Lake Antoine

Dickinson County, T42N R30W Sec. 19, 20, 21, 28, 29,30
Menominee River Watershed, April 16-21, 2007

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Environment

Lake Antoine is a popular waterbody located in Michigan's Upper Peninsula in southwest Dickinson County, partly within the city limits of Iron Mountain, Michigan (Figure 1). The physical structure of Lake Antoine can be described generally as a single shallow basin with one small island and several small bays (Figure 2). The lake's surface area is 748 acres and its maximum depth is about 25 feet. Bottom substrates are mostly sand and organic matter, with aquatic vegetation prevalent throughout nearshore areas. Biological productivity is known to be relatively high for Lake Antoine, especially compared to other Upper Peninsula lakes, but water chemistry data for Lake Antoine is scarce. Lake Antoine is one of the largest lakes by surface area in Dickinson County.

Lake Antoine is located within the Menominee River watershed. The entire Menominee River watershed is over 4,000 square miles and has a predominantly rural and/or forested landscape that spans across portions of Michigan and Wisconsin. The Menominee River itself is about 118 miles long and drains into Lake Michigan near the cities of Marinette, Wisconsin and Menominee, Michigan. No inlets drain into the lake, although groundwater is withdrawn from the Hamilton Mine Shaft that extends deep into underlying bedrock and this water is discharged into the west end of the lake (Luukkonen and Westjohn 2000). According to Luukkonen and Westjohn (2000), a hydraulic connection likely exists between the bedrock and Lake Antoine based on water levels in the mine shaft. The only outlet for Lake Antoine, Antoine Creek, originates at the western corner of Lake Antoine and flows for approximately 3 miles before draining into the Menominee River. Additionally, Lake Antoine is located within the Michigan Department of Natural Resources Fisheries Division's Northern Lake Michigan Management Unit (NLMMU).

The landscape immediately surrounding Lake Antoine is primarily forested and has many residential developments. The dominant forest type is northern hardwoods, with smaller areas of pine and lowland deciduous, and the dominant soil type is sandy loam, with some muck and rock outcrops. County Roads 396 and 607 closely follow Lake Antoine's perimeter. There are two public parks, Lake Antoine County Park along the eastern shoreline and Goulette Senior Citizens Park along the western shoreline, and each park has a public boat launch.

History

Stocking History

The stocking history of Lake Antoine exemplifies the changes in fisheries management objectives over time (Table 1). The earliest recorded fish stocking event for Lake Antoine occurred during 1936 and subsequent stocking events continued on an occasional basis through 1944. Fishes stocked into Lake Antoine during this time were walleyes, largemouth bass, smallmouth bass, yellow perch, and bluegills. Walleyes were also stocked periodically during 1954-1958. Tiger muskellunge were stocked in the late 1970s, but these efforts were later suspended due to a lack of local support. Northern pike

were stocked from 1985-1990. Since the late 1970s, walleye have been stocked on a routine basis. Walleye spring fingerlings were stocked into Lake Antoine biennially during 1985-1998, annually from 1999-2003, and again in 2011 and 2012. The average spring fingerling stocking rate was 46/acre (range 9-135/acre). Fall fingerlings were stocked in 1979 (10/acre) and 1983 (73/acre). In 1982, 2,082 adult walleyes were transferred from the Groveland Mine Ponds to Lake Antoine.

Lake Antoine's walleye fishery was popular during the 1980s as a result of the aggressive stocking techniques including transfer of adults and stocking of fall fingerlings, but the fishery subsequently declined over time due to limited natural reproduction and poor survival of stocked fingerlings. As a response to this decline, somewhat more aggressive stocking efforts were initiated during the late 1990s and continued through 2003 and many follow-up fisheries surveys were conducted to evaluate the outcome of these more aggressive stocking efforts. Although walleyes were regularly stocked into Lake Antoine for many years, walleyes were not stocked into Lake Antoine during 2004-2010 for various reasons. There was an approved prescription to stock walleyes into Lake Antoine during 2004-2006, but this planned stocking never occurred. File records do not clearly indicate why this stocking did not occur, but probable reasons include concern about low forage abundance (e.g., slow walleye growth rates during 1996) and poor spring fingerling survival. Another possible reason is that walleye production is variable and may have been inadequate to fill NLMMU stocking requests. During 2007, all walleye stocking efforts were suspended statewide in response to fish health concerns due to the Viral Hemorrhagic Septicemia virus (VHS). With adequate VHS and fish health testing protocols in place, the DNR resumed its walleye rearing and stocking efforts in 2011. Despite ongoing concerns about low forage abundance and poor fingerling survival for Lake Antoine, spring fingerling walleyes were once again stocked into Lake Antoine during 2011 and 2012 in response to strong public demand and to provide further opportunity to evaluate the contribution of stocked walleye to Lake Antoine's fishery.

Fisheries Management

In order to guide management decisions, the fish community in Lake Antoine has been surveyed numerous times, beginning with a general survey in 1936. Survey efforts have aimed to quantify the fish community, gauge the level of walleye stocking success and natural recruitment, evaluate the smallmouth bass and yellow perch populations, and monitor the effects of white sucker removals. In general, the analyses from these surveys indicate that walleye natural reproduction was limited and routine stocking was needed to maintain the population.

