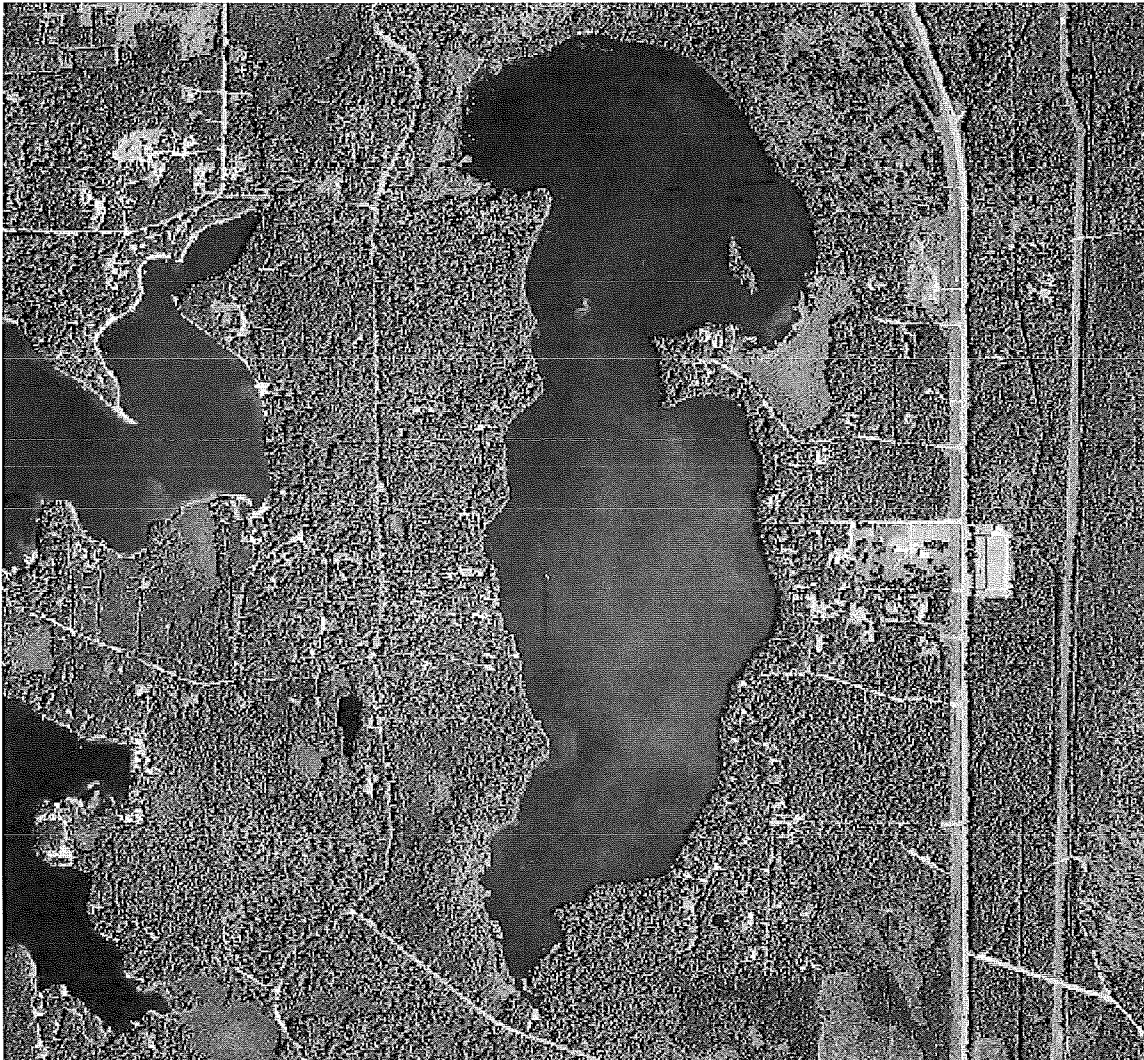
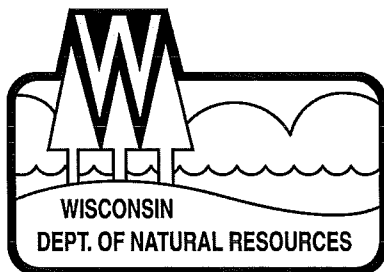


Comprehensive Fisheries Survey of Horsehead Lake, Oneida County Wisconsin during 2010.

Waterbody Identification Code 1588000



John Kubisiak
Senior Fisheries Biologist
Rhinelanders
January, 2011



Your purchase of fishing equipment
and motor boat fuel supports boating
access and Sport Fish Restoration.

Comprehensive Fisheries Survey of Horsehead Lake, Oneida County Wisconsin during 2010.

