

Nancy Lake Fishery Survey, Washburn County, Wisconsin

2012

MWBIC 2691500



Jamison Wendel

Senior Fisheries Biologist

Wisconsin Department of Natural Resources

Northern Region – Spooner

March, 2013

Executive Summary

A comprehensive survey of Nancy Lake (Washburn County) was conducted during 2012 by the Wisconsin Department of Natural Resources. The primary objective of this study was to assess the status of the walleye population, as well as sport and tribal exploitation of walleye on Nancy Lake. Secondary objectives were to assess muskellunge, largemouth bass, northern pike, and panfish populations.

Largemouth bass catch rates in 2012 were slightly lower than surveys on comparable waterbodies. However, catch rates may have been impacted by a sudden decrease in water temperatures prior to sampling. Largemouth bass size structure was poor and growth rates were below statewide averages. The bluegill population was found to be high density with poor size structure. Northern pike size structure improved since the previous survey. The adult walleye population in Nancy Lake was too low density to calculate a population estimate in 2012. Catch rates of YOY walleye have been very low in both stocked and non-stocked year surveys. No muskellunge or smallmouth bass were captured during the 2012 survey.

Total angler effort on Nancy Lake (23.2 hours/acre) was below ceded territory averages. Over 85% of angling effort on Nancy Lake was directed at centrarchids, primarily bluegill (39%), largemouth bass (21%), black crappie (20%), and pumpkinseed (5%). Panfish species comprised most of the sport angler harvest on Nancy Lake.

Management recommendations include: 1) Monitor impacts of liberalized bass regulations on bluegill populations, 2) Maintain largemouth bass as the primary gamefish in Nancy Lake and continue with the no minimum size limit, 3) Focus walleye stocking efforts on large fingerlings and consider discontinuing walleye stocking if survival is poor, 4) Continue consumptive opportunities for northern pike, 5) Protect and enhance critical fish habitat, 6) Continue efforts to maintain and enhance habitat diversity whenever possible, and 7) Continue exotic species monitoring and control programs.

Introduction

Nancy Lake is a soft water drainage lake in northern Washburn County. The lake's shoreline is primarily privately owned and well developed. Nancy Lake is 772 acres with a maximum depth of 39 feet and mean depth of 11 feet. An unnamed, intermittent outlet on the south end of Nancy Lake drains into the Totagatic River. Invasive species present in Nancy Lake include Chinese mystery snail Bellamya chinensis, curly-leaf pondweed Potamogeton crispus, and Eurasian water-milfoil Myriophyllum spicatum.

Nancy Lake is a clear-water, mesotrophic lake. TSI is an index for evaluating trophic state or nutrient condition of lakes (Carlson 1977; Lillie et al. 1993). TSI values can be computed for water clarity (secchi disk measurements), chlorophyll-a, and total phosphorus values. TSI values represent a continuum ranging from very clear, nutrient poor water (low TSIs) to extremely productive, nutrient rich water (high TSIs). The data on Nancy Lake (WDNR (online) 2012) indicate the nutrient conditions were mesotrophic (moderate productivity) when considering secchi disk, total phosphorus and chlorophyll-a TSI indices. Between 2002 and 2012, the mean secchi TSI value was 39.73 (S.D. = 1.56) from samples taken near the deep hole of Nancy Lake.

Gamefish species present in Nancy Lake include largemouth bass Micropterus salmoides, walleye Sander vitreus and northern pike Esox lucius. Muskellunge Esox masquinongy and smallmouth bass M. dolomieu were documented in previous surveys. Panfish species include bluegill Lepomis macrochirus, black crappie Pomoxis nigromaculatus, pumpkinseed L. gibbosus, yellow perch Perca flavescens, and rock bass Ambloplites rupestris. Other species common in Nancy Lake include bowfin Amia calva, white sucker Catostomus commersoni, and brook silverside Labidesthes sicculus.

Recent fisheries management activities on Nancy Lake have focused on fish stocking and sport angler regulations. Since 1997, walleye have been the only fish species stocked into Nancy Lake (Appendix Table 1). During this survey, all of the standard statewide fishing

regulations applied to Nancy Lake, except for an 18 in minimum size limit on walleye and no minimum length limit on black bass (Appendix Table 2). Rock spawning reefs were placed along the shoreline in 1998 with the goal of improving natural reproduction of walleye.

Numerous surveys primarily targeting walleyes have been conducted by Wisconsin DNR and Great Lakes Indian Fish and Wildlife Commission in recent years. Since 1990, 21 fall surveys assessing juvenile walleye recruitment have been conducted on Nancy Lake by either Great Lakes Indian Fish or Wildlife Commission or Wisconsin Department of Natural Resources staff. The only years Nancy Lake was not assessed for juvenile walleye recruitment were 2008 and 2010. More comprehensive surveys were conducted in 1993 and 1998. The primary objective of this study was to assess the status of the walleye population, as well as sport and tribal exploitation of walleye on Nancy Lake. Secondary objectives were to assess muskellunge, largemouth bass, northern pike, and panfish populations.

Methods

Nancy Lake was surveyed during 2012-2013 following the Wisconsin Department of Natural Resources treaty assessment protocol (Cichosz 2010). Spring sampling utilized fyke nets and electrofishing to assess gamefish and panfish populations. Beginning with the gamefishing opener in May, 2012, a creel survey (both open water and ice) was conducted. Summer mini-fyke netting was used to sample juvenile and nongame fish species. Fall electrofishing targeted young of year (YOY) walleye.

The first phase of the survey was initiated soon after ice out with fyke nets (4 x 5 ft frame) set on 22 March. Nets were checked daily and set at areas expected to contain high concentrations of spawning northern pike and walleye. Nets were removed on 30 March, with a total effort of 76 net nights. After removal of nets, the entire shoreline of Nancy Lake was sampled with an electrofishing boat on 30 March for the adult walleye recapture run.

Sampling targeting largemouth bass and panfish was conducted on 30 May. Largemouth bass were sampled over three, two-mile index stations. A 1/2 mile index station was embedded in each station where panfish were collected in addition to bass.

All walleyes, northern pike, and largemouth bass captured during the spring portion of the survey were measured to the nearest 0.5 in and given the appropriate fin clip (Appendix Table 3). Sex was determined for walleyes and northern pike by the presence of gametes.

Four mini-fyke nets (3 x 3 ft frame) were set on 20 August and run for one night. Juvenile and nongame fish species were targeted during this survey. Exclusion panels on the front frame of the nets were used to exclude larger fish and turtles. Minifyke netting surveys were also conducted in 1998 and 2004.

The final component of the on-the-water sampling consisted of a fall electrofishing run on 17 September. During this survey, only walleye <12.0 in and muskellunge <20.0 in were targeted and collected over the entire shoreline.

For age analysis, scale samples were removed from walleyes and largemouth bass less than 12 in, while dorsal spines were removed from larger walleyes and largemouth bass. Age interpretations on northern pike were not conducted due to the unreliability and difficulty of determining annuli. Casselman (1990) attributed this to irregular growth and resorption or erosion on the midlateral region. Mean length-at-age comparisons were made to regional (18 county Northern Region) and statewide data using the WDNR Fish and Habitat statewide database.

Size structure quality of species sampled was determined using the indices proportional (PSD) and relative (RSD) stock densities (Anderson and Gutreuter 1983). The PSD and RSD value for a species is the number of fish of a specified length and longer divided by the number of fish of stock length or longer, the result multiplied by 100 (Appendix Table 4).

Catch per Unit Effort (CPE) was calculated as the number of fish captured above stock, preferred, and quality sizes divided by the appropriate unit of sampling effort for that species.

