Douglas Lake
Cheboygan County, T37N, R3W, many sections
last surveyed 2014

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Environment

Douglas Lake is a 3,395 acre natural lake in northwestern Cheboygan County. It is the 28th largest lake in Michigan based on surface acreage. The nearest prominent town, Pellston, is located about 5 miles southwest of the lake.

The maximum water depth of Douglas Lake is 80 feet deep. Most of the lake is less than 30 feet deep. It is composed of seven distinct basins, or glacial depressions, with expansive shoals between. Shoals, defined as waters less than 15 feet deep, extend over a large percentage of the lake's acreage. Douglas Lake is considered a mesotrophic lake, with some limited oligotrophic characteristics which provide for suitable levels of dissolved oxygen in cold water depths during summer. Limnological examinations were conducted by the Michigan Department of Conservation on Douglas Lake in 1959, 1967, and 1977. The Michigan Department of Natural Resources did similar limnology measurements in August of 2014, as part of this most recent survey. In July 1959, the lake was found to be stratified thermally with dissolved oxygen levels below 4 ppm at 45 feet below the surface. In late June 1967, the water column was again noted as thermally stratified, yet dissolved oxygen levels did not drop below 6 ppm at the bottom (55 foot depth location). In August of 2014, the lake again was thermally stratified, but oxygen levels dropped below 6 ppm at 33 feet below the surface, and below 4 ppm at 54 feet (Table 6). The later timing of the most recent measurements may have affected the observed oxygen levels and may account for the differences. Chlorophyll-a (0.4 ug/L) and total phosphorus (0.0082 mg/L) measured in 2014 are both low, but are typical of lakes in this area (Table 7).

The Douglas Lake riparian zone is hilly, wooded, and partially developed. Riparian ownership is nearly all private with a large percentage owned by the University of Michigan. Lake-bottom types consist of sand, marl, rock, and small gravel with sand being the dominant substrate. Aquatic vegetation is limited and consists mainly of an emergent variety of rushes and lilies. Near-shore cover is also sparse.

Notable features of Douglas Lake include North Fishtail Bay, South Fishtail Bay, and Marl Bay; Maple, Bentley, Sedge, and Grapevine points; and Pells Island, which is also known as Fairy Island. The drainage area of Douglas Lake is about twenty square miles (12,800 acres). Major inlets include Lancaster (also known as Bessey) and Beavertail creeks. These are warm water streams which enter the lake at the northwestern and northeastern shores, respectively. Lancaster Creek provides access for migrating fish to a vast flooded marsh north of Marl Bay. This marsh has been primarily used for propagation of northern pike for many decades. The outlet, the East Branch Maple River, exits Douglas Lake on the southwest shore. This river is a designated Michigan trout stream. A hard-surfaced boat ramp is located on the south shore near Pells Island at a county road ending. Access is very limited, however, to only a few boat trailers. The site is maintained by the Cheboygan County Road Commission. Fishing pressure is considered relatively light at Douglas Lake as a result of limited accessibility.

History

Fisheries management started at Douglas Lake in the late 1920's, when the first fish stocking efforts were initiated. Fingerling Yellow Perch were stocked on six occasions between 1929 and 1938. Bluegill fingerlings were stocked eleven times between 1932 and 1945. Smallmouth Bass adults and fingerlings were stocked on eight occasions between 1933 and 1942, while Largemouth Bass were stocked six times between 1932 and 1945. The period of these stocking efforts coincides directly with an era when stocking of warm water fish was an often used management tool by the Michigan Department of Conservation. Splake were planted in Douglas Lake in 1968 (5,000 yearlings) and 1972 (35,956 yearlings) in attempts to improve the stunted Yellow Perch population. The effort was unsuccessful, and splake or trout of any kind have not been stocked since.

Northern Pike and Walleye are two other popular predator game fish that were stocked into Douglas Lake. Walleye were stocked in 1937, 1954, 1955, and 1957. The stocking rates during this period were relatively low. An attempt to gain better Walleye production and recruitment was made in 1974 by the Michigan Department of Conservation (MDOC) and the Douglas Lake Association. A total of 750,000 fry were released into the Douglas Lake Pike Marsh on the northwest end of the lake as an experiment to determine the effectiveness of rearing young walleye in the marsh. Northern Pike were excluded from entering the marsh that year. The rearing of Walleye fry to fingerling stage was deemed unsuccessful due to eventual oxygen deficits in the marsh and predation from aquatic insects. Walleye have not been stocked into Douglas Lake since 1974.