Surveys conducted in 1956, 1961, 1969, 1977, 1978, 1981, and 1984 evaluated walleye stocking and survival. These surveys documented very little walleye natural reproduction and variable survival of stocked walleye. In most instances, recommendations were made to continue stocking walleye to maintain the population.

Fall electrofishing surveys were recently conducted on Lake Antoine during eight separate years from 1991-2003 using Serns protocol to evaluate recruitment of young walleyes and smallmouth bass (Serns 1982, 1983; Ziegler and Schneider 2000). Catch rates were calculated for young-of-the year (YOY) and yearling walleyes and were compared with Serns index values to determine overall year-class strengths. Over 360,000 spring fingerling walleyes and approximately 1,000,000 walleye fry were stocked into Lake Antoine during 1991-2003. Regardless of these efforts, fall electrofishing surveys during 1991, 1992, 1993, 1995, 1997, 1999, 2001, and 2003 all indicated extremely poor walleye year-

class strength (Figure 3). These results suggest that stocked spring fingerling walleyes have survived poorly in Lake Antoine and that walleye recruitment through natural reproduction has been minimal. Catch rates were also calculated for YOY and yearling smallmouth bass, and these catch rates were much higher, compared to lower walleye catch rates (Figure 4). Smallmouth bass are not stocked into Lake Antoine, and therefore are occurring solely though natural reproduction.

A spring fyke net survey was conducted on Lake Antoine during May 13-16, 1996, with the primary purpose of evaluating the adult walleye and northern pike populations and to investigate angler complaints of a declining walleye population. A total of 513 walleyes and 89 northern pike were captured, with a total sampling effort of 42 net nights. This survey identified limited survival of stocked walleyes and some natural reproduction with walleye total lengths ranging from 7-28 inches and 8 year-classes including ages 1, 2, 4, 7, 8, 9, 10 and 13. Northern pike total lengths ranged from 11-36 inches, and 6 year-classes were identified (ages 1, 2, 3, 5, 7, and 9). Mean growth rates were below average or slow for walleyes (-2.2) and above average or fast, for northern pike (+1.4). Also during the 1996 survey, a partial mark-recapture population estimate was conducted for walleyes that resulted in an estimated 0.8 adult walleyes per acre.

Zebra mussels, rusty crayfish, and Eurasian watermilfoil, all invasive species, have been documented in Lake Antoine. Since at least 2005, the Lake Antoine Association has routinely sought a permit from the Department of Environmental Quality to treat Eurasian watermilfoil with aquatic herbicide. A comprehensive aquatic vegetation survey was conducted by the Dickinson County Conservation District in 2003 and documented a diverse native plant community and non-native Eurasian watermilfoil.

At least two fish removals occurred historically in Lake Antoine. The file indicates that white sucker removals were conducted by the District Two Walleye Club in April and May, 1990 and 1991. Although no data was provided for the 1990 effort it was mentioned to be larger than the 1991 effort that resulted in 2,000 pounds of suckers being removed. Follow up surveys found that the removal efforts were effective at reducing the numbers of white suckers, but unexpectedly led to a decline in available forage for species such as northern pike.

Several habitat improvement projects are described in the file. In 1972, a "walleye spawning bar" was constructed using 66 cubic yards of shattered granite. The rock was placed along the northeast shoreline with the help of the Michigan National Guard and the Iron Mountain-Kingsford Sportsmen's Club. Approximately 100 fish shelters made of logs, brush, and rocks were constructed in 1975, followed by 30-50 structures made of brush and cement blocks and placed along the north shoreline in 1989. Fish reefs, comprised of oak fish cribs, were constructed just northeast of "Bugni Island" and on southeast side of the lake during the winters of 1994 and 1995 by the District Two Walleye Club, Wildlife Unlimited of Iron County, and Fisheries Division. References are also made to a pike spawning marsh for the purpose of increasing pike numbers and yellow perch size structure. Although the file documents a parcel of land deeded by the City of Iron Mountain for this purpose in 1986, there is no documentation of the pike spawning marsh project being completed.

Current Status

The most recent fisheries survey for Lake Antoine occurred on April 16-21, 2007. The main purpose of this survey was to duplicate the 1996 netting survey and evaluate the status of Lake Antoine's adult

walleye population. Survey data were evaluated specifically to address questions about the lake's predator-prey balance and walleye recruitment. This survey was conducted using 10 fyke nets and netting efforts specifically targeted adult walleyes by placing nets on expected walleye spawning locations such as rocky shoreline shortly after ice out when walleyes were actively spawning. Fish were identified to species, counted, measured, and dorsal spines were collected from a subsample to estimate age. The overall sampling effort was 50 net nights.

Growth rates were calculated by comparing length-at-age data from Lake Antoine to the statewide average length-at-age and to the Upper Peninsula regional length-at-age for walleyes. Growth rates were expressed as numerical values, where positive values indicate above average (fast) growth and negative values indicate below average (slow) growth. Because growth rates are largely influenced by food intake, growth rate calculations were used as an indicator of predator-prey balance (i.e., fast growth suggests that forage is abundant and accessible, relative to predator abundance; while slow growth suggest that forage many be scarce, inaccessible, and/or predators may be overabundant). Age data were also used to identify walleye year classes, which were compared to past stocking events to determine if natural reproduction may be contributing to Lake Antoine's adult walleye population.

