Population characteristics of walleye, northern pike, largemouth bass, and bluegill in Long and Mud Lakes, Washburn County, Wisconsin, 2009.

WBIC 2106800 (Long) and 2107700 (Mud)

Kent Bass

Fisheries Technician, Advanced

Wisconsin Department of Natural Resources

Northern Region - Spooner

February, 2012

Executive Summary

Long Lake was sampled in 2009 to determine population abundance, growth, and size distribution of walleye. Largemouth bass, smallmouth bass, northern pike, and panfish were also collected. Relative abundance, size distribution, and growth were assessed for selected species. Mud Lake was also sampled for northern pike. A total of 2,240 walleyes were collected by fyke nets and electrofishing during the spawning period in Long Lake. Adult population abundance was estimated to be 6,915 fish or 2.1 fish/ acre, a 40% increase in adult abundance since 2001. A large 2005 year class accounted for much of the increase. Abundance of walleyes < 20 in was greater in 2009 than it was in either of the two previous surveys, while abundance of larger walleyes was lower. Walleye growth rates continued to be good and remained better than state and regional averages. Fall electrofishing captured only 1.2 young-of-the-year (YOY) walleyes per mile of shoreline sampled. A total of 261 northern pike were captured by fyke nets in Long and Mud Lakes. Mean length of the sample was 19.7 in, and size structure was comparable to what was found in the 1994 and 2001 surveys. Growth rates of northern pike improved since 2001 and were better than state and regional averages. A total of 270 largemouth bass were collected during May electrofishing, averaging 12.1 in. The catch rate (27 fish/mi) was identical to that found in a May 2001 survey. PSD and RSD-15 values were 56 and 16, respectively, which were both improvements from the three surveys since 2001. Growth rates of largemouth bass also improved since 2004. May electrofishing also captured 315 bluegill, averaging 4.9 in. The catch rate (126 fish/mi) was more than double of that from a May 2001 electrofishing survey (59 fish/mi). PSD and RSD-8 values were 23 and 1, respectively, a reduction from 2001 (35 and 3). Bluegill growth rates continued to be better than the local average. Management

recommendations for Long Lake focus on restoring a self-sustaining walleye population. The minimum harvest length limit for walleye should remain at 18 in with a daily bag limit of 3 fish. Small fingerling stocking has contributed to the fishery but only to a minor degree. Large fingerling stocking of appropriate strain walleye should be conducted until there is evidence of meaningful natural reproduction, and these fish should be marked in order to document their contribution to the fishery. The exemption from a minimum harvest length limit on largemouth and smallmouth bass should remain in effect to minimize predation and competition with walleye. The exemption may also be responsible for the improvement in largemouth bass growth and size structure.

Introduction

Long Lake is a 3,290 acre drainage lake in the Red Cedar River sub-basin of the Chippewa River in Washburn County. Long Lake is considered mesotrophic with a maximum depth of 74 ft and an alkalinity of 86 ppm (Sather and Busch 1978). Mud Lake is a 103 acre, 13 ft deep lake with a navigable outlet channel to Long Lake. Mud Lake contains northern pike spawning and nursery habitat that is important to the whole ecosystem (Damman 2007). For management purposes, Long Lake and Mud Lake are considered a single waterbody whose water level is controlled by a dam on the outlet of Long Lake. The dam is owned and operated by Washburn County. A detailed report on Long Lake's trophic status based on secchi records, phosphorus concentration, chlorophyll–*a*, as well as other limnological data was prepared by Barr Engineering, Minneapolis, Minnesota (1995).

Long Lake, including Mud Lake, has approximately 43 miles of shoreline, almost all of which is in private ownership. The exceptions are five developed public boat access sites, and several platted but undeveloped or minimally developed access sites owned by township governments. An eight mile section of shoreline on the east central portion of the lake owned by the Tomahawk Boy Scout Camp remains relatively undeveloped. Long Lake is a very popular fishing and recreation lake and supports a diverse fish community (Table 1).

Long Lake has a history of fish stocking dating back to the 1930s. Walleye have been the species most often stocked, but largemouth bass, smallmouth bass, northern pike, muskellunge, sunfish, white sucker, and rainbow trout have also been stocked over the years in varying numbers and sizes. Wisconsin Department of Natural Resources (WDNR) hatcheries have been the primary source of walleye, but supplemental stocking

sponsored by the Long Lake Chamber of Commerce and the St. Croix Chippewa Tribe has also occurred. In an attempt to determine the contribution of walleye natural reproduction, fingerling stocking occurred after the fall YOY survey in 1978, and no stocking occurred in 1979-80. The catch of fingerling walleye was 2-3 per mile in 1978 and 1979, while 13 YOY per mile were captured in 1980. Johannes (1981) considered this insufficient natural reproduction and resumed annual stocking of small fingerling walleye in 1981. In 1994 small fingerling walleye stocking was switched from annual to alternate year stocking to better monitor natural reproduction and stocking success.

In addition, with the exception of 2008, the local chapter of Walleyes for Tomorrow cooperated annually with The Long Lake Chamber of Commerce and WDNR to operate a portable walleye hatchery on Long Lake from 2004 through 2010. A goal of increasing the fall survey average count by one YOY per mile was established (Damman 2006). Using Long Lake walleyes, they were successful at filling the hatchery with eggs and hatching them out. Nearly 3 million fry were hatched annually from eggs collected from Long Lake. Attempts were made at marking walleye fry with oxytetracycline (OTC), but marking fry and documenting marking success proved difficult. However, marking of walleye fry using identical methods has proven very successful in other situations including with nearby Red Cedar Lake's walleye wagon fry (Damman 2006). A fall 2005 survey captured 10.3 YOY per mile, the highest count in 14 years. However, examination of a large sample of YOY showed very few OTC marks. Also, summer fingerling stocking occurred in 2005, further complicating any conclusions regarding the source of the year class. Although fall YOY counts have generally been poor whether stocking occurred or not, annual surveys since 1989 have captured YOY at a rate 12 times greater in stocked years than in non-stocked years, regardless of the portable

hatchery operation. There was no indication that the portable hatchery benefitted walleye recruitment, and its use was discontinued following 2010.

Historic fisheries management of Long Lake has also included fish surveys and spawning records collected by Spooner hatchery personnel. A June 1957 fyke net survey found yellow perch and young bluegills to have below average growth. The recommendation was to continue managing for walleyes. In November 1961 and January 1962 surveys were conducted in order to locate concentrations of cisco. Few cisco were captured in November electrofishing, but four days of netting under the ice in January produced 76 cisco, averaging 15 in. In September 1962 an electrofishing survey found walleye from age groups 1 to 9 to be "evenly distributed" and suggested that Long Lake could "probably be taken off the walleye stocking quotas" with additional substantiating work. The recommendation, however, was to continue stocking walleyes (William Weiher, WDNR internal memo, 1962). Walleye population abundance estimates were completed in 1978, 1994, and 2001, with densities ranging from 1.5 to 3.1 adults per acre. Some of the annual fall electrofishing surveys have gathered centrarchid data as well.

Angling regulations have mainly followed statewide or regional regulations. There was a regional 13 in minimum length limit on walleye prior to 1980 when a no minimum length limit went into effect for ten years. A 15 in minimum length limit was in effect for walleye from 1990 to 2010. In 2011 an 18 in minimum length limit with a daily bag limit of 3 was implemented for walleye. Largemouth and smallmouth bass are the only other species that have had minimum length limits in recent decades; a 10 in minimum length limit applied from 1971 through 1978 followed by no length limits from 1979-1988. A 14 in minimum length limit for largemouth and smallmouth bass applied from 1989

through 2004. A no minimum length limit has been in effect since 2005 to help address declining largemouth bass growth rates and poor walleye recruitment.

Objectives of the 2009 survey included determining population abundance, size structure, growth, recruitment, and other population parameters of walleye and other important game and panfish.

Methods

Sampling was conducted in Mud and Long Lakes in 2009 to assess the fish community. Adult northern pike were targeted and collected during the spring spawning period with fyke nets in Mud Lake. Walleyes, though not targeted, were also collected in Mud Lake. Three (4x6 ft frame) fyke nets were set on 10 April when ice breakup allowed access to the Mud Lake channel (Figure 1). On 15 April all three nets were removed for a total of 15 net lifts on Mud Lake. Adult walleye were targeted and collected during the spring spawning period in Long Lake. One fyke net was set in the northern basin of Long Lake on 10 April while Mud Lake was being sampled. Twelve fyke nets were set in the southern basin of Long Lake on 14 April. On 15 April five fyke nets were added to the northern basin of Long Lake. More fyke nets were added and moved as ice-out allowed. All nets were removed from the northern basin of Long Lake on 19 April and from the southern basin on 20 April for a total of 113 net lifts on Long Lake (Figures 2a-2d). Although not targeted, northern pike were also collected from fyke nets in Long Lake. AC electrofishing was conducted on the night of 19 April in the northern basin and on the night of 20 April in the southern basin to recapture marked walleyes. Mud Lake and the entire length of the narrows were not electrofished during the walleye recapture effort.

Adult walleye population abundance was estimated using the Chapman modification of the Petersen method (Ricker 1975). The fyke net catch was used as the marked sample, while the two electrofishing runs were combined to provide the recapture sample. The small number of walleyes marked in Mud Lake was not included in the marked sample for population estimate calculations. Walleyes were grouped by length to estimate abundance. These numbers were then combined for an estimate of total adult population abundance.

