Comprehensive Fisheries Survey of Willow Lake, Oneida County Wisconsin during 2013.

Waterbody Identification Code 1529500

John Kubisiak
Senior Fisheries Biologist
Rhinelander
March, 2014

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DEPT. OF NATURAL RESOURCES

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EXECUTIVE SUMMARY

A comprehensive fisheries survey was conducted in Willow Lake during spring and fall, 2013. We captured low numbers of gamefish including largemouth bass, northern pike and walleye. There was a remnant muskellunge population, which were last stocked in 1977 and were stocked in connected Pier Lake in 1986. Panfish species were abundant, with good size structure. We found high catches of yellow perch, black crappie and bluegill, moderate catches of pumpkinseed, yellow bullhead and bluegill x pumpkinseed hybrids and low catches of rock bass and black bullhead. Non-game species in the catch include creek chub, golden shiner, silver redhorse and white sucker. I recommend continuing to manage Willow Lake for vegetation-loving species including largemouth bass, northern pike and panfish. Willow Region Sportsmans Club has created a secondary walleye fishery through stocking. A northern pike regulation that allows harvest of abundant small fish, but protects older, larger fish would be appropriate if there is public interest in improving pike size structure.

Lake and location:
Willow Lake, west-central Oneida County, T37N R04E Section 9. Willow Lake is in the town of Lynn, about 23 road miles southwest of Minocqua. Willow is part of the Tomahawk River and Upper Wisconsin River watersheds. It is a drainage lake fed by Bootjack Creek, Thunder Creek and Willow River and drained by Willow River. A dam on Willow River about 1.7 miles downstream of the lake basin is owned by Oneida County Forestry Department.

Physical/Chemical attributes (Andrews and Threinen 1966):
Morphometry: 395 acres with maximum depth of 6 feet.
Watershed: 31 square miles, including 417 acres of adjoining wetlands.
Lake type: Drainage lake.
Basic water chemistry: Soft – alkalinity 37 mg/l, conductance 88 μmhos.
Water clarity: Light brown water of moderate transparency.
Littoral substrate: 50% muck, 35% sand, 10% gravel with some rubble and boulders.
Aquatic vegetation: moderate to dense, present across most of the lake. Eurasian watermilfoil is scattered throughout the lake.
Winterkill: none reported.
Boat landing: town-owned gravel ramp at Willow Road bridge over Willow River, 1.1 miles downstream of Willow Lake. Parking for about four vehicles with trailers and overflow parking for six additional vehicles with trailers south of the Willow River bridge.
Other features: Shoreline 90% meadow and shrub wetland with upland adjoining a limited part of the lake basin.

Purpose of Survey: Assess status of game and panfish species and develop management recommendations.
Dates of fieldwork: Walleye and northern pike netting, May 8 – 16 2013. Panfish netting, June 3 – 7 2013. Electrofishing May 28 and September 11, 2013.

BACKGROUND

Six fyke nets were fished for 3 nights during April 17-20, 1963 for a total of 18 net-nights. Catch per net-night included 6.5 walleye, 1.9 northern pike, 1.1 largemouth bass and 0.17 muskellunge. Panfish numbers were estimated, with bullhead the most abundant (28 per net-night), followed by crappie (13), perch (6.9), bluegill (5.5) "sunfish (3.9) and rock bass (1.4). A combined sucker and redhorse catch was estimated at 14 per net night. (Morehouse 1963).

Six mini-fyke nets (1/8 inch mesh, bar measure) were fished for the night of August 11, 2005. The catch was mostly young-of-year fishes, and consisted of 15.3 bluegill, 2.2 largemouth bass, 1.8 yellow perch, 1.3 black crappie and 0.17 common shiner per net night.

Fall electrofishing surveys were conducted in 2001 and 2005.

METHODS

We watched the ice break up and wash down the Willow River around mid-day on May 7, 2013, and 6 standard fyke nets (¾-inch mesh, bar measure) were set on May 8. These nets targeted walleye and northern pike. The nets were pulled on May 16, and effort totaled 48 net-nights. Five standard ¾-inch nets targeting panfish were set June 3 and pulled June 7 for a total of 20 net-nights. (we neglected to set a 3/8-inch mesh to target smaller fish)

An electrofishing boat using alternating current was used to collect gamefish along the entire shoreline on May 28, 2013. The shoreline was also electrofished on September 11, 2013, targeting juvenile gamefish.

Length or length category (nearest half-inch) was recorded for all gamefish and for panfish in June. Adult gamefish captured in spring were given a left-ventral fin clip and juveniles were given a top-tail clip for use in mark-recapture population estimates. Age structures (scales or spines) were removed from ten fish per species, per half-inch group.

