108 (181)	10,930 (2,212)
Coho No clip	0.0004 0.0007	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	94 (162)	0 (0)	0 (0)	94 (162)
Chinook salmon No clip	0.0527 0.0124	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,485 (861)	10,319 (2,663)	398 (355)	0 (0)	12,202 (2,821)
Chinook salmon Clipped	0.0107 0.0043	31 (62)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	590 (386)	1,862 (899)	0 (0)	0 (0)	2,483 (980)
Pink salmon No clip	0.0007 0.0014	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	169 (329)	0 (0)	0 (0)	0 (0)	169 (329)
Walleye No clip	0.0007 0.0010	0 (0)	0 (0)	0 (0)	0 (0)	58 (118)	93 (180)	0 (0)	0 (0)	0 (0)	0 (0)	151 (215)
Smallmouth bass No clip	0.0014 0.0018	0 (0)	0 (0)	147 (283)	81 (291)	99 (146)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	327 (431)
Largemouth bass No clip	0.0003 0.0006	0 (0)	0 (0)	0 (0)	0 (0)	58 (121)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	58 (121)
Yellow perch No clip	0.0006 0.0012	0 (0)	0 (0)	0 (0)	0 (0)	41 (85)	89 (236)	0 (0)	0 (0)	0 (0)	0 (0)	130 (251)
Rock bass No clip	0.0054 0.0106	0 (0)	0 (0)	0 (0)	347 (613)	0 (0)	894 (2,362)	0 (0)	0 (0)	0 (0)	0 (0)	1,241 (2,440)
White sucker No clip	0.0013 0.0015	0 (0)	230 (327)	73 (141)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	303 (356)
Drum No clip	0.0005 0.0007	0 (0)	0 (0)	0 (0)	0 (0)	116 (172)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	116 (172)
Total harvest	0.1401 0.0212	1,855 (689)	9,561 (1,989)	1,994 (718)	428 (679)	372 (294)	1,076 (2,381)	2,244 (999)	13,443 (3,003)	1,263 (675)	200 (231)	32,436 (4,657)
Angler hours		15,493 (2,782)	75,287 (6,893)	19,435 (2,812)	7,670 (2,023)	12,821 (3,312)	12,874 (2,541)	25,060 (2,950)	49,412 (5,005)	11,022 (1,500)	2,382 (783)	231,456 (11,013)
Angler trips		2,861 (661)	13,959 (1,554)	4,525 (830)	3,040 (1,129)	5,422 (1,741)	5,180 (1,374)	8,596 (1,487)	12,722 (1,706)	3,331 (666)	848 (361)	60,484 (3,928)

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Table 17.—Total catch and release, fishing pressure, and catch per hour at Au Sable River section 316A, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow trout No clip	0.0233 (0.0080)	428 (425)	2,630 (1,186)	1,910 (1,173)	162 (582)	0 (0)	0 (0)	0 (0)	177 (265)	96 (140)	0 (0)	5,403 (1,842)
Rainbow trout Clipped	0.0118 (0.0053)	254 (294)	1,014 (670)	531 (347)	133 (263)	0 (0)	0 (0)	0 (0)	796 (865)	0 (0)	0 (0)	2,728 (1,214)
Chinook salmon No clip	0.0318 (0.0163)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	51 (103)	6,480 (3,698)	755 (604)	67 (127)	7,353 (3,751)
Brown trout No clip	0.0001 (0.0002)	31 (62)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	31 (62)
Lake trout No clip	0.0016 (0.0016)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	61 (124)	299 (346)	0 (0)	360 (368)
Pink salmon No clip	0.0002 (0.0004)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	55 (114)	0 (0)	0 (0)	55 (114)
Brook trout No clip	0.0001 (0.0002)	0 (0)	0 (0)	32 (64)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	32 (64)
Walleye No clip	0.0032 (0.0024)	66 (98)	51 (112)	0 (0)	199 (389)	322 (316)	0 (0)	102 (208)	0 (0)	0 (0)	0 (0)	740 (563)
Northern pike No clip	0.0005 (0.0008)	35 (72)	0 (0)	0 (0)	0 (0)	83 (166)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	118 (181)
Smallmouth bass No clip	0.0742 (0.0326)	0 (0)	110 (221)	179 (345)	1,837 (1,725)	12,087 (6,192)	2,261 (3,782)	574 (498)	116 (164)	0 (0)	0 (0)	17,164 (7,488)
Largemouth bass No clip	0.0018 (0.0021)	0 (0)	0 (0)	0 (0)	67 (138)	264 (438)	93 (186)	0 (0)	0 (0)	0 (0)	0 (0)	424 (495)
Yellow perch No clip	0.0047 (0.0032)	0 (0)	0 (0)	0 (0)	266 (331)	645 (589)	182 (301)	0 (0)	0 (0)	0 (0)	0 (0)	1,093 (740)
Channel catfish No clip	0.0017 (0.0016)	0 (0)	0 (0)	0 (0)	0 (0)	298 (327)	101 (203)	0 (0)	0 (0)	0 (0)	0 (0)	399 (385)
Rock bass No clip	0.1451 (0.0411)	0 (0)	0 (0)	1,809 (1,894)	8,958 (5,328)	12,221 (5,278)	6,478 (3,340)	4,110 (4,113)	0 (0)	0 (0)	0 (0)	33,576 (9,376)
White sucker No clip	0.0446 (0.0183)	31 (62)	7,698 (3,869)	2,060 (1,534)	67 (139)	0 (0)	185 (372)	286 (387)	0 (0)	0 (0)	0 (0)	10,327 (4,199)
Drum No clip	0.0011 (0.0012)	0 (0)	0 (0)	0 (0)	0 (0)	116 (175)	101 (203)	34 (80)	0 (0)	0 (0)	0 (0)	251 (280)