A total of 2,889 fishes totaling 1,404 pounds and 14 fish species were collected from Lake Antoine during the April 16-21, 2007 netting survey (Table 2 and 3). Although the primary purpose of the survey was to target walleyes and northern pike, the capture of other species are also highlighted because of their contribution to the overall health of the Lake Antoine fishery. The total catch (N=2,889) consisted mainly of yellow perch (N=1,010), rock bass (N=989), bluegills (N=472), walleyes (N=174), and northern pike (N=129).

Walleyes are of particular importance to the local fishing groups and 174 walleyes were collected during the 2007 survey with lengths ranging from 15-27 inches, meaning that 100% of the catch was ≥ the 15 inch minimum legal size limit. Ageing analysis indicated ages 3-18 in the population, and growth was determined to be above the statewide average length-at-age (+0.8) and above the Upper Peninsula regional average length-at-age (+1.7).

Northern pike (N=129) averaged 23 inches and ranged from 17-31 inches with 36% of the catch of legal size for harvest (≥24 inches). Ageing analysis indicated ages 2-9 in the population, and growth was determined to be below the statewide average length-at-age (-1.7).

Yellow perch (N=1,010) averaged 5.1 in and ranged from 3-13 inches long, with 7% of the catch of desirable size for harvest (≥7 in). Ageing analysis indicated ages 2-9 in the population, and growth was determined to be below the statewide average length-at-age (-1.7).

Rock bass (N=989) averaged 6.1 inches and ranged from 2-9 inches long, with 52% of the catch of desirable size for harvest (≥6 in). Ageing analysis indicated ages 1-8 in the population, and growth was determined to be at the statewide average length-at-age (0).

Bluegills (N=472) averaged 5.2 inches and ranged from 2-8 inches long, with 24% of the catch of desirable size for harvest (≥6 in). Ageing analysis indicated ages 2-6 in the population, and growth was determined to be above the statewide average length-at-age (+0.3).

Other species captured in the 2007 survey included black crappie, brown bullhead, golden shiner, largemouth bass, pumpkinseed, sculpins, smallmouth bass, and white sucker.

Analysis and Discussion

Lake Antoine has a diverse fish community with many legal-sized fishes that are commonly pursued by recreational anglers (e.g., walleyes, smallmouth and largemouth bass, northern pike, and panfish; Table 2 and 3).

Growth rates from 2007 indicate that Lake Antoine's fish community is healthy, with above average growth for several game fishes such as bluegill, bass, pumpkinseed and walleyes and below average growth for northern pike and yellow perch. Fast growth rates indicate adequate forage to support the energetic demands of predator fish communities while below average growth rates indicate competition for food resources.

Although the walleye population in Lake Antoine appears to have declined since 1996, the population has good age structure and some level of natural reproduction. In 2007, a total of 12 walleye age-classes were identified, and ages ranged from 3-18 (Figure 5). Of the age classes with a sample size greater than four fish, one age class (age 8) did not correspond with past stocking events, meaning that at least some natural reproduction and recruitment is occurring. On the other hand, six age classes with sample sizes greater than four fish (ages 3, 4, 5, 6, 7, 8 and 10) corresponded with stocking events from years 2003, 2002, 2001, 2000, 1999, 1997, and 1996, although these fish could also be attributed to natural reproduction. This age data reveals that recent walleye year classes may have survived and contributed to Lake Antoine's walleye fishery, however the contribution of stocked walleyes versus naturally produced walleyes remains uncertain because stocked fish were not uniquely marked and stocking occurred most years. Overall, walleyes in Lake Antoine are low in numbers, have good growth rates, good age structure, and exhibit some natural reproduction.

Northern pike growth was similar by age class in 1996 and 2007, yet overall northern pike growth was below the statewide average length-at-age in 2007 and above the statewide average length-at-age in 1996. In both years, young sub-legal northern pike were found to exhibit fast growth, while older legal sized northern pike grew slow. In 1996, very few older walleye were aged, thus skewing the overall growth rate to the positive. A better representation of older age classes of northern pike was sampled in 2007 and, therefore, below average growth accurately describes the population. Collectively, this data indicates sufficient food available for sub-legal northern pike and competition for food resources for northern pike that are approximately 24 inches or larger.

Bluegills were more abundant in 2007 compared to 1996, although larger and older fish were captured in 1996. This information indicates that the higher number of walleyes present in 1996 likely exerted heavy predation on bluegill population, resulting in higher size structure with reduced abundance.

Management Direction

Future fisheries management efforts for Lake Antoine should be focused on protecting and enhancing fish populations and habitats, providing diverse public fishing opportunities, and contributing to the public's stewardship and understanding of the lake's fishery (Fisheries Division 2002). It is important to understand that future management decisions will require consideration of many important, and

potentially conflicting factors, including history and success of past fisheries management efforts, public interest, availability of fish for stocking, and the biological status of the lake.

The current fisheries information indicates that Lake Antoine should be managed for a balanced fish community with rock bass, bluegill, yellow perch, largemouth bass, smallmouth bass, and walleyes. At the time of the 2007 survey, Lake Antoine's fish community was found to have growth rates that varied by species and indicated concerns with sufficient forage for species including northern pike and yellow perch. It is possible that stocking additional predators such as walleyes could upset the balance of the fishery in Lake Antoine by causing further completion among predator species and additional pressure on prey species.