John Kubisiak
Senior Fisheries Biologist
January, 2011

EXECUTIVE SUMMARY

A comprehensive fisheries survey was conducted in Horsehead Lake during spring and fall, 2010. Northern pike (population estimate, PE = 15.7 adults per acre) were the dominant gamefish, along with low numbers of largemouth bass. The pike showed good size and appeared to be in good condition. Panfish species were also abundant, with low to moderate size and slow growth rates. We found high catches of pumpkinseed, bluegill x pumpkinseed hybrids, yellow perch, black crappie, bluegill and yellow bullhead. Non-game species in the catch include golden shiner and white sucker. Despite the presence of an aerator, Horsehead experiences periodic winterkill, documented as recently as 2006. The prevalence of species more tolerant to low oxygen conditions (e.g., northern pike, black crappie, yellow perch, pumpkinseed and golden shiner) also suggests that winterkill is structuring the fish community. Largemouth were a prominent species in the past, but are currently at very low abundance. Largemouth stocking is warranted to aid their recovery. Other species are self-sustaining. I recommend managing Horsehead Lake for northern pike, largemouth bass and panfish.

Lake and location:

Horsehead Lake, central Oneida County, T38N R07E Sec14. Horsehead Lake is in the town of Lake Tomahawk, about 2 miles south of the Village of Lake Tomahawk and 14 miles northwest of Rhinelander. Horsehead is part of the Upper Wisconsin River watershed. It is a spring lake with no inlet. A dam was originally authorized in 1946 and a roller dam was constructed of rock with a concrete cap. The dam was replaced in 1975 by a concrete dam with stoplogs. The dam is located on DNR lands under easement and is operated by Town of Lake Tomahawk. The dam maintains 3.4 foot of normal head (7.3 feet maximum) and regulates outflow to Horsehead Creek, which originates at the dam and drains to the Wisconsin River.

Physical/Chemical attributes (Andrews and Threinen 1966):

Morphometry: 366.5 acres, maximum depth of 11 feet and 4.99 miles of shoreline (1968 lake map).

Watershed: 2 square miles, including 28 acres of adjoining wetlands.

Lake type: Spring with a low-head dam at the outlet.

Basic water chemistry: Soft – alkalinity 38 mg/l, conductance 89 μ mhos.

Water clarity: Clear water of moderate transparency.

Littoral substrate: 80% sand with some gravel and muck.

Aquatic vegetation: abundant

Winterkill: periodic, but an aerator reduces the severity. Reported in 2006 and 2008.

Boat landing: One concrete plank ramp with parking for 10 vehicles with trailers.

Other features: Shoreline 85% upland with coniferous-bog wetland adjoining portions of the lake.

Purpose of Survey: Assess status of game and panfish species and develop management recommendations.

Dates of fieldwork: Gamefish netting, March 31 – April 7 2010. Panfish netting, June 1-4 2010. Electroshocking (entire shoreline) April 14 and September 8, 2010.

BACKGROUND

Four days of fyke netting with an unspecified number of nets during June, 1953 resulted in 114 perch, 3 northern pike, 12 largemouth bass, 73 "sunfish" and "many" golden shiner, "fat heads" (possibly bluntnose minnow), suckers, additional perch under 4 inches and bullhead.

Three large- and five small-mesh fyke nets were set during June 14-18, 1954 to assess a "heavy experimental walleye plant." The walleye stocking consisted of 5,720,000 fry in 1952 and 80,153 fingerlings in 1953. They found 27 largemouth bass, 10 northern pike and a single 4.2-inch walleye. "Perch, sunfish, suckers, bullheads, and golden shiners were numerous in net catches."

Netting with 4 large mesh and 1 small mesh fyke net during May 2-6, 1956 (20 net-lifts) resulted in 12 walleye, 41 northern pike, 12 largemouth bass, 18 sunfish, "many" perch, 400 bullhead and 400 suckers.

An August 6, 1960 electrofishing survey of 85% of the shoreline resulted in 4 northern pike, 7 perch, 11 largemouth bass, 10,000 suckers and "abundant" minnows.

Electrofishing was performed on September 26, 1972 and a netting and seining survey was conducted during 1974. The September 26 electroshocking survey resulted in 5.0 northern pike and 0.5 largemouth bass per hour. They estimated observations of 250 yellow perch and white sucker and 500 black bullhead and golden shiner per hour. Six minnow seine hauls on July 2, 1975 resulted in a combined catch of 3 northern pike, 500 yellow perch, 100 black bullhead and 50 golden shiner. Twelve fyke net lifts during July 1-3, 1974 captured 0.33 walleye, 1.7 northern pike and 0.08 smallmouth bass per net-night. Panfish and nongame catch per net-night included 87.5 yellow perch, 14.1 pumpkinseed, 0.66 bluegill, 0.16 rock bass, 9.2 white sucker, 433.3 bullhead and 1.2 golden shiner. The report describes "an unattractive fish population for sport fishing. ... The most abundant fish species captured were black bullheads, yellow perch and golden shiners. This is indicative of the numerous partial winterkills which have occurred in the past." (Tyler 1975).

