

**Fisheries survey of Wood Lake, Burnett County, 2006-2007.**

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Kent Bass

Fisheries Technician, Advanced

Wisconsin Department of Natural Resources

Northern Region - Spooner

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## Executive Summary

The fish community of Wood Lake was sampled using mini fyke nets, fyke nets, and electrofishing in 2006 and 2007 to determine relative abundance, size distribution, and growth, especially for gamefish and panfish. A total of 194 northern pike Esox lucius were captured during fyke netting in April 2007. Size distribution was comparable to electrofishing surveys in 1985 and 1994, but PSD was lower than northern Wisconsin averages. Growth rates improved since the previous survey and are near regional and statewide averages. Electrofishing samples of largemouth bass Micropterus salmoides in October 2006 and May 2007 showed an abundant population. Catch-per-effort (CPE) of largemouth bass averaged 100 fish/hr between the fall and spring samples, which is much higher than in 1985 and 1994. However, CPE of fish  $\geq 16$  in declined. The growth rate of largemouth bass also declined since 1994 and was below regional and statewide means. In addition, growth rates no longer meet the minimum standard ( $\geq 14$  in at age-6) established for largemouth bass by Wisconsin Department of Natural Resources (WDNR). Bluegill Lepomis macrochirus CPE from electrofishing was also higher than in 1985 and 1994, mainly due to an abundance of small fish ( $\leq 4$  in). CPE for bluegills  $\geq 7.5$  in was higher than in the past. Growth of bluegills declined since 1985 and was below state and regional means for fish younger than age-5. The fish community of Wood Lake remained diverse. An August 2006 mini fyke net survey captured 21 species of fish and several other species were noted during recent sampling. White sucker Catostomus commersoni and shorthead redhorse Moxostoma macrolepidotum appear to be less abundant than in the past. Carp Cyprinus carpio remain a minor part of the fish community, and rusty crayfish Orconectes rusticus were documented by WDNR for the first time in Wood Lake. The minimum length limit for harvest of largemouth bass should be eliminated in the hopes of reducing largemouth bass abundance. Any sampling efforts in the future should include collection of ageing data.

## Introduction

Wood Lake is a 520 acre, hard water, drainage lake located on the Wood River in southwestern Burnett County. There is a park and a county owned boat landing on the northwest side of the lake. There is also a town owned undeveloped boat landing on the east side of the lake. The shoreline of Wood Lake is mostly privately owned and is well developed. There are six state owned islands on the lake. The littoral zone is composed mostly of sand and gravel, with some muck. Aquatic vegetation is abundant. The maximum and mean depths are 35 feet and 16 feet, respectively. The fishery consists mainly of largemouth bass, northern pike, bluegill, and black crappie Pomoxis nigromaculatus. Yellow perch Perca flavescens, pumpkinseed L. gibbosus, green sunfish L. cyanellus, rock bass Ambloplites rupestris, black bullhead Ameiurus melas, brown bullhead A. nebulosus, yellow bullhead A. natalis, bowfin Amia calva, white sucker, shorthead redhorse, and carp are also present. Common forage species include blacknose shiner Notropis heterolepis, golden shiner Notemigonus crysoleucas, brook silverside Labidesthes sicculus, and bluntnose minnow Pimephales notatus. Also found during recent sampling were banded killifish Fundulus diaphanus, fathead minnow Pimephales promelas, hornyhead chub Nocomis biguttatus, iowa darter Etheostoma exile, johnny darter E. nigrum, blackchin shiner N. heterodon, common shiner Luxilus cornutus, mimic shiner N. volucellus, spottail shiner N. hudsonius, spotfin shiner Cyprinella spiloptera, central mudminnow Umbra limi, walleye Sanders vitreus, and tadpole madtom Noturus gyrinus.

Wood Lake has been managed mainly for largemouth bass, northern pike, and panfish in the past. The first record of stocking occurred in 1936 when “bass” were stocked. Walleyes were stocked in the early 1940s but failed to establish a fishery. Largemouth bass and northern pike had been stocked frequently in the 1940s and early 1950s, but no stocking has occurred in Wood Lake since 1962. WDNR egg taking operations took 12 quarts of northern pike eggs from 1948-59.

There has been a 14 in minimum length limit on largemouth bass since 1989. No length limits were in effect from 1979 to 1988. A 10 in minimum length limit was in place from 1971 to 1978 due to a Burnett County-wide regulation. Prior to that, there were no length limits in effect on largemouth bass for more than 20 years on Wood Lake. Volunteers from Wood Lake have monitored water quality since 1987 as part of the Self Help Lake Monitoring Program. A WDNR report (Cahow 1998) identified 16 sensitive areas “that merit special protection of the aquatic habitat.” Wild rice was found in four of the sensitive areas. Carp have been present in the Wood River system for decades and have been

occasionally removed by commercial fishermen. The last record of commercial carp harvest on Wood Lake occurred in 1989 when 3,500 lb were removed in 3 days of gill netting.

A number of fisheries surveys have been conducted on Wood Lake. In June 1970 an electrofishing survey was conducted to determine the status of the fishery and required management. A small number of northern pike were captured. Haanpaa (1971) concluded that stocking of northern pike may be necessary to maintain a fishery. A limited carp population was also found which “did not present a management problem” at the time. Two nights of electrofishing were conducted in the fall of 1985. Largemouth bass, northern pike and panfish were collected and measured, and ageing material was taken. Largemouth bass were growing faster than the northwest Wisconsin average, while northern pike were growing slower than average. Large northern pike were found to be in excellent condition, but small northern pike were found to be in very poor condition. Very few “small” bluegill were collected or observed. Growth of bluegill and pumpkinseed was found to be slightly slower than the northwestern Wisconsin average. While other fish species were not collected, relative abundance was noted. Brook silversides and common shiners were deemed abundant. An electrofishing survey was conducted in September 1994. Ageing material was collected from northern pike and largemouth bass. Northern pike continued to grow slower than the local average and were in poor condition. Largemouth bass growth rates had slowed since the 1985 survey but remained above local averages. Panfish were also collected and measured, and the relative abundance of other species was recorded. Brook silversides were the only species noted as abundant, while white suckers and bowfin were considered common. Large, but no small carp were observed. Six mini fyke nets were set for one night in July 1996 as a part of a statewide lakes monitoring program. Fourteen species of fish were captured. Largemouth bass, bluegill, and hybrid sunfish dominated the catch. The objectives of this study were to sample the fish community of Wood Lake during 2006-2007 using statewide baseline monitoring protocol.

### **Methods**

As a component of the statewide baseline lakes monitoring protocol, eight mini fyke nets were set on 22 August 2006 to sample the entire fish community (Figure 1). The mini fyke nets measured 3 ft wide by 3 ft tall and included a 1 in square mesh panel to exclude turtles and larger fish. All 8 nets were removed the following day, and all fish were identified and counted.