That value is then compared to surveys of similar waterbodies throughout Wisconsin using the Fisheries Assessment Classification Tool (FACT) to determine how that value compares to other fisheries. For example, in Table 1, CPE8 was calculated by dividing the number of largemouth greater than 8 in captured during late spring electrofishing by the number of miles surveyed (15.3 fish/mile). This value exceeded 42 percent of surveys of similar waterbodies in Wisconsin.

Creel survey data were collected on Nancy Lake beginning the first Saturday in May and continuing through 03 March of the following year (the open season for gamefish angling in Wisconsin). No creel survey data were collected during November because thin ice created dangerous fishing conditions. Creel survey methods followed a stratified random design as described by Rasmussen et al. (1998) and Cichosz (2010). Walleye exploitation rates were calculated using the proportion of fin clipped walleye (from spring population estimates) observed and measured during the creel survey.

Results

Panfish. A total of 332 bluegills (mean length = 4.9 in, S.D. = 1.7) were captured during the 30 May sampling on Nancy Lake (Figure 1). This catch rate of 221 bluegill/mile was greater than 84% of similar surveys of Wisconsin waterbodies. The PSD value of 37 was greater than 2% of statewide surveys.

Black crappies captured during fyke netting on March 26 were measured to establish a length frequency. Fish ranged from 3.1 to 12.8 in (Figure 2), with a mean length of 6.7 in (S.D. = 2.4).

Largemouth bass. The mean length of largemouth bass collected during the 30 May 2012 survey on Nancy Lake was 10.1 in (S.D. = 2.8), with a range of 3.7-19.6 in (Figure 3). A total of 92 largemouth bass \geq 8.0 in (15.3/mile) were collected during that survey, which was greater than 42% of surveys in Wisconsin (FACT). Largemouth bass collected during fall surveys have shown a significant increase for both CPE8 and CPE15 (Figure 4). PSD and RSD-14 values in 2012 were similar to previous surveys (Table 1). Largemouth bass growth rates were below both the 1998 survey and statewide averages (Figure 5).

Northern pike. A total of 153 northern pike, ranging in length from 6.9-36.0 in were captured during 2012 spring fyke netting surveys (Figure 6). Mean lengths of male and female northern pike captured in 2012 were 17.4 in (S.D. = 2.2) and 22.9 in (S.D. = 5.2), respectively. PSD and RSDP values for northern pike sampled during spring netting were both higher in 2012 than in the 1998 survey (Table 2). Though calculated from a relatively small sample, catch rates in 2012 were higher for all northern pike size classes than in the 1998 survey (Table 2).

Walleye. A total of 37 adult walleyes were captured during the 2012 spring survey on Nancy Lake. As no walleye were captured during the electrofishing recapture run, a population estimate was not calculated. Adult walleyes captured in the spring 2012 survey ranged from 18.5 to 28.9 in (Figure 7). Mean lengths of male and female walleyes were 18.7 (S.D. = 0.6) and 24.3 in (S.D. = 2.3), respectively. All adult walleyes captured in the 2012 survey were

longer than the 18 in minimum size limit. Modal length of adult walleyes increased from 14 in to 22 in during the 1998 and 2012 surveys, respectively (Figure 8). The proportional stock density (PSD) and relative stock density of preferred size (RSDP) walleyes captured during spring fyke netting was 100 and 83.7, respectively. Compared to similar Wisconsin waterbodies (FACT), these values exceeded 99% of surveys for both PSD and RSDP. Growth rates for female walleyes on Nancy Lake exceeded regional averages (Figure 9). All male walleyes captured on Nancy Lake were assessed to be six years old.

The average catch rate of Young of Year (YOY) walleye in surveys conducted by both Great Lakes Indian Fish and Wildlife Commission and Wisconsin DNR crews between 1990 and 2012 was 5.5 fish/mile (S.D. = 9.0, N = 21; (Figure 10)). YOY catch rates in years with no walleye stocking averaged 2.7 fish/mile (S.D. = 6.4, N = 8) compared to 7.3 fish/mile (S.D. = 10.2, N = 13) in years where small fingerling walleyes were stocked. Catch rates of walleye less than 10 in averaged 1.0 fish/mile from 2000-2012, greater than 14% of similar surveys statewide (FACT).

Muskellunge. No muskellunge were collected during the 2012 survey on Nancy Lake.

Smallmouth bass. No smallmouth bass were collected during the 2012 survey of Nancy Lake.

Nongame fish. A total of 8 fish species were captured during the 2012 mini fyke netting survey (Figure 11). Largemouth bass and brook silverside were the primary species sampled. Catch rates of all species except largemouth bass were much lower than in the 1998 and 2004 surveys.

Angler Survey. Total projected angling effort on Nancy Lake during the 2012-2013 season was estimated at 17,944 hours (23.2 hours/acre). This was lower than mean angling effort in the ceded territory (32.4 hours/acre). Open water anglers accounted for 82% of the total effort on Nancy Lake in 2012-2013. The majority of angling effort on Nancy Lake was directed at bluegill (39%), largemouth bass (21%), black crappie (20%), and northern pike (9%). Bluegill had the

highest estimated sport angler harvest of any species on Nancy Lake (Table 3). With no documented walleye harvested during the creel survey, estimated exploitation was 0%.

Discussion

The sport fishery of Nancy Lake has undergone substantial changes in the past 40 years. A 1976 survey (Johannes 1978) found walleye as the most abundant gamefish species followed by northern pike, largemouth bass, and smallmouth bass. Also, a 1965 survey found high density walleye and panfish populations (Johannes 1978). Since those surveys, largemouth bass have steadily increased in numbers while walleye densities have declined. Currently, the sport fishery is dominated by centrarchid species with very low numbers of percids and esocids. For example, in the 2012-2013 angler survey, centrarchid species comprised over 99% of the estimated harvest. Shifts in species abundance towards increasing centrarchid abundance and stable or decreasing percid abundance have been observed on other regional lakes (Benike 2005a; Benike 2005b, Benike 2005c, Benike 2006, Toshner 2009, Benike 2010).

In 2005, the standard statewide 14 in minimum size limit for black bass was replaced with a no minimum size limit on Nancy Lake. The intent of this regulation change was to improve largemouth bass size structure and allow higher levels of walleye natural reproduction. Largemouth bass catch rates in 2012 were lower than in the previous spring survey in 1998. However, catch rates in 2012 may have been impacted by a sudden decrease in water temperatures prior to the electrofishing survey. Fall electrofishing surveys show no reductions in catch rates up to the most recent fall survey collecting largemouth bass in 2010.

The majority of angler effort on Nancy Lake was directed towards panfish, particularly bluegill, black crappie, and pumpkinseed. Bluegill catch rates during the spring 2012 survey far exceeded statewide averages for similar waterbodies. Though comparable creel statistics were not available for panfish, catch and harvest rates were higher than other area lakes with recent

creel surveys such as Lipsett Lake, Burnett County (Damman 2008) and Wapogasset Lake, Polk County (Benike 2009).

Impacts of liberalized black bass regulations should also examine impacts to bluegill populations. Largemouth bass CPE has been found to be positively correlated with bluegill PSD (Guy and Wills 1990). Also, Gabelhouse (1987) found largemouth bass PSD values between 20-40 maximized production of large bluegill.

Good to excellent natural reproduction supports all fish communities in Nancy Lake except walleye. Catch rates of YOY walleye have been low both in non-stocked years and when small fingerlings were stocked. Years where small fingerling walleyes were stocked had higher catch rates for YOY walleye but still at relatively low levels.