During 1970s, Horsehead Lake Protection and Rehabilitation District looked into several lake renovation projects to remove sediment, improve water quality or improve the fishery. After the 1974 survey, Tyler (1975) proposed killing off the fish population with Rotenone followed by restocking, installing a new dam that would allow winter drawdown, and installing an aerator system if drawdown alone was not adequate. The dam was replaced in 1975 (see Lake and location above). A Rotenone proposal was drafted by DNR, but was apparently not accepted by the Lake District. By 1980, the northern pike fishery had improved enough that the Rotenone treatment was tabled (Niebler 1980). An aerator was installed in late winter, 1982, although it was too late in the year to prevent a winterkill that year. The most recent winterkills were in 2006 (dead fish reported from the northwest corner of the lake) and 2008 (report of thousands of dead bluegill along with 1-2 bass and perch).

Northern pike eggs were collected from Horsehead Lake and fry were stocked back to the lake during 1990-94.

METHODS

The ice was mostly out when 8 standard fyke nets (¾-inch mesh, bar measure) were set on March 31, 2010, targeting northern pike. The nets were pulled on April 7. Effort totaled 56 net-nights. A WDNR-standard alternating current electrofishing boat was used to collect gamefish on April 14 and

September 8, 2010. Five standard ¾-inch fyke nets (except one ½-inch mesh was set to target smaller fish) were fished June 1-4, 2010 (15 net-nights), targeting panfish. Length or length category (nearest half-inch) was recorded for all gamefish and for panfish in June. Adult gamefish were given a right-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

Table 1. Fish catch per unit effort during a 2010 survey of Horsehead 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. Only gamefish data were collected during shocking runs.

| species | spring netting | April 14 shocking | panfish netting | Sept 8 shocking |
|-------------------------------|----------------|-------------------|-----------------|-----------------|
| largemouth bass | 0.02 | 0.19 | 0 | 0 |
| northern pike | 6.9 | 10.0 | 1.7 | 13.2 |
| black bullhead | 1.5 | | 1.7 | |
| black crappie | 53.6 | | 23.1 | |
| bluegill | 22.8 | | 56.2 | |
| hybrid bluegill x pumpkinseed | 64.2 | | 263.3 | |
| golden shiner | 0.36 | | 1.3 | |
| pumpkinseed | 31.9 | | 314.2 | |
| white sucker | 0.29 | | 0 | |
| yellow bullhead | 23.4 | | 77.5 | |
| yellow perch | 236.8 | | 5.2 | |

Largemouth Bass

Largemouth bass were relatively abundant in past surveys, exceeding northern pike in the catch during 1953, 1954 and 1960 (see BACKGROUND section). Local anglers and lake residents also commented that bass were a prevalent species until recently. Only two bass were encountered in the 2010 survey. One largemouth (14.9 inches, 2.1 pounds, age 5) was captured during spring netting and a second largemouth (13.7 inches, 1.4 pounds, age 5) was captured during April 14 electroshocking. Regionally, largemouth average 12.1 inches at age 5, so the two fish from Horsehead were growing well. Horsehead appears to be well-suited for largemouth. It has abundant vegetation and sandy littoral areas for spawning, comparable to similar lakes with strong bass populations. No large bass mortality has been reported, but it is possible that winterkills (recent kills

occurred in 2006 and 2008) decimated the bass population. The abundant panfish may also inhibit bass recruitment by preying on eggs and fry. A strong largemouth population is desirable to increase predation on panfish, and to provide an additional species for anglers. I propose to re-establish the largemouth bass population with field transfers of adult fish.

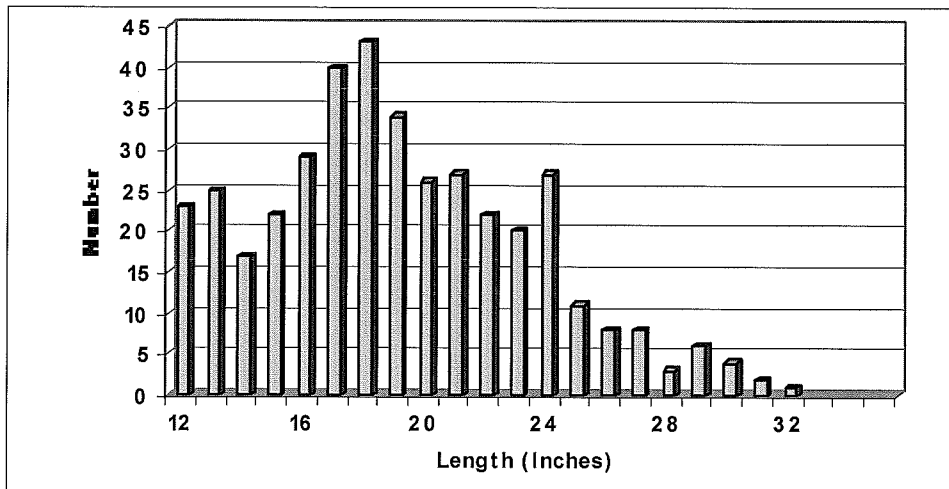
Northern Pike

We captured 536 northern pike (including 20 recaptures of previously-marked fish and 6 immature fish less than 12 inches in length). The northern pike population (including sexually mature fish and all fish over 12 inches) was estimated at 5,760 ($\pm 1,288$ SD), or 15.7 per acre, using the Schnabel multiple-capture method (Ricker 1975). This is considered high density for a northern pike population. Pierce and Tomcko (2003) found slower growth rates in 7 Minnesota lakes at densities above 4.8 to 5.7 northern pike per acre.

