Pike Lake

Luce County, T49N, R09W, Sec. 15
Little Two Hearted River Watershed, last surveyed in 2008

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Environment

Pike Lake is located in the Little Two Hearted River watershed in Luce County, about 20 miles northeast of Newberry. The lake covers 292 surface acres (Figure 1). The lake outlet is located on the northeast side and drains into the Little Two Hearted River. Small streams enter on the southwest and northwest sides of the lake.

Access to Pike Lake is from the state forest campground on the northwest shore, off of CR414. The campground facility includes a concrete boat ramp, pit toilets, a small parking area, and several camping sites. The single resort is now closed, and the owner is selling his cabins separately. In addition, several new private residences have been built during the last two decades. There is neither electricity nor a sewage collection system around the lake. Septic drain fields flow into sand and gravel substrates; some fields have been in existence for about 100 years.

The shoreline around Pike Lake is sandy and heavily wooded. Surrounding countryside consists mainly of rolling jack pine plains. The lake has a convoluted shoreline with four bays and several points. The slope of the drop-off is gradual, having a maximum depth of 40 ft, with two submerged shoal islands in the northeast basin. The bottom is sand with very little gravel or rock. Deeper areas are organic bottom. There is abundant submerged, floating-leaved, and emergent vegetation in the sheltered embayments. A water chemistry survey in 1980 found that the water was stained brown and slightly turbid, with a secchi disc depth of seven feet. Poor light penetration into the water, combined with alkalinity of only 25 ppm CaCO3, reduced photosynthesis and overall productivity. An August 2003 survey found a secchi disc reading of 13 feet, and alkalinity of 36 mg/l, while pH was just over 7 at the surface. The water chemistry changes implied more productivity in 2003.

The original survey in 1947 found "tolerable oxygen" down to 25 feet. During the last 56 years, the lake has lost another 9 vertical feet of oxygenated water. The 1947 report also described good submerged log cover along the eastern and southern shorelines, while a 1980 report described "a severe lack of submerged log cover, excepting the west shore and southeast bay." Limnological data from August 2003 showed that sufficient dissolved oxygen (generally assumed to be 3+ mg/l for warm water fish communities) disappeared at about 16 ft (Figure 2), leaving the deeper waters depleted of oxygen (anoxic). This same condition occurred in 2008 (Figure 3), which verified that the previous sample was not an anomaly.

Water quality degradation is possibly accelerating, as indicated by the comparison of dissolved oxygen vertical profiles between 2003 and 2008 (Figure 3). Dissolved oxygen in 2008 began to disappear at only 9 ft compared with 16 ft in 2003 (Figure 3), although the decline was much more gradual than the precipitous drop seen in 2003. Lake over-enrichment is a common condition around the state that generally results in a significant dissolved oxygen deficit. Even maintained septic drain field soils will become saturated and pass nutrients along to whatever water source is closest, following the path of

least resistance. Drain field maintenance focuses on the septic tank itself, keeping bacteria live and active to break down solids and allow the finished liquid product to flow out into the drain field. From there, the nutrient-filled liquid drains to the easiest water source. The bacteria do not reduce the amount of nutrients flowing through the septic system, they maintain a steady-state nutrient equation within the tank. Drain fields, especially in sand and gravel, tend to become nutrient saturated within 20 to 30 years. Nutrients discharged into saturated drain fields flow through soils and into either groundwater or surface water. Since some of the drain fields around Pike Lake have been in existence for about 100 yrs, they are likely leaching nutrients directly into the lake. As more riparian development occurs with its concurrent increase in number of septic drain fields, accelerated nutrient concentrations will be leached into the lake.

History

Species present during a 1947 MDNR survey found northern pike, yellow perch, rock bass, white suckers, and minnow species. Earlier reports indicated some bluegill may also have been present. A 1980 survey found that largemouth bass, pumpkinseed sunfish, and brown bullheads were present in addition to those species listed in 1947.

Stocking records indicate that Pike Lake has been stocked with a wide array of fish species. Largemouth bass were stocked in 1948 and 1958, rainbow trout in 1957, northern pike in 1941 and from 1965 to 1970, and walleye from 1937 to 1940 and from 1981 until present. During the late 1960s northern pike came from operation of a local rearing marsh. Intensive netting and an electrofishing survey in 1980 showed brown bullhead dominating the catch. The northern pike population had declined sharply and the yellow perch population was dominated by small fish. A subsequent manual removal was conducted in 1981 for rough fish (brown bullheads and white suckers). A total of 718.5 lbs. (2.5 lbs/acre) of bullhead and 134 lbs. (0.5 lbs/acre) of sucker were removed. In 1982, a second removal took 0.39 lbs/acre of bullhead and 0.75 lbs/acre of sucker. The large drop in brown bullhead numbers trapped and removed in 1982 indicated a successful overall removal.

Fisheries management shifted in 1981 toward creating a walleye fishery through stocking. Evaluations in 1983 and 1984 indicated survival and good growth of stocked walleye, and improvements in the largemouth bass, northern pike, and yellow perch populations. Since walleye were surviving and the fish community balance was improving, the walleye stocking protocol was continued. Fingerlings were stocked in 1985, 1988, 1989, 1991, 1992, and 1993 (Table 1).