An AC electrofishing survey was conducted on the night of 9 October 2006. Two 2-mile stations were sampled (Figure 2). Gamefish were collected throughout the entire stations. Each station included a half-mile index station where all fish were collected. All gamefish and panfish were measured to the nearest 0.1 in, while other fish were identified and counted. For age analysis, scale samples were removed from a subsample of bluegill and largemouth bass less than 12 in, while dorsal spines were removed from larger largemouth bass. Mean length-at-age comparisons for bluegill and largemouth bass were made to regional (18 county Northern Region) and statewide data using the WDNR Fish and Habitat statewide database. Local comparisons for bluegill and largemouth bass were made using Washburn and Burnett County data from 2000 to 2007. An index of proportional stock density (PSD) and relative stock density (RSD) was used to describe and compare population size structure of northern pike and largemouth bass to regional means and past surveys (Anderson and Neumann 1996). PSD values for bluegill and largemouth bass represent the percent of fish larger than stock length (3.0 and 8.0 in, respectively) that are larger than 6.0 and 12.0 in, respectively. RSD-15 values represent the percent of largemouth bass larger than stock length that are larger than 15 in.

Northern pike were sampled in Wood Lake during the spring spawning period of 2007. Fyke nets (4x6 ft frame) were set in Wood Lake immediately at ice-out to collect adult northern pike (Figure 1). Five nets were set on 1 April and an additional net was set the following day. Due to weather conditions all six nets were laid down on 4 April. On 9 April all six nets were reset along with two additional nets. Some nets were occasionally moved to different locations to maximize catch. Three nets were removed on 11 April, and the remaining five nets were removed on 12 April for a total of 38 net lifts. All northern pike sampled were sexed, measured to the nearest 0.1 inch, and given a top caudal fin clip. Weight was measured to the nearest ounce, and a scale sample was removed for age analysis on a subsample of northern pike. Sex of individual fish was determined by the presence of gametes. Northern pike mean length-at-age comparisons were made to previous Wood Lake surveys and to regional and statewide data using the WDNR Fish and Habitat statewide database. Indices of proportional stock density (PSD) and relative weight ( $W_r$ ) were used to describe and compare population size structure and condition to regional means and past surveys (Anderson and Neumann 1996). PSD represents the percent of fish larger than stock length (14.0 in) that are larger than 21.0 in. Relative weight is the ratio of a fish's weight to the weight of a "standard" fish of the same length.

Largemouth bass and panfish were targeted and collected using AC electrofishing on the night of 15 May 2007. Three 2-mile index stations were sampled (Figure 2). All gamefish were collected throughout the entire stations. Each index station included a half-mile substation where all panfish were also collected. All fish collected were measured to the nearest 0.1 in. PSD and RSD values were generated and used to describe and compare size structure.

## **Results and Discussion**

Largemouth bass. Electrofishing in October 2006 captured 140 largemouth bass, of which 31% measured 12-13.9 in (Figure 3). Lengths of sampled fish ranged from 3.0 to 16.4 in and averaged 10.5 in (SD=3.2). In comparison, mean lengths of fall electrofishing samples in 1985 and 1994 were 10.3 (SD=3.1) and 10.9 (SD=4.0) in, respectively. PSD of the 2006 sample was 55, compared to 32 in 1985 and 76 in 1994. RSD-15 in 2006 was only 6, which has decreased from 11 in 1994 and 12 in 1985. Fall electrofishing CPE of largemouth bass has increased from 18 fish/hr in 1985 and 46 fish/hr in 1994 to 82 fish/hr in 2006 (Figure 4). Further, fall CPE was higher in every individual inch group from 6 to 15 in. However, CPE for fish  $\geq 16$  in was lower than in the previous fall surveys. Also, largemouth bass  $\geq 14$  in accounted for a smaller percentage of the total catch in 2006 than before (Figure 5).

Electrofishing in May 2007 captured 290 largemouth bass, ranging from 4.5 to 17.9 in and averaging 11.8 in (SD=2.6; Figure 3). The catch rate (118 fish/hr; 48 fish/mi) was the highest yet recorded on Wood Lake, further evidence of increased abundance. As with the fall sample, more largemouth bass measured in the 12 and 13 in classes than in any other length groups. Largemouth bass measuring 12 to 14.9 in accounted for 54% of the May sample. Despite this, May PSD was 68, lower than that from the fall 1994 survey. May RSD-15 was only 7, also lower than in 1994.

Growth of largemouth bass has declined since previous surveys and is now below local, regional, and statewide means (Figure 6). In 1985 largemouth bass grew much faster than average, reaching 16 in in 6 years. The 14 in minimum length limit went into effect in 1989. By fall 1994, six growing seasons later, CPE was more than 2 times higher and growth rates had declined. Six year old largemouth bass averaged only 13.7 in. It now takes more than 7 full growing seasons for the average largemouth bass in Wood Lake to reach the 14 in legal minimum and more than 10 seasons to reach 16 in. Wood Lake largemouth bass growth fails to meet the minimum growth standard established by WDNR ( $\geq 14$  in at 6 years), and, therefore, an exemption to the minimum length limit has recently been proposed for Wood

Lake. The reduction in growth is very likely due to an increase in abundance. If current growth rates are maintained or continue to decline, it will be increasingly unlikely that “memorable” large ( $\geq 20$  in) largemouth bass will be present in Wood Lake.

Northern pike. Electrofishing in October 2006 captured 46 northern pike (27 fish/hr). CPE in fall 1994 and 1985 was 17 fish/hr and 32 fish/hr, respectively (Figure 7). Lengths ranged from 10.0 to 34.4 in and averaged 18.5 in (SD=4.0). Fish between 16.0 and 20.9 accounted for 69% of the catch. Only 2 northern pike (4%) measured  $\geq 25$  in. PSD of this sample was 14. In comparison, fall electrofishing PSD was 16 and 25 in 1985 and 1994, respectively.

A total of 194 northern pike (5.1 fish/per net night) averaging 18.6 in (SD=3.7) were captured with fyke nets, ranging in length from 8.8 to 33.3 in (Figure 8). Male northern pike accounted for 52% of the catch and averaged 17.8 in (SD=2.3), while females averaged 20.6 in (SD=3.9). Comparable to the fall electrofishing survey, northern pike measuring between 16.0 and 20.9 in accounted for approximately two-thirds of the catch, and only 7 fish (4%) measured  $\geq 25$  in. Northern pike PSD in 2007 was 21, which is lower than the mean (30) reported by Margenau et al. (1998) for 19 northern Wisconsin lakes. There have been no spring fyke netting surveys on Wood Lake in the past to compare this survey with.

The mean weight of sampled northern pike from fyke netting was 1.76 lb (SD=1.2). Weights ranged from 0.2 to 9.0 lb. Relative weight (Wr) of all sampled northern pike was 95, which is above the mean value (92) reported by Margenau et al. (1998) for 19 northern Wisconsin lakes. However, Wr decreased with age for both sexes and for all fish combined (Figure 9). Female northern pike, in particular, showed a pronounced decrease in Wr with age. This may be explained by a possible lack of preferred prey availability for larger northern pike.

Growth of northern pike in Wood Lake appears to have improved since both the 1985 and 1994 surveys and is now better than the Northern Region average (Figure 10). The average length of a four year old northern pike in Wood Lake is now 20.0 in, compared to 15.5 in and 18.2 in in 1985 and 1994, respectively. Despite the apparent increase in growth, caution should be exercised when making any management decisions based on northern pike growth data from this and previous years. Age interpretations using northern pike scales can be difficult and unreliable. Casselman (1990) found this to be due to irregular growth and resorption or erosion on the midlateral region. As with many ageing samples of northern pike, there were inconsistencies found while interpreting the 2007 sample.