Historically, Northern Pike used the near-shore and expansive adjacent wetlands near Marl Bay for spawning. When inundated, Northern Pike would use the flooded timber and small ditch and creek drainages for accessing appropriate spawning habitat (Williams 1951). Investigations into early pike spawning habitat on Douglas Lake arose from concerns over a declining Northern Pike fishery, and concerns regarding the stranding of adults and offspring in drying marshes on the northwest shore (Williams 1951). Williams examined these areas of concern in 1951 and found few spawning pike in the various tributaries and marshes along the northwest shore. He also found that most suitable spawning locations were dry later in May when Northern Pike stranding could occur. In addition to these variables (stranding, limited spawning runs of pike), Williams noted that heavy localized spearing/poaching was known to occur during heavy spawning migrations, which also contributed to limiting the Northern Pike fishery.

By the late 1960's, concerns over consistent pike production in and around Douglas Lake continued. In response, the Douglas Lake Association completed the renovation and expansion of a natural pike marsh in 1969 north of Marl Bay and near Lancaster Creek. Over the years, minor modifications were undertaken by the lake association in order to improve pike production and accessibility to the 10-acre marsh. MDOC, later known as the Michigan Department of Natural Resources (MDNR), served in an advisory capacity throughout this period and received annual production reports from facility operators. From 1969-2010, production was variable based on annual fingerling counts (Table 1). Adult migration into the marsh and fingerling production was heavily linked to precipitation and spring runoff. More serious issues with the pike marsh control structure, along with plans by the county road commission to replace Ingleside Road, led to pike marsh operations being discontinued in 2011.

Douglas Lake has always had an abundant White Sucker population, and this species has been manually removed from the lake in various years. In the past, overabundant non-game fish populations were believed to hinder game fish densities and growth in Douglas Lake. Manual removals of White Suckers and Bowfin were made at Douglas Lake during the 1950's and as recent as 1979. This was often done by commercial operators under permit from the MDOC. White Sucker eggs were gathered from Douglas Lake fish in many of those years and transported to various state hatcheries where the hatched fry and fingerlings would be used as forage. White Sucker egg takes were conducted from 1969 through at least 1976.

The University of Michigan has owned and operated a biological station on the shores of Douglas Lake for more than 100 years. The lake has served as a study ground for many professors and students in a variety of biological disciplines. Many dissertations, theses, and other informative studies are listed under Research and Data section of the University of Michigan Biological Station website (http://www.lsa.umich.edu/umbs/) and are too numerous to summarize here. Major focuses of many of these projects involved the following Douglas Lake topics: wetlands, historical biota and limnology, algal and vascular plant communities, plankton dynamics, and trophic state.

Historical fish community surveys were done less frequently at Douglas Lake compared to other large local waterbodies such as Burt and Mullett lakes. This may have been a result of the limited accessibility to the lake. Despite this, a few fisheries surveys were completed and they provide snapshots of the fish communities of Douglas Lake over time.

The first documented fish survey dates back to the spring and summer of 1959. MDOC personnel used various mesh-sized seines and gill nets to capture 21 species of fish. MDOC extracted eggs from Northern Pike immediately following ice-out at the mouth of Lancaster Creek for statewide rearing purposes. The summer survey was done to evaluate recent Walleye stocking efforts. A total of 34 adult Walleye were collected, and mostly represented fish stocked in the 1950's. Largemouth and Smallmouth bass were noted as common, while Northern Pike were abundant. Also noted as abundant were panfish such as Rock Bass, Yellow Perch, Bluegill, and Pumpkinseed Sunfish. Cisco, or Lake Herring, were sparse.

The next fish survey was made by MDOC in the spring and summer of 1967. This survey was done in response to complaints of poor fishing and concerns over the current fish community. Electrofishing and gill nets were used to survey the fish population. Twelve species of fish were collected. Northern Pike growth was considered poor, with fish growing two inches less than the statewide average at the time. It was also believed that most pike were harvested by anglers at or near the 1967 size limit of 20 inches. Eight year classes of Walleye were collected ranging in length from 16-26 inches. Walleye growth was considered excellent. Yellow Perch were growing below the statewide average. As a result of the survey, fish managers believed that forage fish numbers were too high in Douglas Lake in 1967, while predator numbers were too low. In response, the MDOC and the Douglas Lake Association expanded the Northern Pike spawning and rearing marsh in 1969 on the northwest side of the lake in an attempt to increase Northern Pike numbers.