Pike Lake was surveyed in June, 1995, to evaluate walleye stocks and the general condition of other fish species. Anglers had been complaining about the small walleye population size. Compared with the 1989 survey, the average number of fish per net in 1995 for sunfish fell from 3.2 to 1.3, rock bass from 11.6 to 5.1, and yellow perch from 25.5 down to 1.7. Walleye captured in the 1995 survey ranged from 6 to 24 in, and had an average length of 13.9 in. Eight year classes were present, not all of which coincided with previous plantings. Therefore natural reproduction was present. Growth, however, was considerably slower than from previous surveys. The northern pike were slightly larger than those of the 1989 survey, and their relative abundance had increased from previous years, from 0.07 per net to 0.71. Even so, only 1 of 17 was greater than 24 in. Although only 40 yellow perch were captured, comprising 13% of the total catch, they averaged 4.5 in, a modest 0.2 in gain from the

1989 survey. Their growth rate was still slow, and only one perch larger than 7 in was captured. Brown bullheads and white suckers were present in relatively low numbers.

A 1999 survey verified the previous determination of walleye natural reproduction. Fewer walleyes were caught than in 1995, but there was excellent representation from non-stocked years, and their average size was about 4 in larger. Their growth rate in 1999 approached state average, much improved from 1995. Walleye natural reproduction appeared adequate to sustain the population. In addition, length/frequency analyses indicated that walleyes were not being heavily harvested.

Brown bullheads were almost non-existent in the 1999 survey. While rock bass were not common, 66% were greater than 6 in. The number of white suckers had more than doubled from those caught in 1995, and their average size had increased 3 in. Their population alone comprised about 73% of the catch biomass. The increase in suckers was good for the lake forage base, because numbers of panfish and yellow perch had decreased by more than 75% since 1989. As expected with that decline, pumpkinseed average size had increased about 2 in, while yellow perch had increased about 1.5 in. Even so, yellow perch continued to grow slowly. All forage species other than suckers in 1999 together comprised only 3% of the total catch biomass.

A broad-based survey was conducted in 2003, again scheduled due to many angler complaints about the declining walleye fishery. The two major surprises from this survey concerned dissolved oxygen and the decreased sucker population. Pike Lake in August was devoid of oxygen below 16 ft. Between 16 and 17 ft, water temperature fell from 73ºF to 64ºF, pH dropped from 7.7 to 6.2, and dissolved oxygen plummeted from 7.6 to 0.8 ppm (Figure 2). That decline would create a significant barrier to fish vertical migration during months of lake stratification. With no oxygen available, no fish or aquatic invertebrates can live deeper than 16 ft during late summer, nor probably would they go there during seasons of lake mixing because there would be no living food to draw them. Seasonal mixing will also dilute the relatively small volume of oxygenated waters with a huge volume of anoxic water, conceivably causing serious stress to the entire aquatic community.

The second surprise, lack of white suckers, was illustrated by comparison with the 1999 netting survey results. While 103 suckers in 1999 comprised about 73% of the catch biomass, the seven captured during 2003 only comprised 12%. Part of the disparity was possibly due to survey timing and water temperatures; the 1999 survey in late May was at 57ºF, while the 2003 survey in late June was at 75ºF. Suckers would normally be harder to net in the warmer temperatures. However, with only 16 ft of oxygenated water, suckers were confined to nettable depths in June, rather than moving into deeper, cooler water. Because suckers should therefore have been available for capture, their observed decline is likely a real phenomenon. Even so, different seasonal behavior may have exaggerated the degree of decline. Shoreline netting provided good numbers of forage minnows, which was one of the questions needing an answer. Walleyes, at 45% of the total catch biomass, were the main sport fish species in the lake, although anglers could also target large brown bullheads or an occasional keeper rock bass. No legal-sized northern pike were captured. Growth rates of both walleye and northern pike showed that their growth slowed dramatically as they matured and reached 16-20 in.

After 15 years of no active management, recovery of fish species was minimal. Panfish remained small, with slow growth and concurrent small populations, and pike never reached legal size. The pike population was also too small to support a harvest regulation change to 0 in minimum size. In

addition, survey data beginning in 1999 generated concern about catching no young walleyes despite a modest natural population. Walleye from the 1995 survey were 38% legal-sized at 15+ in, 75% legal in 1999, 96% legal in 2003, and 100% legal in 2008. The increasing percentage of larger, older walleye and lack of young implied that the natural population was incapable of maintaining itself. A decision was made in 2003 to stock a limited number of walleye every 2-3 years to help maintain the population, which was the only fishable species in the lake for many years. Even if the rest of the fish community failed to respond positively to the modest stocking program, the anglers would still have a species to target. Walleye were subsequently stocked during 2003 and 2005. The next scheduled stocking, 2007, coincided with the statewide concern for stopping the spread of viral hemorrhagic septicemia. For that reason, Pike Lake was not stocked in 2007 and will not be stocked in 2009. A new prescription and stocking request will be necessary for stocking in 2011.