Any walleye stocking efforts by the Wisconsin DNR should be directed towards re-establishing a self-sustaining population in Nancy Lake. Given the poor survival of small fingerling walleyes, future efforts should be focused on stocking of large fingerling walleye that may have greater survival than small fingerlings (Kampa and Hatzenbeler 2009). To evaluate survival of large fingerlings, fall electrofishing surveys should be conducted in the year after the stocking occurred. If mean catch rates of yearling walleye do not exceed 6 fish/mile after at least two of these surveys, stocking by the Wisconsin DNR should be discontinued.

Nancy Lake has had an 18 in minimum length limit for walleye since 2011. With no adult walleyes less than 18 inches captured, the regulation is likely providing very little additional protection to adult walleye than the statewide standard minimum length of 15 in. However, the regulation does protect juvenile walleyes to maturity and should be retained until the fishery becomes self-sustaining.

Muskellunge were introduced into Nancy Lake in 1984, 1987, and 1990 as part of a research project assessing performance of Leech Lake strain muskellunge in Wisconsin (Margenau and Hanson 1997). Currently, muskellunge appear to be at extremely low densities or absent from Nancy Lake as no fish were captured during the field survey and no fish reported

caught by anglers during the creel survey. Poor survival and growth of stocked muskellunge have been found in centrarchid-dominated communities (Wahl 1999). Also, adult white sucker densities have been positively correlated to muskellunge growth (Hanson 1986). Though white sucker densities on Nancy Lake appeared to be high in the 1990s (Margenau and Hanson 1997), few fish were observed during 2012 sampling. Therefore, it is not recommended that a muskellunge stocking program be re-established on Nancy Lake.

Northern pike size structure and catch rates improved since the previous assessment in 1998. Nancy Lake lacks deep, cool water that has been found to allow growth and survival of large northern pike (Jacobson 1992). Also, optimal prey items for trophy northern pike such as cisco Coregonus artedi (Colby et al. 1987), medium size yellow perch (Margenau et al. 1998), and white sucker (Jacobson 1992) may be limited in Nancy Lake. Cisco are not known to be present in Nancy Lake. Also, few yellow perch or white sucker were captured either in the 2012 spring survey or by sport anglers in the 2012-2013 creel survey.

Conclusions and Management Recommendations

1. The popular bluegill fishery on Nancy Lake supports high catch and harvest rates. Potential impact to the bluegill population with decreasing largemouth bass densities should be evaluated.
2. Largemouth bass are the primary gamefish on Nancy Lake. The no minimum length limit provides increased angler harvest opportunity for this high density population and should be continued.
3. After years of very low levels of natural reproduction and poor survival of stocked small fingerlings, the walleye population on Nancy Lake is at extremely low levels. Stocking should focus on large fingerlings with a goal of re-establishing a self-sustaining population. Walleye stocking should discontinued if catch rates of yearling walleyes do

not exceed 6 fish/mile in at least two fall surveys in the year after stocking of large fingerlings.

4. Northern pike densities are at moderate levels and should provide good consumptive opportunities for anglers. Numbers of very large fish may be limited by lack of optimal prey items such as cisco, yellow perch, and white sucker.
5. Critical fish habitat in Nancy Lake needs to be protected and enhanced where possible. Efforts should be made to work with the Nancy Lake Association and local angler groups stressing the importance of protecting critical habitat and water quality.
6. Efforts to increase habitat complexity in Nancy Lake should be strongly encouraged. Input of coarse woody debris, protection of aquatic vegetation, and maintenance or restoration of 35 foot vegetative buffers are some examples of work that can increase habitat complexity.
7. Exotic species monitoring and control programs should continue. Efforts to keep aquatic invasive species out of a waterbody are much more effective than controlling these species once they are established.

Acknowledgements

I would like to thank Kent Bass and Eric Berge, who conducted the field work, aged fish, and entered data during this study. The WDNR treaty assessment unit, particularly Todd Brecka, Gene Hatzenbeler, Marty Kangas, Mike Keniry, Misty Rood, and Jill Sunderland for data collection and entry of both field and creel survey information. Terry Margenau provided a critical review of the manuscript.

Literature Cited

- Anderson, R. O., and S. J. Gutreuter. 1983. Length, weight, and associated structural indices. Pages 283-300 in L. Nielson and D. Johnson, editors. Fisheries Techniques. American Fisheries Society, Bethesda, Maryland.
- Benike, H. 2005a. Changes in the Gamefish Community of a Small Northwestern Wisconsin Lake Over a 25-Year Period, Ward Lake, Polk County, Wisconsin, Wisconsin Department of Natural Resources, Internal Fisheries Management Report. Barron Field Office.
- Benike, H. 2005b. Treaty Assessment Survey, Half Moon Lake, Polk County, Wisconsin 2001. Wisconsin Department of Natural Resources, Internal Fisheries Management Report, Barron Field Office.
- Benike, H. 2005c. Treaty Assessment Survey, Big Butternut Lake, Polk County Wisconsin 2003. Wisconsin Department of Natural Resources, Internal Fisheries Management Report, Barron Field Office.
- Benike, H. 2006. Treaty Assessment Survey, Lower Turtle Lake, Barron County Wisconsin 2004. Wisconsin Department of Natural Resources, Internal Fisheries Management Report, Barron Field Office.
- Benike, H.M. 2009. Wapogasset and Bear Trap Lakes, Treaty Assessment survey, Polk County, Wisconsin 2007-2008 (MWBIC: 2618000; 2618100). Wisconsin Department of Natural Resources, Internal Fisheries Management Report. Barron Field Office.
- Benike, H. 2010. Balsam Lake Treaty Assessment Survey, Polk County, Wisconsin. Wisconsin Department of Natural Resources, Internal Fisheries Management Report, Barron Field Office.
- Carlson, R. 1977. A trophic state index for lakes. Limnology and Oceanography 22(2):361-369.

- Casselman, J.M. 1990. Growth and relative size of calcified structures of fish. *Transactions of the American Fisheries Society* 119:673-688.
- Cichosz, T.A. 2010. 2007-2008 Ceded territory fishery assessment report. Wisconsin Department of Natural Resources. Administrative Report 65, Madison.
- Colby, P.J., R.A. Ryan, D.H. Schupp, and S.L. Serns. 1987. Interactions of north-temperate lake fish communities. *Canadian Journal of Fisheries and Aquatic Sciences* 44:104-128.
- Damman, L. 2008. Summary of fisheries surveys, Lipsett Lake, Burnett County, 1990-2007, WBIC Code (Lipsett Lake – 2678100). Wisconsin Department of Natural Resources, Internal Fisheries Management Report. Spooner Field Office.
- Gabelhouse, D.W. 1987. Responses of largemouth bass and bluegills to removal of surplus largemouth bass from a Kansas pond. *North American Journal of Fisheries Management* 7:81-90.
- Guy, C.S., and D.W. Willis. 1990. Structural relationships of largemouth bass and bluegill populations in South Dakota ponds. *North American Journal of Fisheries Management* 10:338-343.
- Hanson, D.A. 1986. Population characteristics and angler use of muskellunge in eight northern Wisconsin Lakes. Pages 238-248 *in* G. E. Hall, editor. *Managing muskies*. American Fisheries Society, Special Publication 15, Bethesda, Maryland.
- Jacobson, P.C. 1992. Analysis of factors affecting growth of northern pike in Minnesota. Minnesota Department of Natural Resources, Section of Fisheries, Investigational Report 424.
- Johannes, S.J. 1978. Fish management project evaluation survey – Nancy Lake, Washburn County. Wisconsin Department of Natural Resources, Internal Fisheries Management Report, Spooner Field Office.