RESULTS AND DISCUSSION

Walleye

During netting just after ice-out, 57 walleye were captured in 8 nights, including 36 immature fish and 1 immature recapture, at a rate of 1.3 walleye per net night (Table 1). The high proportion of juvenile fish is unusual for a stocked water, where low-level recruitment often results in a buildup of larger fish. The electrofishing sample on May 28 yielded 8 walleye (2.0 fish per mile) with no recaptures, so a population estimate could not be calculated. Walleye were scattered across all sizes from 6 to 21 inches, with two larger fish (Figure 1). The majority of walleye were not in spawning condition, despite the late ice-out that should have had fish ready to spawn. Only 3 fish that could be identified as females and 4 males were captured, but we captured 21 unknown-sex fish over 15 inches during May netting and one unknown-sex over 15 inches during May 28 electrofishing.

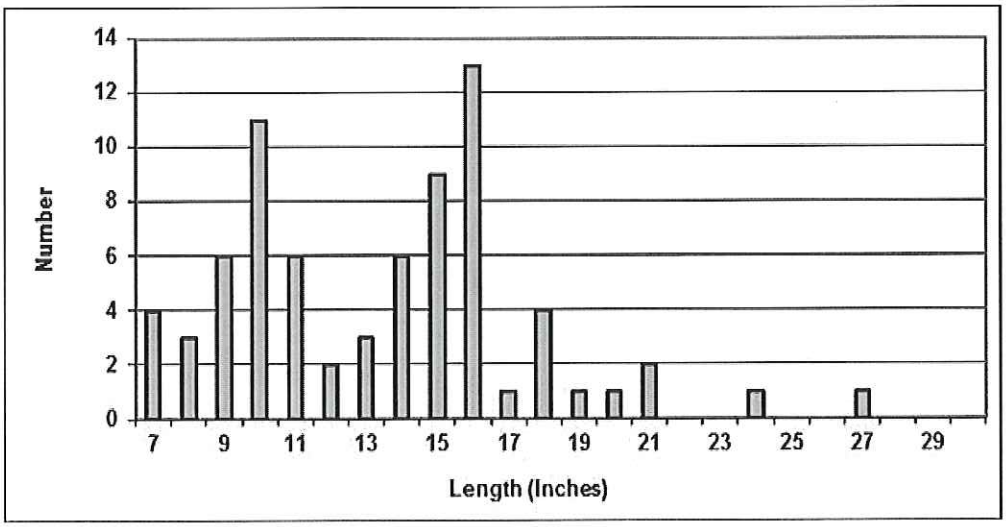
Table 1. Catch per unit effort during a 2013 survey of Willow Lake, Oneida County WI. Netting catch rates are reported as number of fish per net night, while electrofishing catch rates are number of fish per mile of shoreline. Blank cells during shocking runs indicate a species was not targeted.

species	walleye netting	May 28 electrofishing	panfish netting	Sept 11 electrofishing
walleye	1.3	2.0	0.35	0.84
largemouth bass	1.5	3.3	0.20	2.2
muskellunge	0.10	0	0.10	0
northern pike	2.1	1.5	0.45	1.1
black bullhead	0.021		0.050	
black crappie	47.0		12.5	
bluegill	43.1		40.5	
hybrid bluegill x pumpkinseed	3.4		1.85	
creek chub	0.021		0	
golden shiner	0.63		0.050	
pumpkinseed	8.1		19.25	
rock bass	0.29		0.15	
silver redhorse	0.10		0	
white sucker	1.4		0.65	
yellow bullhead	18.7		13.3	
yellow perch	60.9		4.4	

Table 2. Fish stocking record during 1975 through 2013 in Willow Lake, Oneida County Wisconsin.

Year	Species	Size	Number	Comments
1975	walleye	fry	500,000	
1975	muskellunge	lg fingerling (10 inch)	400	
1977	muskellunge	lg fingerling (8 inch)	500	
1988	walleye	sm fingerling	20,000	
1989	walleye	sm fingerling (2-4 inch)	28,330	
1990	walleye	sm fingerling (2 inch)	19,530	
2000	walleye	lg fingerling (6-8 inch)	1,000	Tomahawk Fishing Unlimited
2001	walleye	lg fingerling (6 inch)	1,000	Private stocking
2002	walleye	lg fingerling (7-10 inch)	1,000	Willow Region Sportsmans Club
2003	walleye	lg fingerling (7-11 inch)	1,000	Willow Region Sportsmans Club
2004	walleye	lg fingerling (7 inch)	1,000	Willow Region Sportsmans Club
2005	walleye	lg fingerling (7 inch)	1,025	Willow Region Sportsmans Club
2006	walleye	lg fingerling (6-9 inch)	500	Willow Region Sportsmans Club
2007	walleye	lg fingerling (6 inch)	1,000	Willow Region Sportsmans Club
2008	walleye	lg fingerling (8 inch)	1,000	Willow Region Sportsmans Club
2009	walleye	lg fingerling (8 inch)	1,000	Willow Region Sportsmans Club
2010	walleye	lg fingerling (8 inch)	1,000	Willow Region Sportsmans Club
2011	walleye	lg fingerling (8 inch)	2,379	Willow Region Sportsmans Club
2012	walleye	lg fingerling (8 inch)	1,000	Willow Region Sportsmans Club
2013	walleye	lg fingerling (8 inch)	1,000	Willow Region Sportsmans Club