Table 17.—continued.

Species	Catch/hour	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Redhorse spp. No clip	0.0160 (0.0117)	0 (0)	3,444 (2,648)	252 (497)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3,696 (2,694)
Carp No clip	0.0057 (0.0096)	0 (0)	1,090 (2,207)	63 (124)	167 (247)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,320 (2,224)
Bluegill No clip	0.0136 (0.0077)	0 (0)	0 (0)	0 (0)	332 (467)	1,332 (1,004)	989 (978)	506 (1,011)	0 (0)	0 (0)	0 (0)	3,159 (1,790)
Pumpkinseed No clip	0.0015 (0.0029)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	337 (659)	0 (0)	0 (0)	0 (0)	337 (659)
Total catch	0.3826 (0.0634)	845 (538)	16,037 (5,364)	6,836 (2,797)	12,188 (5,688)	27,368 (8,247)	10,390 (5,173)	6,000 (4,339)	7,685 (3,814)	1,150 (710)	67 (127)	88,566 (14,068)
Angler hours		15,493 (2,782)	75,287 (6,893)	19,435 (2,812)	7,670 (2,023)	12,821 (3,312)	12,874 (2,541)	25,060 (2,950)	49,412 (5,005)	11,022 (1,500)	2,382 (783)	231,456 (11,013)
Angler trips		2,861 (661)	13,959 (1,554)	4,525 (830)	3,040 (1,129)	5,422 (1,741)	5,180 (1,374)	8,596 (1,487)	12,722 (1,706)	3,331 (666)	848 (361)	60,484 (3,928)

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Table 18.—Total estimated harvest, fishing effort, and catch per hour at Au Sable River section 316B, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow trout No clip	0.0040 (0.0046)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	117 (154)	0 (0)	75 (156)	192 (219)
Rainbow trout Clipped	0.0221 (0.0118)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	562 (420)	431 (340)	75 (156)	1,068 (562)
Chinook salmon No clip	0.0129 (0.0083)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	251 (203)	374 (343)	0 (0)	0 (0)	625 (399)
Chinook salmon Clipped	0.0022 (0.0024)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	107 (115)	0 (0)	0 (0)	0 (0)	107 (115)
Walleye No clip	0.0177 (0.0106)	0 (0)	0 (0)	0 (0)	501 (412)	155 (160)	100 (137)	99 (201)	0 (0)	0 (0)	0 (0)	855 (504)
Smallmouth bass No clip	0.0013 (0.0019)	0 (0)	0 (0)	0 (0)	61 (91)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	61 (91)
Channel catfish No clip	0.0088 (0.0086)	0 (0)	0 (0)	0 (0)	61 (93)	242 (335)	122 (227)	0 (0)	0 (0)	0 (0)	0 (0)	425 (415)
Rock bass No clip	0.0153 (0.0171)	0 (0)	0 (0)	0 (0)	412 (519)	27 (57)	0 (0)	298 (633)	0 (0)	0 (0)	0 (0)	737 (821)
Drum No clip	0.0018 (0.0028)	0 (0)	0 (0)	0 (0)	58 (122)	27 (57)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	85 (135)
Total harvest	0.0861 (0.0280)	0 (0)	0 (0)	0 (0)	1,093 (686)	451 (380)	222 (265)	755 (704)	1,053 (564)	431 (340)	150 (221)	4,155 (1,290)
Angler hours		1,991 (760)	3,547 (1,478)	2,137 (1,199)	4,843 (1,723)	9,572 (2,665)	6,376 (1,821)	7,388 (1,344)	6,258 (1,037)	5,108 (1,133)	1,044 (433)	48,264 (4,684)
Angler trips		471 (228)	834 (441)	1,479 (1,431)	1,866 (831)	3,389 (1,139)	2,955 (1,203)	2,115 (504)	1,884 (517)	1,546 (512)	364 (192)	16,903 (2,559)