Current Status

A 2008 netting survey was scheduled because of uncertainty attached to the walleye stocking program, which had resumed in 2003 (Table 1). The initial concern was what effect the stocked walleye were having to an almost non-existent yellow perch population, slow growth rates of all fish, and competition with northern pike that never grew large enough to become legal at 24 in. Several types of nets, fyke (F), trap (T), and gill (G) were located to sample all distinct habitats (Figure 4).

The 2003 intensive survey captured four forage species not seen in 2008: bluntnose minnow, mimic shiner, Johnny darter, and log perch. The 2008 survey once again found a small number of bluegills, plus common shiner and spottail shiner that had not been seen previously. Other species captured were brown bullhead, white sucker, fathead minnow, golden shiner, northern pike, pumpkinseed sunfish, rock bass, walleye, and yellow perch (Table 2). Despite loss of representation of four species, fish community structure and balance appeared much improved from the 2003 survey, which itself had shown improvement over the 1995 and 1999 surveys. Growth of all sports fish species showed significant improvement (Table 3). Northern pike growth index was -1.5 in (1.5 in slower than state average) during 2003, increasing to +0.3 in during 2008. Younger pike were growing much faster than the older fish. Walleye growth increased from -0.3 in during 2003 to +0.5 in during 2008, also with younger fish growing faster. All average lengths per age of walleyes aged 4-11 were between 19.2 and 21.3 in. Yellow perch growth index increased from -1.1 in 2003 to -0.6. Rock bass growth index also increased, from -1.0 in to -0.6 in compared with the 2003 survey, while pumpkinseed sunfish growth remained stable at -0.6 in.

This survey effort consisted of two parts, a late April electroshocking effort to fin-clip as many walleyes and northern pike as possible, and then the normal summer netting. Electroshocking resulted in 76 clipped walleyes and 15 clipped northern pike. Later, during the netting effort, all walleyes and northern pike were inspected for fin clips in order to produce a population estimate for both species. A total of 14 walleyes and 26 northern pike were netted, but no clipped specimens were found. For that reason, no population estimates were possible.

The April electroshocking effort targeted only northern pike and walleyes. For that reason, the catch biomass comparisons did not include that electroshocking effort (Table 2). Bullhead percent of capture biomass remained similar in 2008, down to 2.8% from 3% in 2003. Predator biomass

(northern pike and walleye) decreased from 69% to 30%. The percent of the catch biomass represented by forage species increased from 22% to 61%, of which white suckers comprised 44%. Other species represented in the 2008 forage calculation included bluegill, common shiner, fathead minnow, golden shiner, pumpkinseed sunfish, rock bass, spottail shiner, and yellow perch. The sharp increase in the sucker population was cause for some concern about them dominating the fish community, but not yet a reason to conduct a manual removal. If their percent of catch biomass increases to 60% in the future, it will be time to consider a removal. The sucker population should be watched, however, to verify that predation control remains capable of keeping their numbers in check.

Analysis and Discussion

Pike Lake has suffered from a skewed fish community structure and poor growth rates for almost twenty years. Several manual removals of brown bullheads and white suckers were conducted in the early 1980s. Because there was evidence of walleye natural reproduction, the stocking program was ended after 1993 (Table 1). MDNR Fisheries has recently completed a state-wide walleye analysis, trying to determine what conditions produce a good walleye fishery. Results show that northern Michigan lakes with low alkalinity seldom produce good quality walleye populations. With an alkalinity concentration of only 36 ppm, Pike Lake waters are considered very low. The state-wide study therefore predicts that walleye will never become a strong, self-sustaining population in Pike Lake. In addition, it predicts that even with stocking, walleyes will not provide a good, steady-state walleye fishery. Given this new data, implications are that the good walleye fisheries of the 1980s and 1990s were the result of stocking into a new ecosystem. Once the fish community reached a new balance and stability, current theory predicts that there was less "room" for the recently introduced walleyes.

There were two separate survey efforts in 2008. An April electroshocking effort targeted northern pike and walleye to fin clip them prior to an attempt to determine more accurate population estimates. The summer netting effort was an extensive, general netting survey. Catch biomass calculations were for only the netting survey, in order not to skew the numbers of northern pike and walleye. Walleye growth in 2008 was slightly better than in 2003, but the younger fish were growing considerably faster than the older. Concurrent with better growth, however, the survey catch was down to 13 fish and 12% of the biomass, compared with from 25 and 45% from 2003.

Northern pike abundance has remained stable since 2003. Ages 1-5 were represented, which signified consistent spawning success. Length/frequency analysis, however, implied heavy angling harvest, as only two fish out of 26 were greater than 24 in. Northern pike in this lake had been a puzzle for many years, as growth appeared to stop after age 3. In 2008, however, growth rates increased for the first time since 1991, up almost 2 in from 2003, possibly in response to the larger white sucker population.

The near absence of yellow perch and their concurrent slow growth paradox became less of an issue after the 2008 survey. Growth rates had improved and yellow perch comprised almost 11% of the catch biomass. Even so, only 4% of 795 perch captured were greater than 7 in. Yellow perch length/frequencies implied significant angler harvest.

