

# The Muskellunge Spawning Population in Tomahawk Lake, Oneida County Wisconsin during 2005-06.

Waterbody Identification Code 1542700



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Senior Fisheries Biologist  
Rhinelanders  
January, 2007



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## EXECUTIVE SUMMARY

A muskellunge survey was conducted in Tomahawk Lake during springs of 2005 and 2006. Muskellunge (adult population estimate, PE = 0.10 per acre) were found at low abundance. Muskellunge growth was at or above regional averages. Size structure was very good, with 19.0 % of the adult muskellunge population larger than 40 and 5.8% larger than 45 inches.

### Lake and location:

Tomahawk Lake, Oneida County, T39N R06E Sec24; Commonly referred to as "Lake Tomahawk." Located in north-central Oneida County in the towns of Minocqua, Hazelhurst, Woodruff and Lake Tomahawk, it is 2 miles southeast of the city of Minocqua and the city of Lake Tomahawk touches its eastern tip. It is part of the Minocqua Chain of lakes, with inlets draining four adjoining wetlands and Katherine, Mud and Little Tomahawk Lakes. The Minocqua Chain forms the headwaters of the Tomahawk River, and is part of the Upper Wisconsin River watershed. The outlet drains to Minocqua Lake by way of the Tomahawk Thoroughfare. A dam on Kawaguesaga Lake impounds the Minocqua Chain and adds about four feet of head to the system. The Katherine Channel provides a narrow navigable-water access to Katherine Lake, but boats must be carried over an earthen dam at Tomahawk Lake.

### Physical/Chemical attributes (Andrews and Threinen 1966):

**Morphometry:** 3,392 acres, maximum depth 84 feet.

**Watershed:** 26 square miles, including 220 acres of adjoining wetlands.

**Lake type:** Drainage. Outlet forms Tomahawk Thoroughfare.

**Basic water chemistry:** Soft – alkalinity 47 mg/l, conductance 106  $\mu$ mhos.

**Water clarity:** Clear water of high transparency.

**Littoral substrate:** 55% sand, 20% rubble, 19% gravel 5% muck, and some boulders.

**Aquatic vegetation:** well-developed beds of vegetation. Eurasian water milfoil has recently invaded portions of the lake.

**Winterkill:** None.

**Boat landings:** One gravel ramp on Tomahawk Thoroughfare and two asphalt and concrete ramps with parking for 31 vehicles with trailers. Navigable water access from Minocqua Lake.

**Other features:** Shoreline 95% upland with marsh and bog wetlands adjoining limited portions of the basin.

Purpose of Survey: Assess the muskellunge population and develop management recommendations.

### Dates of fieldwork:

Netting for marking, April 28 – May 13 2005. Five additional muskellunge were marked by Art Oehmcke State Fish Hatchery crews during 15 days of sucker netting in early May, 2005.

Netting for recapture, April 27 – May 5 2006

## BACKGROUND

Half-page spring netting records from April and May of 1948, 53, 54 and 56 appear to be from spawning operations, likely targeting walleye. The 1948 record shows a catch of 10 muskellunge ranging 12 to 34 inches in 135 net nights during April 20 through May 5. During May 3-14, 1951, no muskellunge are listed from 109 net nights. The 1954 records consist of two sheets labeled “spawning crew Jess Hall & John Joswiak” and “spawning – Wendt & Koutnik.” During April 22 through May 2, 1954, one 14-inch muskellunge is recorded from approximately 157 net nights (there is some discrepancy in number of nets set versus pulled).

The 1956 record (labeled “Wendt – Hall”) stands out because of the relatively high muskellunge catch. The number of fish larger than 40 inches appears to be very low, but they handled one exceptionally large fish. Twelve nets set during April 30 – May 10 1956 (120 net-nights) yielded 34 muskellunge, or 0.28 per net night. Muskellunge numbers (size range in parentheses) for each day of netting are: 0, 3 (12-30), 0, 3 (12-40), 2 (24-30), 10 (24-40), 3 (28-56), 8 (27-45), 3 (14-26) and 2 (30-36).

A sheet with no year is stapled between the 1956 and fall, 1957 records. It indicates 8 nets set during May 7-10 (3 lifts) with no muskellunge listed in the catch. A record from October 15, 1957 (apparently written by Frank Eschenbauch and labeled “Kahler, Eschenbauch, Barrows, Swanson”) is for an unknown number of nets and no muskellunge are listed.

No muskellunge were encountered during seining in July 1959 (file data), gill netting for lake trout in July 1964 (Radonski 1964) and electroshocking for lake trout in May 1965 (Radonski 1965).