- Kampa, J.M., and G.R. Hatzenbeler. 2009. Survival and growth of walleye fingerlings stocked at two sizes in 24 Wisconsin lakes. *North American Journal of Fisheries Management* 29:996-1000.
- Lillie, R.A., S. Graham, and P. Rasmussen. 1993. Trophic state index equations and regional predictive equations for Wisconsin lakes. Bureau of Research – Wisconsin Department of Natural Resources, Research Management Findings, Number 35.
- Margenau, T.L., and D.A. Hanson. 1997. Performance of Leech Lake, Minnesota, muskellunge in a Wisconsin lake. Wisconsin Department of Natural Resources, Research Report 175, Spooner Office.
- Margenau, T.L., 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.
- Rasmussen, P. W., M. D. Staggs, T. D. Beard, Jr., and S. P. Newman. 1998. Bias and confidence interval coverage of creel survey estimators evaluated by simulation. *Transactions of the American Fisheries Society* 127:469-480.
- Toshner, S. 2009. Fishery Survey – Lake Owen, Bayfield County, 2007-2008, WBIC Code 2900200. Wisconsin Department of Natural Resources, Internal Fisheries Management Report. Brule Field Office.
- Wahl, D.H. 1999. An ecological context for evaluating the factors influencing muskellunge stocking success. *North American Journal of Fisheries Management* 19:238-248.
- WDNR (online) 2012. Citizen monitoring lake water quality database. Available from: <http://dnr.wi.gov/lakes/CLMN/about.html>.

Table 1. Largemouth bass PSD and RSDP values and catches per mile from fish collected during spring electrofishing assessments on Nancy Lake, Washburn County. CPEx was calculated as the number of fish captured above stock, preferred, and quality sizes divided by the number of miles sampled during the survey. The numbers in parentheses refers to the percentage of surveys of similar waterbodies in Wisconsin below the value for that survey as calculated from the FACT database. Distance surveyed was not recorded for the 1993 survey.

Parameter	2012	1998	1993
PSD (percentile)	29.3 (1)	25.5 (1)	18.4 (1)
RSD14 (percentile)	4.3 (7)	5.5 (7)	5.1 (7)
CPE8 (percentile)	15.3 (42)	29.7 (70)	
CPE12 (percentile)	4.5 (38)	7.6 (52)	
CPE15 (percentile)	0.5 (14)	0.8 (20)	

Table 2. Northern pike PSD and RSDP values and catches per net night from fish collected during spring spawning population assessments on Nancy Lake, Washburn County. Only fish captured during spring fyke netting were included in analyses. CPEx was calculated as the number of fish captured above stock, preferred, and quality sizes divided by the number of net nights for the survey.

Parameter	2012	1998
PSD	32	25
RSDP	11	5
CPE14	1.92	1.59
CPE21	0.62	0.39
CPE28	0.21	0.07

Table 3. Summary of effort, catch, harvest, and mean length statistics for Nancy Lake, Washburn County, Wisconsin, 2012-2013.

	Bluegill	Largemouth Bass	Black Crappie	Northern Pike	Rock Bass	Muskellunge	Walleye
Directed Effort (Hours)	10,800	5,843	5,406	2,507	673	435	160
Directed Effort/Acre	14.0	7.6	7.0	3.2	0.9	0.6	0.2
Projected Catch (# of fish)	55,402	7,775	10,575	2,668	1,210	0	10
Catch/Acre	71.8	10.1	13.7	3.5	1.6	0.0	0.0
Specific Catch Rate (Fish/Hour)	5.05	0.93	1.90	0.56	0.52	0.00	0.06
Projected Harvest (# of fish)	17,751	1,915	5,684	189	238	0	0
Harvest/Acre	23.0	2.5	7.4	0.2	0.3	0.0	0.0
Specific Harvest Rate (Fish/Hour)	1.63	0.26	1.03	0.07	0.26	0.00	0.00
Mean Length (in)	7.7	13.0	9.7	20.9	8.2	NA	NA

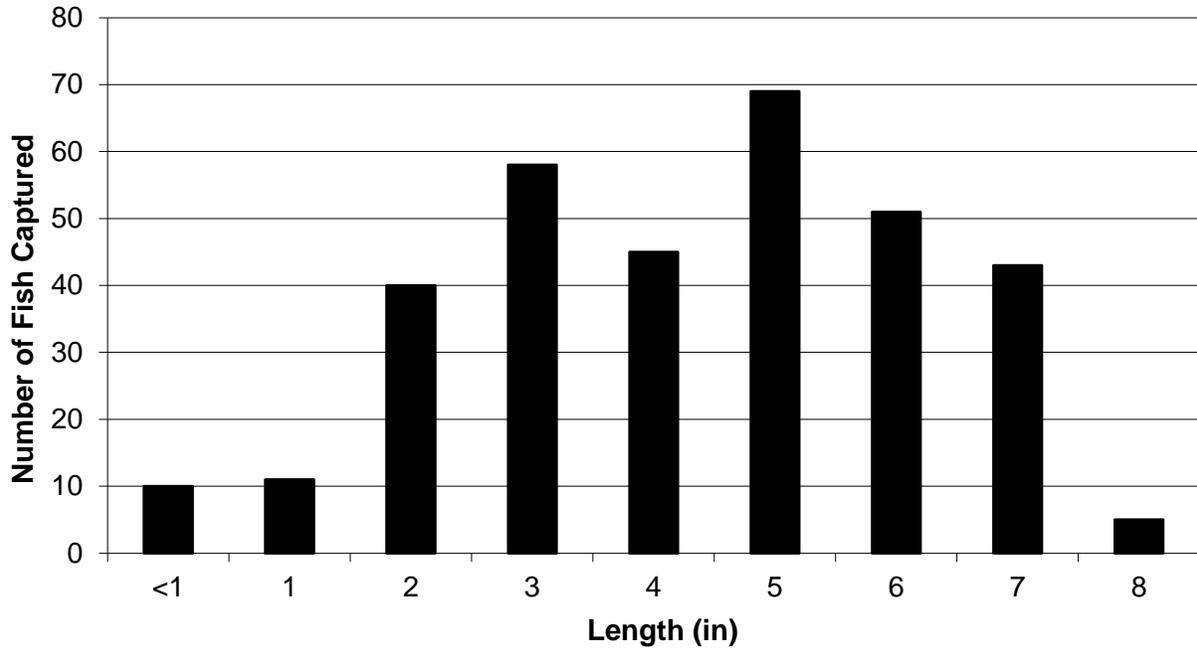


Figure 1. Length frequency of bluegill captured during spring 2012 surveys on Nancy Lake, Washburn County, Wisconsin (n=332).