Pike Lake in 2008 was slowly returning to a more stable, sustainable fish community structure, concurrently with the increased growth rates for all species. The fish community during summer

months appeared to be confined to only the upper 16 ft of water volume. That depth, however, still allowed fish access to the shallow shoal islands in the east bay. The 2008 data implied that although somewhat sterile, this lake is fully capable of supporting an acceptable angling fishery. The only potential for concern in 2008 was the sudden increase in the white sucker population. Suckers comprised a major component of the lake forage base, however, which might help explain the good growth of both northern pike and walleye. Even so, suckers have the ability to dominate the invertebrate forage and limit numbers of other species. For that reason, the sucker population should be watched in the future to keep it from becoming a dominant negative factor in the fish community structure.

No walleye had been stocked since 2005, and 100% of that population in 2008 was legal at 15+ in. Growth analyses implied there was modest evidence of positive contribution of stocked fish to the population (Table 4). Even so, it is unknown how continued stocking will affect the overall fish community structure and balance. Before resuming walleye stocking, another netting survey should be conducted to verify that the fish community is capable of supporting the increase in walleye numbers.

Management Direction

Surficial sand and gravel soils surrounding Pike Lake are incapable of adsorbing all of the septic drain field nutrients. As a result of increased eutrophication, or fertilization, more of the water volume will become anoxic in the future, limiting the zone of life to ever shallower waters. Unfortunately, there is no easy cure for this condition. The ultimate solution would be a sewage collection and treatment system, which is not likely to happen in such an isolated area. Another alternative solution might be application of a limestone slurry throughout the lake. As powdered limestone sinks and settles onto the bottom, it carries with it much of the lake nutrients, similar to a tertiary sewage treatment system. Effective limestone control, however, will require periodic, possibly annual treatments which would become quite expensive. Further limnological study would also be required in order to determine the need or efficacy of a limestone slurry treatment.

Fish community dynamic parameters through the last 15 years in this lake have been contradictory. For example, previous survey data indicated that species population numbers were low while growth rates at the same time were slow. Numbers usually cycle in opposition to growth rates; low numbers imply more food available for the remaining fish. Fish community numbers had been very depressed and composition apparently skewed for several years. The forage base appeared to be poorly represented in survey results. Reasons were unsubstantiated, but the four main potential factors appeared to be removal of too much forage in the 1980s, over-stocking of walleyes during the late 1980s and early 1990s, on-going loss of shoreline woody structure and associated habitat, or the loss of a significant portion of the oxygenated portion of the lake. Results from the 2008 netting survey, however, were very encouraging that the fish community was beginning to re-balance and stabilize.

Management direction should be continued as in the past, with focus on warm water and cool water sport fish species which are already present in the lake. Management concerns include increasing bullhead and white sucker numbers, the small forage base, a small, slow-growing yellow perch population, stunted northern pike, and an unusual walleye population. Even so, potential management activities are limited. Many actions were considered, including minnow stocking, walleye stocking,

manual removals of brown bullheads, etc. The strongest management action will be to restore the large woody structure along shorelines, although riparians will have to take responsibility for that effort. Within this data framework, there are three management goals.

The first goal is to maintain a fishable walleye population. Walleyes remain present in relatively good numbers through natural reproduction and possibly also due to a very modest stocking program that effectively ended in 2005. A renewed stocking program had been in place since 2003. The results of the 2008 netting survey showed that the walleye population was possibly responding to alternate year stocking efforts (Table 4). The fish were apparently supplementing a small natural population, but too much time will have passed before we can stock more. Renewed stocking for that reason will require another netting survey to verify the potential need for the young walleyes.

Goal two is to enhance the northern pike population and size frequency. Obstacles to this goal include slow growth rate and possibly extensive harvest of sublegal fish. Even so, pike numbers appeared to be rebounding on their own in 2008. The increased white sucker population will provide more forage for the pike, so an increasing growth rate is expected. Sublegal harvest might remain a problem due to difficulties in enforcement at a relatively remote location, but greater pike numbers and faster growth in the future will help minimize sublegal harvest. This goal will not require immediate MDNR effort, but the pike population will be watched to verify that it is recovering from the many years of low numbers and slow-growth rate.

The third goal is to re-establish a fishable yellow perch population. However, the unusual phenomenon of low population numbers combined with slow growth appeared to be less of an issue in 2008. Perhaps the sudden increase noticed in 2008 of minnow species populations was providing forage for the larger perch. Even so, placement of large woody structure, such as tree drops into the water along portions of the shoreline for spawning habitat, may alleviate more of the problem. As discussed previously, with restoration of open water log cover along much of the shoreline, Pike Lake will see a rebound in surface-colonizing algae and its related periphyton community. That forage base will then produce more minnow populations, panfish, suckers, and eventually provide better growth and numbers of sport fish. Increase of shoreline log cover has to become a high priority. If that habitat restoration occurs, all fish species will see increases in both numbers and growth rates.

Concluding, the most important management activity recommended is restoration of shoreline and near-shore large woody habitat. The second activity is, if the 2011 netting survey finds it necessary, to continue stocking a small number of walleyes on a two-year rotation. This fish community is better balanced, with better species population dynamics now than it was in 2003, and much better than it was in 1995. We recommend no change in management at this time. The lake should be re-surveyed in three years, prior to again stocking walleyes.