All walleyes and northern pike were measured to the nearest 0.1 in (total length). Adult walleyes were defined as all fish for which sex could be determined and all fish 15 in or longer (Hennessey 2002). Walleyes and northern pike were sexed by the presence of gametes. Adult walleye and unsexable walleye $\geq$15 in were given a top caudal fin clip. All other walleye were given a bottom caudal clip. Northern pike captured in Mud Lake were given a bottom caudal fin clip, while those captured in Long Lake were given a top caudal fin clip. This was done to observe potential northern pike movement in and out of Mud Lake from Long Lake, as was observed in past surveys (Damman 2007).

Electrofishing was conducted on the night of 26 May to assess the centrarchid community. Five two-mile stations were sampled where all largemouth bass and smallmouth bass were collected. Each two-mile station contained a half-mile index station where all panfish were also collected. Electrofishing was also conducted on the nights of 14 and 15 October to assess young-of-the-year (YOY) walleye abundance. Five two-mile stations were sampled.

For age analysis, scale samples were removed from walleyes, largemouth bass, and smallmouth bass less than 12 in, while dorsal spines were removed from larger walleyes and bass. Scale samples were also removed from northern pike and bluegill. Mean

length-at-age comparisons for walleye and northern pike were made to regional (18 county Northern Region) and statewide data using the WDNR Fish and Habitat statewide database. Growth comparisons for largemouth bass and bluegill were made using statewide data and Washburn and Burnett County data from 2000 to 2008. Mean length of largemouth bass in 2009 was compared with other sample years using a t-test. Changes in length frequency distribution between the 2009 sample and other sample years were compared using a Kolmogorov-Smirnov test. An index of proportional stock density (PSD) and relative stock density (RSD) was used to describe and compare population size structure of northern pike, largemouth bass, and bluegill to regional means and past surveys (Anderson and Neumann 1996). The PSD and RSD values for a species represent the percentage of the stock size fish sampled that are equal to or greater than a quality length (PSD) or specified length (RSD) (Appendix Table 1).

Results and Discussion

Walleye. A total of 2,744 walleyes were captured in Long Lake using fyke nets and electrofishing, averaging 16.4 in (SD=3.1), and ranging in length from 9.5 to 30.1 in (Figure 3). More than 60% of the sample measured 14-16.9 in. This length distribution is skewed toward relatively small fish when compared to past surveys (Figure 4). This can be attributed to the large 2005 year class that averaged 16.4 in. Male walleyes accounted for more than 80% of the sample, the majority of which were from the 2005 year class. It is likely that a fair percentage of females from the 2005 year class were not yet mature and, therefore, not vulnerable to our sampling gear. YOY walleyes from the 2005 year class were captured at a modest rate of 10 fish per mile in September 2005.

The sizeable contribution of the 2005 cohort to the 2009 survey catch suggests good survival to age 4.

Adult walleye abundance in Long Lake during 2009 was estimated at 6,915 fish (95% C.I. 6,013-7,817) or 2.1 fish/acre. This is a 40% increase from the 2001 estimate. This estimate was generated by pooling mark and recapture data from the north and south portions of the lake. Although statistically a good estimate (CV=6.7), the recapture effort did not cover the entire shoreline. Therefore, some sampling bias may have occurred. Walleyes <15 in accounted for 26% of the 2009 adult estimate, more than in any previous estimate (Figure 5). Conversely, fish $\geq$20 in accounted for 22% of the estimate, less than in previous surveys. The recently recruited 2005 year class was largely responsible for this shift.

Growth of walleye was comparable to that found in previous surveys, with the exception of ages 3 and 4 (Figure 6). Growth of these younger fish is somewhat slower than in any of the previous three surveys, dating back to 1978. The slower growth may be the result, in part, from limited food resources for the large 2005 year class mentioned above. The decline in growth of older walleye after 1978 is likely due to survey methodology (Damman 2007). Age interpretations in 1978 were done using only scale impressions (Johannes 1979), possibly underestimating the age of older fish compared to the use of spine cross sections in subsequent years. All year classes up to age 16 were present in the 2009 sample, although the majority of fish corresponded to years when stocking occurred.

Electrofishing in October 2009 captured only 12 YOY walleyes in 10 miles of sampling. This number is consistent with past surveys in years when small fingerling stocking occurred. While 1.2 YOY per mile is a poor count, it is higher than the average

catch rate in non-stocked years. From 1989 to 2009, fall electrofishing surveys captured an average of 0.3 YOY/mile (range 0 to 0.9/mile) in non-stocked years (N=7), while counts averaged 3.7 YOY/mile (range 0 to 11.4) in stocked years (N=14; Table 2).

Walleye natural recruitment has declined since the late 1970s. Extensive walleye stocking of a variety of sizes from a variety of sources has occurred over the years (Table 3). Stocking small fingerling walleye has contributed to recruitment but has not mitigated the decline in natural recruitment. The Long Lake Chamber of Commerce has purchased and stocked large fall fingerlings most years since the early 1990s. These stockings occur after fall electrofishing surveys and, therefore, do not contribute to the YOY catch. While their contribution is unknown, they may be a sizeable contributor to actual recruitment. Future stocking of large fingerlings could be marked by WDNR in an attempt to quantify the contribution these fish make to year class strength and the fishery. Recruitment concerns coupled with good growth rates justified an increase in the walleye minimum length limit to 18 in.

Northern pike. A total of 261 northern pike (2.0 fish/ net lift) were captured with fyke nets in 2009. The catch rate during the first three days of netting was 13 fish per net lift compared to 29 fish/ lift in 1994 and 35 fish/ lift in 2001. This disparity is likely due to factors other than actual abundance changes. Only Mud Lake was ice free for the first three days of netting in 2009, and northern pike were not targeted when nets were set in Long Lake. In addition, lake water levels were low in 2009 making the sampling of some spawning areas more difficult.

Lengths of sampled northern pike ranged from 8.7 to 34.0 in and averaged 19.7 in (SD=4.4, Figure 7). Size structure was comparable to the 1994 and 2001 fyke net surveys. Mean lengths were 19.4 in (N=821) and 20.0 in (N=1,283) in the 1994 and

2001 surveys, respectively. Northern pike PSD was 34 in 2009, which is above the mean (30) for 19 northern Wisconsin lakes reported by Margenau et al. (1998). It was nearly identical to PSD in both 1994 (34) and 2001 (35). RSD-28 in 2009 was 5, compared to 4 in both the 1994 and 2001 surveys.

Northern pike growth rates improved somewhat from previous surveys and remained better than regional and statewide averages (Figure 8). No northern pike older than age 7 were found in the 2009 sample. However, caution should be used when considering scale derived northern pike age estimates. Casselman (1990) found the determination of annuli on northern pike scales to be difficult due to irregular growth and resorption or erosion on the midlateral region.

Largemouth and smallmouth bass. A total of 270 largemouth bass were captured during the May 2009 electrofishing survey, ranging from 3.5 to 18.1 in (Figure 9). The catch rate (27 fish/mi) was identical to that from the last spring survey in May 2001. Seventy one percent of the 2009 sample measured between 9 and 13.9 in, which is also comparable to what was captured in May 2001 (73%). Although largemouth bass size structure was similar to 2001 ($D=0.25$; $P=0.63$), there are signs of improvement. Larger fish were more numerous and smaller fish were less numerous in the 2009 sample than in any of the three previous surveys since 2001 (Figure 10). Largemouth bass $\geq$16 in accounted for 7% of the sample, a percentage that has increased in each of the last four surveys. Largemouth bass <9 in also accounted for 7% of the sample, representing the lowest proportion of small fish captured in the last four surveys. Mean length of the 2009 sample was 12.1 in, significantly better than in any of the three recent surveys ($P\leq0.015$ in each case). PSD of the 2009 sample was 56, which was higher than in 2001 and 2004 (42 and 54, respectively). RSD-15 was also higher in 2009 (14) and 2007 (16) than in

2001 and 2004 (5 both years), further demonstrating recent improvements in size structure. In addition, the two fish that measured ≥18 in were the largest largemouth bass captured in any of the previous four surveys since 2001.

Growth of largemouth bass improved since 2004 (Figure 11). Age 6 fish averaged longer than 14 in, and growth was better than the local average for all cohorts up to age 9. Despite this, largemouth bass still grew at a considerably slower rate than they did in 1978. Interestingly, tournament anglers have commented on the recent improvement in condition of largemouth bass in Long Lake (Larry Damman, pers. communication). The elimination of the minimum size limit on largemouth bass in 2005 may have contributed to the improvement in growth and, subsequently, size structure.

The May electrofishing survey captured only 13 smallmouth bass, ranging from 8.2 to 18.6 in. Due to the small sample size, no meaningful conclusions can be drawn about the smallmouth bass population.

Bluegill and Other Panfish. May electrofishing captured bluegill, green sunfish, black crappie, rock bass, and pumpkinseed, as well as hybrid sunfish (Table 4). A total of 315 bluegills (126 fish/mi) were captured during May electrofishing in 2009. This catch rate was more than double of that produced by a May 2001 survey (59 fish/mi). The 2009 sample ranged from 1.6 to 8.4 in and averaged 4.9 in. PSD was 23, while RSD-8 was 1, both reductions from values generated during the May 2001 survey (35 and 3).

Growth of bluegill in Long Lake was considerably better than the recent average for Washburn and Burnett Counties (Figure 12), surpassing 7 in by age 6. Bluegill growth data was last collected in 1978, and growth in 2009 was comparable to what was found in 1978 for fish ages 4 to 6.