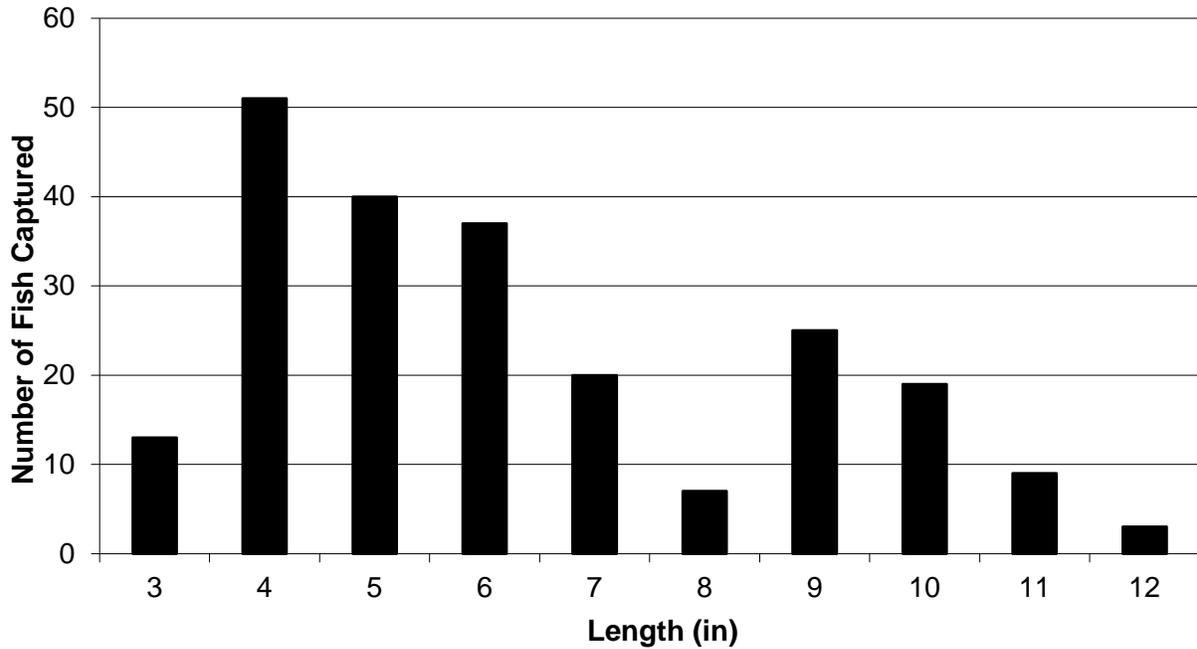


Figure 2. Length frequency of black crappie captured during spring 2012 surveys on Nancy Lake, Washburn County, Wisconsin (n=224).

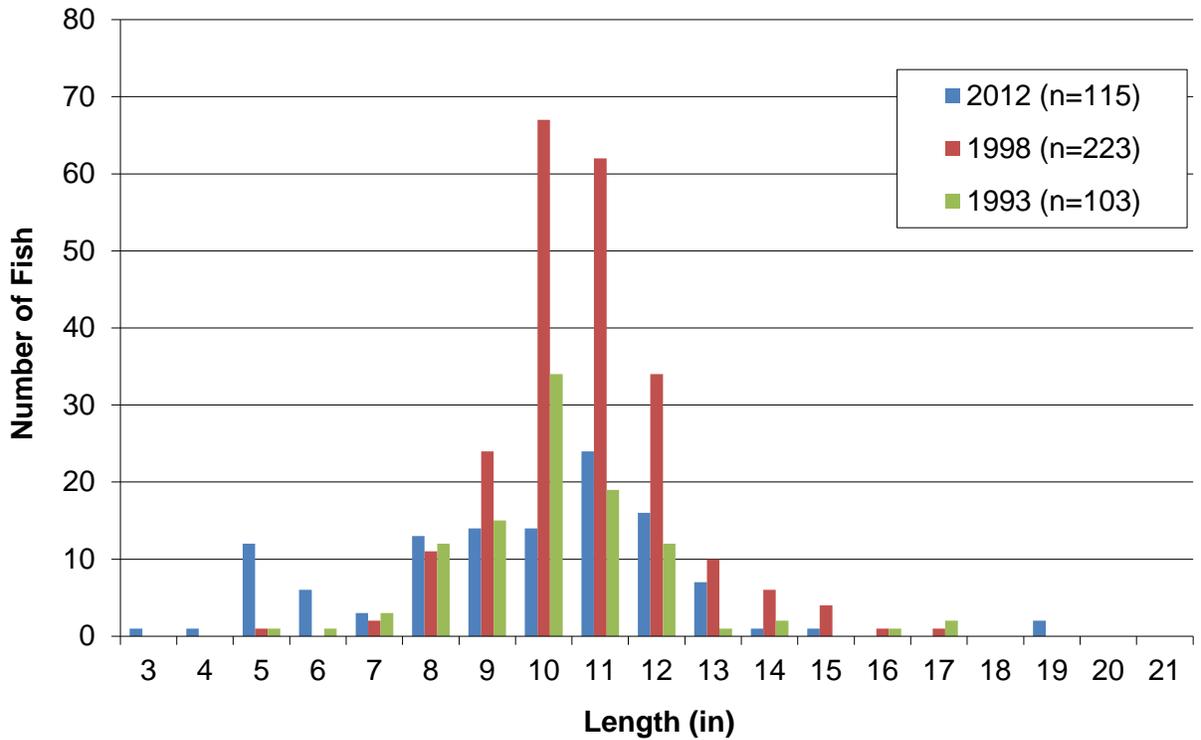


Figure 3. Length frequency of largemouth bass captured in Nancy Lake, Washburn County, Wisconsin, in spring 2012, 1998, and 1993 surveys.

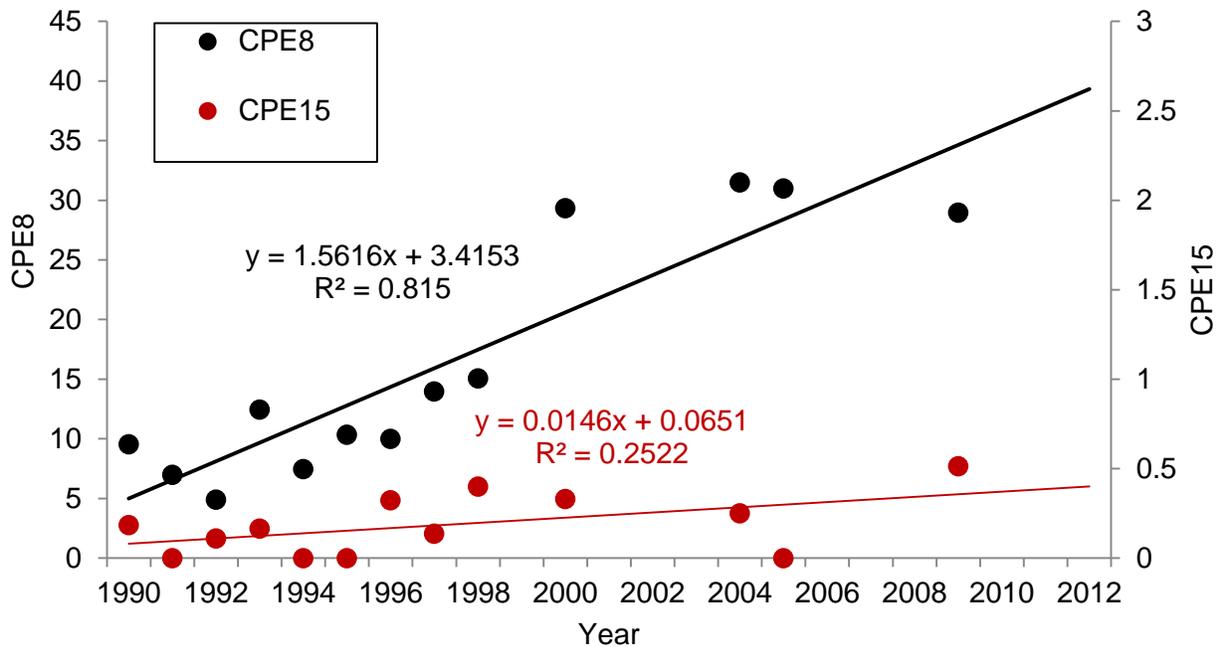


Figure 4. Largemouth bass relative abundance as determined by fall electrofishing surveys on Nancy Lake, Washburn County, Wisconsin.