References

Historical files are kept at the Newberry Operations Service Center, 5100 S. M-123, Newberry, MI 49868

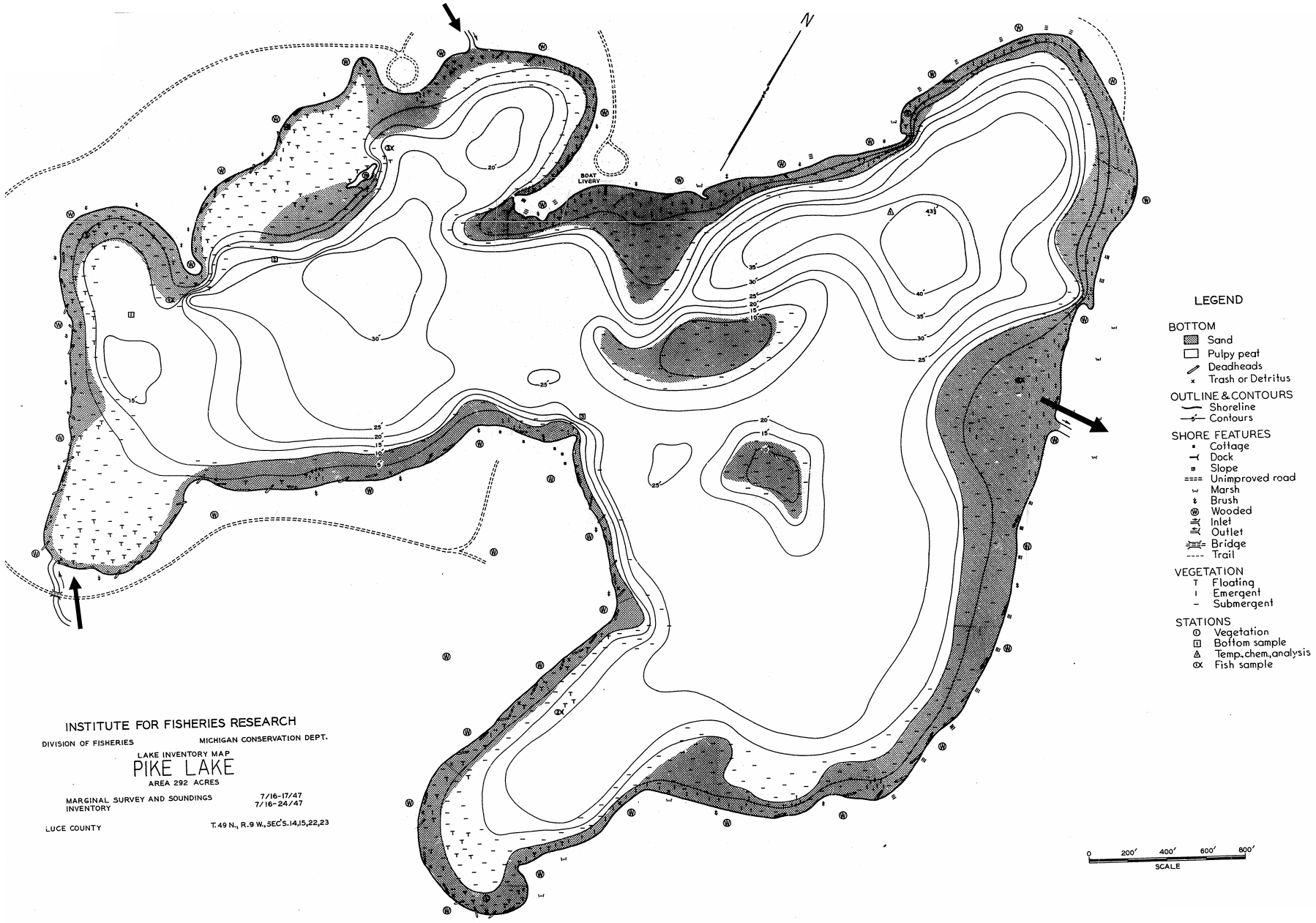

Figure 1. Contour map of Pike Lake, Luce County.