Summary and Management Recommendations

1. Walleye abundance in Long Lake increased recently with the recruitment of the large 2005 year class, but remained lower than in 1994. Size structure of the population continued to be very good, and growth remained better than state and regional averages. Recruitment continued to be low despite decades of intensive small fingerling stocking. The recently implemented 18 in minimum length limit with a daily bag limit of 3 should continue, protecting most females until they spawn for the first time.

2. At this time, walleye stocking should continue in an effort to develop a self-sustaining population. Due to the failure of small fingerling stocking, appropriate strain extended growth walleyes should be stocked in alternate years until there is evidence of meaningful natural reproduction. If WDNR hatcheries are unable to provide extended growth walleyes, stocking efforts by the Long Lake Chamber of Commerce or other private donors should be encouraged provided appropriate strains are used. Marking of these fish should be done in an attempt to quantify their contribution to Long Lake's walleye population. Small fingerling walleye stocking should only be considered if appropriate strain extended growth walleyes are unavailable. Annual fall electrofishing surveys should be conducted to assess the strength and source of walleye year classes. Consideration should be given to suspending stocking should fall YOY catch rates average greater than five fish per mile in three consecutive years. Because survival of YOY walleyes in Long Lake

appears to be good, even modest YOY catch rates could translate to meaningful recruitment.

3. A no minimum length limit on largemouth and smallmouth bass has been in effect since 2005 and should continue. Growth rates and size structure of largemouth bass have shown signs of improvement. Controlling largemouth bass densities may also aid in restoring a naturally reproducing walleye population by limiting competition and predation. The impacts of this regulation on the entire fish community should continue to be monitored. Separating smallmouth bass from largemouth bass angling regulations may be an option worth considering in the future, especially if and when the walleye population becomes self sustaining.

4. The northern pike population of Long Lake appears to be stable and provides a quality fishery with trophy potential. Growth rates remained good and were better than regional averages in 2009.

5. Bluegill numbers have increased but size structure appears to have declined. While no management changes are recommended at this time this trend should be monitored closely in future surveys.

6. Preserving aquatic habitat and water quality is important to sustaining a quality fishery. The Long Lake Sensitive Area Report and Management Guidelines (WDNR 1998) provides good base information and strategies to manage and preserve water quality and habitat.

Literature Cited

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 *in* B. R. Murphy and D. W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Barr Engineering. 1995. Long Lake management plan, phase 1. Water quality study of Long Lake and its watershed.

Casselman, J. M. 1990. Growth and relative size of calcified structures of fish. Transactions of the American Fisheries Society 119:673-688.

Damman, L. 2006. 2006 Long Lake Walleye Wagon Report. WDNR, Spooner.

Damman, L. 2007. Summary of Fisheries Surveys, Long and Mud Lakes, Washburn County, Wisconsin. WDNR, Spooner.

Hennessy, J.M. 2002. Wisconsin Department of Natural Resources 2001-2002 Ceded Territory Fishery Assessment Report. Administrative Report No. 55. Wisconsin Department of Natural Resources, Madison.

Johannes, S. 1979. Survey report. Long Lake, Washburn County, WI. Basic fish and resource inventory with special emphasis on walleye. WDNR, Spooner.

Johannes, S. 1981. Evaluation of walleye natural reproduction in Long Lake, Washburn County, for years 1978, 79, and 80. WDNR, Spooner.

Margenau, T.M., P.W. Rasmussen, and J.M. Kampa. 1998. Factors Affecting Growth of Northern Pike in Small Northern Wisconsin Lakes. North American Journal of Fisheries Management 18:625-639.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada, Bulletin 191.

Sather, L. M., and C. D. Busch. 1978. Surface water resources of Washburn County. Wisconsin Department of Natural Resources, Madison.

WI-DNR 1998. Long Lake sensitive area survey report and management guidelines. WDNR, Spooner.

Table 1. List of fish species present in Long Lake, Washburn County, Wisconsin.

Common Name	Scientific Name
Walleye	Sander vitreus
Northern pike	Esox lucius
Largemouth Bass	Micropterus salmoides
Smallmouth Bass	Micropterus dolomieu
Bluegill	Lepomis macrochirus
Black crappie	Pomoxis nigromaculatus
Pumpkinseed	Lepomis gibbosus
Rock bass	Ambloplites rupestris
Yellow perch	Perca flavescens
Green sunfish	Lepomis cyanellus
Black bullhead	Ictalurus melas
Brown bullhead	Ictalurus nebulosus
Yellow bullhead	Ictalurus natalis
Bowfin	Amia calva
White sucker	Catostomus commersoni
Cisco	Coregonus artedi
Brook stickleback	Culaea inconstans
Golden shiner	Notemigonus crysoleucas
Common shiner	Notropis cornutus
Spottail shiner	Notropis hudsonius
Weed shiner	Notropis texanus
Blacknose shiner	Notropis heterolepis
Mimic shiner	Notropis volucellus
Logperch	Percina caprodes
Iowa darter	Etheostoma exile
Blackside darter	Percina maculata
Johnny darter	Etheostoma nigrum
Banded darter	Etheostoma zonale
Fantail darter	Etheostoma flabellare
Brassy minnow	Hybognathus hankinsoni
Creek chub	Semotilus atromaculatus
Central mudminnow	Umbra limi
Brook silverside	Labidesthes sicculus
Trout perch	Percopsis omiscomaycus
Banded killifish	Fundulus diaphanus
Bluntnose minnow	Pimephales notatus
Slimy sculpin	Cottus cognatus
Golden redhorse	Moxostoma erythrurum

Table 2. Fall electrofishing catch of age-0 walleyes, Long Lake, Washburn County, Wisconsin.

Year	Number Age-0		Number/ Mile	Miles Sampled
1978	58		2.4	24.4
1979	35		3.0	11.8
1980	137		13.2	10.4
1981		No Survey		
1982		No Survey		
1983		No Survey		
1984		No Survey		
1985		No Survey		
1986		No Survey		
1987		No Survey		
1988		No Survey		
1989	0		0.0	38.0
1990	158		4.2	38.0
1991	161		4.2	38.0
1992	433		11.4	38.0
1993	57		1.5	38.0
1994	36		0.9	38.5
1995	344		9.1	38.0
1996	13		0.3	38.0
1997	22		1.2	18.5
1998	0		0.0	20.5
1999	24		1.2	20.5
2000	0		0.0	38.0
2001	136		3.6	38.0
2002	2		0.1	20.5
2003	22		1.1	20.5
2004	7		0.3	27.2
2005	290		10.3	28.2
2006	17		0.8	22.6
2007	31		2.6	12.0
2008	12		0.6	20.5
2009	12		1.2	10.0

Table 3. Walleye stocking by size, Long Lake, Washburn County, Wisconsin.

Year	Fry	Fingerling <4 in	Fingerling ≥4 in
1972	0	0	28,336
1973	0	0	7,265
1974	0	0	4,068
1975	0	49,156	0
1976	0	0	15,868
1977	0	15,337	370
1978	0	0	4,310
1979	0	0	0
1980	0	0	0
1981	0	50,000	0
1982	1,000,000	17,250	32,640
1983	0	46,938	1,850
1984	0	71,760	0
1985	0	11,954	29,890
1986	100,000	70,118	0
1987	0	0	0
1988	0	43,986	13,772
1989	0	60,775	0
1990	135,680 (T)	36,251	0
1991	0	24,658	0
1992	0	91,266 (T/DNR)	(P) 1,148
1993	0	100,538	(T) 3,273
1994	0	0	(P) 5,000
1995	0	132,660 (T/DNR)	5,877
1996	0	0	0
1997	0	126,549 (T/DNR)	(P) 5,000
1998	0	0	(P) 3,191
1999	0	185,118 (T/DNR)	1,500
2000	0	10,000 (P)	0
2001	0	314,135 (T/DNR)	(P) 1,000
2002	0	0	0
2003	0	277,160 (T/DNR)	(P) 5,033
2004	WW	0	(P) 5,000
2005	WW	97,739 (T)	(P) 5,500
2006	WW	0	0
2007	WW	21,406	(P) 3,003
2008	0	50,403 (T)	1,082
2009	WW	115,150	(P) 2,227

Fish stocked by DNR hatchery unless noted; P=private hatchery, T=tribal hatchery; WW=walleye wagon.

Table 4. Panfish catch from electrofishing in May 2009, Long Lake, Washburn County, Wisconsin.