Bluegill. October electrofishing captured 168 bluegills up to 8.1 in and averaging 4.1 in (SD=1.6). Sample PSD was 21 with more than half of the sample measuring <4 in. In contrast, less than 10% of the catch from fall electrofishing in both 1985 and 1994 measured <4 in (Figure 11). PSD of the 1985 and 1994 samples were 63 and 47, respectively. CPE in October 2006 was 373/ hr (168 fish/ mi), which is higher than in both 1985 (317 fish/hr) and 1994 (258 fish/hr; Figure 12). While CPE for fish 5.5 to 7.5 in was much lower than in 1985 and 1994, CPE for bluegills  $\geq 7.5$  in was higher.

May electrofishing captured 390 bluegills, of which 371 were measured (Figure 13). Mean and maximum lengths were 4.9 (SD=1.5) and 8.2 in, respectively. PSD of this sample was 36, and CPE was 600 fish/hr (260 fish/ mi). Like the October sample, bluegills <4 in were abundant, indicating large bluegill year classes in recent years. However, large bluegills ( $\geq 7.5$ ) were also caught more frequently than in past surveys, exhibiting a catch rate (38 fish/hr) that was nearly five times higher than in any previous survey. Despite the increase in largemouth bass abundance, the bluegill population appears to be more abundant than it had been during past surveys. Predation by largemouth bass has not reduced the bluegill population and may have even triggered a compensatory response of increased bluegill reproduction. Lewis and Helms (1964) found that bluegills have a remarkably low vulnerability to largemouth bass. This may explain the reduction in largemouth bass growth during the same period that bluegills appear to have become more abundant. In addition, the bluegill population may have benefitted from predation by largemouth bass on other species.

Growth of bluegills in Wood Lake has declined since 1985 and is now below state and regional averages for fish ages 5 and younger (Figure 14). However, bluegill growth remains faster than the local average, especially for older fish. Growth data from 1985 shows a similar pattern of sub-average growth in young bluegills and above average growth in older bluegills. The high catch rate of small bluegill is evidence of recent strong hatches and is likely contributing to the sub-average growth of young bluegills. Wood Lake is a popular panfish lake and receives more fishing pressure than most lakes in the area. It is possible that high bluegill harvest helps maintain and even improve the growth of older bluegills.

Non-game species and mini fyke net sampling. A total of 21 species of fish were captured with mini fyke nets (Table 1). Bluegills and bluntnose minnows dominated the catch. Nearly 800 bluegills were captured, with 74% of them identified as young-of-the-year (YOY). Largemouth bass, blacknose shiners, brook silversides, and yellow perch were also common. Ten species were captured in 2006 that did not appear in the 1996 mini fyke net survey. There were three species sampled in 1996 that were not found in 2006. Bluegills, bluntnose minnows, and blacknose shiners were captured at a much higher rate



than in 1996, while largemouth bass, pumpkinseeds and green sunfish were less common than in the 1996 survey.

It appears that white suckers and shorthead redhorse were less abundant in 2006/2007 than they were in the past. Both were noted as common during the September 1994 electrofishing survey, but only 2 white suckers and 3 shorthead redhorse were captured during electrofishing in October 2006. Fyke netting in April, when white suckers are fairly vulnerable to capture, accounted for <0.5 fish per net-night. The apparent decrease in their abundance may be due to the dramatic increase in largemouth bass numbers and may be partially responsible for the decline in largemouth bass growth, as well as the decline in  $W_r$  of older/larger northern pike.

A small number of rusty crayfish were captured in the April fyke net survey. This is the farthest point upstream on the Wood River that they have been documented by WDNR. As a recent introduction to Wood Lake, it is probable that rusty crayfish numbers will increase in the future and may cause significant habitat alterations, impacting the fish community.

### **Summary and Management Recommendations**

1. Largemouth bass were abundant in Wood Lake. Sampling catch-per-effort was much higher than in previous surveys. The growth rate of largemouth bass declined since 1994 and was below state and regional averages in 2006. CPE of larger fish ( $\geq 16$  in) has declined, likely as a result of slower growth. The decline of some previously abundant forage species may be a result of predation by an increasing largemouth bass population. Eliminating the 14 in minimum length limit on largemouth bass will likely reduce density and improve growth. Growth rates of largemouth bass should exceed the minimum growth standard ( $\geq 14$  in after 6 years). Growth data should be gathered during the next sampling of Wood Lake. Fall electrofishing CPE for largemouth bass should eventually be reduced to less than 40 fish per hour.
2. The northern pike population of Wood Lake appears to be stable. Catch-per-effort was comparable to previous surveys, while growth rates improved. Northern pike may benefit from a reduction in largemouth bass density. No direct management action on the northern pike population is recommended.

3. Sampling catch-per-effort of bluegills was higher than in past surveys. Small (<4 in) bluegills, in particular, were captured at a much higher rate, indicating large hatches in recent years. It is possible that largemouth bass predation on other species has benefitted the bluegill population, allowing it to increase. It is also possible that the large hatches are simply due to favorable environmental conditions in recent years. The growth rate of bluegills declined since 1985 and was below state and regional averages in 2006 for fish ages 5 and younger. Despite this, CPE of large bluegills ( $\geq 7.5$  in) was higher than in past surveys.
  
4. The fish community of Wood Lake remained diverse. More than 30 species of fish were collected during recent sampling. White suckers, redhorse, and common shiners were seen less frequently than in previous surveys. It is possible that increasing largemouth bass abundance has led to this decline. Carp remain a minor component of the fish community. Efforts to reduce or eliminate the carp population are not necessary at this time. The recent discovery of rusty crayfish may eventually cause changes to the habitat and fish community of Wood Lake. Future samplers of Wood Lake should take note of their presence and relative abundance.

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Table 1. Mini fyke net catch from Wood Lake, Burnett County, 1996 and 2006.

Species	2006 (8 nets)		1996 (6 nets)	
	Number	No./ Net	Number	No./ Net
Banded killifish	8	1.00	0	0.00
Black bullhead	1	0.13	5	0.83
Black crappie	2	0.25	0	0.00
Blackchin shiner	3	0.38	0	0.00
Blacknose shiner	46	5.75	8	1.33
Bluegill	794	99.25	270	45.00
Bluntnose minnow	204	25.50	6	1.00
Bowfin	0	0.00	8	1.33
Brook silverside	23	2.88	0	0.00
Fathead minnow	1	0.13	0	0.00
Golden shiner	11	1.38	0	0.00
Green sunfish	1	0.13	22	3.67
Hornyhead chub	1	0.13	0	0.00
Hybrid sunfish	0	0.00	101	16.83
Iowa darter	1	0.13	0	0.00
Johnny darter	8	1.00	4	0.67
Largemouth bass	44	5.50	374	62.33
Mimic shiner	1	0.13	0	0.00
Pumpkinseed	3	0.38	59	9.83
Rock bass	1	0.13	0	0.00
Spottail shiner	0	0.00	3	0.50
Tadpole madtom	1	0.13	3	0.50
Yellow bullhead	1	0.13	2	0.33
Yellow perch	22	2.75	15	2.50