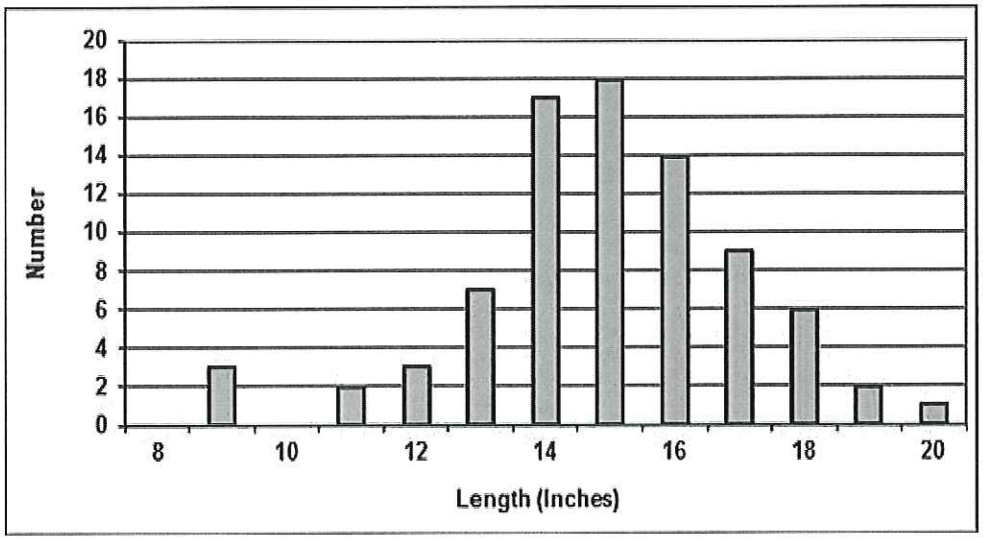
Figure 1. Length-frequency of walleye during 2013 in Willow Lake, Oneida County WI.



Largemouth Bass

We captured 91 largemouth bass during spring sampling, including only 7 recaptures of previously-marked fish and 2 fish less than 8 inches in length. Too few fish were recaptured to calculate a reliable population estimate. Size was centered on about 15 inches, and 82% of adult largemouth (including all fish 8 inches and larger) were over 14 inches and 11% were over 18 inches in length (Figure 2). The longest largemouth was 20.2 inches. Largemouth were growing very well, and length-at-age had increased to a year ahead of average after age 6 (Appendix A). No smallmouth bass were encountered during the survey.

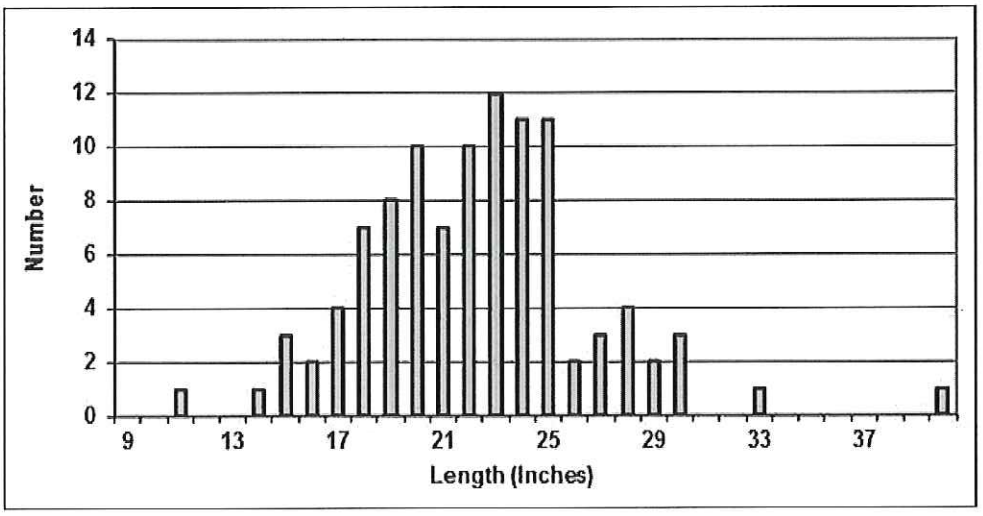
Figure 2. Length-frequency of adult largemouth bass during 2013 in Willow Lake, Oneida County Wisconsin.