Length (in)	Bluegill	Rock Bass	Black Crappie	Pump-kinseed	Green Sunfish
<3.0	7	3	1		
3.0- 3.9	77	2		2	
4.0- 4.9	91	19	1	5	2
5.0- 5.9	68	39	2	3	2
6.0- 6.9	45	42		8	2
7.0- 7.9	23	33		8	
8.0- 8.9	4	29	3	1	
9.0- 9.9		8	9		
10.0-10.9			1		
11.0-11.9					
12.0-12.9					
13.0-13.9			1		
TOTAL	315	175	18	27	6

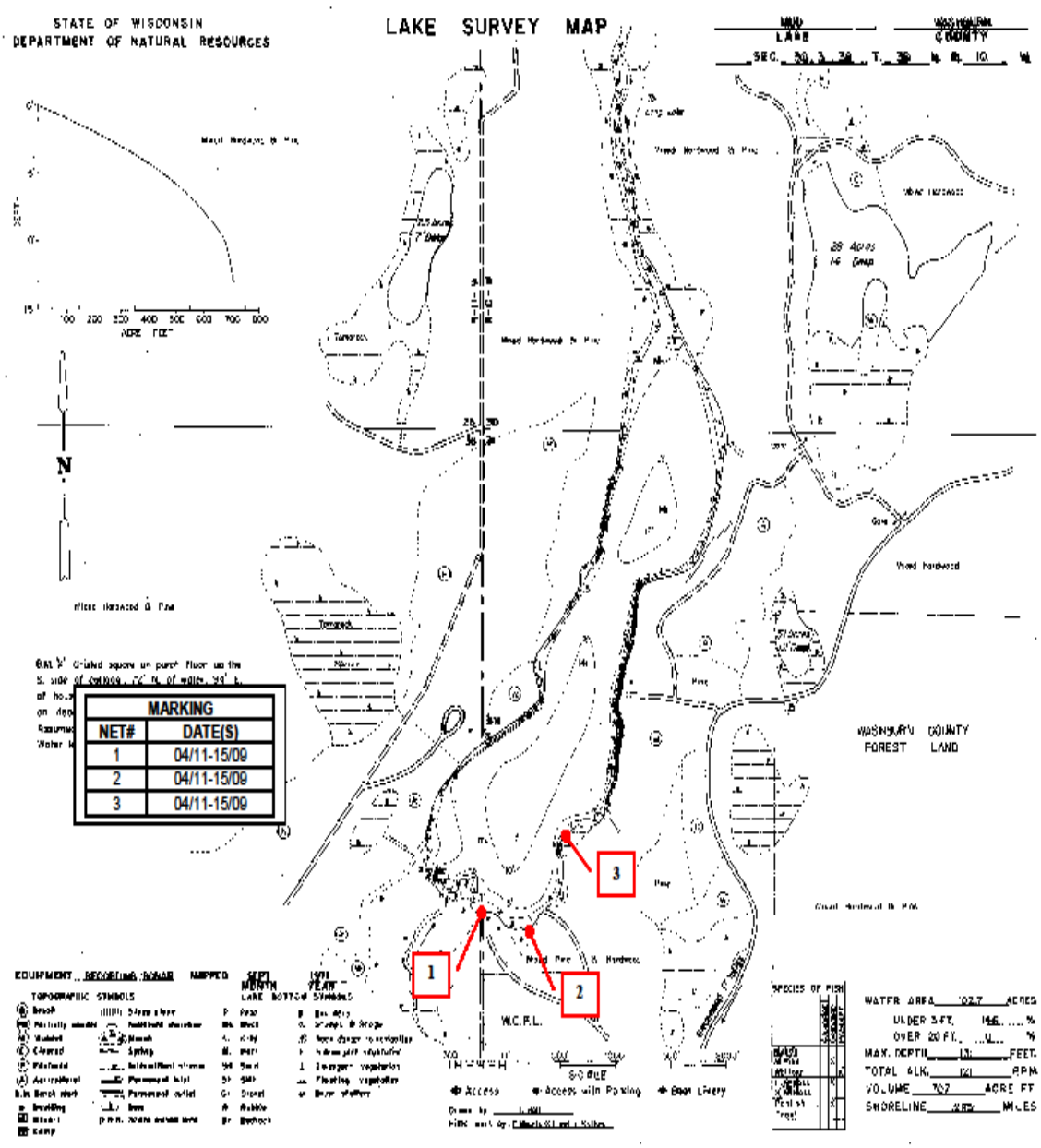

Figure 1. Fyke net locations, Mud Lake, Washburn County, Wisconsin, 2009.

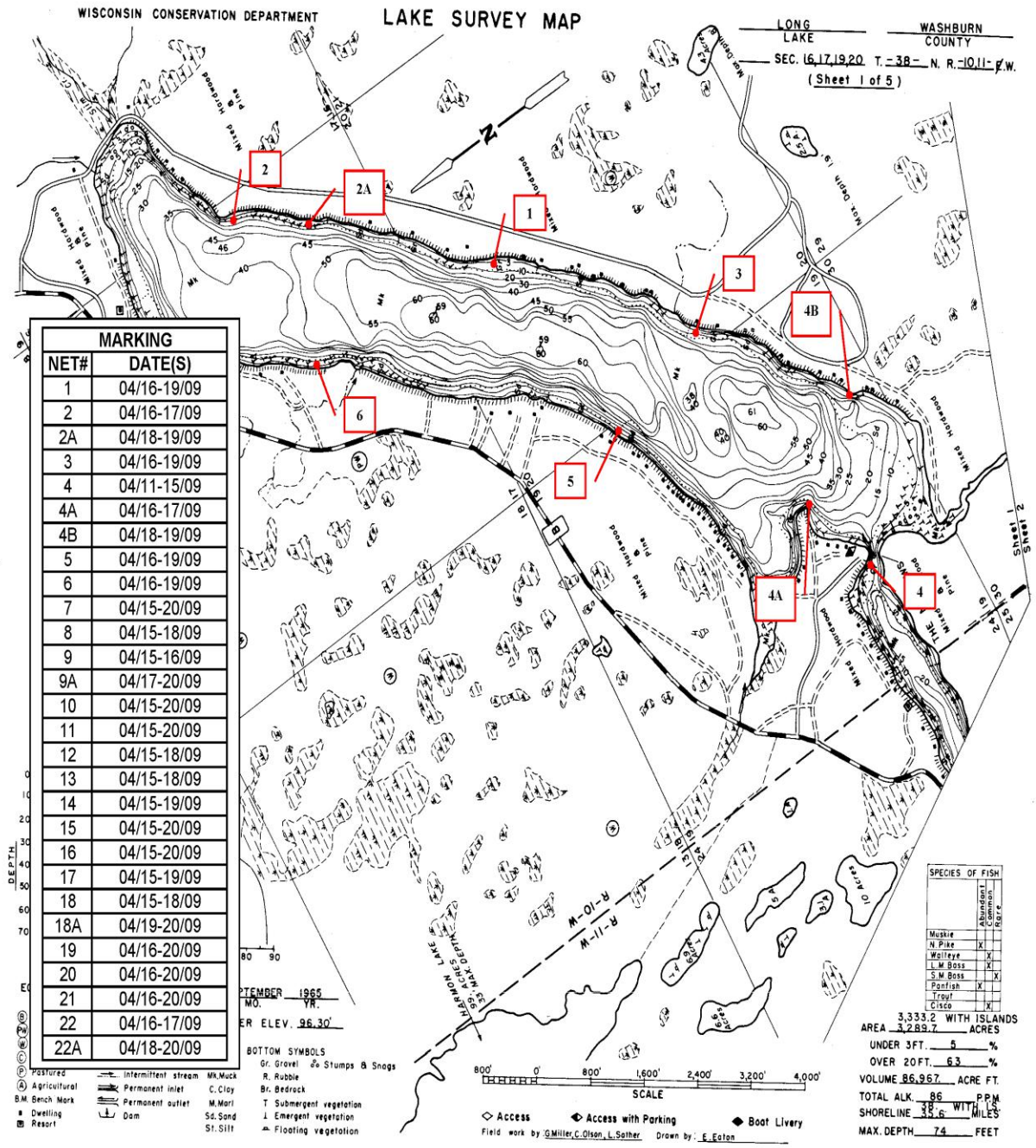

Figure 2a. Fyke net locations, Long Lake, Washburn County, Wisconsin, 2009.