A netting survey was conducted during May and September of 1967 and April of 1968 (McKnight and Theis 1968). The primary focus of the survey appears to be a walleye assessment and mark-recapture population estimate (although not enough recaptures were obtained to complete the walleye population estimate). Two muskellunge were caught in trap nets, 6 by electrofishing and 0 with gill nets. Six fish were 20.0 to 31.9 inches in length; one was 47 to 47.9 inches, and length of the eighth fish is not reported. Although spawning habitat for muskellunge and northern pike is described as “good,” the report later states: “Periodic support stocking of muskellunge is recommended.” The report indicates that muskellunge and northern pike were spawned during most recent years in the Tomahawk Thoroughfare, and northern pike were removed at the same time, with removal numbers given for 1964-68. The report seems to question the usefulness of removing northern pike, but recommends continuing the program:

### “III. Fish Removal

As part of the muskellunge management program, northern pike are being removed from the chain. This is to decrease competition between the species. Whether this program is as effective as intended is difficult to assess. Catch records (see V, “Past Management”) do not reveal the answer. There are considerable amounts of northern pike spawning areas where removal is not carried on. The result, therefore, may merely be the removal of a “harvestable surplus”. Since this removal program coincides with spawn-taking operations, however, continuation is recommended. Intensification of this effort might be considered.” (McKnight and Theis 1968)

A netting and shocking survey in 1978 was conducted “with the main purpose of evaluating the present state of the walleye population and determining whether several years of walleye spawn-taking ... had an adverse impact on the walleye population.” (Serns 1979). The

muskellunge fyke-net catch was reported as 18 fish (0.3 per net night) ranging 25.6 to 41.7 and averaging 35.0 inches in length. All fish were adults identified to sex, but only one fish was longer than 40 inches. During two 5-mile electrofishing runs, a 13.7-inch muskellunge was captured on June 22 and two muskellunge 20.9 and 22.0 inches were captured on August 25 1978. Muskellunge length-at-age is reported from scale samples on 22 fish, sexes combined.

Several surveys were conducted to assess the walleye population with the onset of spearing by Chippewa tribal members. A 1986 survey reported a catch of 97 muskellunge ranging 11.5 to 44.0 inches in 120 fyke net lifts (0.73 per net night) during April 16-23 (Newman 1987). Muskellunge were marked with the same clip as walleye in a 1987 survey (Newman 1988), with a catch of 184 muskellunge ranging from 15.5 to 46.5 inches in 224 fyke net lifts (0.8 per net night); 7 were recaptures of previously-marked fish. No other muskellunge information is given.

Walleye population estimates were conducted by DNR in 1992 and 1998 and by Great Lakes Indian Fish & Wildlife Commission (GLIFWC) in 2000 and 2002 (data not reported on species other than walleye).

Most fall electroshocking surveys target juvenile walleyes, and in some cases other species are not handled. Fall surveys may be used as an index of muskellunge recruitment, but muskellunge catch rates are higher at colder water temperatures and faster boat speed than typical for walleye surveys. Current DNR standards are to collect muskellunge that appear to be smaller than 20 inches during all fall young-of-year surveys. Recent GLIFWC surveys record only walleyes. Fall electroshocking surveys (year in parentheses indicates only walleye were collected) were conducted by DNR in 78, (83), (85), (86-87, 92), 98, (2001), and 2003 (a baseline survey, described below). Fall surveys were conducted by GLIFWC in 1986, 90, 91, 93-97, 99 and (2000-06). Excluding years where only walleye catch is reported, catch of yoy muskellunge averaged 0.41 per mile and age-1 muskellunge averaged 0.13 per mile (Table 1). Either fry or fingerling muskellunge were stocked during 8 of 10 years from 1987 through 1996 (Table 2). Thus, the contribution of stocked fish to relatively strong yearclasses in 1989, 90 and 91 is unknown. No muskellunge were stocked during another strong yearclass in 1993.

A baseline survey was conducted in 2003, consisting of ten mini-fyke nets set for one night in August and four, 2-mile electroshocking stations during September 10-11. All gamefish were targeted during the baseline electroshocking stations, and all species were targeted on four 0.5-mile sub-stations. One 18.5-18.9 inch muskellunge was encountered during September electroshocking (Table 1).

Table 1. Muskellunge catch during fall electroshocking surveys on Tomahawk Lake, Oneida County Wisconsin. Muskellunge are assigned age young-of-year (YOY) if smaller than 14 inches and age-1 if between 14 and 20 inches.

Year	0-14 inch (yoy)	14-20 inch (age-1)	20+ inch	miles shocked	temperature (Fahrenheit)	comments
1978	0	0	2	5.0	not listed	8/25/1978
1986	0	0	14	11.33	59	
1990	14	30	4	23.6	66	A 13.7" fish may be age 1.
1991	91	0	14	30.2	53-58	
1993	37	2	0	29.7	56	
1994	3	1	0	28.7	54-56	
1995	0	1	4	30.0	64-69	
1996	0	0	0	30.2	60-62	
1997	0	0	0	18.0	49-50	
1998	0	1	0	32.5	54	muskellunge listed as 'common, 7-30 inches'
1999	0	0	0	16.9	62	
2003	0	1	0	8.0	70	

Angler creel surveys were conducted in 1949, 50, 52, 87, 92 and 98. The June 27 1949 survey was a warden check of 36 anglers in 20 boats with an effort of 321.5 angler hours. No muskellunge were reported in the catch (Threinen, undated). The 1950 survey used 59 census cards returned from resorts from May to September. Fishing effort from the cards was 840 angler hours; two muskellunge (33 and 44 inches) were reported (Threinen and Morrison, undated). The 1952 survey consists of several summary tables with no date or author. The survey is based on 82 census cards reporting 1,373 angler hours during May 17 through August 31 1952; no muskellunge are reported.