Northern Pike

We captured 115 northern pike, including 12 recaptures of previously-marked fish. The population was estimated at 1.1 adult pike per acre, but the variance was quite high (± 29%, coefficient of variation). Most northern pike ranged broadly in size from 17 to 26 inches, with an average length of 22.3 inches; 15.5% of pike were 26 inches or larger and 4.8% (5 fish) exceeded 30 inches (Figure 3). The largest northern pike was a 40.1 inch female, aged at 10 years from a scale. Growth of pike was a little behind average for the region (Appendix A), but the fish showed good size potential.

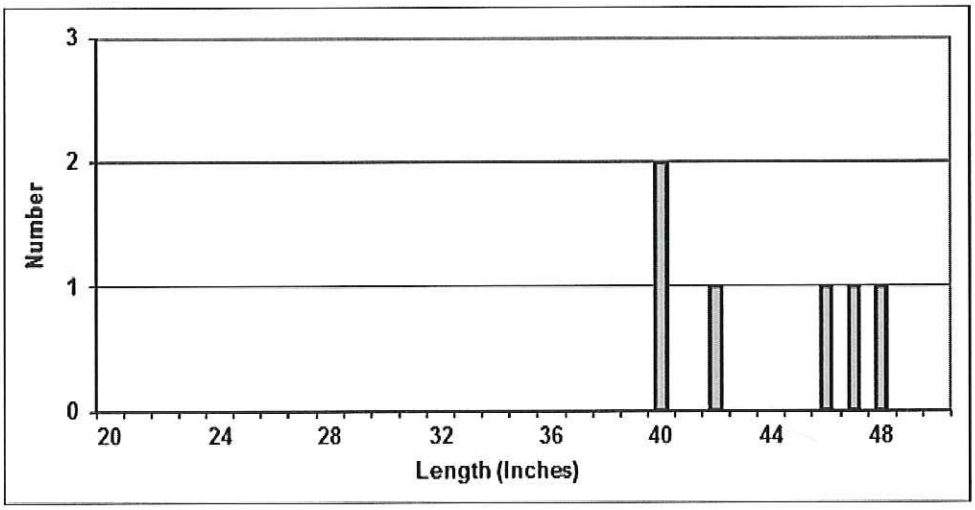
Figure 3. Length-frequency of northern pike during 2013 in Willow Lake, Oneida County Wisconsin.



Muskellunge

We captured 9 muskellunge during the survey, including 3 recaptures of previously-marked fish. Adult muskellunge ranged from 40.1 to 48.4 inches in length (Figure 4). Muskellunge were stocked a few times in late 1970s (Table 2), and were stocked in connected Pier Lake in 1986. It may be that the stocked fish pulled off some yearclasses, but we saw no indication of recent recruitment.

Figure 4. Length-frequency of muskellunge during 2013 in Willow Lake, Oneida County WI.



Panfish

Willow has shallow depth and extensive beds of aquatic vegetation, resulting in high panfish abundance. Crappie and yellow perch catch was highest during early netting periods, while bluegill were high in both periods and pumpkinseed catch was higher in June (Table 1). Panfish were not measured during walleye netting, but we noticed abundant small yellow perch, bluegill and black crappie. In contrast, bluegill and pumpkinseed sizes were dramatically larger in June, when the mature fish were moving to spawning areas.

We found high net catches over 40 per night of yellow perch, black crappie and bluegill moderate catches of pumpkinseed, yellow bullhead and bluegill x pumpkinseed hybrids and just 17 rock bass and 2 black bullhead (Table 1). During June panfish netting, bluegill size showed a broad peak from 6 to 8 inches, with a few fish over 8 and 2 fish over 9 inches (Figure 5). Bluegill length-at-age was a little behind the regional average (Appendix A). Pumpkinseed length-at-age was at or ahead of average. Pumpkinseed rarely reach 8 inches in this area, but in Willow Lake we measured 7 pumpkinseed over 8 inches (Figure 6). Black crappie growth was slow, and fish were 2 years behind average by age 6. We found a yearclass of 4 to 5-inch, age-2 crappies coming up, along with good numbers of 8.5 to 10-inch fish that were mostly ages 6 and 7 (Figure 7). Yellow perch were growing close to average, with a broad peak of 4- and 5-year-old fish at about 6 to 8.5 inches (Figure 8). Yellow bullhead showed a broad range of sizes, with most fish measuring 8.5 to 14 inches (Figure 9)

Figure 5. Length-frequency of bluegill during 2013 in Willow Lake, Oneida County Wisconsin.