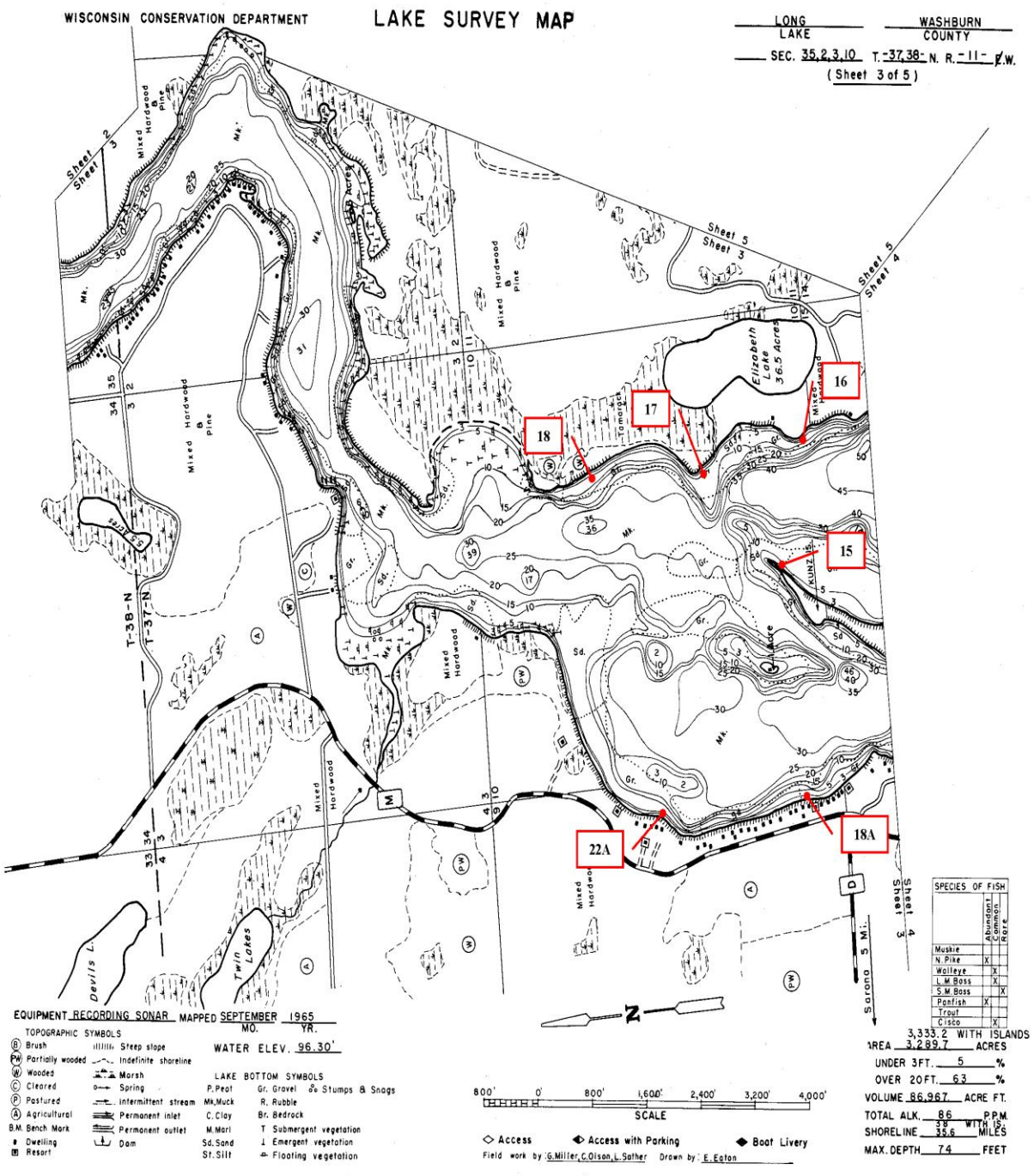

Figure 2b. Fyke net locations, Long Lake, Washburn County, Wisconsin, 2009.

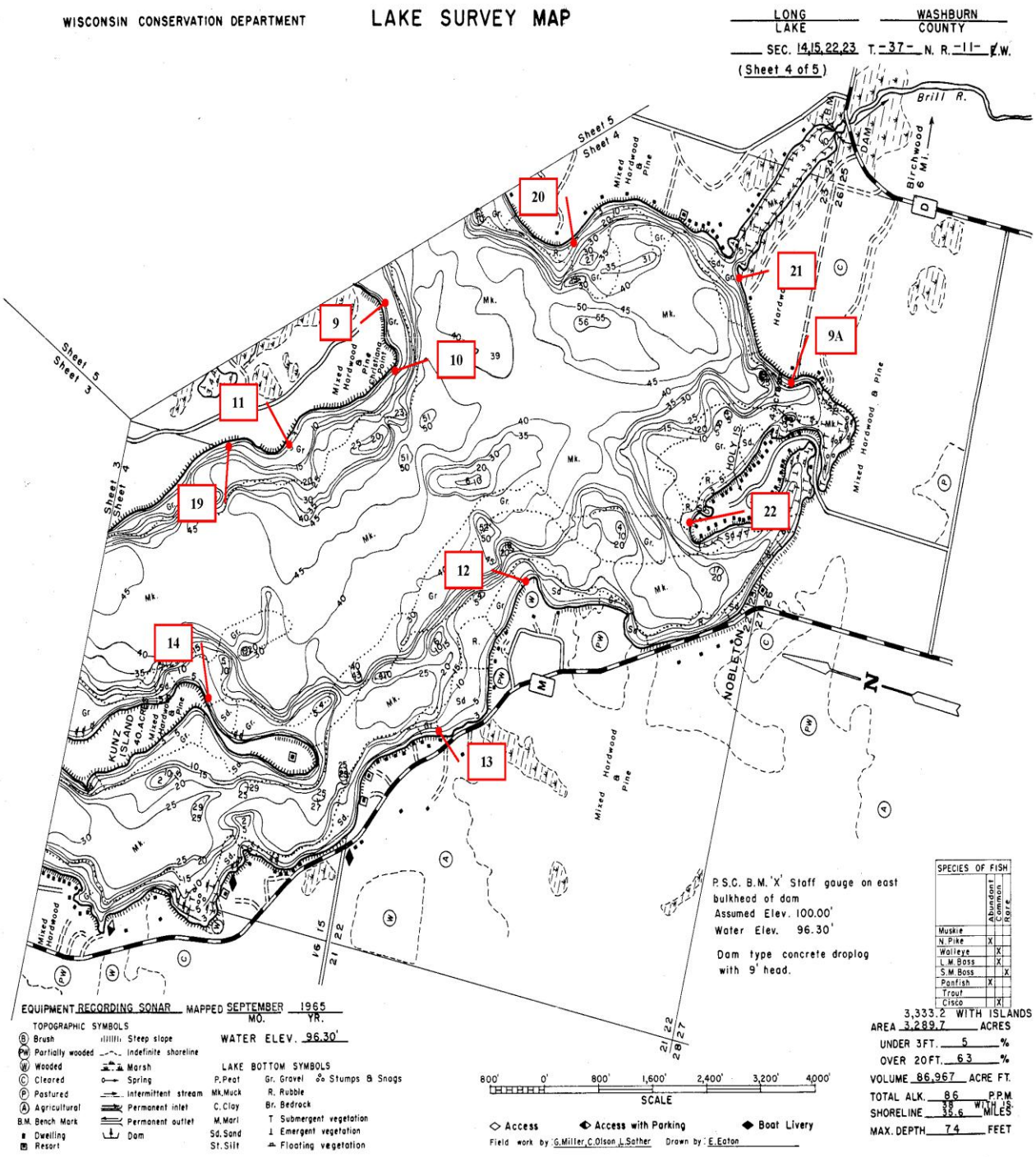

Figure 2c. Fyke net locations, Long Lake, Washburn County, Wisconsin, 2009.

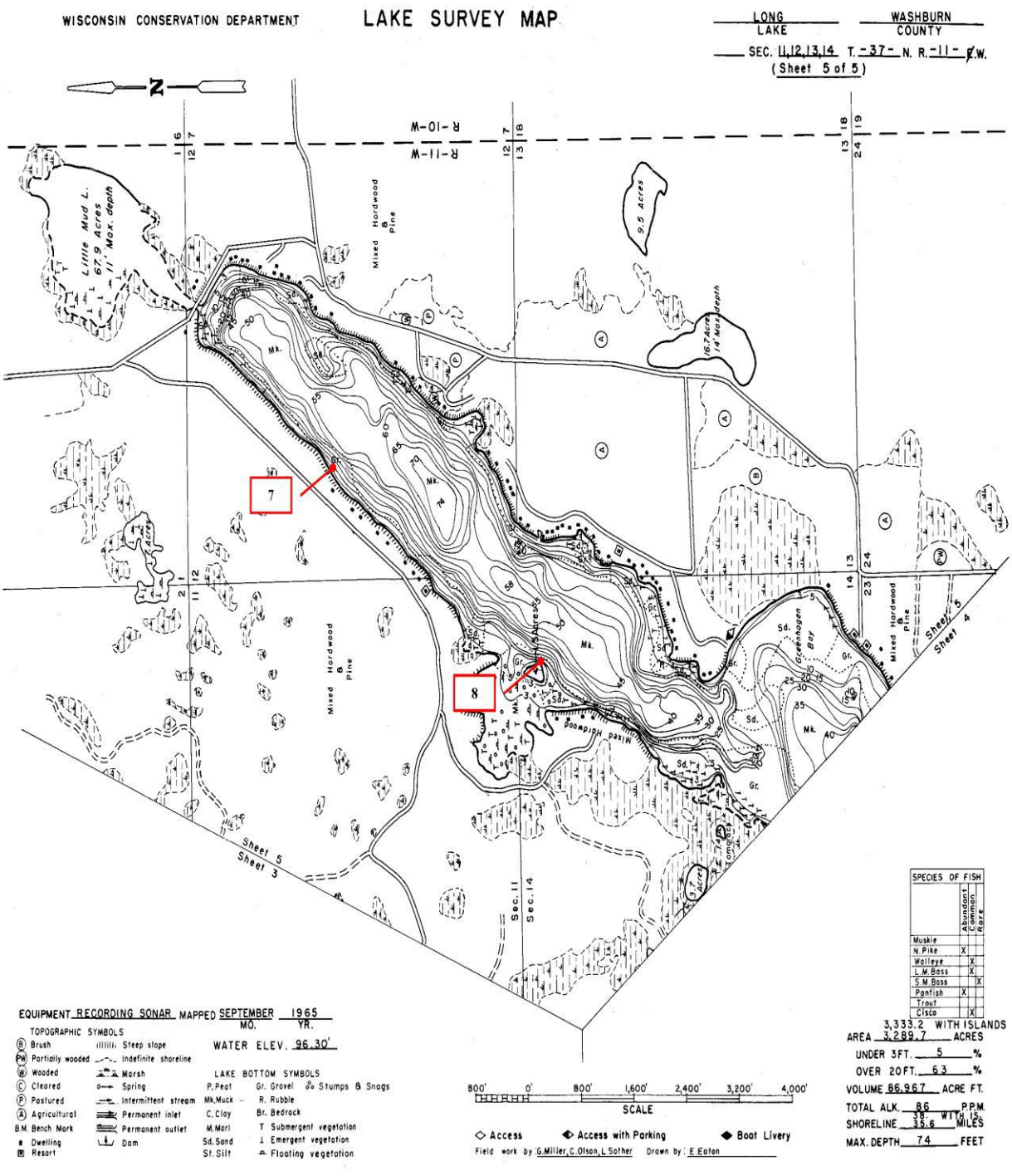

Figure 2d. Fyke net locations, Long Lake, Washburn County, Wisconsin, 2009.