The 1987 creel survey spanned May 2 through November 8, 1987. Total angler effort was estimated at 58,839 hours, while effort targeting muskellunge was not reported. An estimated 677 muskellunge were caught and 29 were harvested. The targeted catch rate was 0.032 muskellunge per hour by anglers fishing for muskellunge, with a harvest rate of 0.001.

The 1992 creel survey spanned May 2 1992 through March 1 1993, excluding November. Total angler effort was estimated at 76,943 (including 9,691 hours during winter months when the muskellunge season is closed) with a targeted muskellunge effort of 24,264 angler hours, or 31% of total effort. Muskellunge catch was estimated at 2,129 with a harvest of 4 fish. The targeted catch rate was estimated at 0.0868 and the harvest rate at 0.0002 muskellunge per hour. Two muskellunge were measured, 35.5 and 41.5 inches.

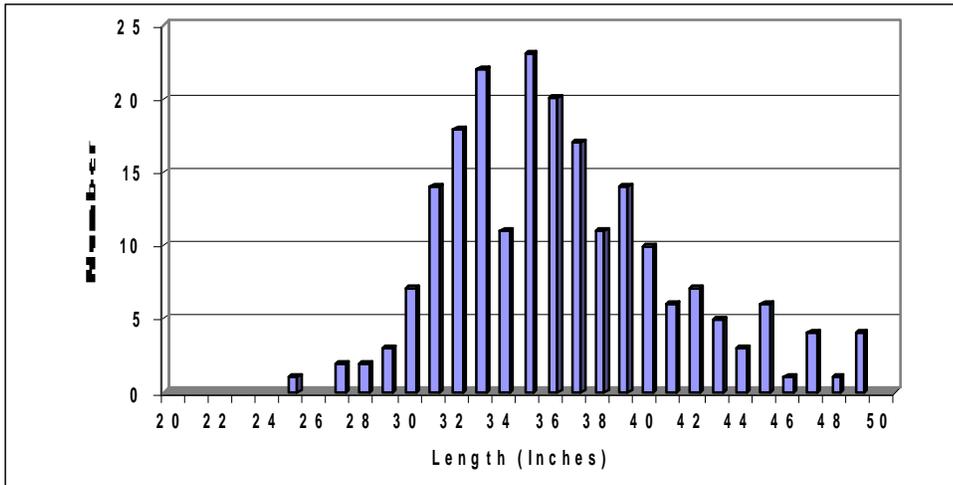
The 1998 survey included both Tomahawk and 160-acre Little Tomahawk lakes and spanned May 2 1998 through March 1 1999, excluding November. Total angler effort was estimated at 84,196 (including 7,683 hours during winter months when the muskellunge season is closed) with a targeted muskellunge effort of 25,587 angler hours, or 30% of total effort. Muskellunge catch was estimated at 631 with a harvest of 21 fish. The targeted catch rate was estimated at 0.0210 and the harvest rate at 0.0008 muskellunge per hour. Two muskellunge were measured, 35.2 and 36.3 inches.

Table 2. Fish stocking record during 1990 through 2006 in Tomahawk Lake, Oneida County WI.

Year	Species	Size	Number	Comments
1990	walleye	fry	800,000	
1990	muskellunge	fry	101,250	
1990	walleye	small fingerling (2 inch)	95,418	
1991	walleye	fry	12,066,100	
1991	walleye	small fingerling (2.9 inch)	188,896	
1991	muskellunge	large fingerling (11.3 inch)	4,320	
1992	walleye	fry (0.2 inch)	3,588,000	
1992	muskellunge	fry (0.6 inch)	71,950	
1993	walleye	fry	886,000	
1994	walleye	fry	2,500,000	
1994	walleye	small fingerling (2 inch)	99,990	
1995	walleye	fry	2,500,000	
1995	muskellunge	fry	225,000	
1995	walleye	small fingerling	85,902	
1996	walleye	fry	1,000,000	
1996	muskellunge	fry	82,400	
1996	walleye	small fingerling (1.5 inch)	100,000	
1997	walleye	fry	3,000,000	
1997	muskellunge	fry	334,000	
1997	muskellunge	fingerling	1,500	
1998	walleye	fry	5,300,000	
1998	muskellunge	fry	56,750	
1998	walleye	small fingerling (1.3 inch)	339,206	
1999	walleye	fry	4,700,000	
1999	muskellunge	large fingerling (12.1 inch)	1,000	
2000	muskellunge	fry (0.5 inch)	42,100	
2000	walleye	fry (0.3 inch)	6,500,000	
2000	walleye	small fingerling (2 inch)	311,889	
2000	walleye	large fingerling (4-6 inch)	1,500	private funds
2001	walleye	small fingerling (1.3 inch)	330,000	
2001	walleye	large fingerling (8 inch)	800	private funds
2001	muskellunge	large fingerling (12.0 inch)	850	
2004	walleye	small fingerling (1.3 inch)	169,676	
2006	walleye	small fingerling (1.7 inch)	118,700	