From 1969 to 1974, fisheries surveys on Douglas Lake were limited to species-specific evaluations. Splake were stocked in the lake in 1968, but attempts to capture them in gill nets in 1969 failed. Northern Pike were collected during the spring White Sucker egg take in 1971. Growth of Northern

Pike was still poor, with fish still growing nearly two inches less than the statewide average. Accounts during the year noted that Walleye were migrating up Lancaster Creek in attempts to spawn. MDOC personnel made attempts to capture Walleye fry near the creek outlet in the same year but found no direct evidence of natural reproduction. Trap netting or electrofishing in the spring of 1972 and 1974 found that Walleye aged 8-10 were still inhabiting Douglas Lake, but were not overly abundant. These fish were probably offspring of a low-level naturally reproducing population. Lake residents and MDOC then tried rearing Walleye fry in the pike marsh in 1974. If successful, Walleye released back into Douglas Lake would add another popular predator fish. However, the pike marsh was not suitable to rearing fry Walleye to the fingerling stage, at least in that year.

Fourteen species of fish were collected during a May 1977 survey of Douglas Lake. The survey consisted of a combination of 76 trap and gill net lifts. Five large predator fish species were collected in varying numbers, including Bowfin, Largemouth Bass, Smallmouth Bass, Walleye, and Northern Pike. Northern Pike were considered to be highly abundant, with plenty of fish 22-inches or larger in Douglas Lake. Growth was considered average to slightly below average. Thus, it appeared that Northern Pike size structure and growth had improved from previous years. Angling reports for the period confirmed this. Therefore, fisheries managers suggested the continued operation of the Douglas Lake Pike Marsh. Only four Walleye were collected during the 1977 survey. This again suggested the existence of a low-level, naturally reproducing Walleye population. Recommendations to stock Walleye were made by fisheries managers, but this was not accomplished. Bowfin were abundant and grew to impressive sizes. Largemouth Bass were common, and exhibited average growth. Smallmouth Bass were highly abundant with many 14-18 inch fish available to anglers. Growth was average for this species. Length frequency analysis of the captured bass highlights the quality size structure of this population at the time. In addition, 404 Smallmouth Bass from 10-19 inches in length were tagged by fisheries managers in attempt to gain insight into bass catch and exploitation. (Table 2). Fisheries managers at the time indicated that this quality Smallmouth Bass population was underexploited.

Five species of panfish were collected during the 1977 fish community survey. Yellow Perch were abundant but characterized by poor growth. Most were 6-8 inches in length. Rock Bass were abundant and demonstrated good size structure and growth. Only two Bluegill were collected during the survey, while Pumpkinseed Sunfish were common. Black Crappie were uncommon in the fish catch, yet some very large specimens were collected. Other fish collected included a few Cisco, and many bullheads. Splake, which had been stocked five years earlier, were not collected during the 1977 fish community survey. In fact, none of the stocked splake were ever collected in a fisheries survey, and none were ever reported as caught by anglers. It is likely that predation from abundant predators may have played a major role in the failure of the two splake stocking attempts.

The next survey of Douglas Lake was done by the MDNR Fisheries Division in 2000. This fish community survey included substantial effort of large mesh trap nets (21 lifts) and inland gill nets (12 lifts). Predators comprised 16% of the total catch by number and 44% by weight, and included Bowfin, Northern pike, Largemouth Bass, and Smallmouth Bass. The predator community was dominated by Smallmouth Bass and Northern Pike. The panfish community was dominated by Pumpkinseed Sunfish, Yellow Perch, Rock Bass, Bluegill, and Black Crappie. Bluegill were more abundant than in previous surveys, and were present in six age classes, with average growth. Yellow Perch were abundant, but growth was poor. The fish community was described as very stable. Non-game fish including White Sucker, bullhead, and Bowfin were noted as plentiful.

Zebra mussels were first discovered in Douglas Lake in 2001 (Bob VandeKopple, University of Michigan Biological Station, personal communication).