Good numbers of larger fish were captured in the survey, but the numbers were swamped by abundant small fish with a mode at 18 inches (Figure 1). Average size of adult northern pike was 18.3 inches; 6.9% of adult pike were 26 inches or larger while only 7 fish (1.5%) exceeded 30 inches (Figure 3). Length-at-ages were about 1 to 2 years behind regional averages for both male and female pike (Appendix A). Growth was especially slow through age 3, suggesting a lack of suitable forage for smaller pike. The largest northern pike was a 32.1 inch, 6.1 pound female aged at 6 from a scale.

Horsehead produces some large northern pike, and could potentially produce more under a protective angler regulation. Minimum length limits are unlikely to be effective in lakes like Horsehead, with high recruitment and abundant small fish. Maximum length limits of 20, 22 and 24 inches produced significantly higher proportions of northern pike over 24 and 30 inches in Minnesota (Pierce 2010). However, the restrictions on harvest of trophy-size fish may make high maximums unlikely to be approved in Wisconsin. Protected-slot limits produced more variable results in Minnesota. Slots generally resulted in improved size structure but low numbers of fish larger than the slot (Pierce 2010). Pierce and Tomcko (2003) found that most annual production of northern pike occurs from fish age 3 and younger, while very little production occurs from fish age 6 and older. Thus, restrictions on harvest of older pike can have little impact on yield to anglers while significantly improving size structure. Slow growth in Horsehead Lake may reduce the growth potential of northern pike, but growth rates may improve if pike density is reduced.

Figure 1. Length-frequency of adult northern pike during 2010 in Horsehead Lake, Oneida County Wisconsin.



Panfish

Horsehead is a shallow lake with moderate fertility and abundant aquatic vegetation, resulting in high panfish abundance. It is typical to capture higher numbers of yellow perch and black crappies during April netting, with bluegill and pumpkinseed catch increasing with warmer June temperatures. In Horsehead Lake, yellow perch dominated the April netting catch, with 237 per net night. Panfish were not measured until the June netting period. The perch captured in April were mostly small fish, about 5-6 inches in length. Lower numbers of somewhat larger perch were captured in June, with almost no trace of the smaller fish (Figure 2). Black crappie were also common in the early netting period, at 54 per net night.

The June netting catch was dominated by pumpkinseed, with 314 per net night and bluegill x pumpkinseed hybrids, with 263 per net night. In most area lakes bluegill are by far the dominant catch in June. The bluegill catch of 56 per net night is still a good number of fish, but the numerical dominance of pumpkinseed likely reflects their higher tolerance to low oxygen and winterkill conditions. Bluegill are the least tolerant of the panfish species we captured.

High panfish densities in Horsehead might be expected to retard growth. Bluegill and pumpkinseed catch of over 150 per net night is considered very high density and is usually associated with overpopulation and stunting. Length-at-ages were about 1 year behind the regional averages for bluegill and black crappie, while pumpkinseed were 1.5 to 2 years behind (Tables A.3, A.4 and A.6). In many lakes with slow-growing panfish, bluegill x pumpkinseed hybrids are able to maintain good growth. This was not the case in Horsehead, where average hybrid lengths were smaller than pumpkinseed at the same age (Tables A.4 and A.5). However, we captured a wide range of hybrid ages, resulting in a good number of hybrids over 6.5 inches, while no pumpkinseed exceeded 5.9 inches. Yellow perch were growing close to average through age 5, but showed very slow growth at older ages (Appendix A). Panfish size structure in Horsehead Lake was generally poor. However, a few preferred-size fish were present (Figures 2-7), and we encountered a good number of panfish anglers at the boat landing.

Figure 2. Length-frequency of yellow perch during 2010 in Horsehead Lake, Oneida County Wisconsin.

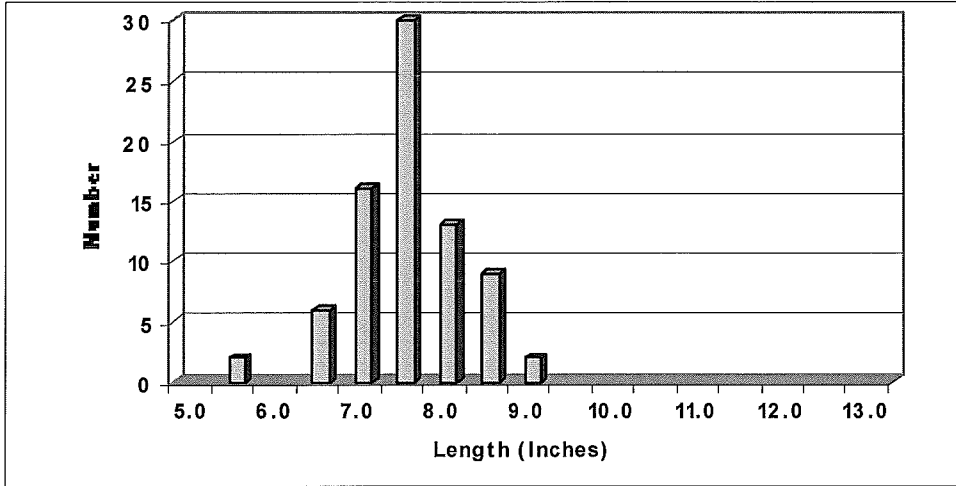


Figure 3. Length-frequency of bluegill during 2010 in Horsehead Lake, Oneida County Wisconsin.