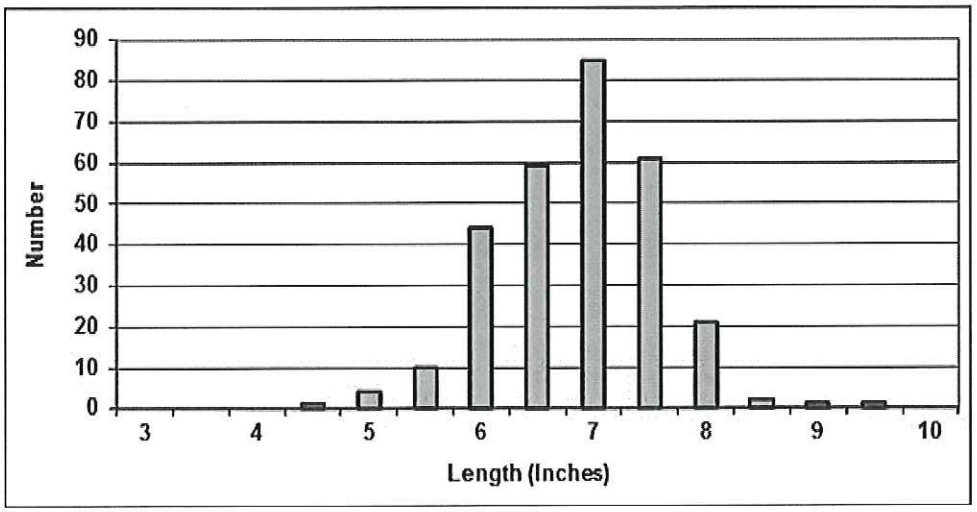


Figure 6. Length-frequency of pumpkinseed during 2013 in Willow Lake, Oneida County WI.

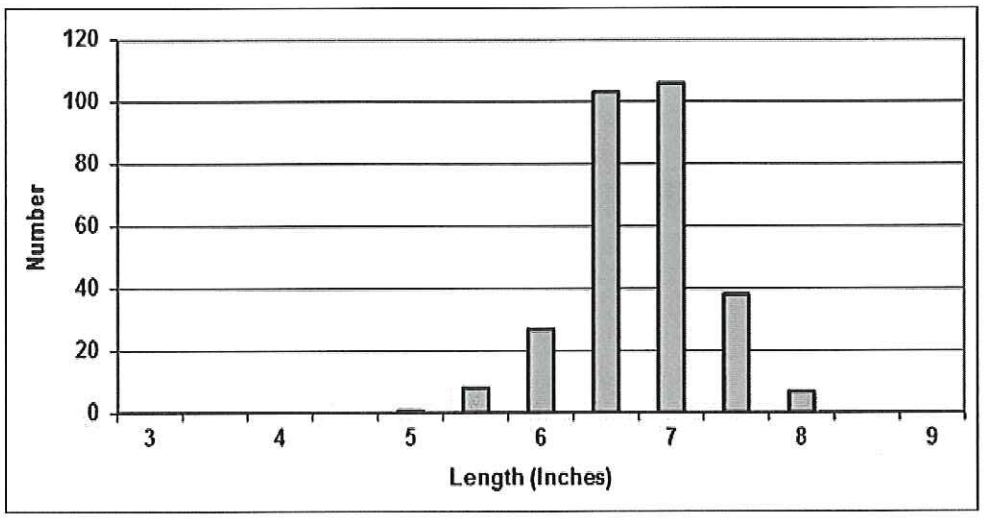


Figure 7. Length-frequency of black crappie during 2013 in Willow Lake, Oneida County WI.