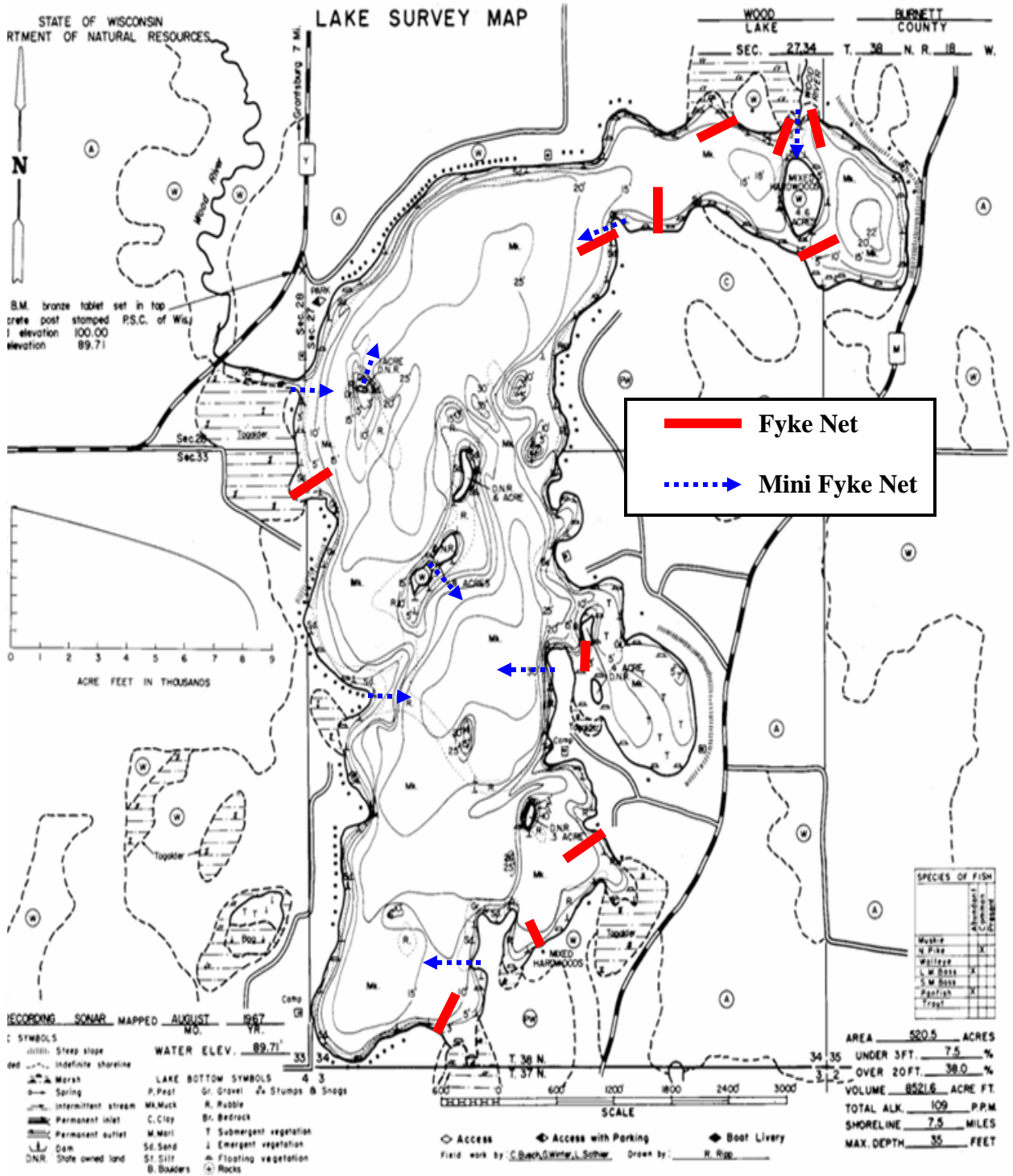


Figure 1. Fyke net locations from Wood Lake, Burnett County, 2006 and 2007.

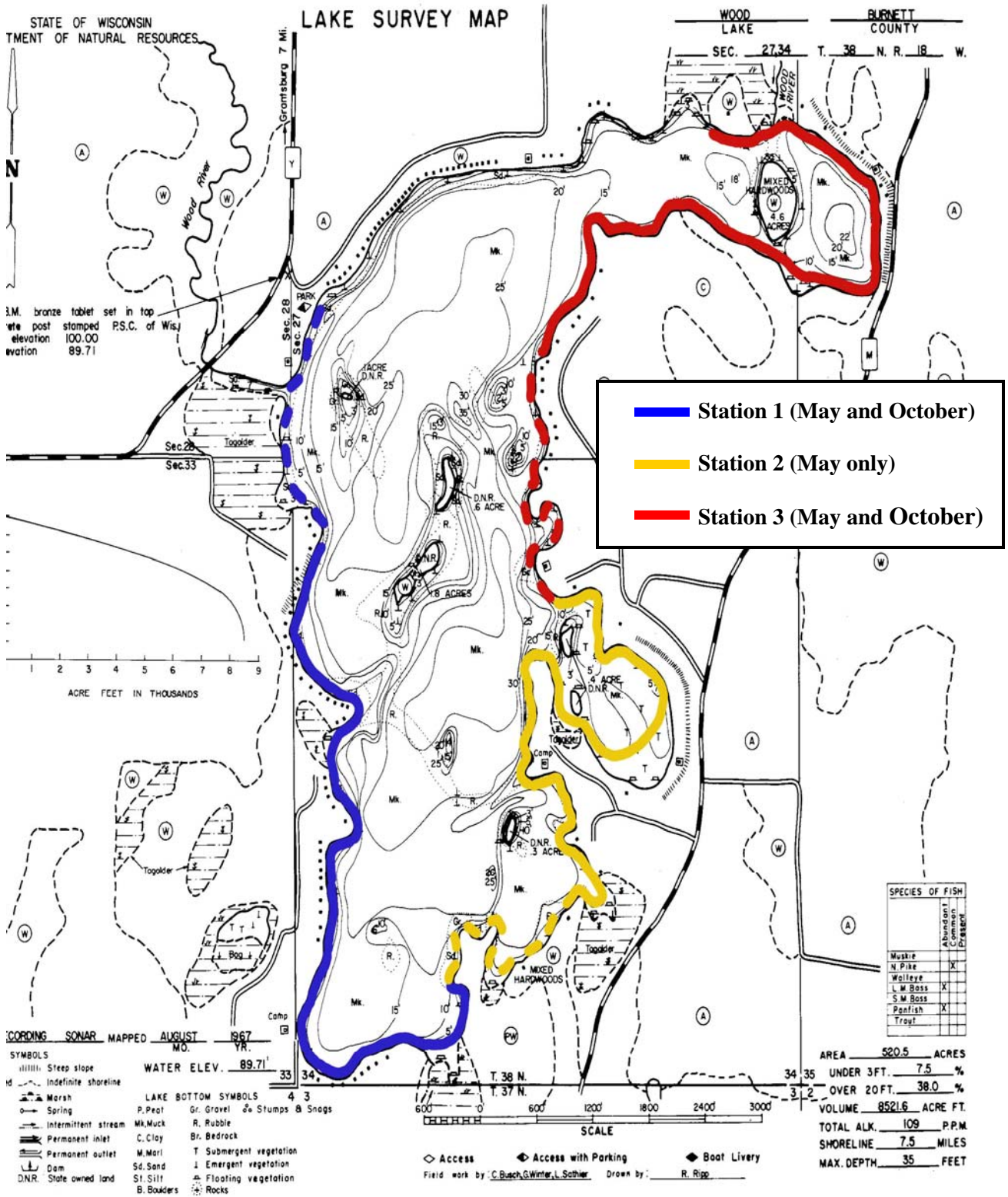


Figure 2. Electrofishing stations for Wood Lake, Burnett County, 2006 and 2007. Dashed lines indicate half-mile index stations.