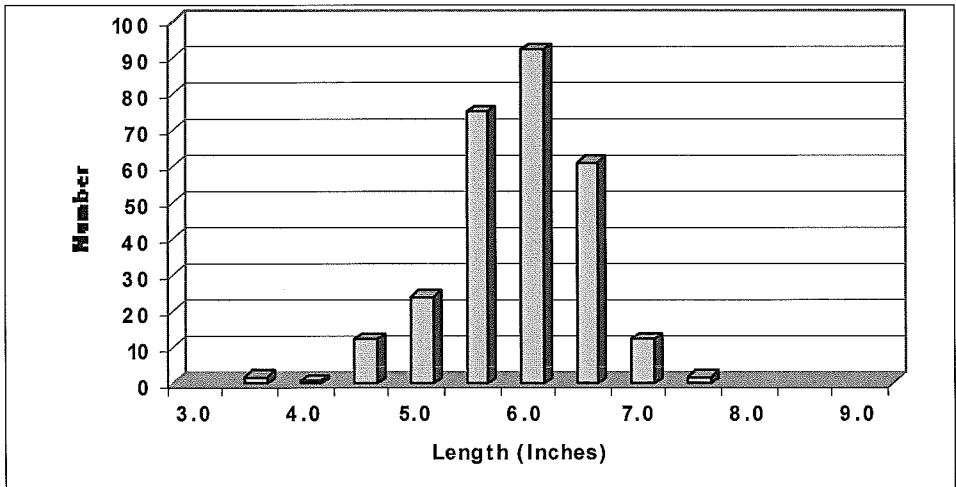


Figure 4. Length-frequency of black crappie during 2010 in Horsehead Lake, Oneida County Wisconsin.

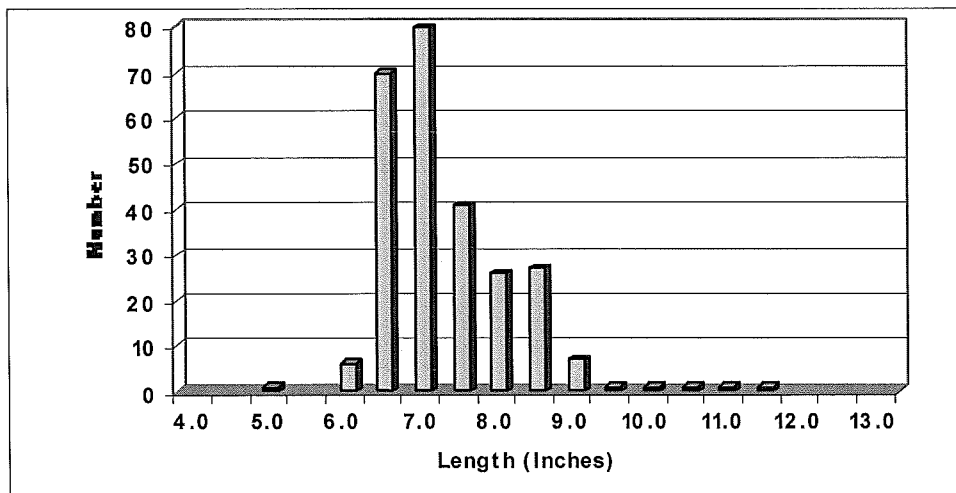


Figure 5. Length-frequency of pumpkinseed during 2010 in Horsehead Lake, Oneida County Wisconsin.

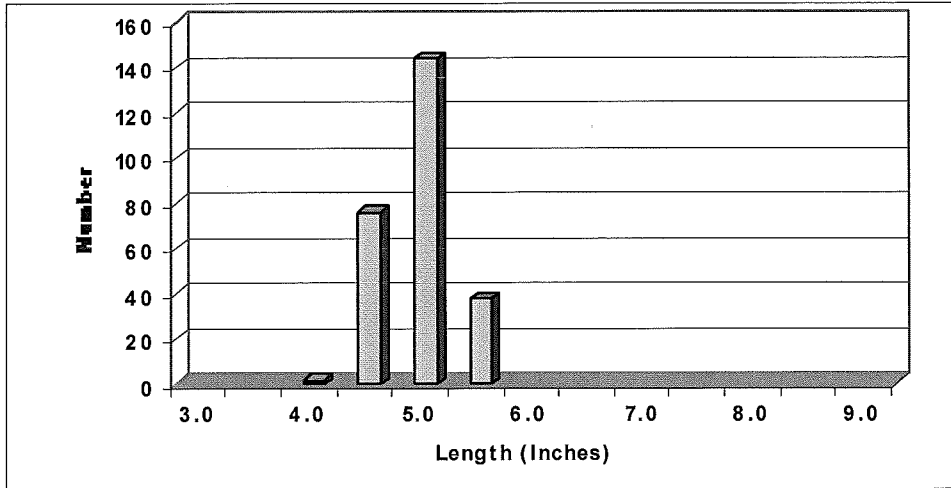


Figure 6. Length-frequency of bluegill x pumpkinseed hybrids during 2010 in Horsehead Lake, Oneida County Wisconsin.