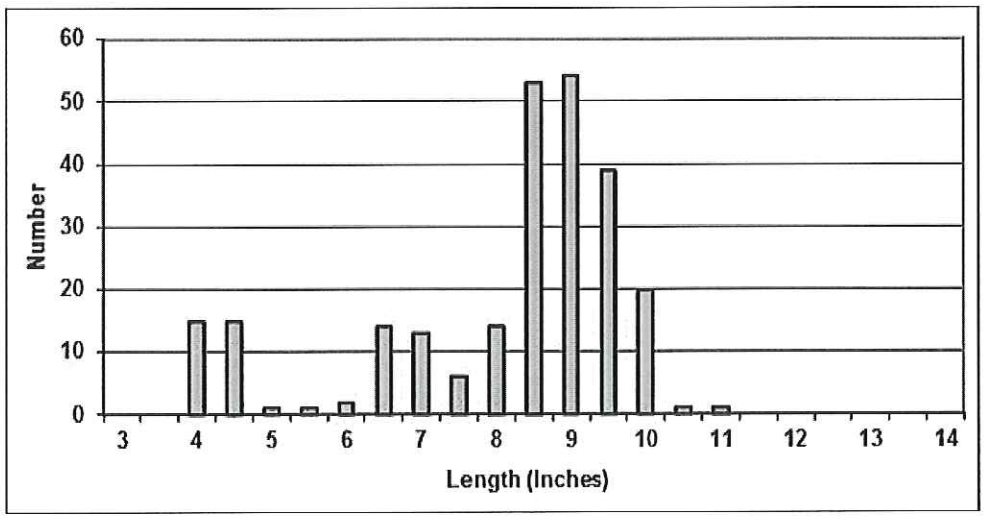


Figure 8. Length-frequency of yellow perch during 2013 in Willow Lake, Oneida County WI.

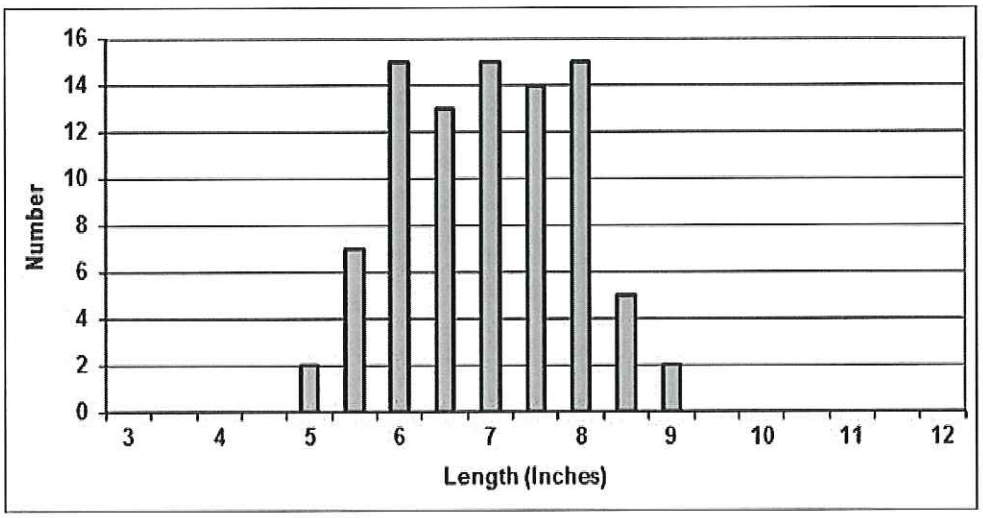
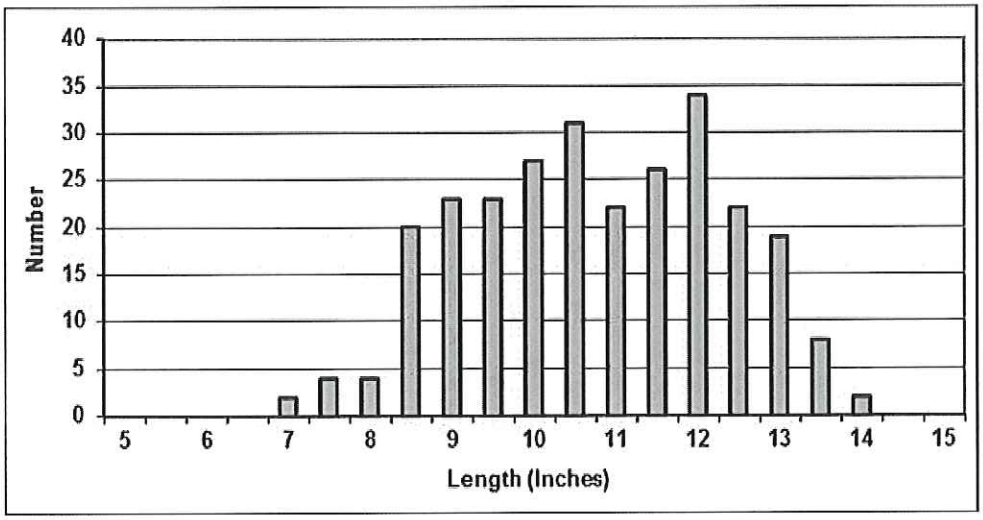


Figure 9. Length-frequency of yellow bullhead during 2013 in Willow Lake, Oneida County WI.