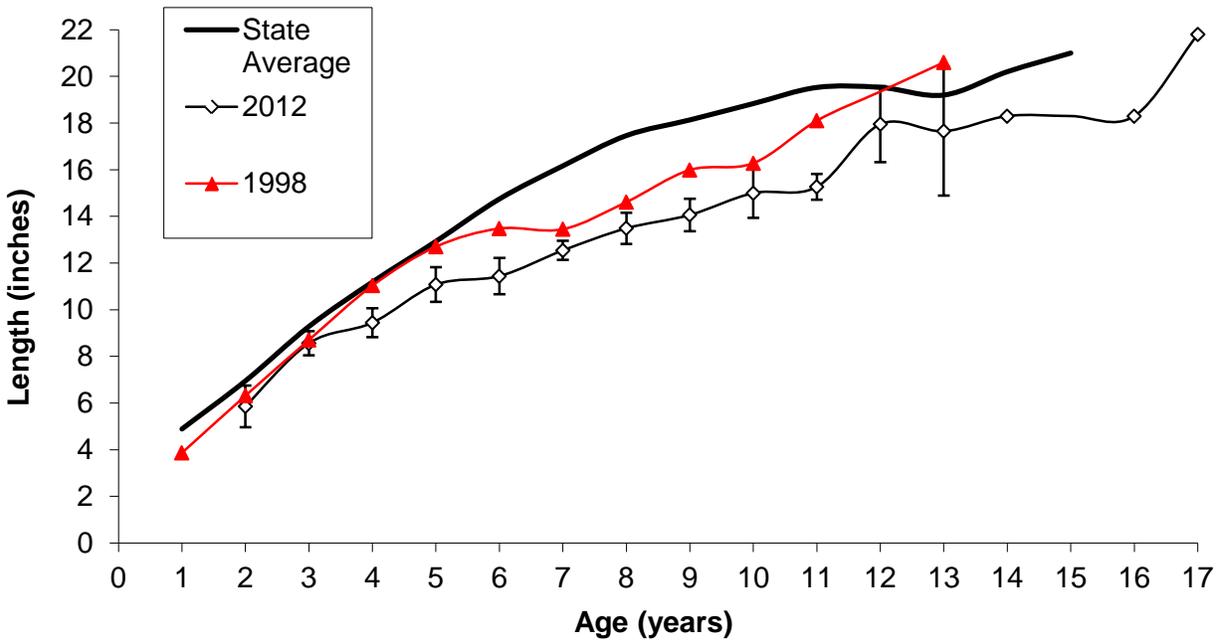


Figure 5. Mean lengths at age (\pm one standard deviation) for largemouth bass captured during spring surveys on Nancy Lake, Washburn County, Wisconsin. Statewide averages are displayed for comparison.

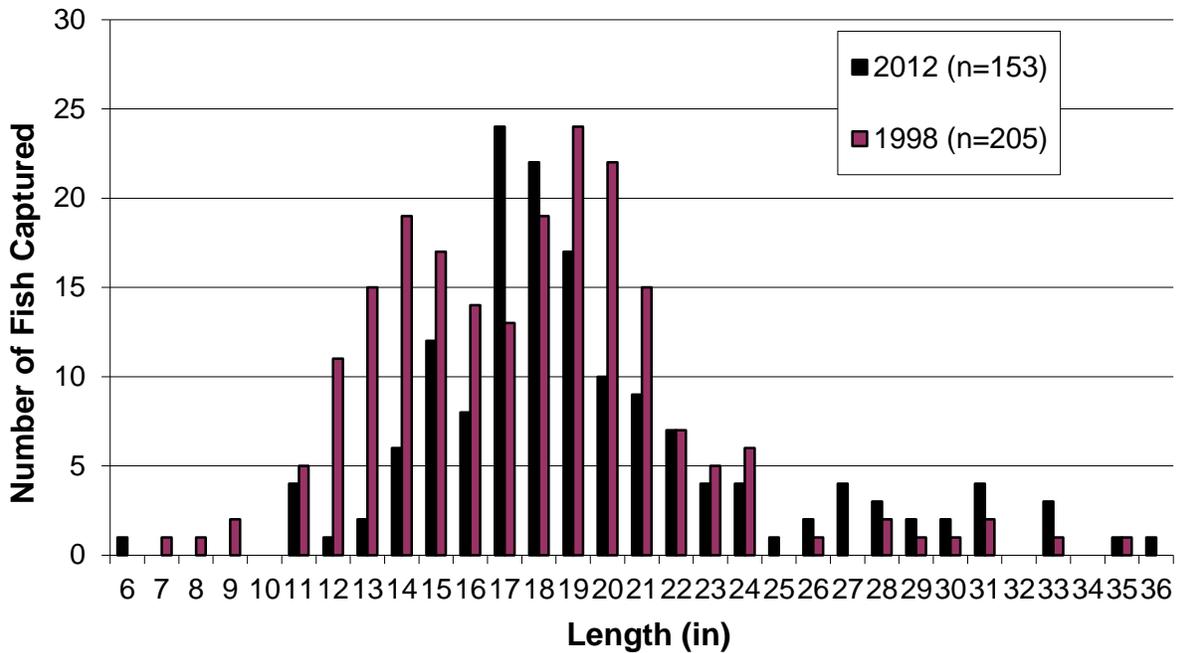


Figure 6. Length frequency of northern pike captured in Nancy Lake, Washburn County, Wisconsin, in spring in 2012 and 1998 surveys.

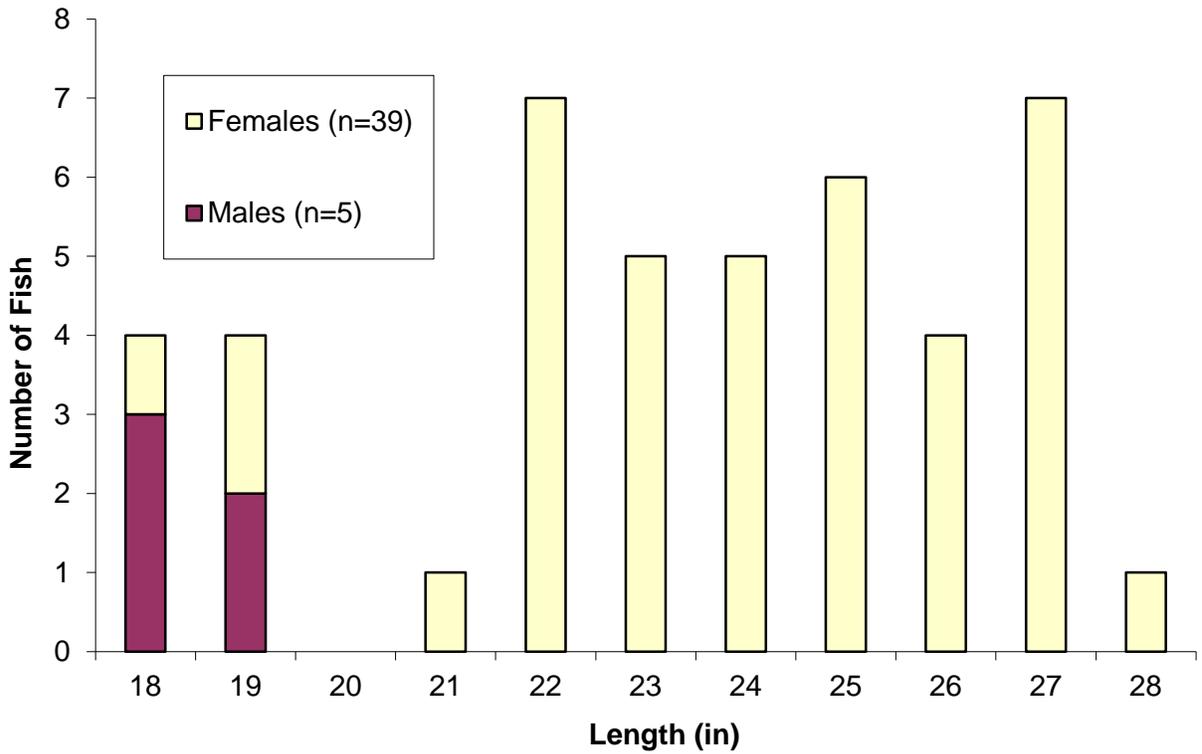


Figure 7. Length frequencies of adult walleyes captured during spring 2012 sampling on Nancy Lake, Washburn County, Wisconsin (n=44).