Tomahawk Lake is subject to off-reservation harvest rights by Chippewa. During 1990 through 2006, tribal members speared an average of 11.4 muskellunge per year from Tomahawk during spring. Ice spearing is also practiced, but no reporting is required. Excluding one unmeasured fish, 22.2% of speared muskellunge were 40 inches and larger and 7.5% were 45 inches and larger (Figure 1).

Figure 1. Length-frequency of 212 muskellunge speared during open water by Chippewa tribal members during 1990-2006 in Tomahawk Lake, Oneida County Wisconsin. Data collected by Great Lakes Indian Fish and Wildlife Commission.



## METHODS

Twelve standard fyke nets (3/4" bar measure) were set on April 28, 2005. Three additional nets were set May 4 and all 15 nets were fished through May 13. Art Oehmcke State Fish Hatchery personnel marked an additional 5 muskellunge captured in 44 nets set for white suckers during May 2005. The sucker nets are excluded from catch-per-effort analyses. Recapture netting for the mark-recapture population estimate was conducted during 2006: nine fyke nets were set on April 27 2006 and six nets were set on April 28 and fished through May 4 and 5 (8 nets). Length was recorded for all muskellunge, and weight was recorded and age structures (scales) removed from fish that had not been previously handled. During 1995, all muskellunge longer than 30 inches were given a right-ventral fin clip and adult fish shorter than 30 inches were given a right-pectoral clip for use in mark-recapture population estimates. Juveniles during 2005 and all fish captured during 2006 were given a top-tail clip.

The 2005 muskellunge spawning population was estimated using the Lincoln-Peterson method (Ricker 1975). One assumption of this model is that the population is closed to additions (recruitment or immigration) or deletions (deaths or emigration). We allowed for recruitment by including only fish larger than 30 inches in the marking year and 32 inches in the recapture year (i.e., we assumed that 30-inch fish grew 2 inches during the year). Deaths and emigration will not affect the estimate as long as marked and unmarked fish are equally likely to leave the population. Past netting and hatchery spawning operations in Mid Lake and the Tomahawk and Minocqua Thoroughfares indicate that a number of fish enter these areas to spawn, but live elsewhere in the system for the remainder of the year. My objective was to measure the Tomahawk Lake spawning population, so fish that live most of the year in Tomahawk but spawn elsewhere were not targeted in this survey. Emigration is a problem if a subset of fish spawned in Lake Tomahawk (and were available to our nets) during only one of the two years.

## RESULTS AND DISCUSSION

### Muskellunge abundance and size structure

During 2005, 36 male, 44 female and 4 unknown-sex muskellunge were marked, including 3 recaptures of previously-marked fish and 71 unmarked fish 30 inches and larger. The 2006 recapture sample of 49 fish includes 44 fish over 32 inches, with 9 recaptures of fish marked in 2005. Unmarked fish consisted of 11 males and 29 females. The overall catch rate (excluding 5 fish caught in nets targeting suckers) was 0.42 muskellunge per net-night. The mark-recapture adult (30+ inch) population estimate is 339 ( $\pm$  101 SD), or 0.10 fish 30 inches and larger per acre. This type of low-density, quality-size population is typical of other large, deep, cisco-based systems.

Muskellunge have not been stocked in Tomahawk Lake since 2001 (Table 2). Stocking likely was initiated as a “plant-back” to replace eggs taken by state hatcheries, and because muskellunge fisheries were heavily exploited before catch and release became popular during the 1990s. Stocking was discontinued after 2001 because the available habitat appears to be adequate to support natural reproduction.

### Muskellunge age and growth

Ages were assigned from scales. While annuli on the scales from Tomahawk fish appeared to be clearly defined, it should be pointed out that scales are notorious for under-estimating age of old or slow-growing muskellunge. Assignment of accurate ages to older muskellunge and projection of a population’s ultimate growth potential (e.g., Casselman et al. 1999) is imprecise or impossible without sacrificing fish to obtain cleithra.