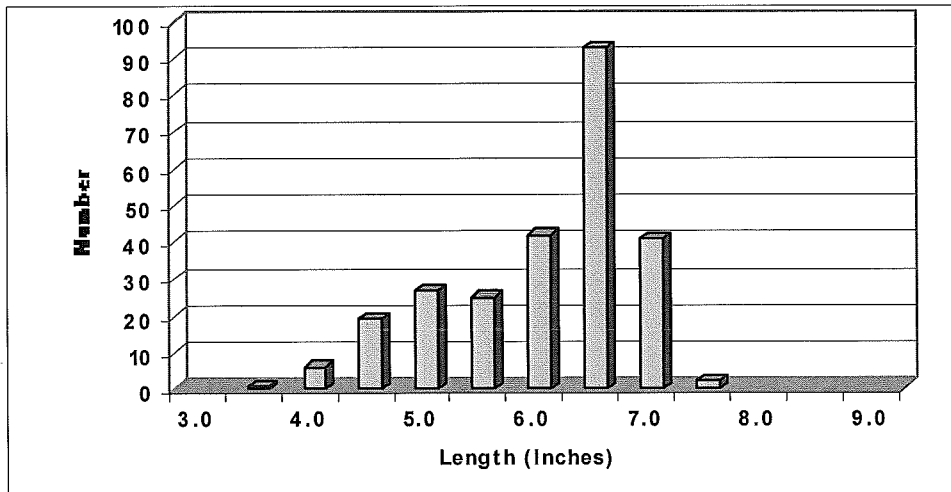
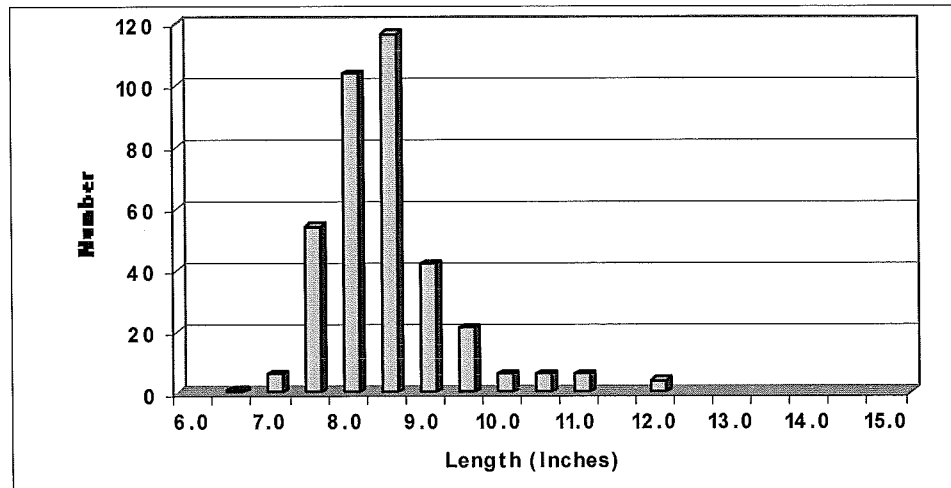


Figure 7. Length-frequency of yellow bullhead during 2010 in Horsehead Lake, Oneida County Wisconsin.



MANAGEMENT RECOMMENDATIONS

Northern pike were the dominant gamefish in Horsehead Lake, along with a very small number of largemouth bass. Size structure of northern pike was good, despite poor growth rates. Pumpkinseed, bluegill x pumpkinseed hybrids and yellow perch dominated the panfish catch. Yellow bullhead, bluegill and black crappie were also found at relatively high abundance, with lesser numbers of black bullhead. Forage and non-game species included golden shiner and white sucker. Panfish size was poor, although some moderate-size panfish were still present. Stunting was most pronounced in pumpkinseed, bluegill x pumpkinseed hybrids and yellow perch. Of the species we captured, largemouth bass and bluegill are the least tolerant to low oxygen conditions. Their reduced abundance relative to other species indicates that the fish community in Horsehead Lake is structured by winterkill. Horsehead is best managed for northern pike and largemouth bass. I recommend the largemouth population be reestablished by stocking.

ACKNOWLEDGEMENTS

Steve Timler and I supervised the field work for this survey with assistance from Jeff Blonski, Marty Kiepke, Steve Kramer and Aaron Nelson. Steve Timler assigned fish ages from scales.

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APPENDIX A FISH AGE RESULTS

For species with at least 50 lengths and over 15% measured but not age, a length-age key from the aged sub-sample was applied against the full length-frequency to eliminate bias from a non-random subsample.