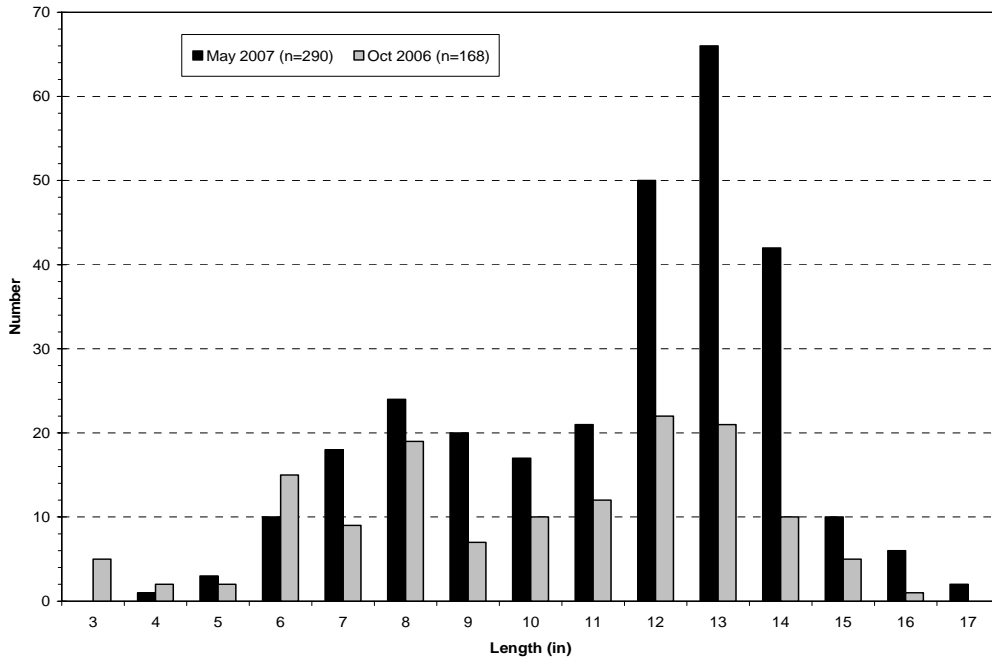


Figure 3. Length frequency of largemouth bass captured with electrofishing in Wood Lake, Burnett County, 2006 and 2007.

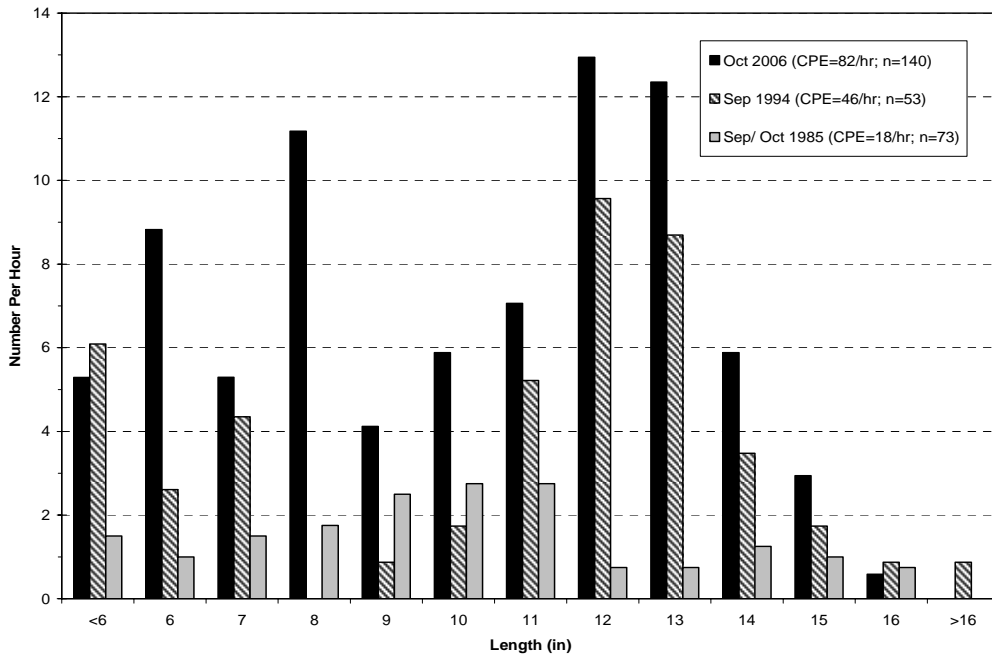


Figure 4. Catch-per-effort of largemouth bass captured with electrofishing in Wood Lake, Burnett County, 1985, 1994, and 2006.

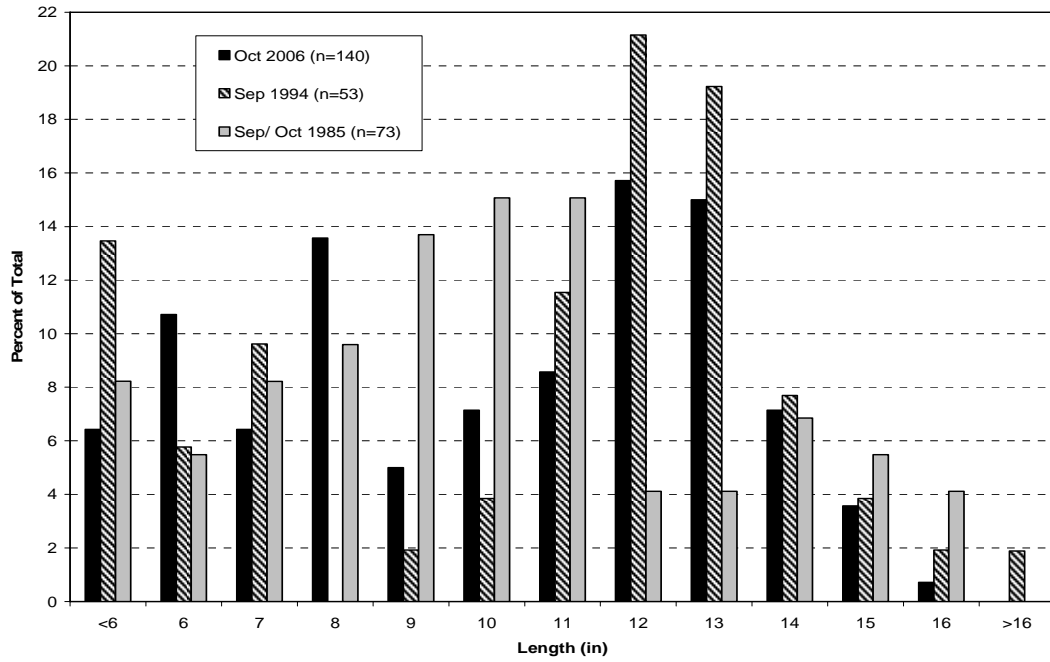


Figure 5. Percent of total catch of largemouth bass captured with electrofishing in Wood Lake, Burnett County, 1985, 1994, and 2006.