Growth rates should be very good in a lake like Tomahawk, with an excellent sucker and cisco forage base. Muskellunge in Tomahawk Lake were growing slightly faster than average for northern Wisconsin (Appendix A). The Tomahawk muskellunge population demonstrates excellent potential to produce quality-size muskellunge. Average length from the overall sample (excluding recaptured fish) was 36.1 inches, and included 23 fish (19.0%) 40 inches and larger and 7 fish (5.8%) 45 inches and larger (Figure 2). The largest fish captured during our netting survey was a female measuring 48.2 inches in length and 41.1 pounds in 2006 (Figure 3). This fish was marked with a right-ventral fin clip, and was undoubtedly a recapture of one of the two largest fish captured in 2005: 46.8 inches and 35.0 pounds and 46.3 inches and 34.7 pounds, respectively. Our largest fish was growing relatively quickly, having increased about 1.5 inches and over 6 pounds in a year. Both fish were assigned ages of 10 in 2005, based on a scale sample, and were well above the length and weight of older fish in the sample (Table A.1). At this rate of growth, they would reach 50 inches and 50 pounds (pre-spawn weight) by age 13. Unpublished data from the cleithrum project (Crossman and Casselman 2000) indicate that across northern Wisconsin, it takes an average of 18 years for female muskellunge to reach 50 inches, while a 50-inch average length may be reached in as short as 15 years in individual waters.

Even larger fish were recently caught by anglers. A 51.5 inch, 42 pound muskellunge was caught and released on Lake Tomahawk in mid-October 2006 (Mandli 2006). Anglers fishing with this same guide released 49 and 50-inch fish in July and August (Bruce Gruening, personal communication). Although no tiger muskellunge (hybrid muskellunge x northern pike) were encountered in our nets, several large tigers were caught by anglers in the Minocqua Chain during 2005. A 50.5 inch, 38 pound tiger was caught in Lake Tomahawk on June 3 2005 (Bortz, 2005). A 49.5 inch tiger was caught and released at an undisclosed Minocqua Chain location on June 19 2005

(McCullough 2005a) and a 49.5 inch, 37 pound tiger (possibly the same fish) was caught on Kawaguesaga Lake on Oct 11 2005 (McCullough 2005b). Large muskellunge are also harvested from Lake Tomahawk by Chippewa tribal members during spring spearing (Figure 1), including 47.5 and 49 inch fish in 2005 and a 47 inch fish in 2006.

Figure 2. Length-frequency of muskellunge captured during spring, 2005 and 2006 in Tomahawk Lake, Oneida County Wisconsin.

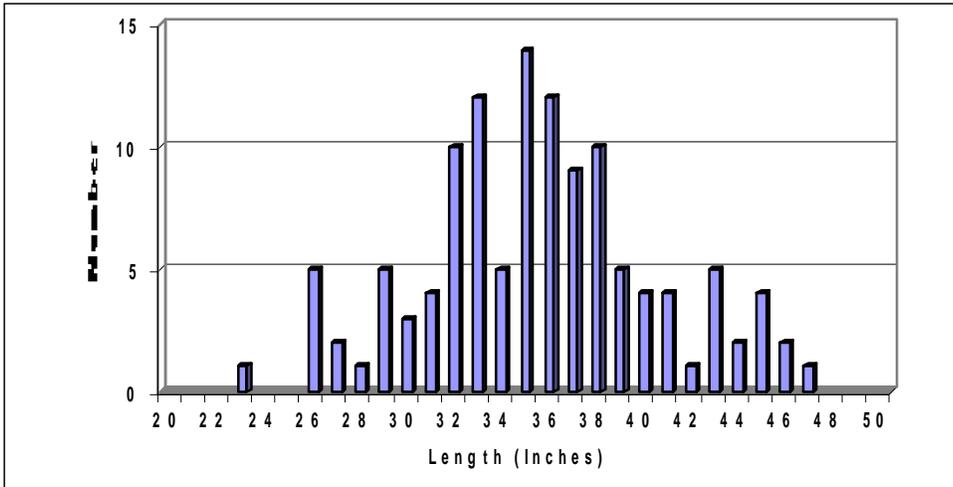


Figure 3. The author holds a 48.2 inch, 41.1 pound muskellunge recaptured on April 29, 2006 in Tomahawk Lake, Oneida County Wisconsin.



Tomahawk has a proven potential to produce trophy-class muskellunge. However, fish will only reach their full growth potential if allowed to survive long enough. It is likely that fishing mortality is impacting the number of large muskellunge. Three creel surveys estimated an average catch of

1145.7 ( $\pm$  851.9 SD) and harvest of 18.0 ( $\pm$  12.8 SD) muskellunge. This is a conservative number because the creel surveys did not interview fishing trips that ended at night. During 1990-2006, tribal open water spearmen harvested an average of 11.4 ( $\pm$  4.1 SD) muskellunge per year. Based on our population estimate of 339 adult muskellunge, the combined angling and spearing exploitation rate is in the neighborhood of 9%. The minimum length limit for muskellunge on Tomahawk is currently the statewide standard 34 inches and a higher length limit has potential to reduce angler exploitation. However, a 2003 proposal to increase minimum length limits on muskellunge to 50 inches on 38 lakes, including Tomahawk and the rest of the Minocqua Chain, failed at public hearings.