MANAGEMENT RECOMMENDATIONS

Willow Lake supports a diverse fishery. Largemouth bass and northern pike are the dominant gamefish, with lower numbers of stocked walleye and a remnant muskellunge population. Largemouth bass growth rates were above average for the region, while pike were growing a little slow. Largemouth bass and northern pike sizes were excellent. Yellow perch, black crappie and bluegill dominated the panfish catch, followed by pumpkinseed, yellow bullhead and hybrid bluegill x pumpkinseed. Rock bass and black bullhead were also present, with non-game species including creek chub, golden shiner, silver redhorse and white sucker. Panfish size was relatively poor during the early netting period, but we found an excellent catch of larger, spawning fish in June. Given the shallow, well-vegetated lake basin, Willow should continue to be managed with largemouth bass and northern pike as the dominant game species. A northern pike regulation that allows harvest of abundant small fish, but protects older, larger fish would improve pike size structure.

ACKNOWLEDGEMENTS
Steve Timler and I supervised the field work for this survey. Jeff Blonski, Jason Halverson, Joelle Underwood and volunteer Jacob Richter assisted on the water. Blonski, Halverson and Timler entered and proofed data.

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Cover image courtesy of Oneida County website. www.co.oneida.wi.gov

APPENDIX A
FISH AGE RESULTS

An age-length key was created from the aged subsample and applied against the full length-frequency to estimate averages.

Table A.1. Male northern pike length at age in Willow Lake, Oneida County Wisconsin during 2014.

Age	Number of fish	avg. length	Northern WI avg.
2			13.4
3	2	13.5	16.2
4	1	18.2	18.9
5	7	20.1	20.6
6	6	20.9	22.3
7	10	22.5	23.4
8	6	22.5	24.8
9	4	23.3	23.9
10	2	24.7	
11	2	24.1	

Table A.2. Female northern pike length at age in Willow Lake, Oneida County Wisconsin during 2014.

Age	Number of fish	avg. length	Northern WI avg.
2			
3	1	14.9	16.9
4	4	17.2	20.4
5	10	21.7	23.1
6	5	24.9	24.4
7	7	24.3	27.3
8	5	25.6	28.8
9	7	28.0	32.1
10	2	35.5	
11	1	30.5	
12	1	27.7	

Table A.3. Largemouth bass length at age in Willow Lake, Oneida County Wisconsin during 2014.

Age	Number of fish	avg. length	Northern WI avg.
1			3.5
2	1	6.5	6.6
3	2	7.7	8.9
4	2	11.7	10.5
5	10	12.9	12.1
6	9	14.3	13.6
7	12	15.7	14.9
8	11	16.3	15.8
9	6	17.3	16.2
10	7	18.2	17.1
11	2	19.0	17.8
12			18.2

Table A.4. Black crappie length at age in Willow Lake, Oneida County Wisconsin during 2014.

Age	Number of fish	avg. length	Northern WI avg.
1			3.4
2	23	4.5	5.3
3	2	6.1	7.1
4	20	7.0	9.0
5	12	8.4	10.0
6	26	9.1	10.7
7	13	9.9	11.6
8	6	10.2	11.7

Table A.5. Bluegill length at age in Willow Lake, Oneida County Wisconsin during 2014.