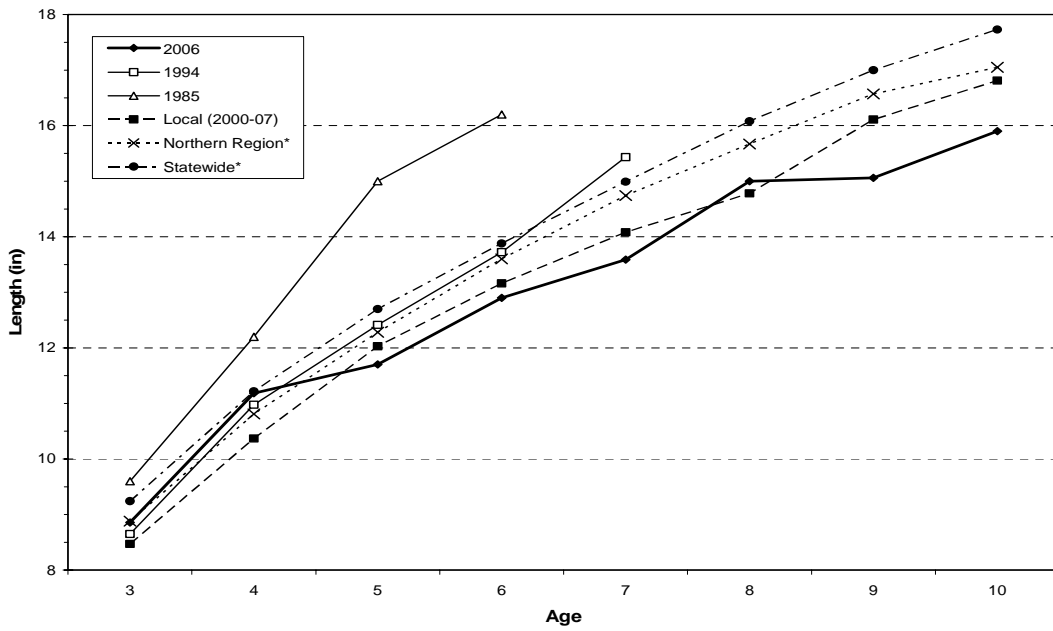


Figure 6. Mean lengths at age of largemouth bass from Wood Lake, Burnett County, 1985, 1994, and 2006, with comparisons to regional and statewide means.

\*from WDNR Fish and Habitat Database



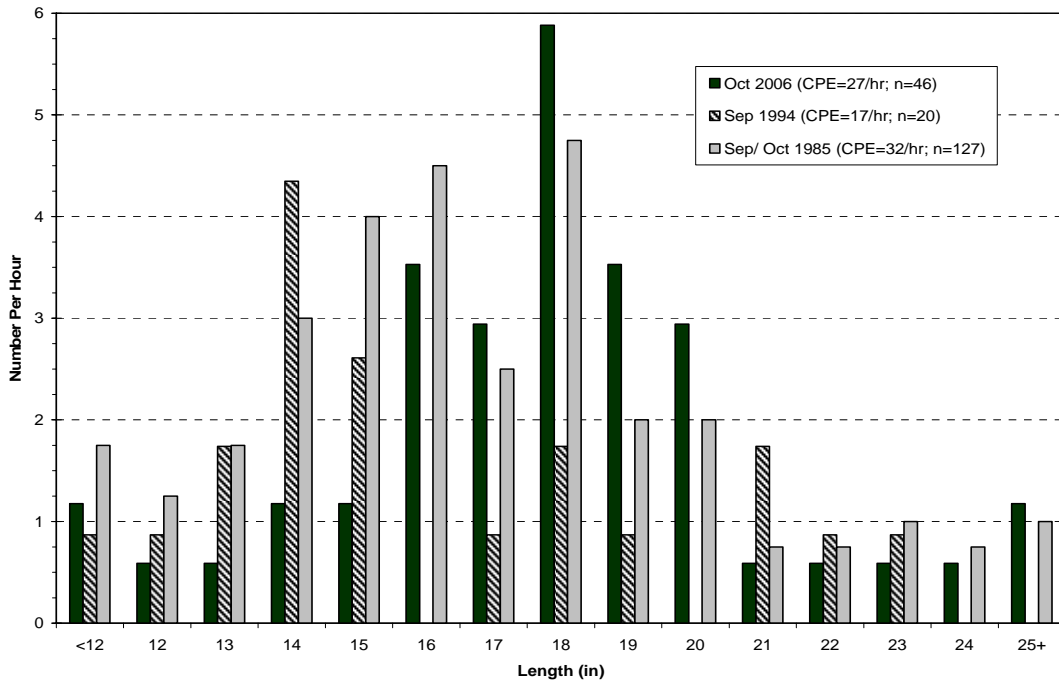


Figure 7. Catch-per-effort of northern pike captured with electrofishing in Wood Lake, Burnett County, 1985, 1994, and 2006.

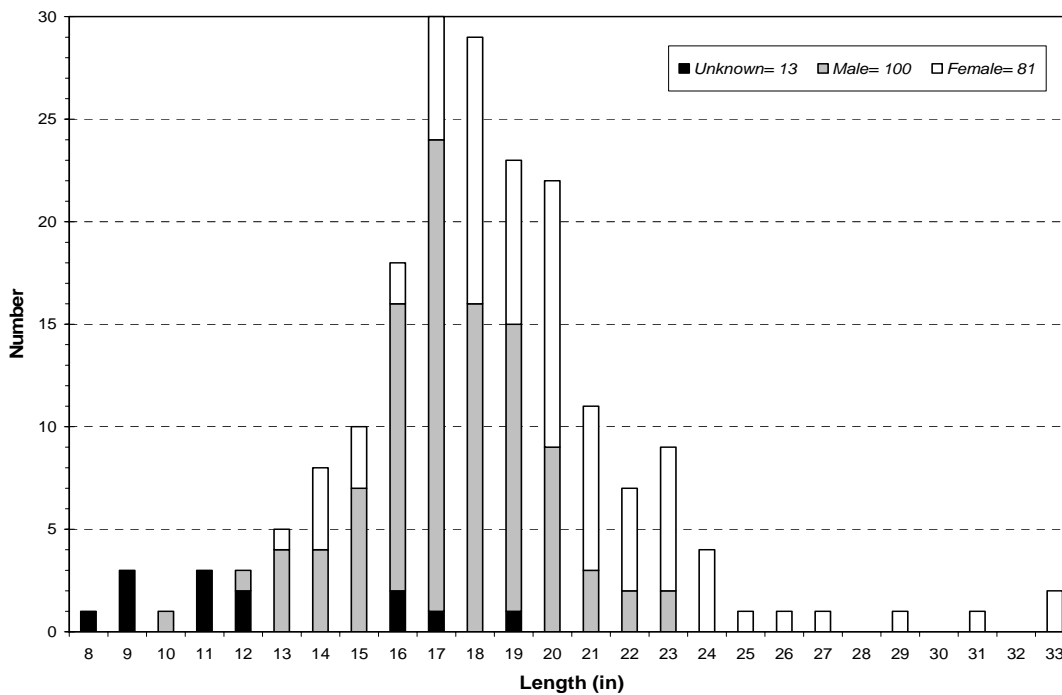


Figure 8. Length frequency by sex of northern pike captured by fyke net in Wood Lake, Burnett County, 2007.