## MANAGEMENT RECOMMENDATIONS

Tomahawk Lake supports a low-density muskellunge population with very good size structure and excellent growth potential. Common forage species include emerald shiner, white sucker, cisco and panfish. Too few years have passed to evaluate natural recruitment after stocking was discontinued in 2001, and chain-wide recruitment should continue to be monitored. A fisheries survey of the full Minocqua Chain is scheduled for 2009-2010 and may provide more insight on natural reproduction, spawning migrations and the Chain-wide muskellunge population.

## ACKNOWLEDGEMENTS

Steve Timler and I conducted the field work for this study, with assistance from Doug Day, Aaron Nelson, Keith Worrall and Dave Van de Water. Fred Hagstrom and Tracy Kusek from Art Oehmcke state fish hatchery measured and marked incidental muskellunge captured in sucker nets. Steve Timler assigned ages from fish scales. Aaron Nelson entered and summarized data.

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Cover image courtesy of TerraServer-USA website and the United States Geological Survey.  
<http://terraserver-usa.com>

## APPENDIX A FISH AGE RESULTS

Age structures (scales) were targeted from all fish (excluding recaptures). All fish were measured, and weights were available on all but five aged fish.

Table A.1. Female muskellunge weight (pounds) and length (inches) at age in Tomahawk Lake, Oneida County Wisconsin during 2005 and 2006.

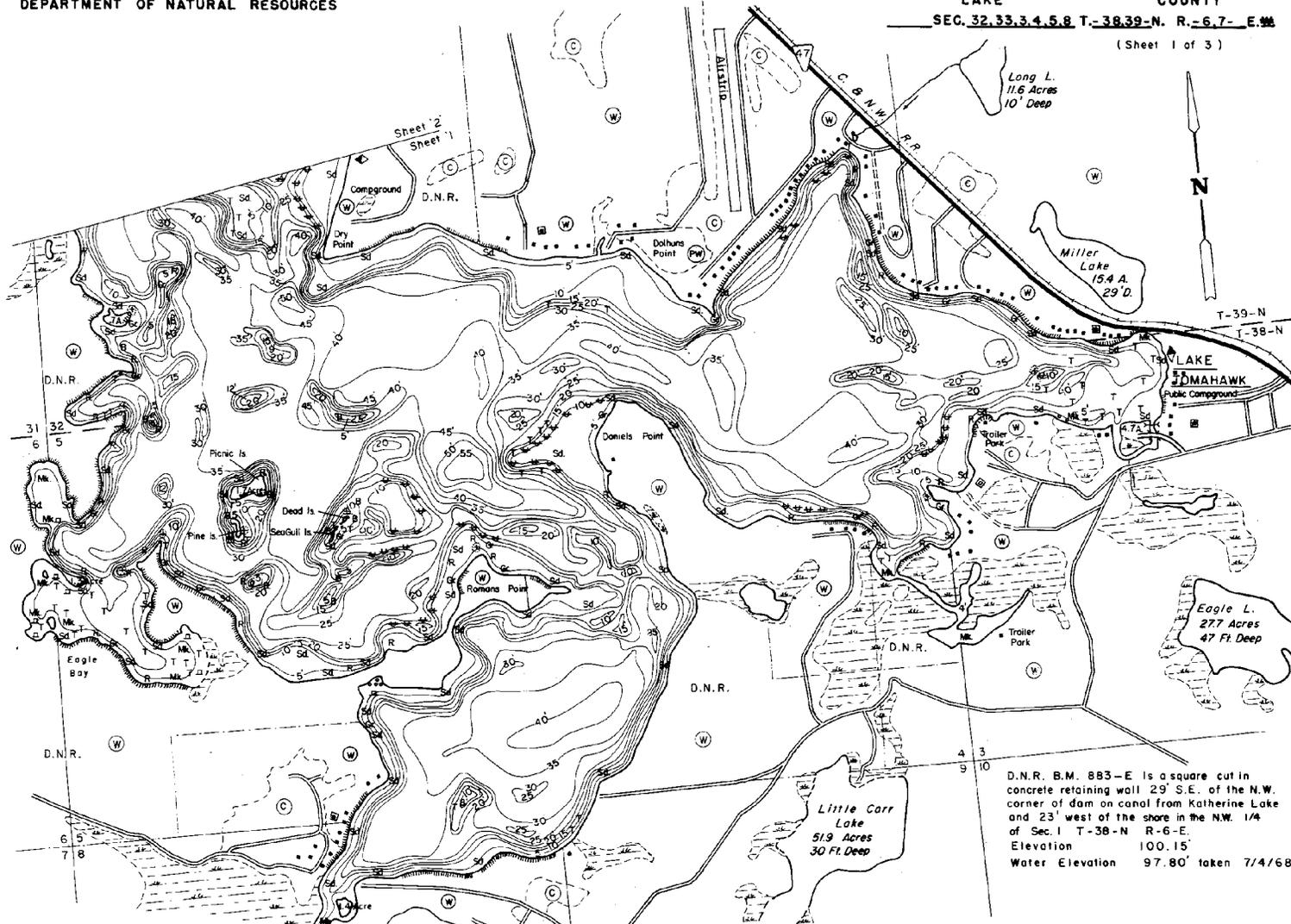
Age of fish aged	Number of fish	Tomahawk		Northern
		avg weight	avg length	WI avg length
4	1	6.6	29.0	27.7
5	7	9.6	33.2	31.9
6	13	12.9	35.6	33.7
7	11	14.4	37.8	35.8
8	17	15.5	38.1	38.1
9	8	20.8	42.4	39.5
10	9	24.8	44.3	41.0
11	2	21.5	42.7	43.2
12	1	21.1	43.6	43.7

Table A.2. Male muskellunge weight (pounds) and length (inches) at age in Tomahawk Lake, Oneida County Wisconsin during 2005 and 2006.