Walleye stocking has been a major component of past fisheries management efforts for Lake Antoine. Walleyes were initially stocked into Lake Antoine during the 1930s and these walleye stocking efforts continued occasionally through 2012. These stocking efforts have received strong public support, stocked walleyes have exhibited poor survival and stocking has not led to a large population sustained by natural reproduction. Given these considerations, three possible and practical future stocking strategies are evident for Lake Antoine with various pros and cons:

1) Continue to Stock Spring Fingerling Walleyes
Pro:
a. Walleye stocking is supported by some stakeholder groups
b. If stocked walleyes are marked, there will be an opportunity to conclusively evaluate the contribution of stocked walleyes to the fishery
Con:
a. Spring fingerlings walleyes have historically exhibited limited survival and contribution to the fishery

2) Initiate Stocking of Fall Fingerling Walleyes Instead of Spring Fingerlings
Pro:
a. Walleye stocking is supported by some stakeholder groups
b. Fall fingering walleyes may survive better then spring fingerlings, especially if predation is affecting survival.
c. If stocked walleyes are marked, there will be an opportunity to conclusively evaluate the contribution of stocked walleyes to the fishery
Con:
a. Fall fingerlings have historically exhibited limited survival and contribution to the fishery
b. Fall fingerlings are more expensive compared to spring fingerlings
c. Fall fingerlings are not readily available through current rearing program

3) Discontinue Lake Antoine's Walleye Stocking Program
Pro:
a. Resources including fish, staff time, and funding, could be allocated to waters where stocked walleyes have better survival
b. Populations of naturally produced fishes such as smallmouth bass, largemouth bass, and yellow perch may improve due to reduced competition from stocked walleyes
Con:

a. Some stakeholder groups would oppose the elimination of walleye stocking in Lake Antoine

Because of public interest, the NLMMU has made a decision to continue to stock spring fingerling walleyes in Lake Antoine at this time. All stocked walleyes will be marked with oxytetracycline (OTC) to determine the contribution of these fish to the overall population. Spring fingerling walleyes will be stocked at a rate of 50/acre for a 3-year period for three consecutive years beginning in 2013 and followed by biennial stocking.

Fall recruitment surveys or Serns index surveys will be conducted to evaluate the contribution of OTC-marked walleyes to the fishery, and evaluate abundance and recruitment of YOY walleyes. A spring/early summer survey is needed to evaluate the largemouth and smallmouth bass community. Creel surveys should be conducted to evaluate angler interest and success. Future survey information will be used to determine if changes in management direction are warranted.

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Ziegler, W. and J. C. Schneider. 2000. Guidelines for evaluating walleye and muskie recruitment. Chapter 23 in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

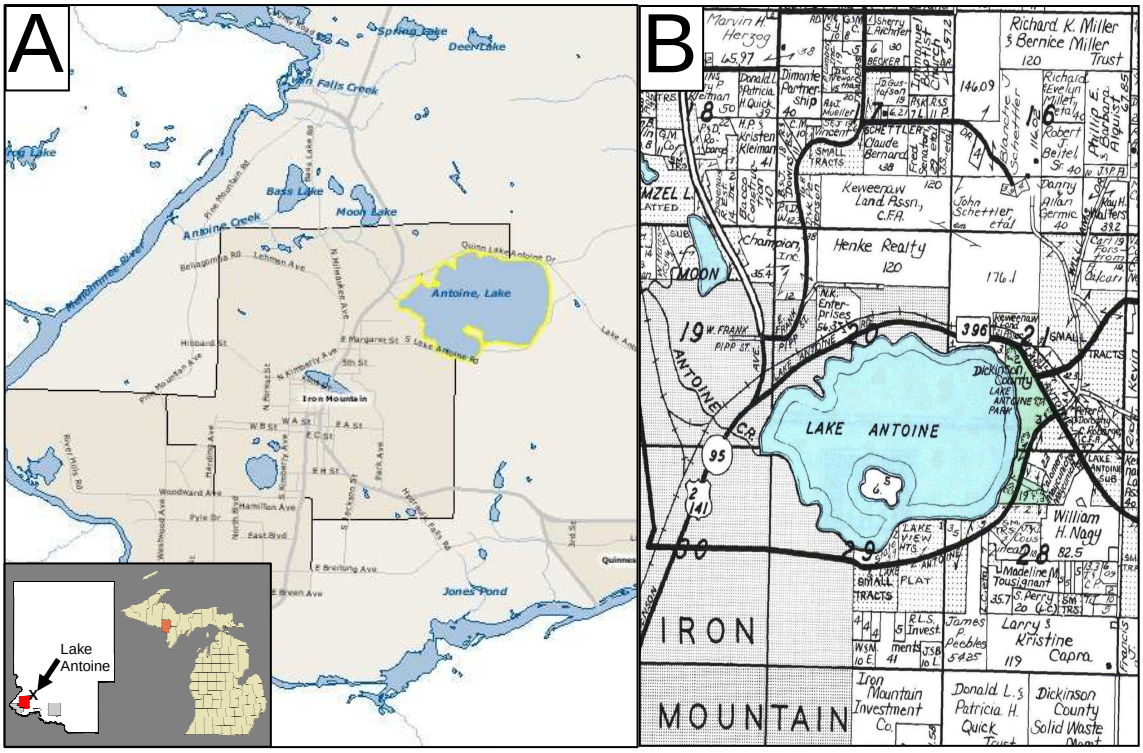

Figure 1. Maps of Lake Antoine showing (A) an inset of Dickinson County and Lake Antoine within the State of Michigan, and Lake Antoine within Iron Mountain city limits and (B) Lake Antoine with surrounding county roads (B).