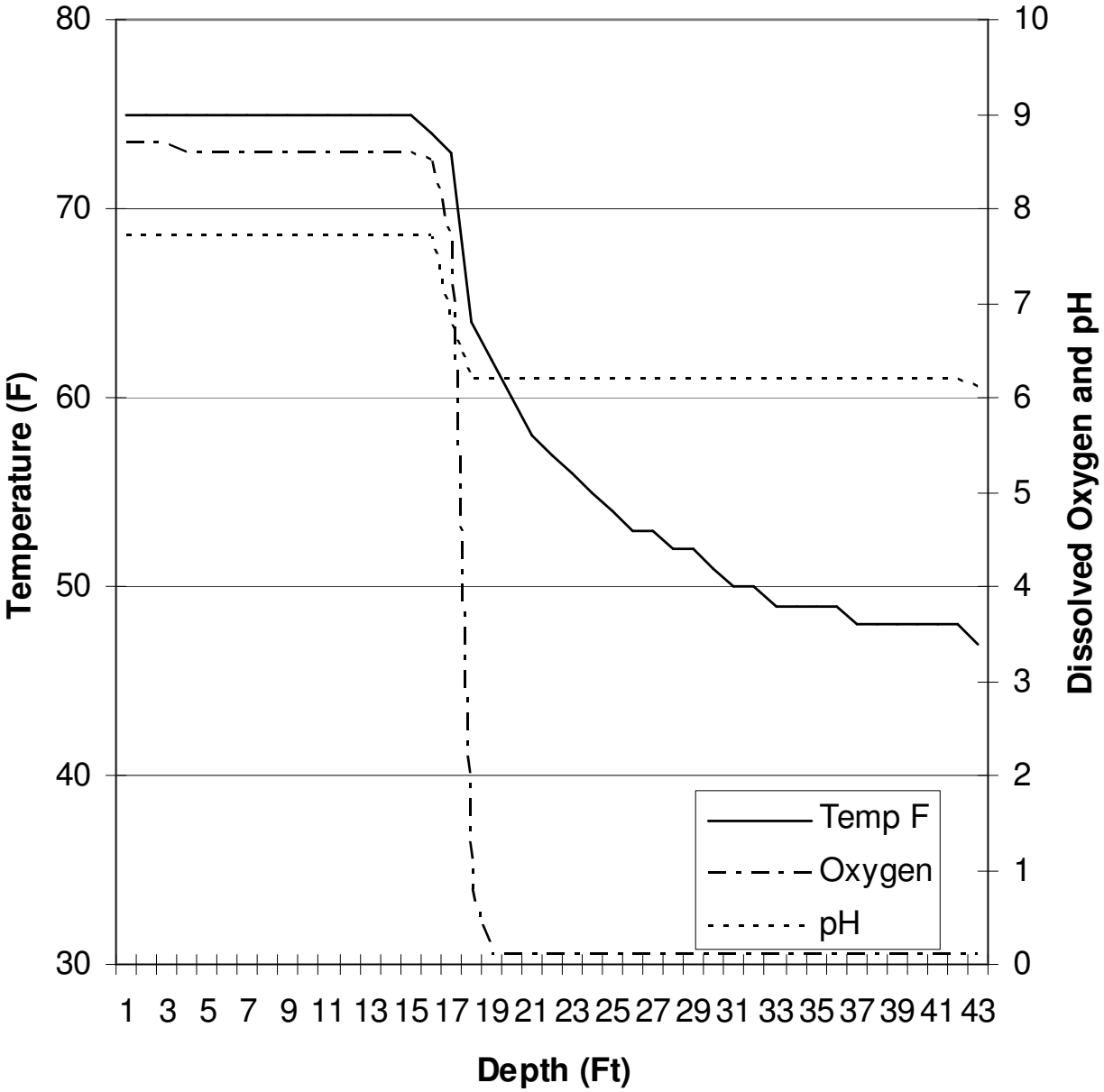

Figure 2. Changes in temperature, dissolved oxygen (mg/l) and pH with depth in Pike Lake, Luce County, August 21, 2003.