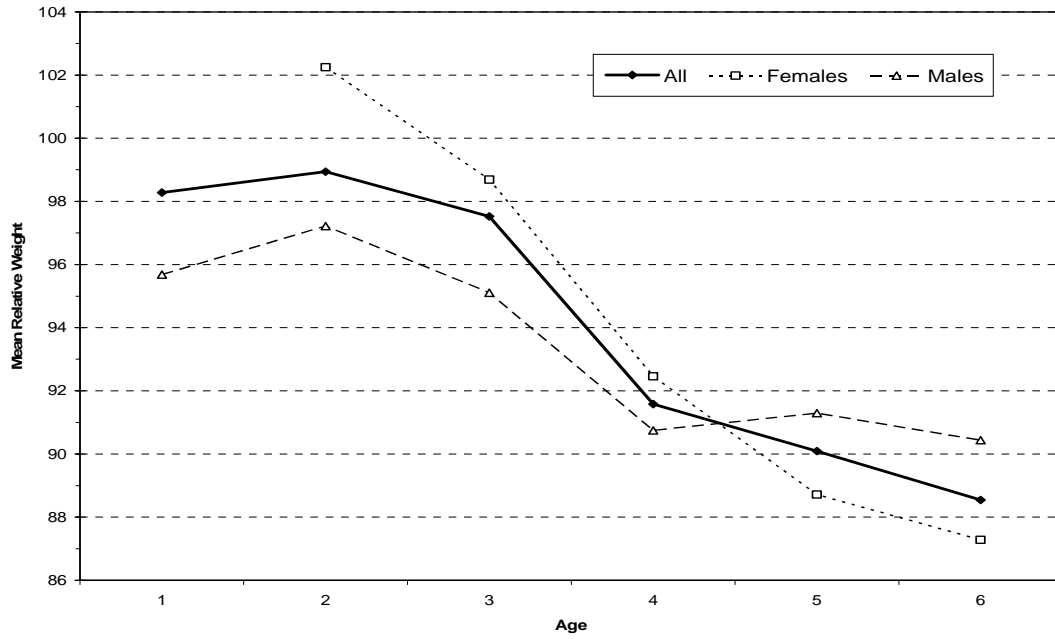


Figure 9. Mean relative weight by age and sex of northern pike from Wood Lake, Burnett County, 2007.

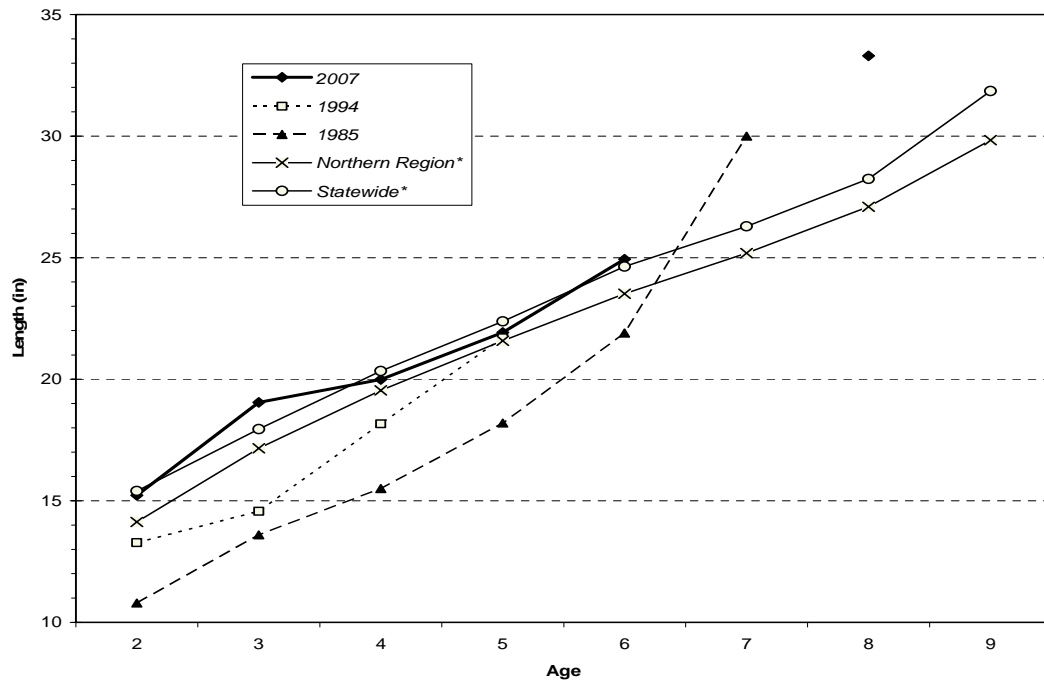


Figure 10. Mean lengths at age of northern pike from Wood Lake, Burnett County, 2007, with comparisons to regional and statewide means.

\*from WDNR Fish and Habitat Database.

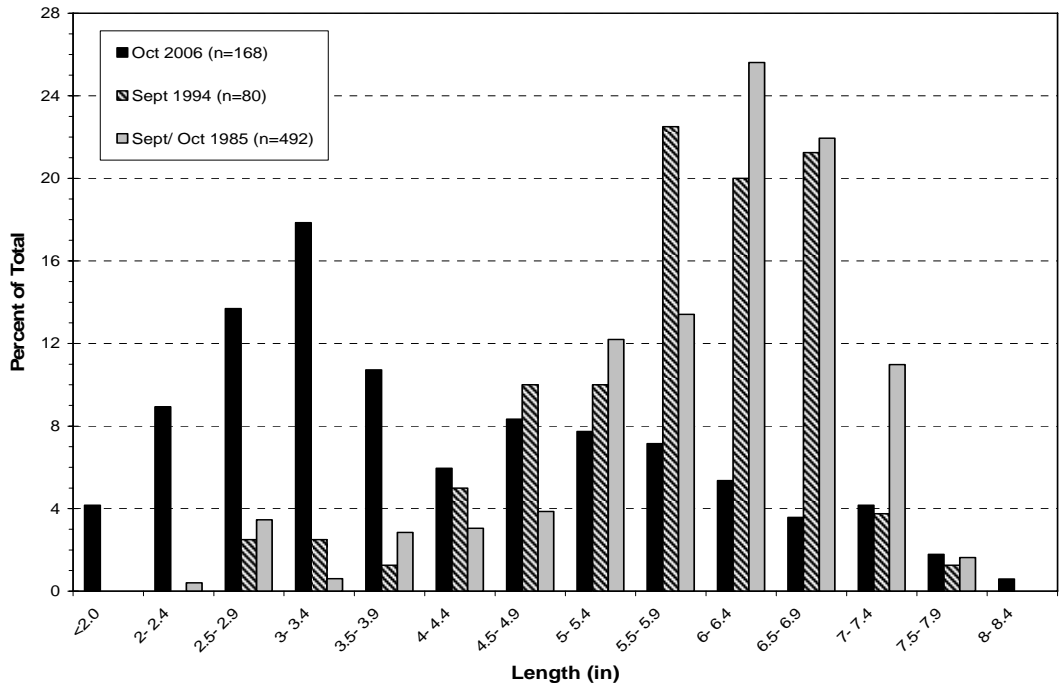


Figure 11. Percent of total catch of bluegill from electrofishing in Wood Lake, Burnett County, 1985, 1994, and 2006.