Table A.1. Male northern pike length at age in Horsehead Lake, Oneida County Wisconsin during 2010.

| Age | Number of fish | Horsehead avg. length | Northern WI avg. |
|-----|----------------|-----------------------|------------------|
| 2 | 6 | 10.3 | 13.4 |
| 3 | 11 | 10.6 | 16.2 |
| 4 | 27 | 14.5 | 18.9 |
| 5 | 43 | 17.7 | 20.6 |
| 6 | 22 | 19.9 | 22.3 |
| 7 | 17 | 20.3 | 23.4 |
| 8 | 5 | 20.7 | 24.8 |
| 9 | 3 | 24.2 | 23.9 |
| 10 | 1 | 23.1 | |

Table A.2. Female northern pike length at age in Horsehead Lake, Oneida County Wisconsin during 2010.

| Age | Number of fish | Horsehead avg. length | Northern WI avg. |
|-----|----------------|-----------------------|------------------|
| 2 | 1 | 9.5 | |
| 3 | 25 | 11.8 | 16.9 |
| 4 | 15 | 15.6 | 20.4 |
| 5 | 21 | 19.4 | 23.1 |
| 6 | 43 | 22.3 | 24.4 |
| 7 | 25 | 23.5 | 27.3 |
| 8 | 8 | 22.5 | 28.8 |
| 9 | 2 | 30.3 | 32.1 |
| 10 | 1 | 25.8 | |
| 12 | 1 | 30.4 | |

Table A.3. Bluegill length at age in Horsehead Lake, Oneida County Wisconsin during 2010.

| Age | Number of fish | Horsehead avg. length | Northern WI avg. |
|-----|----------------|-----------------------|------------------|
| 2 | | | 3.9 |
| 3 | 3 | 3.9 | 5.0 |
| 4 | 34 | 6.0 | 6.2 |
| 5 | 22 | 6.3 | 6.8 |
| 6 | 4 | 6.9 | 7.8 |
| 7 | 2 | 7.5 | 8.2 |
| 8 | 1 | 7.1 | 8.7 |
| 9 | | | 8.7 |
| 10 | | | 9.2 |

Table A.4. Pumpkinseed length at age in Horsehead Lake, Oneida County Wisconsin during 2010.

| Age | Number of fish | Horsehead avg. length | Northern WI avg. |
|-----|----------------|-----------------------|------------------|
| 2 | | | 3.6 |
| 3 | 2 | 4.3 | 4.8 |
| 4 | 22 | 5.1 | 5.7 |
| 5 | 5 | 5.3 | 6.5 |
| 6 | 2 | 5.7 | 6.8 |
| 7 | 1 | 5.8 | 7.3 |
| 8 | | | 7.3 |

Table A.5. Hybrid bluegill x pumpkinseed length at age in Horsehead Lake, Oneida County Wisconsin during 2010.

| Age | Number of fish | Horsehead avg. length |
|-----|----------------|-----------------------|
| 3 | 3 | 4.1 |
| 4 | 16 | 4.9 |
| 5 | 18 | 6.1 |
| 6 | 15 | 6.7 |
| 7 | 11 | 6.7 |
| 8 | 5 | 6.5 |
| 9 | 1 | 7.8 |

Table A.6. Black crappie length at age in Horsehead Lake, Oneida County Wisconsin during 2010.

| Age | Number of fish | Horsehead avg. length | Northern WI avg. |
|-----|----------------|-----------------------|------------------|
| 2 | 1 | 5.1 | 5.3 |
| 3 | 4 | 6.3 | 7.1 |
| 4 | 27 | 7.1 | 9.0 |
| 5 | 16 | 8.0 | 10.0 |
| 6 | 18 | 8.7 | 10.7 |
| 7 | 3 | 10.8 | 11.6 |
| 8 | 2 | 12.0 | 11.7 |
| 9 | | | 10.4 |