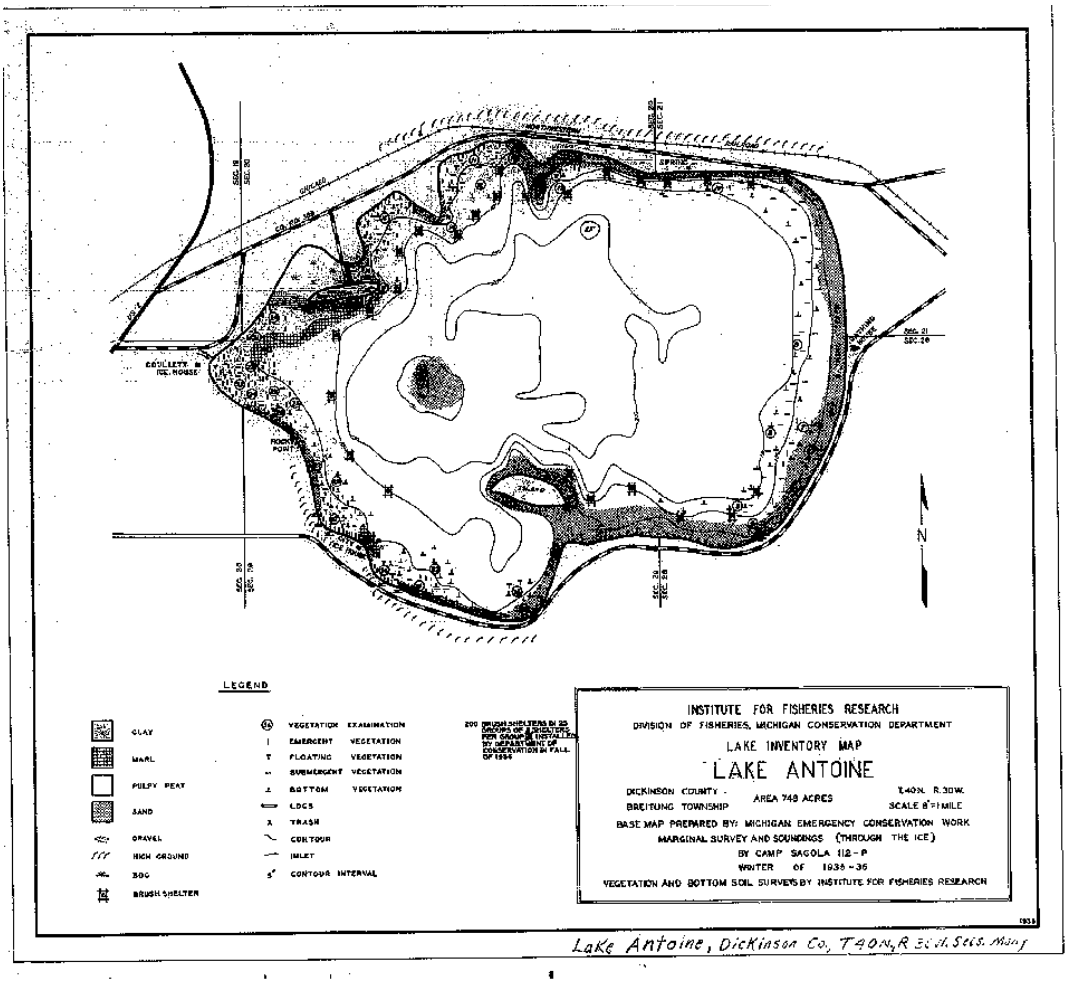

Figure 2. Map of Lake Antoine showing depth contours and bottom substrates.