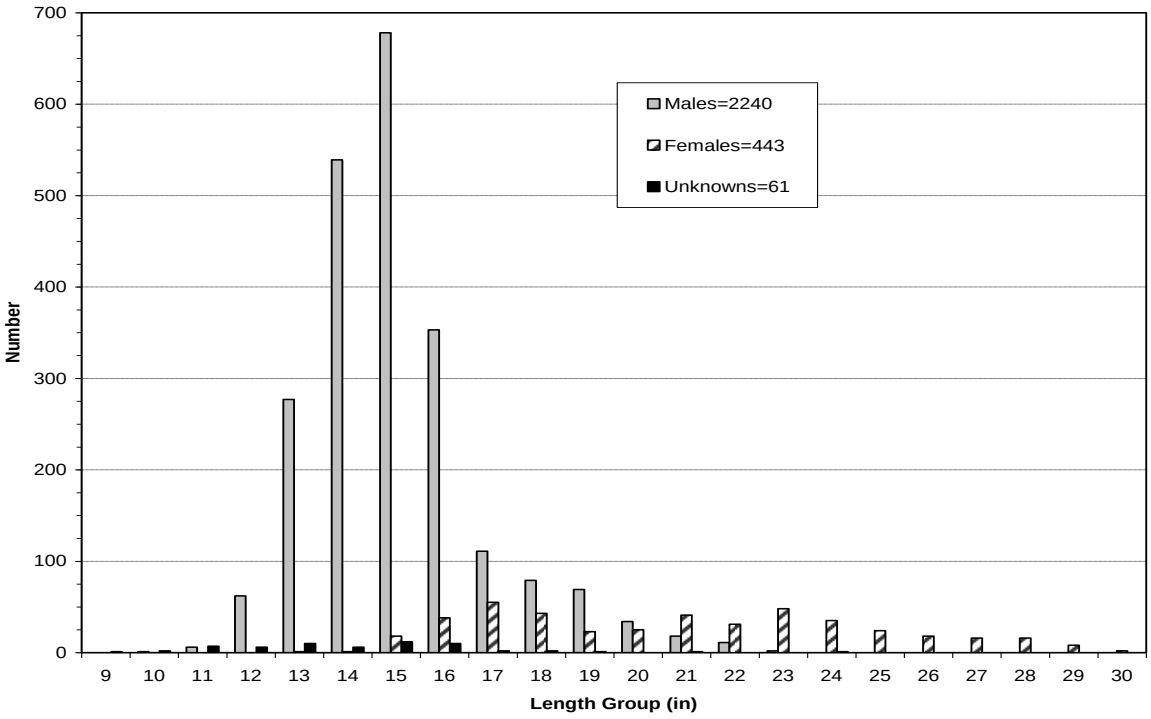

Figure 3. Length frequency of walleyes captured with fyke nets and electrofishing in Long Lake, Washburn County, Wisconsin, 2009.

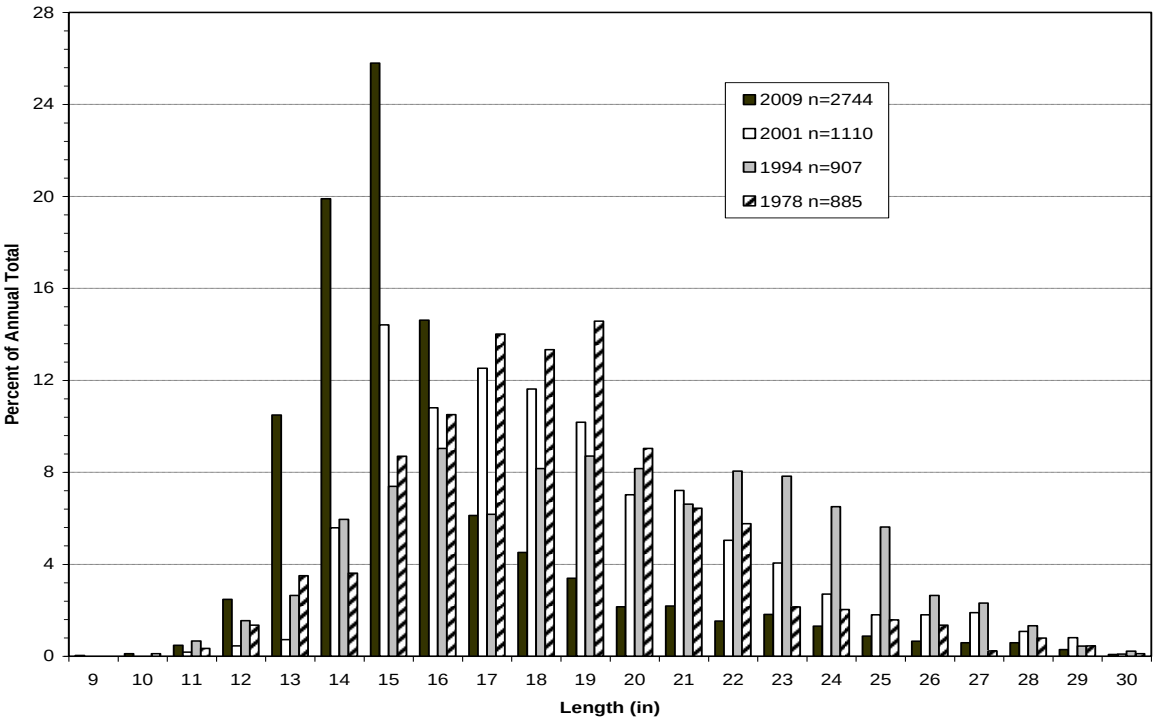

Figure 4. Length frequency as a percentage of the total annual walleye catch in Long Lake, Washburn County, Wisconsin, 1978-2009.

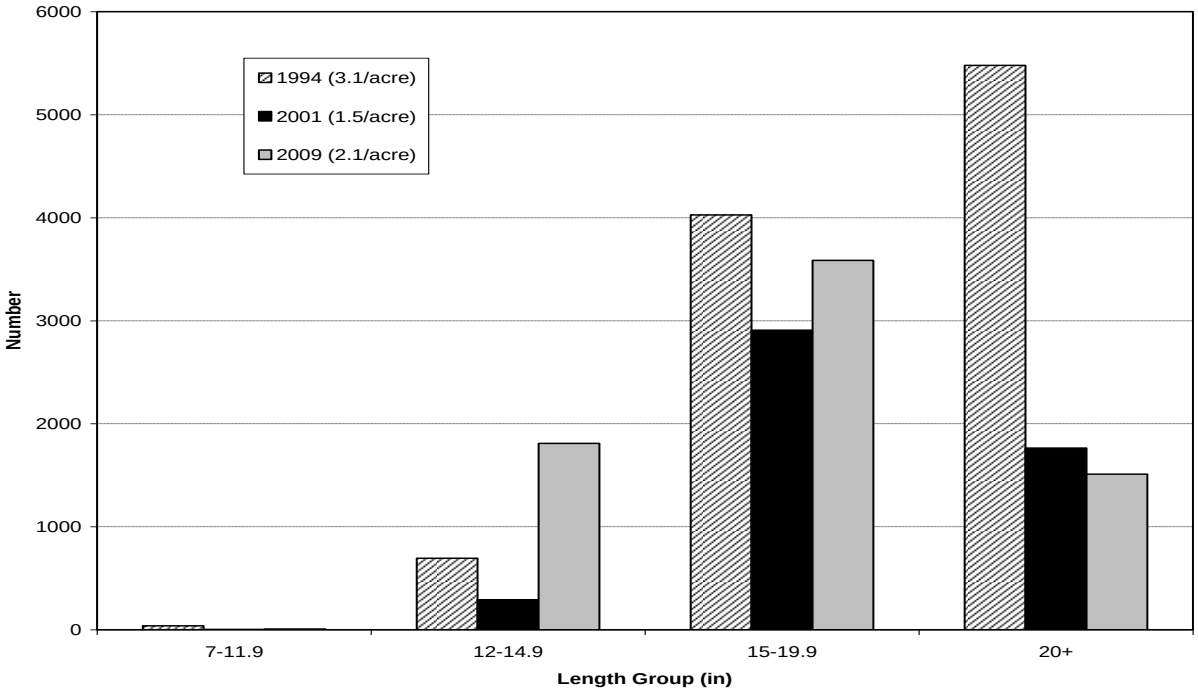

Figure 5. Walleye population abundance estimates by length in Long Lake, Washburn County, Wisconsin, 1994-2009.