Current Status

A fish community survey was conducted on Douglas Lake in June 2014 by MDNR. A variety of net types and sizes were deployed using Status and Trends protocol. Status and Trends is a methodology developed by Fisheries Division where gear is standardized and survey effort is a function of lake size (Wehrly et al. In press). The variety of gear types and mesh sizes is intended to sample different species, life stages, and sizes of fish to give a picture of the overall fish community. Survey effort for this large lake survey was substantial, and included 24 large mesh fyke net lifts, 8 large mesh trap net lifts, 7 small mesh fyke net lifts, 8 experimental gill net lifts, 6 seine hauls, and 4 ten-minute electrofishing transects. For determining age and growth of game fish species, fin rays/spines or scale samples were collected from 10 fish per inch group. Weights for each species were calculated using length-weight regressions summarized by Schneider et al. (2000).

Total catch was 3,571 fish weighing just over 1,391 pounds (Table 3). Twenty-five species were encountered, representing nine families of fish. Large predators captured included Bowfin, Largemouth Bass, Northern Pike, Smallmouth Bass, and Walleye. These predators comprised almost 14% of the catch by number and 44% of the catch by weight. Panfish species included Black Crappie, Bluegill, Green Sunfish, Pumpkinseed, Rock Bass, and Yellow Perch. Panfish comprised 38% of the numerical catch and 21% of the catch by weight in 2014 (Table 3).

Bluegill were numerically the dominant panfish species in Douglas Lake in 2014, with 609 captured during this survey. Bluegill up to 9 inches in total length were captured (Table 4), and consistent reproduction of Bluegill was evident with eight year-classes represented, (Table 5, ages 1-8). Although more abundant in the catch and with more age classes represented than in previous surveys, less than 3% of the bluegill in this survey were 8 inches or larger (Table 4). The higher number of Bluegill in the catch is reflective of the additional gear used to capture smaller/younger fish, but the low percentage of larger fish is consistent with previous surveys. Pumpkinseed were also abundant in the catch, with a higher percentage (26%) of larger size (8 inches or larger). Yellow Perch were only a minor component of the catch, with only 22 individuals captured. None were larger than 7 inches (Table 4).

The predator community was again dominated by Smallmouth Bass (n=291) and Northern Pike (n=116), with those two species comprising 84% of the numerical catch of predator species and 77% of the catch of predator species by weight. Of the total catch in the survey, these two species represented 11% of the numerical catch and 33% of the catch by weight (Table 3). Smallmouth Bass were growing well, averaging almost an inch larger than the statewide average lengths at age for that species. Nine age classes of Smallmouth Bass were represented in the catch from ages 1 through 10 (Table 5). Northern Pike were very abundant, but growth was slow. Reproduction of pike was consistent, with eight age classes present and fairly well distributed from ages 1 through 8 (Table 5). Northern Pike were on average 2.4 inches smaller than the statewide average lengths at age for the species (Table 5). Largemouth Bass (n=64) were also part of the predator community. One Walleye (age 8) was captured in 2014.

Non-game fish species such as White Suckers, bullhead, and Bowfin continued to be plentiful in the catch in 2014. The addition of small mesh gear in 2014 helped to capture additional information on forage fish like various darters and minnow species, which were abundant. One Cisco was collected in 2014 and was age 4. Survey efforts did not target this species, and low numbers have been reported in previous surveys as well.

Analysis and Discussion

The fish community of Douglas Lake has remained fairly stable over the years. The panfish community remains abundant and diverse, and there is a healthy predator community comprised primarily of Smallmouth Bass and Northern Pike.

The panfish community in Douglas Lake in 2014 was represented by six species: Black Crappie, Bluegill, Green Sunfish, Pumpkinseed Sunfish, Rock Bass, and Yellow Perch. There was a shift in the composition of the panfish community in 2014 compared to our survey in 2000, and the relative proportion of the biomass in the catch increased as well. The panfish community comprised approximately 20% of the catch by weight in 2000, but in 2014 it comprised almost 36% of the catch by weight. Yellow Perch abundance was much lower in 2014. At the same time, Bluegill abundance increased substantially compared to the 2000 survey. The abundance of Pumpkinseed Sunfish was very similar between both surveys. Although most of the Bluegill were small in size, over a quarter (26%) of the Pumpkinseed Sunfish were 8 inches or larger in the 2014 survey. Pumpkinseed and Bluegill were both growing above the statewide average, with Pumpkinseed averaging over an inch larger than the statewide average. Black Crappie up to 14 inches were present, and were also growing well, averaging almost an inch larger than the statewide average.