Table 19.—Total catch and release, fishing effort, and catch per hour at Au Sable River section 316B, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow trout No clip	0.0165 (0.0133)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	208 (264)	512 (564)	75 (137)	795 (638)
Rainbow trout Clipped	0.0035 (0.0085)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	170 (411)	0 (0)	170 (411)
Chinook salmon No clip	0.0137 (0.0143)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	179 (233)	481 (645)	0 (0)	0 (0)	660 (686)
Walleye No clip	0.0127 (0.0099)	0 (0)	0 (0)	0 (0)	266 (282)	97 (146)	251 (356)	0 (0)	0 (0)	0 (0)	0 (0)	614 (477)
Northern pike No clip	0.0045 (0.0050)	0 (0)	0 (0)	0 (0)	31 (61)	0 (0)	151 (219)	36 (75)	0 (0)	0 (0)	0 (0)	218 (239)
Smallmouth bass No clip	0.1368 (0.0548)	0 (0)	0 (0)	0 (0)	1,154 (788)	3,414 (1,610)	1,503 (1,747)	533 (577)	0 (0)	0 (0)	0 (0)	6,604 (2,569)
Largemouth bass No clip	0.0024 (0.0052)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	117 (253)	0 (0)	0 (0)	0 (0)	0 (0)	117 (253)
Yellow perch No clip	0.0223 (0.0215)	0 (0)	0 (0)	0 (0)	214 (238)	569 (840)	294 (549)	0 (0)	0 (0)	0 (0)	0 (0)	1,077 (1,031)
Channel catfish No clip	0.0110 (0.0088)	0 (0)	0 (0)	0 (0)	91 (145)	198 (188)	244 (348)	0 (0)	0 (0)	0 (0)	0 (0)	533 (421)
Rock bass No clip	0.2113 (0.0962)	0 (0)	0 (0)	0 (0)	1,979 (1,409)	5,215 (2,286)	2,706 (3,629)	298 (439)	0 (0)	0 (0)	0 (0)	10,198 (4,536)
White sucker No clip	0.0182 (0.0144)	0 (0)	0 (0)	0 (0)	440 (460)	97 (130)	244 (455)	99 (206)	0 (0)	0 (0)	0 (0)	880 (691)
Drum No clip	0.0074 (0.0070)	0 (0)	0 (0)	0 (0)	58 (122)	128 (142)	172 (280)	0 (0)	0 (0)	0 (0)	0 (0)	358 (337)
Redhorse spp. No clip	0.0007 (0.0015)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	36 (76)	0 (0)	0 (0)	0 (0)	36 (76)
Total catch	0.4612 (0.1227)	0 (0)	0 (0)	0 (0)	4,233 (1,730)	9,718 (2,936)	5,682 (4,143)	1,181 (796)	689 (697)	682 (698)	75 (137)	22,260 (5,514)
Angler hours		1,991 (760)	3,547 (1,478)	2,137 (1,199)	4,843 (1,723)	9,572 (2,665)	6,376 (1,821)	7,388 (1,344)	6,258 (1,037)	5,108 (1,133)	1,044 (433)	48,264 (4,684)
Angler trips		471 (228)	834 (441)	1,479 (1,431)	1,866 (831)	3,389 (1,139)	2,955 (1,203)	2,115 (504)	1,884 (517)	1,546 (512)	364 (192)	16,903 (2,559)

Table 20.—Total boat angler harvest, catch and release, fishing effort, and catch per hour at Au Sable River section 316, 1999. Two standard errors are given in parentheses.

Species	Catch/hour	Mar	Apr	Season
Harvest				
Rainbow trout No clip	0.0278 (0.0647)	12 (26)	0 (0)	12 (26)
Rainbow trout Clipped	0.0139 (0.0324)	6 (13)	0 (0)	6 (13)
Rainbow trout Not recorded	0.1694 (0.2617)	36 (73)	37 (60)	73 (94)
Lake whitefish Not recorded	0.0139 (0.0302)	6 (12)	0 (0)	6 (12)
Catch and release				
Rainbow trout No clip	0.0418 (0.0973)	18 (39)	0 (0)	18 (39)
Brown trout Not recorded	0.0418 (0.0804)	6 (12)	12 (28)	18 (31)
Smallmouth bass No clip	0.0278 (0.0756)	0 (0)	12 (31)	12 (31)
Total harvest	0.2251 (0.2995)	60 (79)	37 (60)	97 (99)
Total catch and release	0.1137 (0.1678)	24 (41)	24 (42)	48 (59)
Angler hours		178 (182)	253 (320)	431 (368)
Angler trips		24 (27)	37 (47)	61 (54)