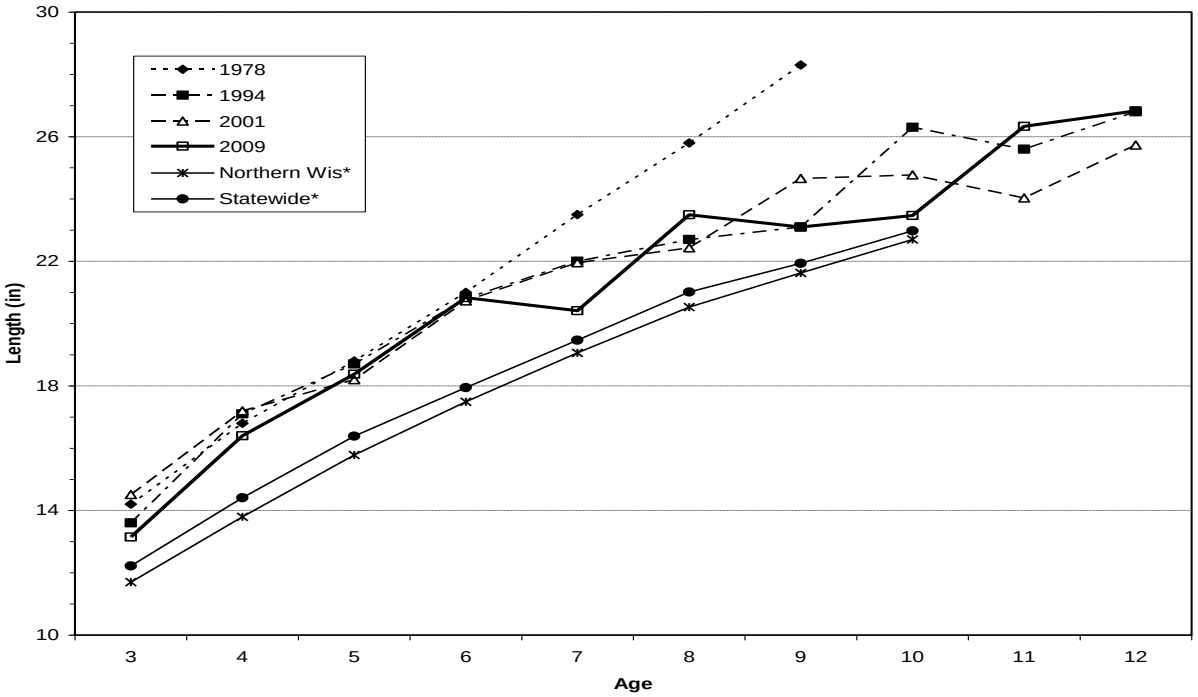

Figure 6. Mean lengths at age of walleyes from Long Lake, Washburn County, Wisconsin, 1978-2009, with comparisons to regional and statewide means.

*from WDNR Fish and Habitat Database

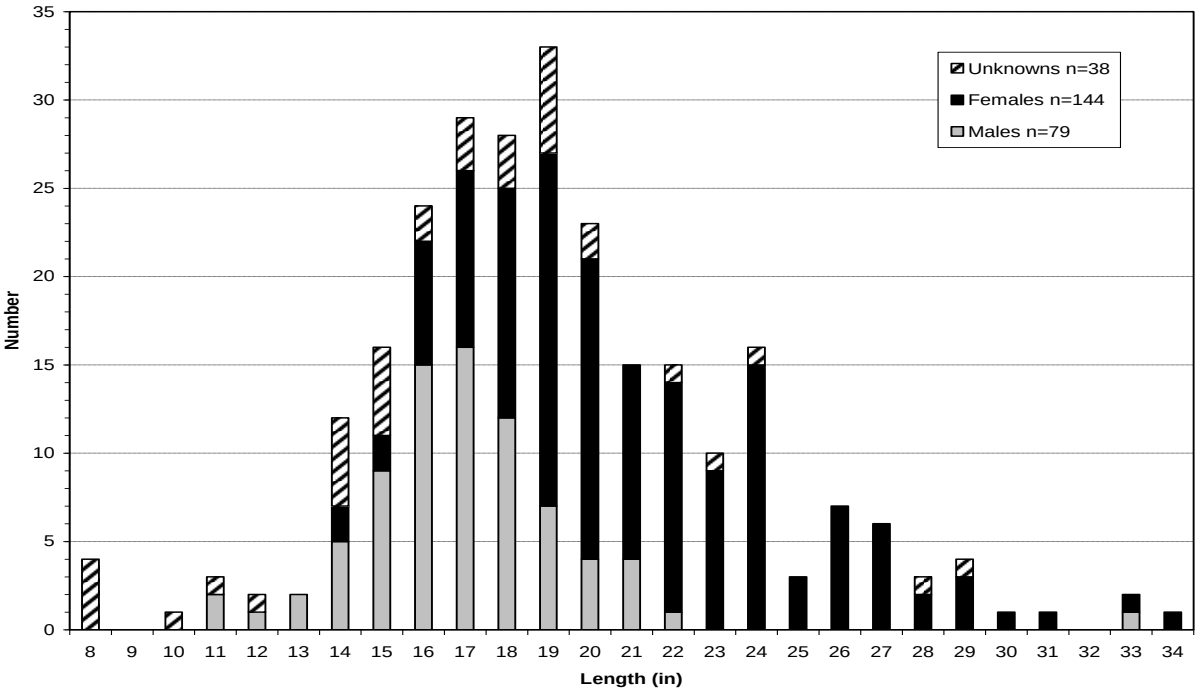

Figure 7. Length Frequency of northern pike captured with fyke nets in Long Lake, Washburn County, Wisconsin, 2009.

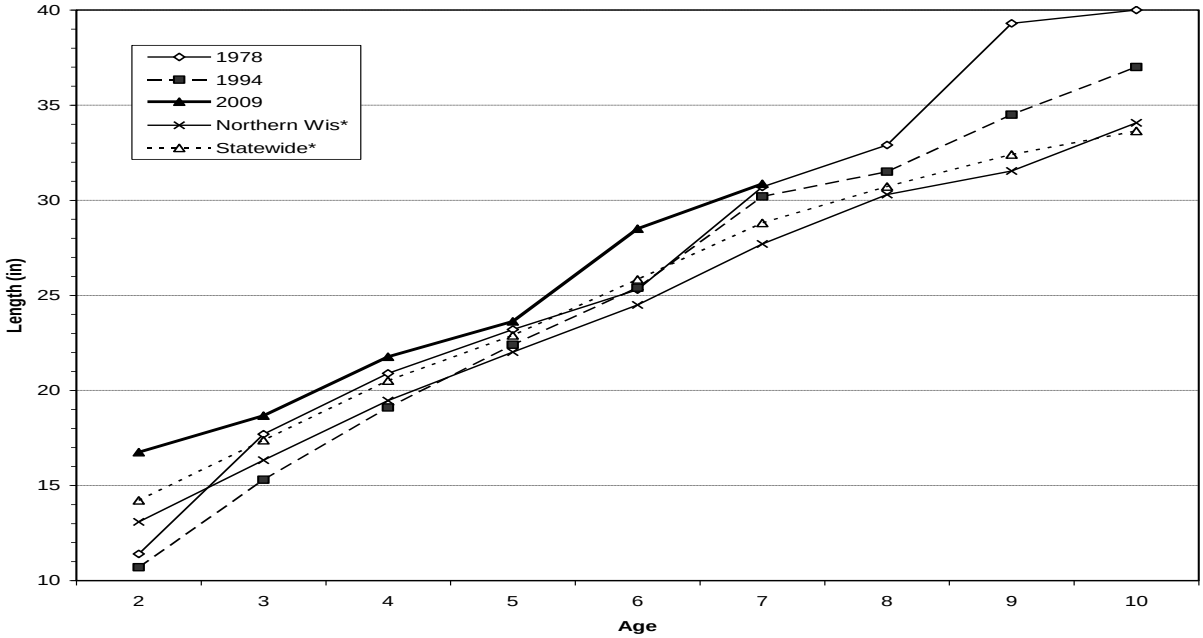

Figure 8. Mean lengths at age of northern pike from Long Lake, Washburn County, Wisconsin, 1978-2009, with comparisons to regional and statewide means.

*from WDNR Fish and Habitat Database

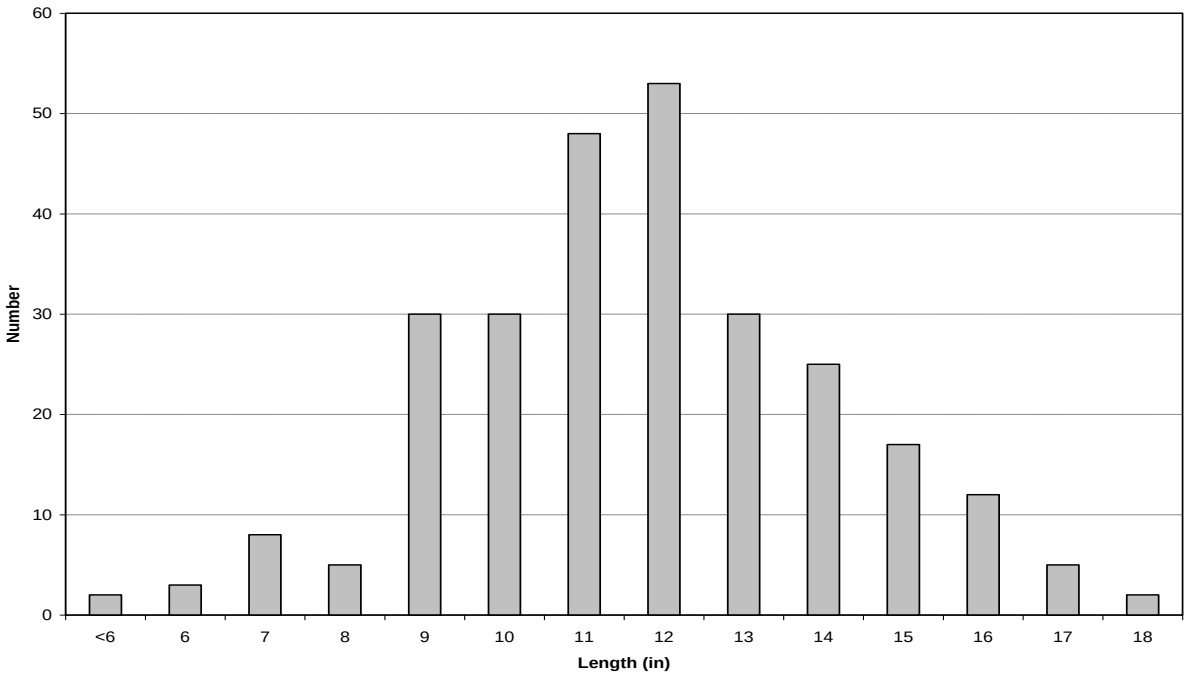

Figure 9. Length frequency of largemouth bass captured by electrofishing in Long Lake, Washburn County, Wisconsin, May, 2009, N = 270.