Age of fish aged	Number of fish	Tomahawk		Northern
		avg weight	avg length	WI avg length
3	1	4.2	26.6	23.5
4	6	4.8	27.0	27.3
5	5	6.5	29.7	29.2
6	15	8.6	32.1	31.5
7	6	11.0	35.3	33.3
8	8	11.4	35.2	34.4
9	1	10.3	35.4	35.8
10	3	14.3	38.2	37.3
11	1	15.5	38.0	37.9

LAKE SURVEY MAP

TOMAHAWK LAKE  
ONEIDA COUNTY  
SEC. 32, 33, 34, 5, 8 T. 38, 39-N. R. 6, 7-E. 33  
(Sheet 1 of 3)



D.N.R. B.M. 883-E is a square cut in concrete retaining wall 29' S.E. of the N.W. corner of dam on canal from Katherine Lake and 23' west of the shore in the N.W. 1/4 of Sec. 1 T-38-N R-6-E.  
Elevation 100.15'  
Water Elevation 97.80' taken 7/4/68

EQUIPMENT RECORDING SONAR MAPPED

- TOPOGRAPHIC SYMBOLS
- (B) Brush
  - (PW) Partially wooded
  - (W) Wooded
  - (C) Cleared
  - (P) Pastured
  - (A) Agricultural
  - B.M. Bench Mark
  - (D) Dwelling
  - (R) Resort
  - (C) Camp
  - (|||||) Steep slope
  - (---) Indefinite shoreline
  - (---) Marsh
  - (---) Spring
  - (---) Intermittent stream
  - (---) Permanent inlet
  - (---) Permanent outlet
  - (---) Dam
  - (---) D.N.R. State owned land
  - (P) Peat
  - (Mk) Muck
  - (C) Clay
  - (M) Marl
  - (Sd) Sand
  - (Sl) Silt
  - (Gr) Gravel
  - (R) Rubble
  - (Bc) Bedrock
  - (B) Boulders
  - (S) Stumps & Snags
  - (X) Rock danger to navigation
  - (T) Submergent vegetation
  - (I) Emergent vegetation
  - (F) Floating vegetation
  - (BS) Brush shelters

AUG 1970  
MONTH YEAR  
LAKE BOTTOM SYMBOLS Little Tomahawk L.



Access Access with Parking Boat Livery  
Drawn by: E. Eaton  
Field work by: J. Smith

SPECIES OF FISH	ABUNDANCE	
	ABUNDANT	PRESENT
Muskie	X	
N. Pike	X	
Walleye	X	
L. W. Bass	X	
S. W. Bass	X	
Panfish	X	
Trout		X
Cisco	X	

WATER AREA 3,392 ACRES  
UNDER 3 FT. 4 %  
OVER 20 FT. 70 %  
MAX. DEPTH 84 FEET  
TOTAL ALK. 47 P.P.M.  
VOLUME 111,958 ACRE FT.  
SHORELINE 30.20 MILES  
WITHOUT ISL. 27.33 MILES

STATE OF WISCONSIN  
DEPARTMENT OF NATURAL RESOURCES

# LAKE SURVEY MAP

TOMAHAWK LAKE ONEIDA COUNTY

SEC. 29, 30, 31, 32, T. 38, 39-N. R. 6, 7-E. 22

36, 5, 6 (Sheet 2 of 3)



EQUIPMENT RECORDING SONAR MAPPED AUG 1970

TOPOGRAPHIC SYMBOLS

- B Brush
- W Partially wooded
- W Wounded
- C Cleared
- P Pastured
- A Agricultural
- B.M. Bench Mark
- D Dwelling
- R Resort
- C Camp
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam
- D.N.R. State owned land

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Bc. Bedrock
- B Boulders
- Stumps & Snags
- Rock danger to navigation
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation
- Brush shelters



◊ Access   ◊ Access with Parking   ◊ Boat Livery

Drawn by: E. Eaton  
Field work by: J. Smith

SPECIES OF FISH	MAY 1970		
	Abundant	Common	Present
Muskie	X		
N. Pike	X		
Walleye	X		
L. N. Bass	X		
S. W. Bass	X		
Panfish	X		
Trout			
Cisco	X		