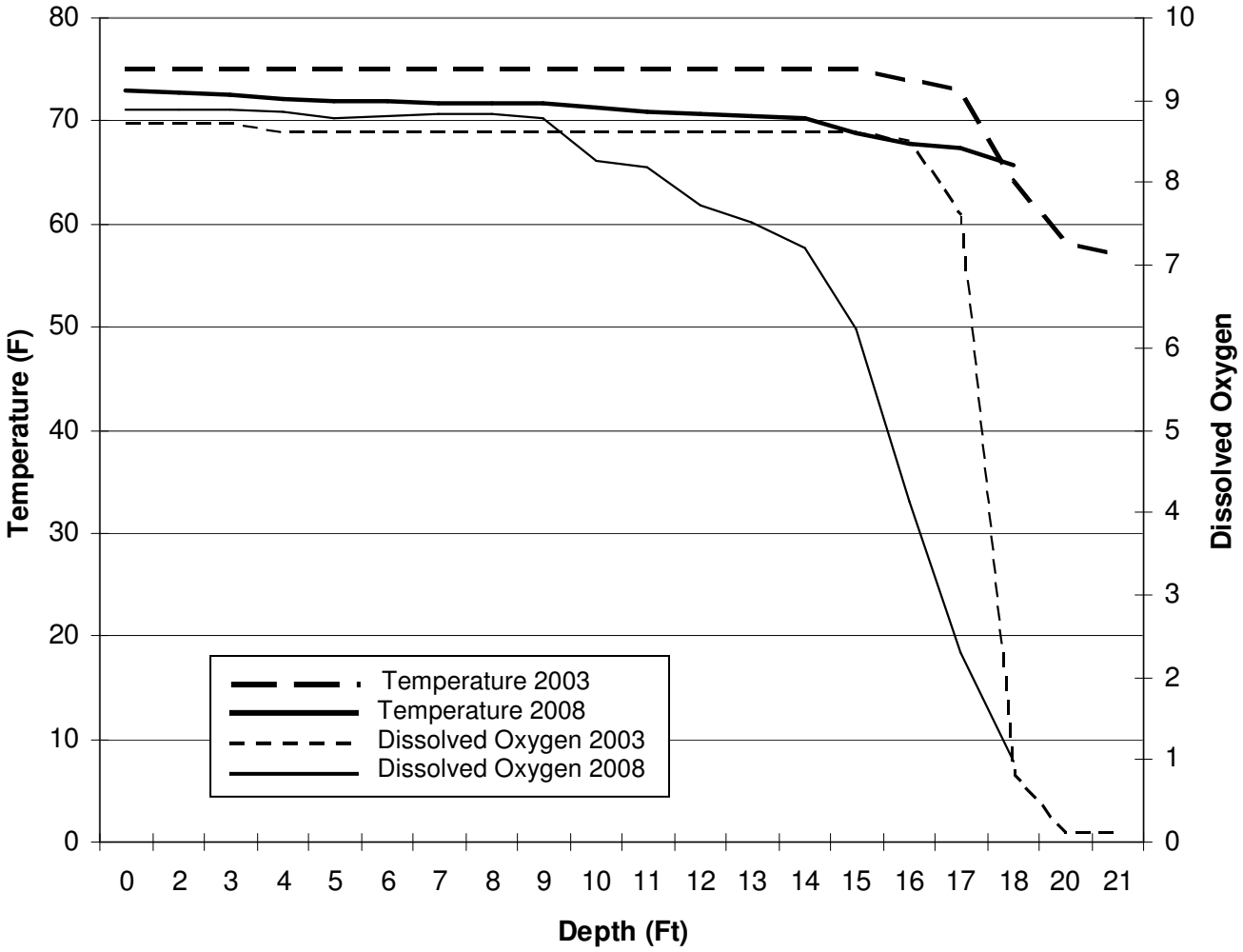

Figure 3. Comparison of temperature and dissolved oxygen (mg/l) from surveys in Pike Lake, Luce County in August 21, 2003 and August 14, 2008.