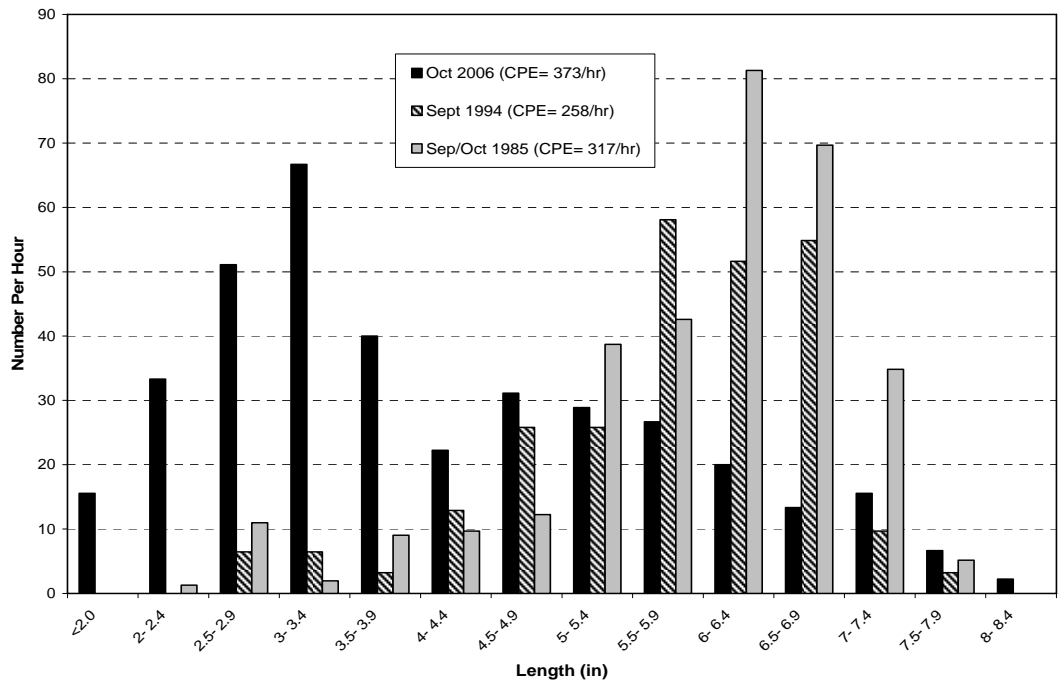


Figure 12. Catch-per-effort of bluegill captured with electrofishing in Wood Lake, Burnett County, 1985, 1994, and 2006.

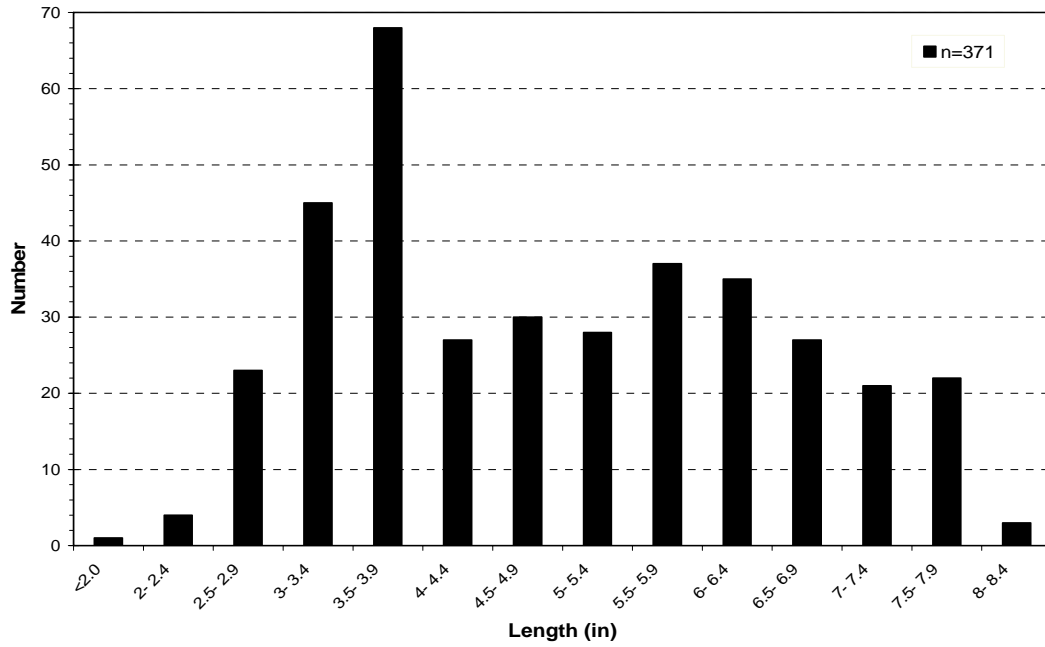


Figure 13. Length frequency of bluegill captured with electrofishing in Wood Lake, Burnett County, May 2007.

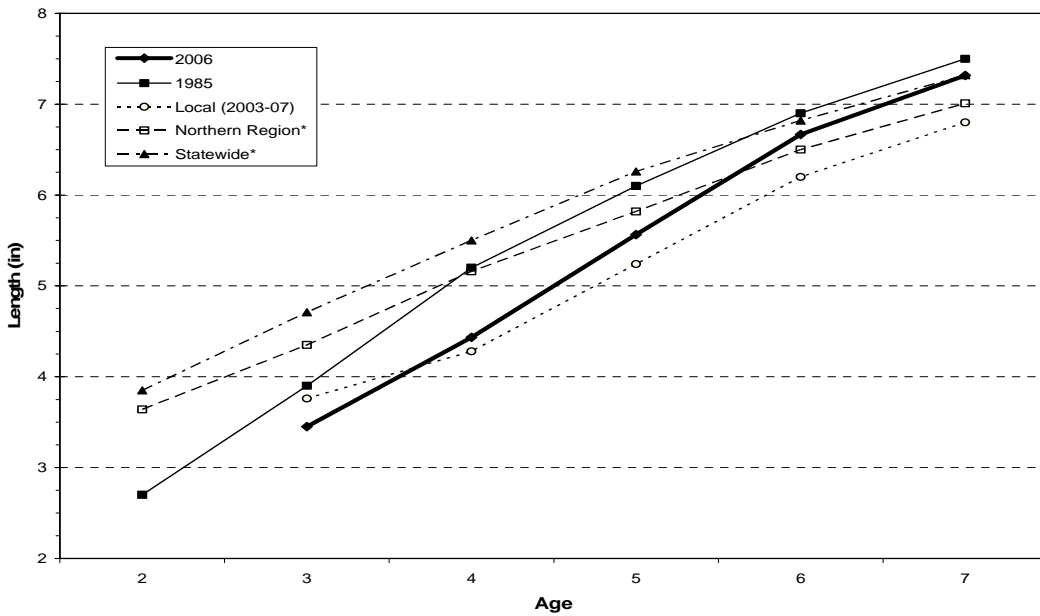


Figure 14. Mean lengths at age of bluegill from Wood Lake, Burnett County, 1985 and 2006, with comparisons to regional and statewide means.

\*from WDNR Fish and Habitat Database