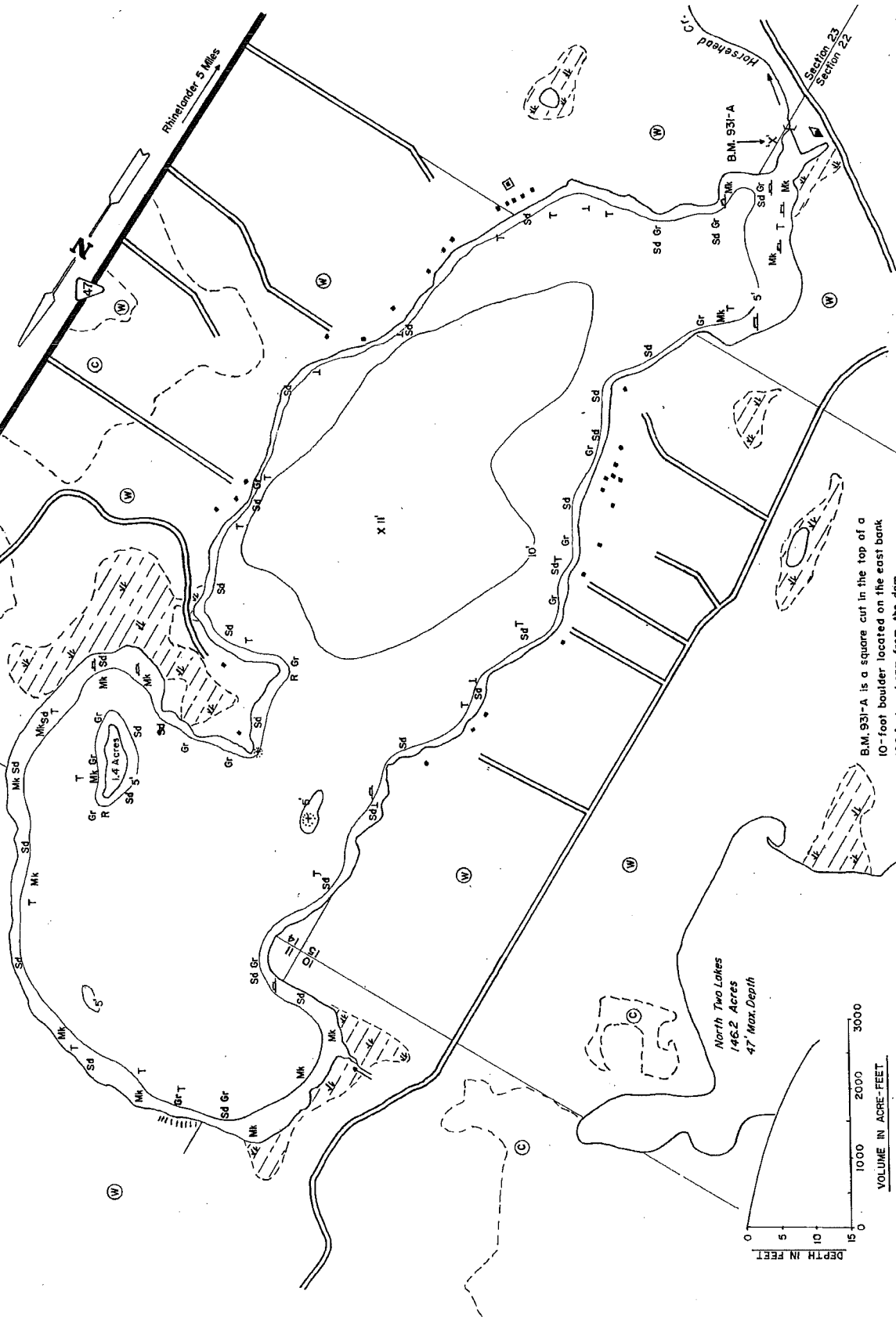
Table A.7. Yellow perch length at age in Horsehead Lake, Oneida County Wisconsin during 2010.

| Age | Number of fish | Horsehead avg. length | Northern WI avg. |
|-----|----------------|-----------------------|------------------|
| 3 | 2 | 5.7 | 6.0 |
| 4 | | | 6.9 |
| 5 | 7 | 7.5 | 7.9 |
| 6 | 8 | 7.9 | 9.0 |
| 7 | 19 | 7.7 | 9.9 |
| 8 | 12 | 8.3 | 10.8 |
| 9 | 1 | 8.8 | 12.1 |

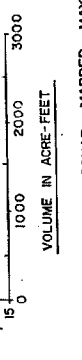
STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

LAKE SURVEY MAP

HORSEHEAD LAKE
ONEIDA COUNTY
SEC. 10, 11, 14, 15, 22, 23, T. 38, N. R. 7, E. 4



B.M. 931-A is a square cut in the top of a 10-foot boulder located on the east bank 100 feet upstream from the dam.
Elevation 1585.96'
Water Elevation 1580.64' taken 3/19/68



SPECIES OF FISH

| Species | Abundant | Common | X | % |
|-----------|----------|--------|---|---|
| Muskie | | | X | |
| Norpike | | | X | |
| Walleye | | | X | |
| S.M. Bass | | | X | |
| Panfish | | | X | |
| Trot | | | | |

EQUIPMENT RECORDING SONAR MAPPED

| Month | Year |
|-------|------|
| 1968 | |

- TOPOGRAPHIC SYMBOLS**
- Partially wooded
 - Wooded
 - Cleared
 - Pastured
 - Agricultural
 - B.M. Bench Mark
 - Dwelling
 - Resort
 - Comp.
- LAKE BOTTOM SYMBOLS**
- Peat
 - Muck
 - Clay
 - Mari
 - Sand
 - Silt
 - Gravel
 - Rubble
 - Bedrock
- 1968 YEAR**
- Boulders & Snags
 - Stumps
 - Rock danger to navigation
 - Submergent vegetation
 - Emergent vegetation
 - Floating vegetation
 - Brush shelters
- Access**
- Access with Parking
 - Boat Livery
- Drawn by: G.V. Johnson
Field work by: J. Smith, J. Jaszczak

WATER AREA 366.84 ACRES
UNDER 3 FT. 9 %
OVER 20 FT. 0 %
MAX. DEPTH 11 FEET
TOTAL ALK. 38 P.P.M.
VOLUME 2739.89 ACRE FT.
SHORELINE 4.99 MILES
WITHOUT ISL. 4.75 MILES