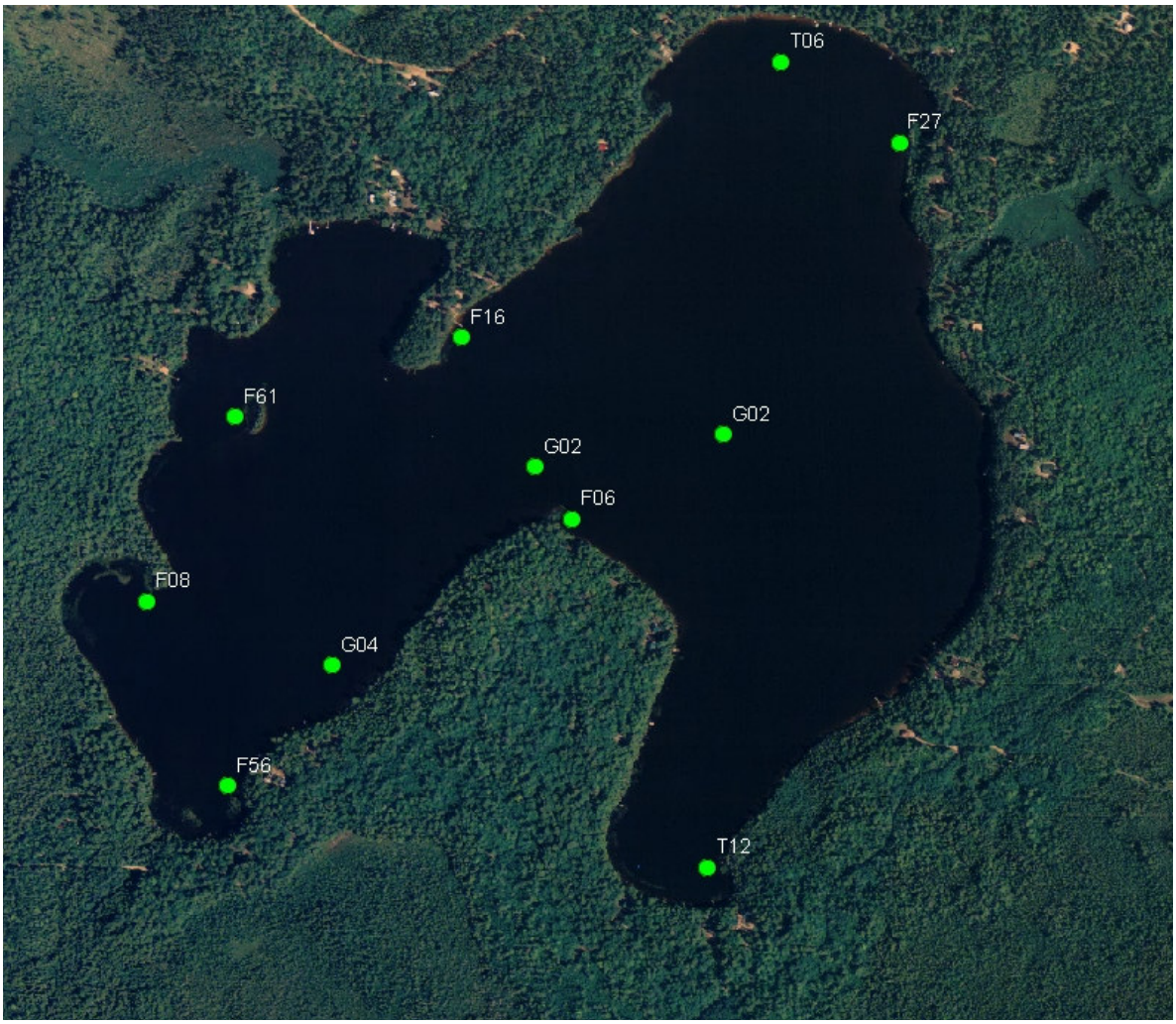

Figure 4. Aerial photograph showing net locations in Pike Lake, Luce County during June 2-5, 2008 using fyke, trap, and gill nets.

Table 1. Walleye stocking history for Pike Lake, Luce County, from 1980 until 2008. Lengths are average lengths in cm, weights are total weight in kg.

Date	Age*	Number	Length	Weight
1981	Fry	600000	0.9	4
1981	Spring fingerling	8490	0	31.4
1982	Spring fingerling	10561	0	17.9
1983	Fry	600000	1	4.6
1983	Spring fingerling	6092	0	3.4
1983	Spring fingerling	5220	0	5.1
1985	Spring fingerling	10612	4.9	9
1985	Spring fingerling	9858	5.7	9
1988	Spring fingerling	20508	5.1	17.8
1989	Spring fingerling	13499	5.2	12.64
1991	Spring fingerling	12069	5.4	12.25
1992	Spring fingerling	12000	4.3	7.18
1993	Spring fingerling	12071	5.1	10.9
2003	Spring fingerling	6555	4.32	3.24
2005	Spring fingerling	5740	3.93	1.86

* Fry are newly hatched fish, SF are spring fingerlings

Table 2. Number, weight (biomass), and length by species for Pike Lake, Luce County netting survey June 2-5, 2008 using fyke, trap, and gill nets.

Species	Number	Percent by Number	Biomass (lb)	Percent by Biomass	Length Range (in)	Average Length (in)*	Percent Legal Size**
Brown bullhead	7	0.3	9.1	2.8	9 - 15	13.8	100
Bluegill	2	0.1	0.2	0.1	2 - 6	4.5	50
Common shiner	313	15.1	12.0	3.7	3 - 5	4.5	100
White sucker	61	2.9	143.3	44.0	5 - 22	17.8	100
Fathead minnow	40	1.9	0.8	0.3	2 - 4	3.5	100
Golden shiner	497	23.9	9.4	2.9	2 - 5	3.9	100
Northern pike	26	1.3	56.0	17.2	11 - 25	21.2	8
Pumpkinseed	284	13.7	8.0	2.4	2 - 7	3.2	1
Rock bass	38	1.8	11.7	3.6	3 - 11	6.8	58
Spottail shiner	1	0.0	0.0	0.0	4	4.5	100
Walleye	13	0.6	40.3	12.4	16 - 23	21.0	100
Yellow perch	795	38.3	35.2	10.8	2 - 9	4.5	4

* Some fish may be measured to 0.1 in, others to inch group: e.g., “5” = 5.0 – 5.9 in, “12” = 12.0 to 12.9 in, etc.
** Percent legal or acceptable size for angling harvest

Table 3. Weighted mean length and age for five fish species from Pike Lake, Luce County, from a netting survey on June 2-5, 2008, using fyke, trap, and gill nets.

Species	Age I	II	III	IV	V	VI	VII	VIII	IX	X	X1	Mean growth index (in.)[1]
Northern pike	11.8 (2)	19.8 (2)	21.7 (7)	22.3 (4)	24.7 (1)							+0.3
Pumpkinseed			4.2 (13)	4.9 (3)	6.8 (1)	7.0 (1)	7.3 (1)					-0.7
Rock bass			4.4 (6)	5.2 (4)	6.3 (4)	7.8 (2)	7.9 (6)	9.2 (2)	9.5 (1)	10.0 (2)	11.8 (1)	-0.7
Walleye			17.2 (6)	19.2 (2)	19.5 (6)		20.1 (1)	20.5 (7)	20.0 (4)	21.1 (12)	20.4 (13) XII 21.3 (2)	+.5
Yellow perch		4.8 (6)	5.7 (16)	7.0 (8)	7.8 (12)	8.6 (4)	9.1 (1)	9.5 (2)	9.6 (1)	9.5 (1)		-0.6

[1] Mean growth index is the deviation from state average length in inches.

Table 4. Representation of walleye from stocked years in the 2008 surveys in Pike Lake, Luce County, from both electrofishing April 30 and netting June 2-5, using fyke, trap, and gill nets.

Age	Represented Year	Number Stocked	Number Captured
0	2008	0	0
1	2007	0	0
2	2006	0	0
3	2005	5,740	6
4	2004	0	2
5	2003	6,555	6
6	2002	0	0
7	2001	0	1
8	2000	0	7
9	1999	0	4
10	1998	0	12
11	1997	0	13
12	1996	0	2