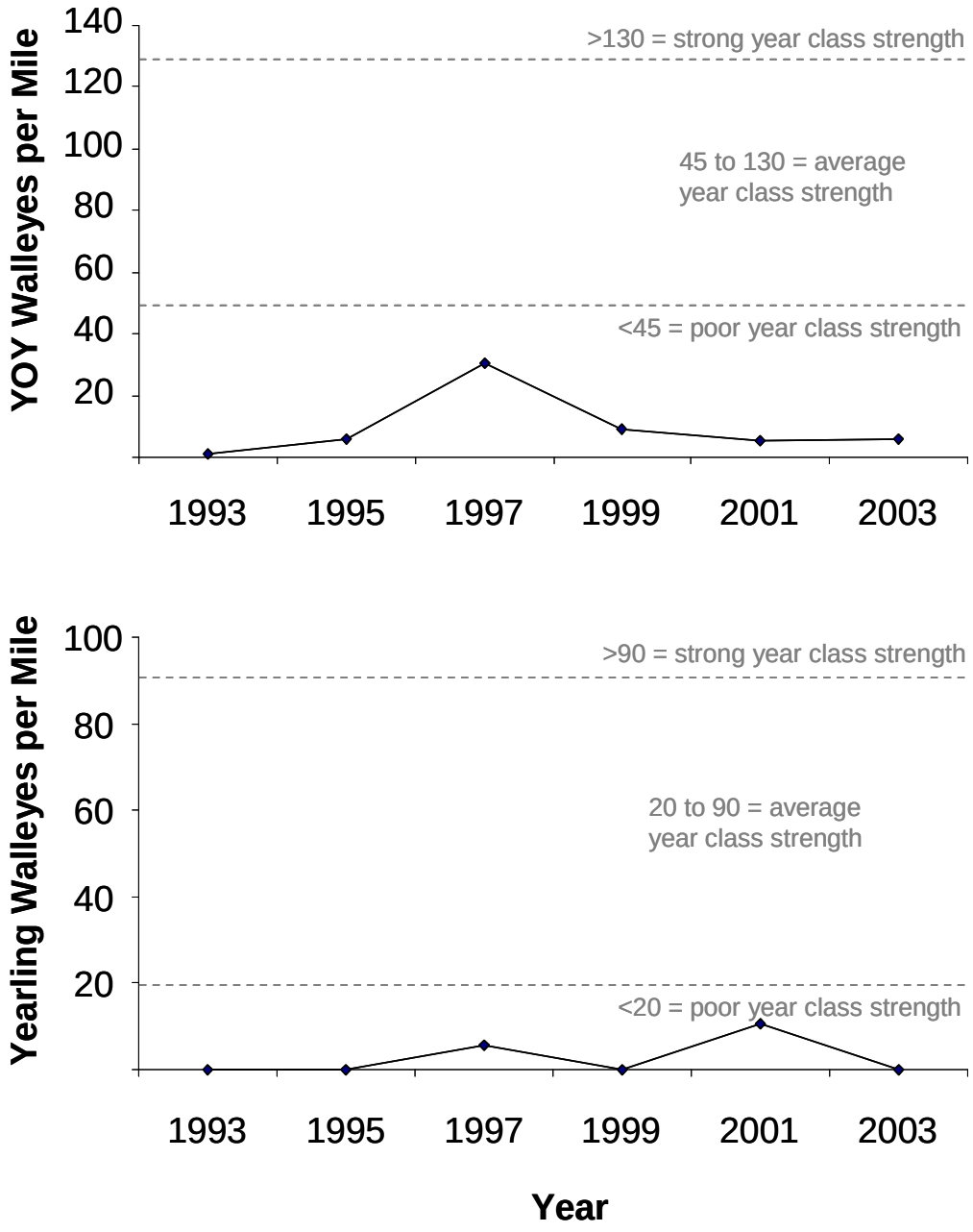

Figure 3. Results from Serns electrofishing surveys conducted on Lake Antoine during 1993-2003.

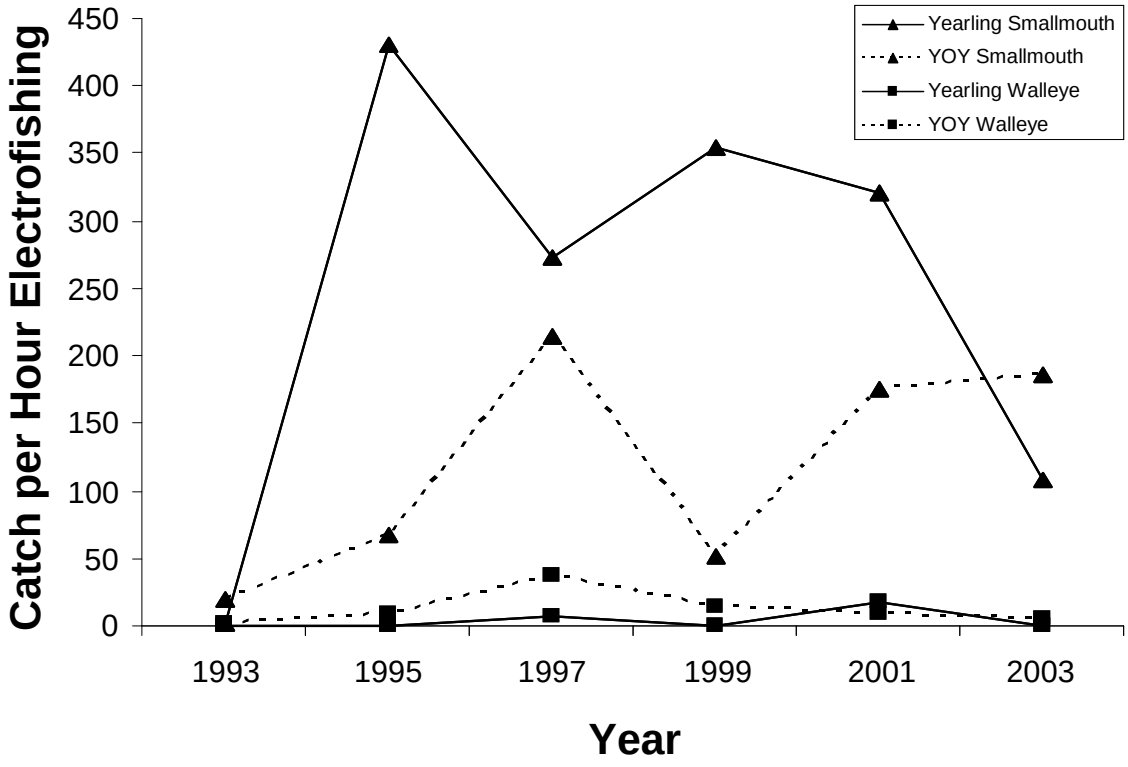

Figure 4**.** Differences between walleye and smallmouth bass catch rates from Serns electrofishing surveys conducted on Lake Antoine during 1993-2003.