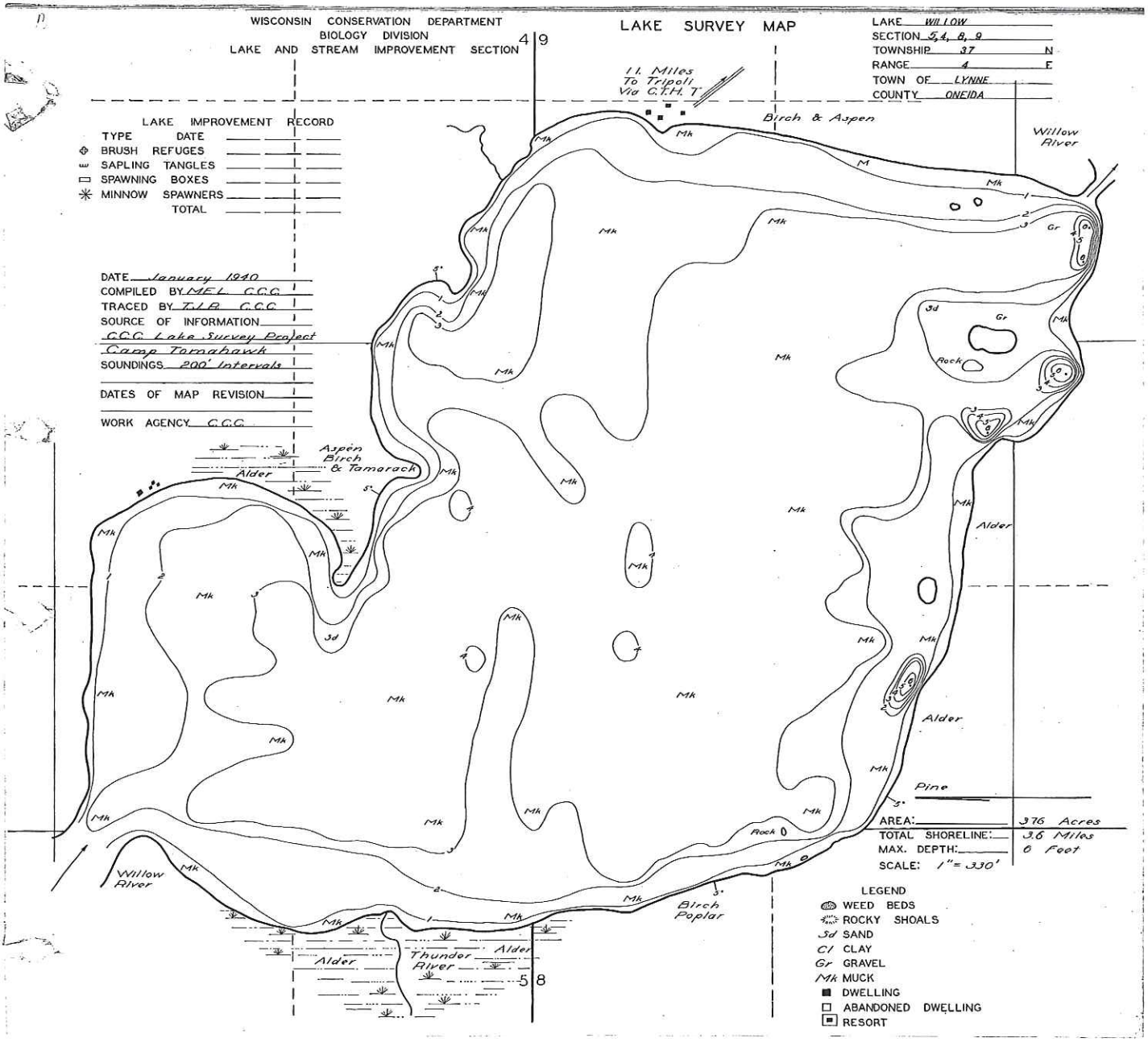
Age	Number of fish	avg. length	Northern WI avg.
2			3.9
3	2	5.0	5.0
4	3	5.3	6.2
5	25	6.6	6.8
6	19	7.2	7.8
7	11	7.6	8.2
8	5	7.8	8.7
9	3	8.1	8.7

Table A.6. Pumpkinseed length at age in Willow Lake, Oneida County Wisconsin during 2014.

Age	Number of fish	avg. length	Northern WI avg.
2			3.6
3	1	5.4	4.8
4	5	5.7	5.7
5	18	6.6	6.5
6	13	7.2	6.8
7	9	7.3	7.3
8	5	8.0	7.3
9	2	8.3	
10	2	7.7	

Table A.7. Yellow perch length length at age in Willow Lake, Oneida County Wisconsin during 2014.

Age	Number of fish	avg. length	Northern WI avg.
2			4.6
3	4	5.5	6.0
4	35	6.7	6.9
5	20	7.9	7.9
6	5	8.4	9.0
7	3	8.8	9.9


WISCONSIN CONSERVATION DEPARTMENT
BIOLOGY DIVISION
LAKE AND STREAM IMPROVEMENT SECTION
LAKE SURVEY MAP
LAKE WILLOW
SECTION 5, 4, 8, 9
TOWNSHIP 37 N
RANGE 4 E
TOWN OF LYNNE
COUNTY ONEIDA
11 Miles To Tripoli Via C.T.H. T
LAKE IMPROVEMENT RECORD
TYPE DATE
BRUSH REFUGES
SAPLING TANGLES
SPAWNING BOXES
MINNOW SPAWNERS
TOTAL
DATE January 1940
COMPILED BY MEL CCC
TRACED BY T.L.B. CCC
SOURCE OF INFORMATION
CCC Lake Survey Project
Camp Tomahawk
SOUNDINGS 200' Intervals
DATES OF MAP REVISION
WORK AGENCY CCC
Birch & Aspen
Willow River
Aspen Birch & Tamarack
Alder
Rock
Pine
Birch Poplar
Thunder River
AREA: 376 Acres
TOTAL SHORELINE: 3.6 Miles
MAX. DEPTH: 0 Feet
SCALE: 1" = 330'
LEGEND
WEED BEDS
ROCKY SHOALS
Sd SAND
Cl CLAY
Gr GRAVEL
Mk MUCK
DWELLING
ABANDONED DWELLING
RESORT