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LAKE SURVEY MAP

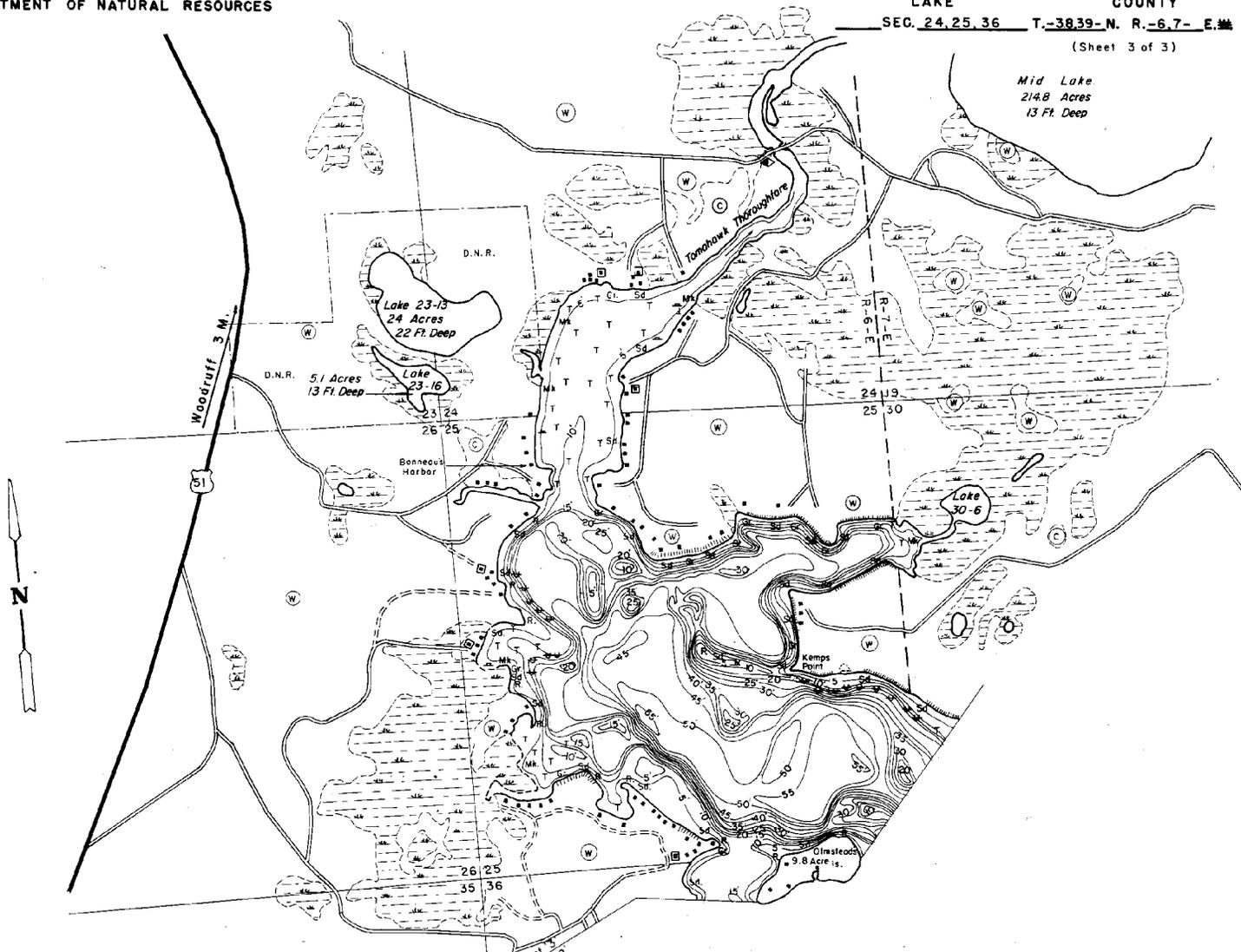
TOMAHAWK  
LAKE

ONEIDA  
COUNTY

SEC. 24, 25, 36

T.-3839-N. R.-67-E.

(Sheet 3 of 3)



EQUIPMENT RECORDING SONAR MAPPED AUG 1970

TOPOGRAPHIC SYMBOLS		MONTH	LAKE BOTTOM	YEAR
(B) Brush	Steep slope	P	Peat	B
(W) Partially wooded	- - - Indefinite shoreline	Mk.	Muck	S
(W) Wooded	Marsh	C	Clay	R
(C) Cleared	Spring	M.	Marl	T
(P) Pastured	Intermittent stream	Sd.	Sand	S
(A) Agricultural	Permanent inlet	Sl.	Silt	V
B.M. Bench Mark	Permanent outlet	Gr.	Gravel	F
Dwelling	Dam	R.	Rubble	Bc
Resort	D.N.R. State owned land	Bc	Bedrock	
Camp				



Drawn by: F. Eaton  
Field work by: J. Smith

SPECIES OF FISH		Abundant	Common	Present
Muskie		X		
N. Pike		X		
Walleye		X		
L. M. Bass		X		
S. M. Bass		X		
Panfish		X		
Trout				X
Cisco				X

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