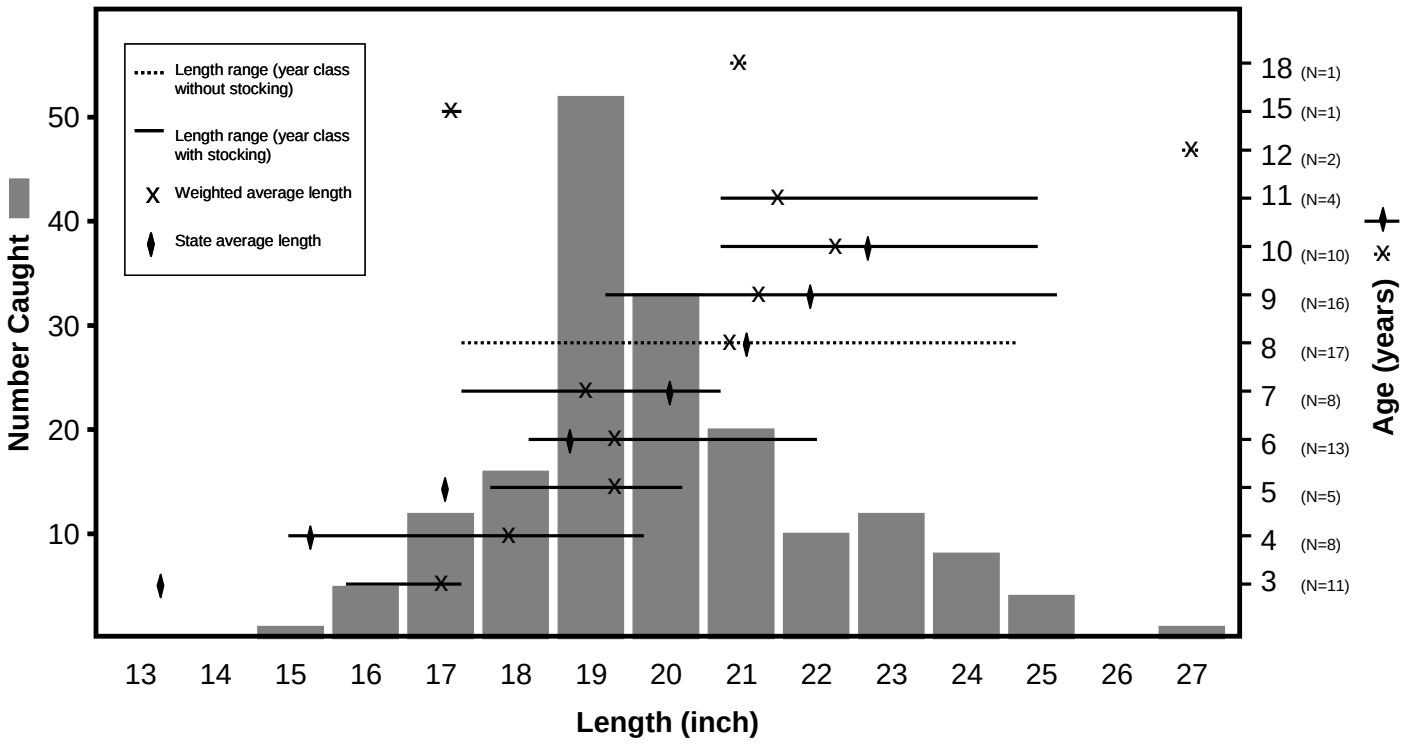

Figure 5. Length frequency distribution and age estimates for walleyes captured during an April 16-21, 2007 netting survey on Lake Antoine.

Table 1. Summary of fish stocked into Lake Antoine from 1936-2012.

Year	Species	Life Stage	Number	Rate (#/acre)
1936	Largemouth bass	Yearling	500	1
1936	Smallmouth bass	Yearling	400	1
1936	Walleye	Fry	300,000	401
1936	Bluegill	Yearling	16,800	22
1937	Largemouth bass	Yearling	200	0
1937	Smallmouth bass	Yearling	200	0
1937	Walleye	Fry	245,000	328
1937	Bluegill	Yearling	7,200	10
1938	Smallmouth bass	Adult	187	0
1938	Bluegill	Yearling	15,000	20
1939	Largemouth bass	Yearling	600	1
1939	Bluegill	Yearling	8,000	11
1940	Largemouth bass	Yearling	900	1
1940	Smallmouth bass	Yearling	500	1
1940	Bluegill	Yearling	13,000	17
1941	Smallmouth bass	Adult	395	1
1941	Bluegill	Yearling	30,000	40
1942	Smallmouth bass	Adult	55	0
1942	Bluegill	Yearling	8,000	11
1943	Largemouth bass	Yearling	200	0
1943	Bluegill	Adult	300	0
1944	Largemouth bass	Yearling	300	0
1944	Bluegill	Adult	350	0
1954	Walleye	Fingerling	1,800	2
1955	Walleye	Fingerling	18,000	24
1957	Walleye	Fingerling	8,500	11
1958	Walleye	Fingerling	3,000	4
1966	Walleye	Fry	700,000	936
1974	Walleye	Fry	500,000	668
1977	Walleye	Fry	700,000	936
1977	Tiger muskellunge	Fall Fingerling	3,000	4
1978	Tiger muskellunge	Fall Fingerling	3,000	4
1979	Tiger muskellunge	Fall Fingerling	3,000	4
1979	Walleye	Fall Fingerling	10,000	13
1983	Walleye	Fall Fingerling	54,500	73
1985	Northern pike	Fall Fingerling	10,000	13
1985	Walleye	Spring Fingerling	7,000	9
1985	Walleye	Yearling	596	1
1985	Walleye	Adult	1,486	2
1986	Northern pike	Fall Fingerling	15,000	20
1987	Northern pike	Fall Fingerling	5,000	7
1987	Walleye	Spring Fingerling	35,804	48
1988	Northern pike	Fall Fingerling	11,440	15
1989	Northern pike	Adult	1,159	2