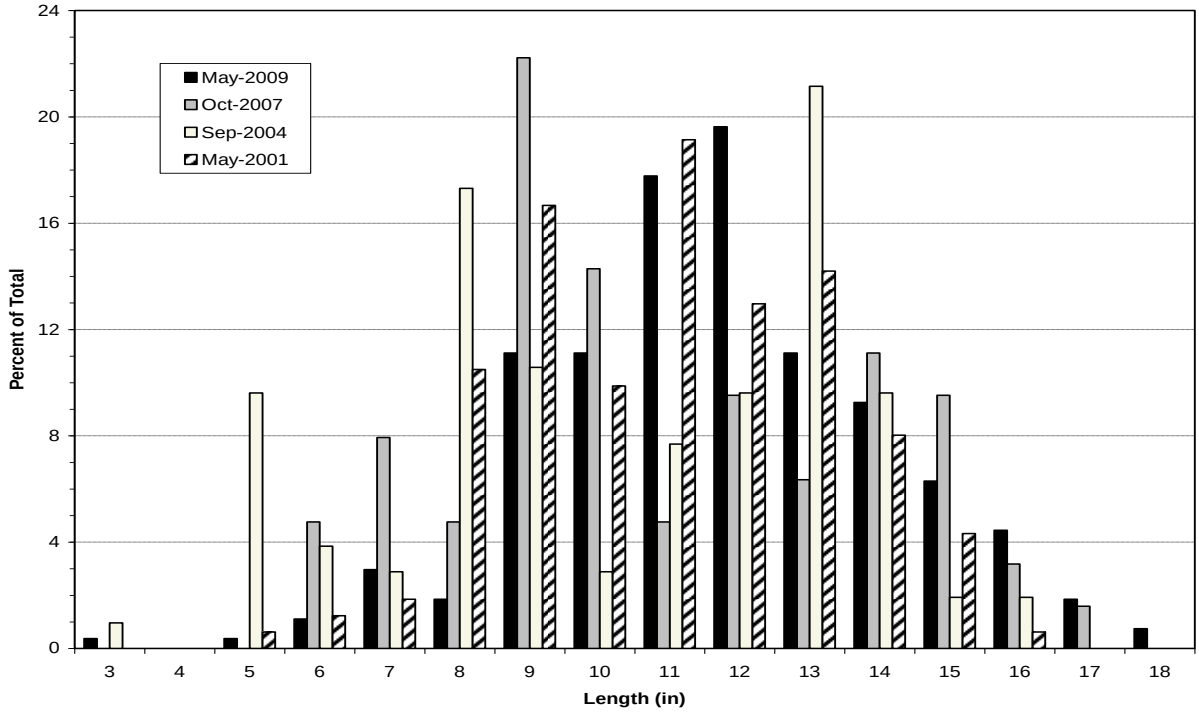

Figure 10. Length frequency as a percentage of the total largemouth bass catch, 2001-2009, Long Lake, Washburn County, Wisconsin.

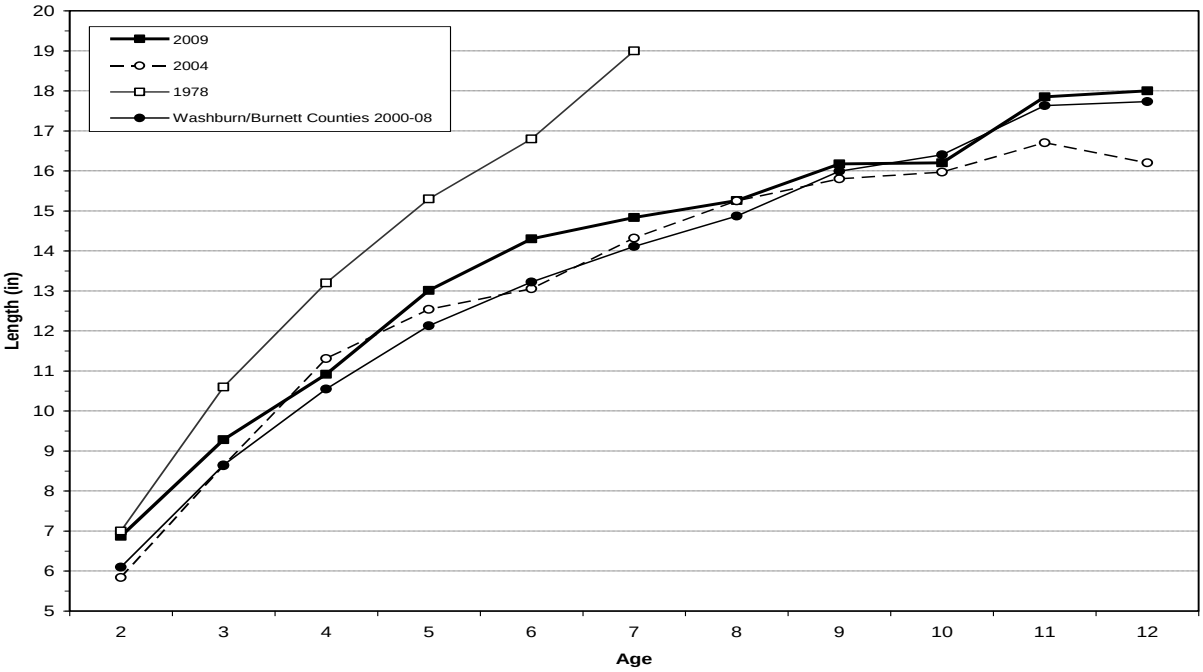

Figure 11. Mean lengths at age of largemouth bass from Long Lake, Washburn County, Wisconsin, 1978-2009, with comparisons to local and statewide means.

*from WDNR Fish and Habitat Database

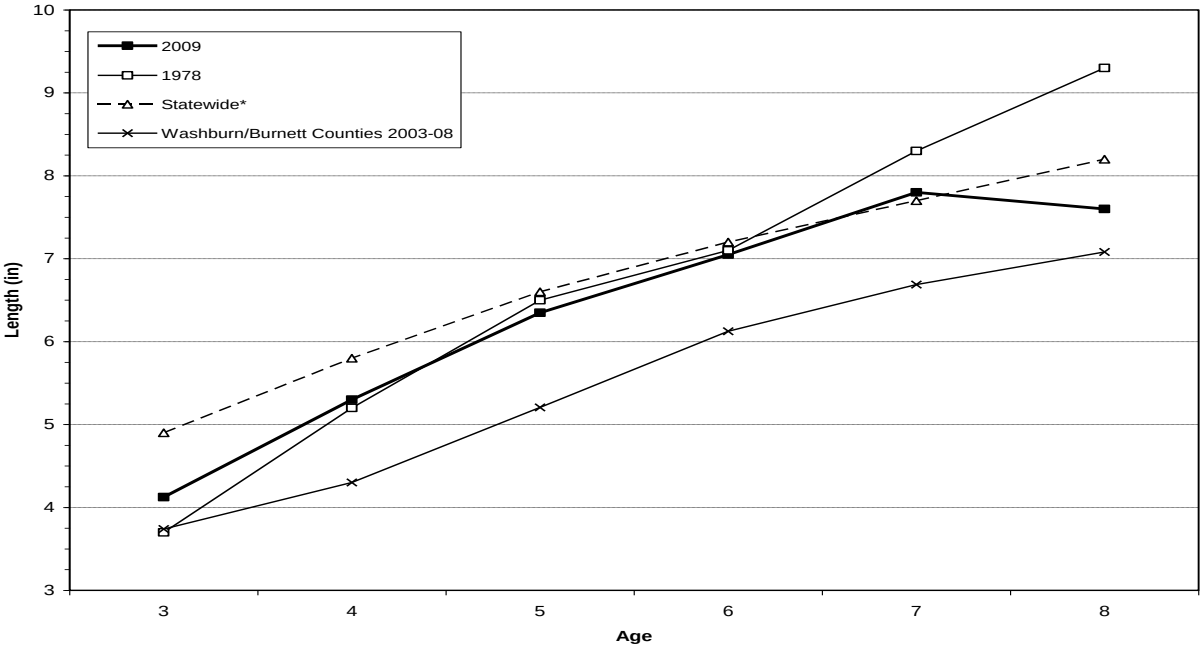

Figure 12. Mean lengths at age of bluegill from Long Lake, Washburn County, Wisconsin, 1978 and 2009, with comparisons to local and statewide means.

*from WDNR Fish and Habitat Database

Appendix Table 1. Proportional and stock density values for selected species.

Species	Stock Size (in)	Quality Size (in)	Preferred Size (in)
Bluegill	3	6	8
Largemouth Bass	8	12	15
Northern Pike	14	21	28
Walleye	10	15	20