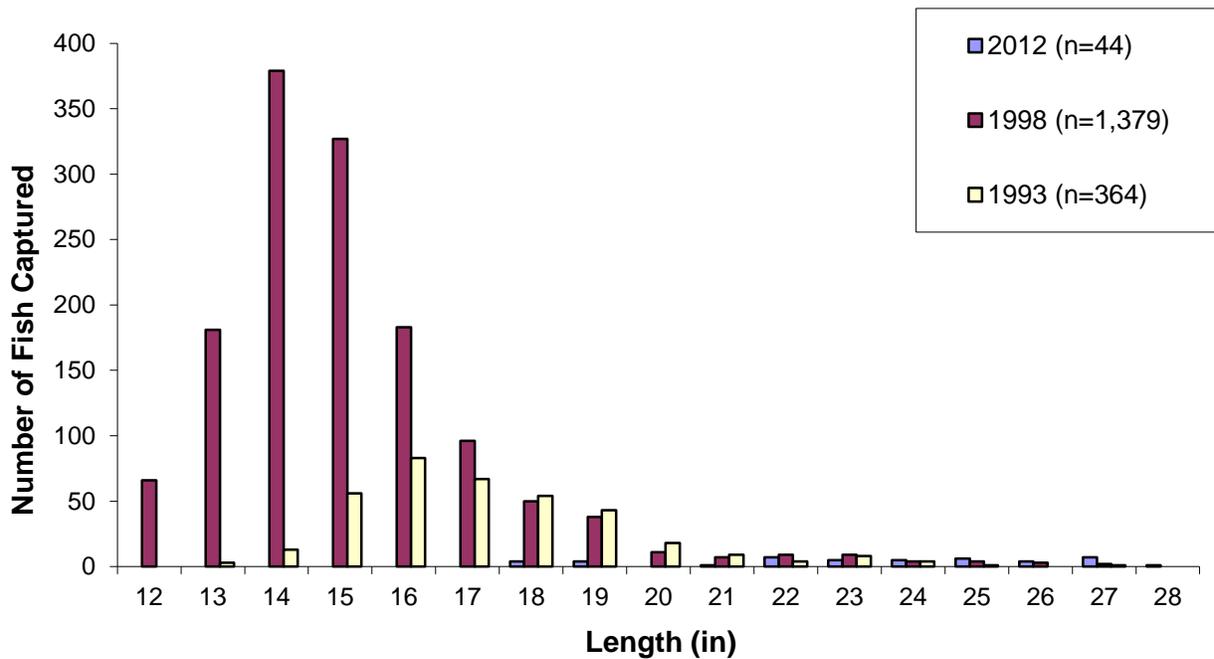


Figure 8. Length frequencies of spawning walleyes captured during spring 2012, 1998, and 1993 surveys on Nancy Lake, Washburn County, Wisconsin.

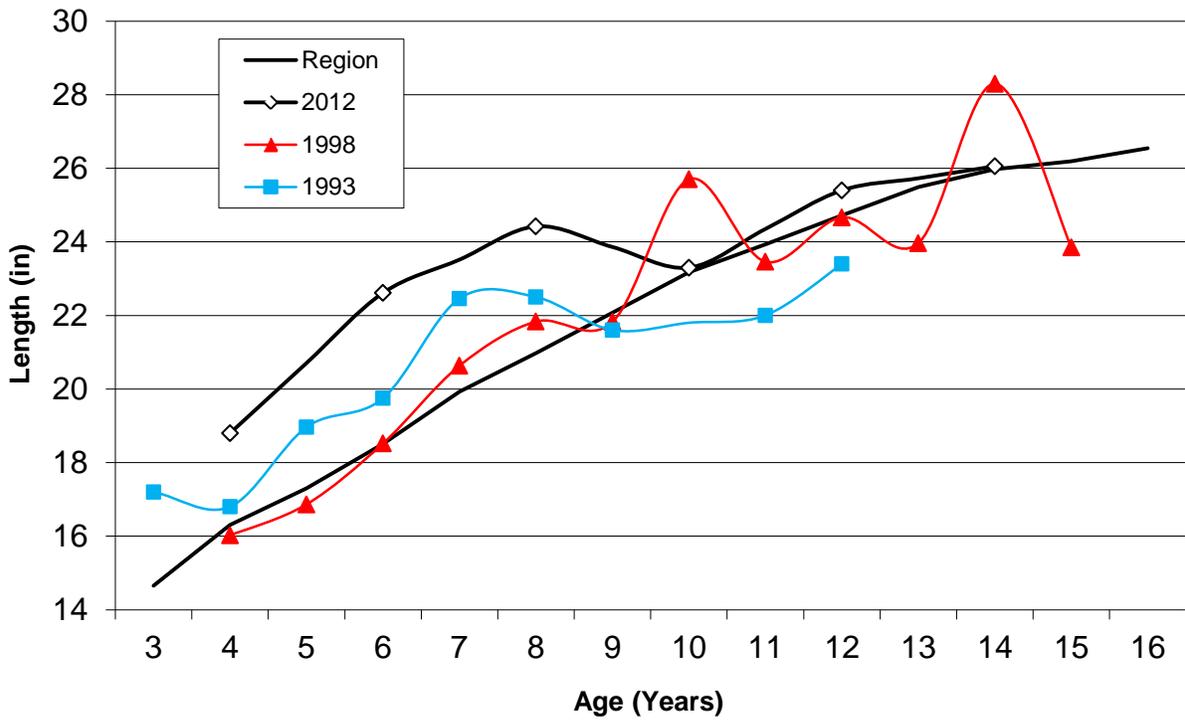


Figure 9. Mean lengths at age for female walleyes captured during spring surveys on Nancy Lake, Washburn County, Wisconsin. Regional averages are displayed for comparison.