Table 1 (continued). Summary of fish stocked into Lake Antoine from 1936-2012.

Year	Species	Life Stage	Number	Rate (#/acre)
1989	Northern pike	Fall Fingerling	3,500	5
1989	Walleye	Spring Fingerling	46,167	62
1989	Northern pike	Adult	306	0
1990	Northern pike	Fall Fingerling	10,000	13
1991	Walleye	Spring Fingerling	30,098	40
1993	Walleye	Spring Fingerling	18,000	24
1995	Walleye	Spring Fingerling	19,471	26
1996	Walleye	Fry	1,000,000	1337
1997	Walleye	Spring Fingerling	33,005	44
1999	Walleye	Spring Fingerling	40,425	54
2000	Walleye	Spring Fingerling	100,799	135
2001	Walleye	Spring Fingerling	37,500	50
2002	Walleye	Spring Fingerling	38,048	51
2003	Walleye	Spring Fingerling	44,934	60
2011	Walleye	Spring Fingerling	22,500	30
2012	Walleye	Spring Fingerling	11,697	16

Table 2. Catch summary of fishes collected with fyke nets from Lake Antoine during April 16-21, 2007.

Common name	Number	Total weight (lbs.)	Average length (in.)	Length range (in.)	Percent of catch by number	Percent of catch by weight	Percent legal or acceptable size
Black Crappie	2	2.01	12	11-12	0.07	0.14	100 (≥ 7”)
Bluegill	472	49.47	5.2	2-8	16.34	3.52	23.52 (≥6”)
Bluegill-Pumpkinseed Hybrid	1	0.00	8.5	8	0.03	0.00	-
Brown Bullhead	3	3.72	12.8	7-17	0.10	0.26	100.00 (≥7”)
Golden Shiner	4	0.13	4.8	4-5	0.14	0.01	-
Largemouth Bass	25	60.78	16.3	6-19	0.87	4.33	92.00 (≥14”)
Northern Pike	129	370.68	23.2	17-31	4.47	26.40	36.43 (≥24”)
Pumpkinseed	37	3.95	4.7	3-7	1.28	0.28	27.03 (≥6”)
Rock Bass	989	289.94	6.1	2-9	34.23	20.65	51.82 (≥6)
Sculpins (family)	2	0.04	3.5	3	0.07	0.00	-
Smallmouth Bass	21	37.14	14.6	9-18	0.73	2.65	71.43 (≥14”)
Walleye	174	502.27	20.4	15-27	6.02	35.77	100 (≥15”)
White Sucker	20	65.98	20.1	13-23	0.69	4.70	-
Yellow Perch	1010	17.97	5.1	3-13	34.96	1.28	7.42 (≥7”)

Table 3. Length range of selected species of fish collected with fyke nets from Lake Antoine during April 16-21, 2007.

	Species								
Inch group	Bluegill	Largemouth bass	Northern pike	Pumpkinseed	Rock bass	Smallmouth bass	Walleye	White sucker	Yellow Perch
0	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-
2	8	-	-	-	2	-	-	-	-
3	89	-	-	17	34	-	-	-	14
4	56	-	-	7	148	-	-	-	209
5	182	-	-	3	108	-	-	-	68
6	67	1	-	8	153	-	-	-	21
7	35	-	-	2	108	-	-	-	13
8	1	-	-	-	46	-	-	-	1
9	-	-	-	-	6	1	-	-	3
10	-	-	-	-	-	2	-	-	-
11	-	-	-	-	-	2	-	-	4
12	-	-	-	-	-	1	-	-	-
13	-	1	-	-	-	-	-	1	4
14	-	2	-	-	-	4	-	-	-
15	-	6	-	-	-	4	1	1	-
16	-	6	-	-	-	2	5		-
17	-	3	3	-	-	4	12	1	-
18	-	4	6	-	-	1	16	1	-
19	-	2	8	-	-	-	52	1	-
20	-	-	12	-	-	-	33	8	-
21	-	-	18	-	-	-	20	5	-
22	-	-	18	-	-	-	10	1	-
23	-	-	17	-	-	-	12	1	-
24	-	-	17	-	-	-	8	-	-
25	-	-	13	-	-	-	4	-	-
26	-	-	6	-	-	-	-	-	-
27	-	-	3	-	-	-	1	-	-
28	-	-	3	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-
30	-	-	1	-	-	-	-	-	-
31	-	-	4	-	-	-	-	-	-