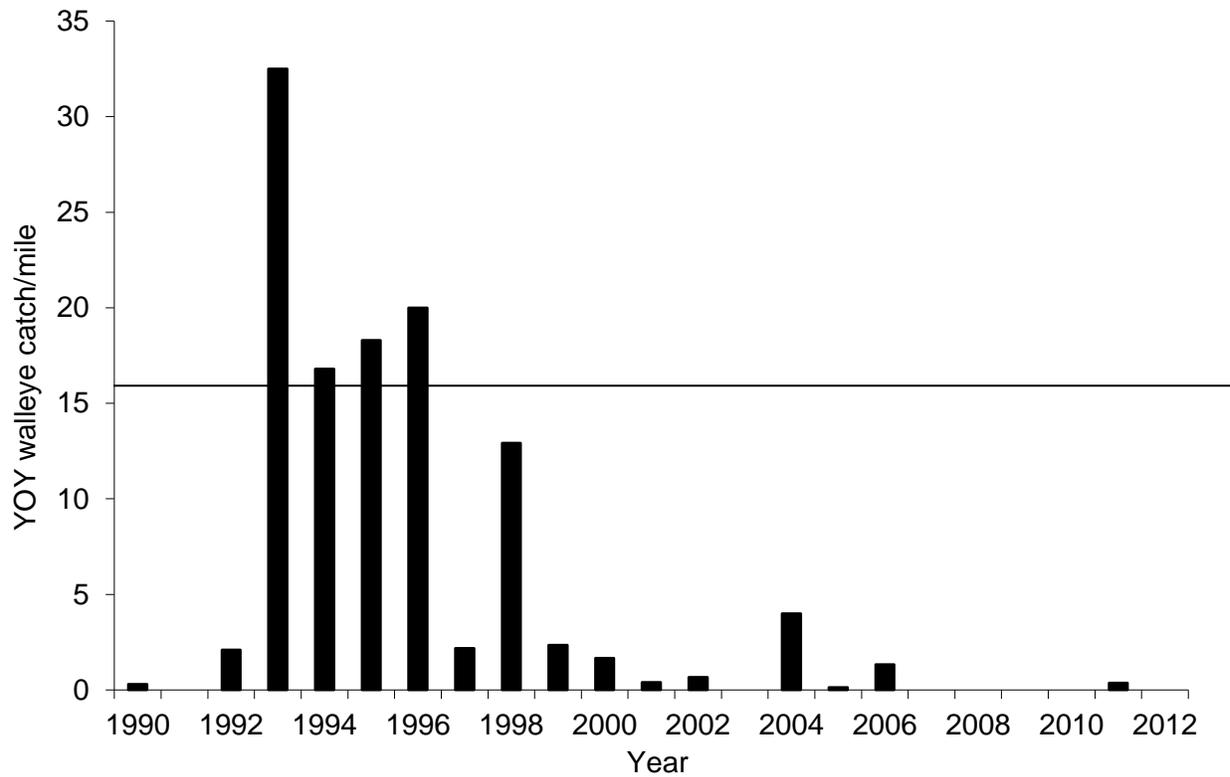


Figure 10. Young of year (YOY) walleye relative abundance as determined by fall electrofishing surveys on Nancy Lake, Washburn County, Wisconsin. The solid horizontal line indicates the modal catch of 16 YOY walleye per mile in northern Wisconsin lakes supported by natural reproduction. Fall surveys were not conducted on Nancy Lake in 2008 and 2010.

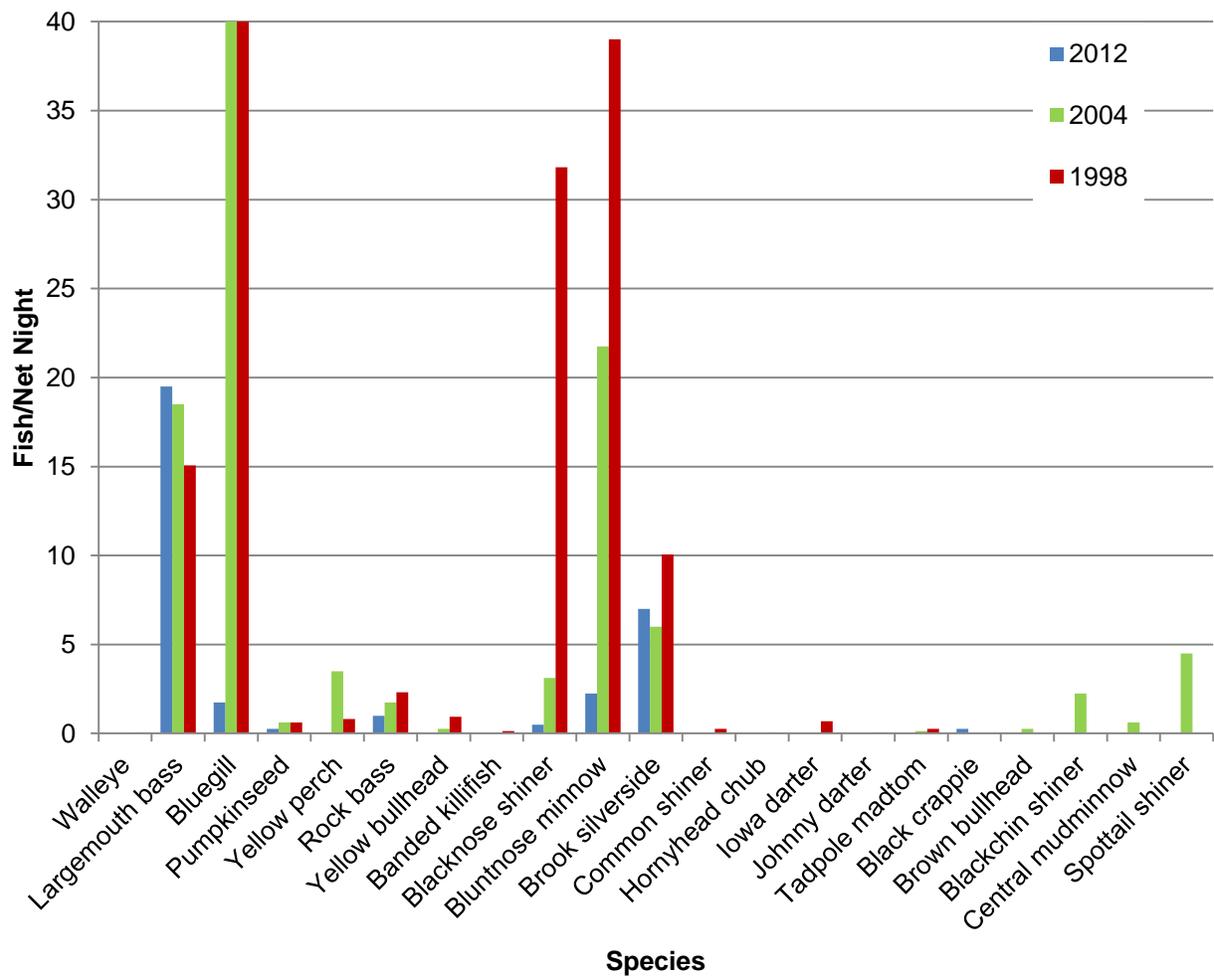


Figure 11. Number of fish captured per net night during summer mini fyke net sampling of Nancy Lake, Washburn County, Wisconsin in 1998, 2004, and 2012. Catch rate for bluegill in 1998 and 2004 was 266 fish/net night and 93.75 fish/net night, respectively.

Appendix Table 1. Fish stocking records for Nancy Lake, Washburn County, Wisconsin, since 1998.

Year	Species	Number Fish Stocked	Mean Fish Length (in)
1998	Walleye	38,600	2
2000	Walleye	52,772	2
2002	Walleye	38,595	1
2004	Walleye	62,333	2
2005	Walleye	32,397	2
2006	Walleye	33,881	2
2008	Walleye	27,061	1
2011	Walleye	16,041	2
2012	Walleye	7,720	8

Appendix Table 2. General Fishing Regulations for Nancy Lake, Washburn County, Wisconsin, in 2012.

Fish Species	Open Season	Daily Limit	Minimum Length
Walleye	May 05-March 03	2	18"
Largemouth and Smallmouth Bass	June 16-March 03	5	NONE
Muskellunge	May 26-November 30	1	40"
Northern Pike	May 05-March 03	5	NONE
Panfish	Open Season Year Round	25	NONE

Appendix Table 3. Size cutoffs used to determine whether primary or secondary fin clips should be applied to gamefish when gender could not be determined.

Fish Species	Primary Fin Clip	Secondary Fin Clip
Walleye	≥15 in	≥ 7" < 15" (TC Clip)
Bass	≥8 in	< 8" (TC Clip)
Muskellunge	≥30 in	Immature fish < 30 in (TC Clip)
Northern Pike	≥12 in	< 12" (TC Clip)

Appendix Table 4. Values used in proportional and relative stock density calculations.

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