Some of the differences in catches between 2000 and 2014 may be due to the different gear used in each survey, but the efforts are similar enough that the above comparisons are valid. The increase in numbers of small Bluegill may also be partially explained by the lower numbers of Yellow Perch as Schneider and Breck (1997) found that Yellow Perch prey heavily on young Bluegill in the winter months. Lower numbers of Yellow Perch may have resulted in better survival of young Bluegill.

Overall the panfish community in Douglas Lake is very healthy. Black Crappie, Bluegill, and Pumpkinseed all had above-average growth rates and had fish in the sizes that are desirable to anglers.

Cisco, or Lake Herring, are listed as a state threatened species, and have typically been captured in past Douglas Lake surveys in low numbers. Cisco were again captured in Douglas Lake in 2014. Although Douglas Lake is a mesotrophic lake, it does have enough deep, cold water to maintain this coldwater fish species. Cisco are an important prey fish when they are abundant as they represent soft-rayed forage that can reach fairly large sizes. The presence of Cisco in Douglas Lake is an indicator of good water quality and a coldwater niche.

Other non-game fish species encountered include White Suckers, several bullhead species, and smaller-bodied fishes such as Fathead Minnows, darters, and shiners (Table 3). Some of these species, particularly the soft-rayed fish, provide forage for game fish and all are part of a healthy fish community.

Predators are an important component of the Douglas Lake fish community and fishery, and Smallmouth Bass and Northern Pike remain the key predators in this lake. These predators help maintain a healthy panfish population in the lake by preventing over-abundance and stunting. The abundance and size of Smallmouth Bass in Douglas Lake is impressive, with growth rates almost an inch above the statewide average.

Northern Pike are a key component of the predator community and remained abundant in the 2014 survey. All age groups from 1-8 were represented, with a fairly good distribution among the different ages. As indicated above, growth was very poor for pike, as they grew over 2 inches slower than pike across Michigan. Although pike growth is slower than indicated in previous surveys, this may be due to a change in the method of aging. Scales were used to age Northern Pike in the 2000 survey, but that method tends to under-estimate the true age of Northern Pike. In 2014, dorsal fin rays were used as the aging structure. Fin rays may give a more accurate age estimate than scale samples, and those ages typically are older than those read from scales. This may help explain the lower, but more accurate, growth estimates. Consistent natural reproduction of Northern Pike, combined with poor growth, support the conclusion that the pike marsh is not needed at this time. Higher water levels in recent years have improved spawning habitat and likely boosted natural reproduction of Northern Pike in Douglas Lake. A 2002 regulation change, which reduced the daily possession limit for Northern Pike from 5 to 2, likely improved pike survival and abundance. The high Northern Pike abundance is also likely contributing to the lower numbers of yellow perch observed in 2014.

Overall, Douglas Lake has a healthy fish community. Smallmouth Bass, Northern Pike, Largemouth Bass, and several panfish species all provide good angling opportunities. Zebra mussels have influenced water quality and the nutrients in the lake to some degree, but water quality remains good and the fish community is healthy. Other invasive species, such as rusty crayfish and invasive aquatic plants, have not been found in Douglas Lake.

Management Direction

1. Maintain statewide fishing regulations. Bag limits and minimum size limits for both panfish and predator species are appropriate for this lake. These regulations have aided in the stability of the fish community over time.
2. Put operation of "pike marsh" on hold for rearing of Northern Pike. The pike marsh has not operated since 2010, and has provided minimal production since about 2005. Even in the absence of the pike marsh operation, pike abundance remains high in the lake. This management tool successfully boosted pike numbers in the past, but the population has reached a threshold now where it is maintaining high abundance without assistance. This tool should be kept in the tool-box, however, in case it is needed in the future.
3. Protect riparian wetlands along the Douglas Lake shoreline and tributaries. Wetland habitats contiguous with Douglas Lake provide numerous benefits, including water quality and shoreline protection, spawning and nursery habitat for Northern Pike and a variety of other fish species, and habitat for reptiles and amphibians.
4. Improve public access to Douglas Lake. MDNR should continue to work with the Douglas Lake Association, Cheboygan County, and other stakeholders to provide better public access to Douglas Lake.
5. Increase public awareness of best management practices for preventing the introduction of new invasive species to Douglas Lake, especially round gobies and rusty crayfish.

References

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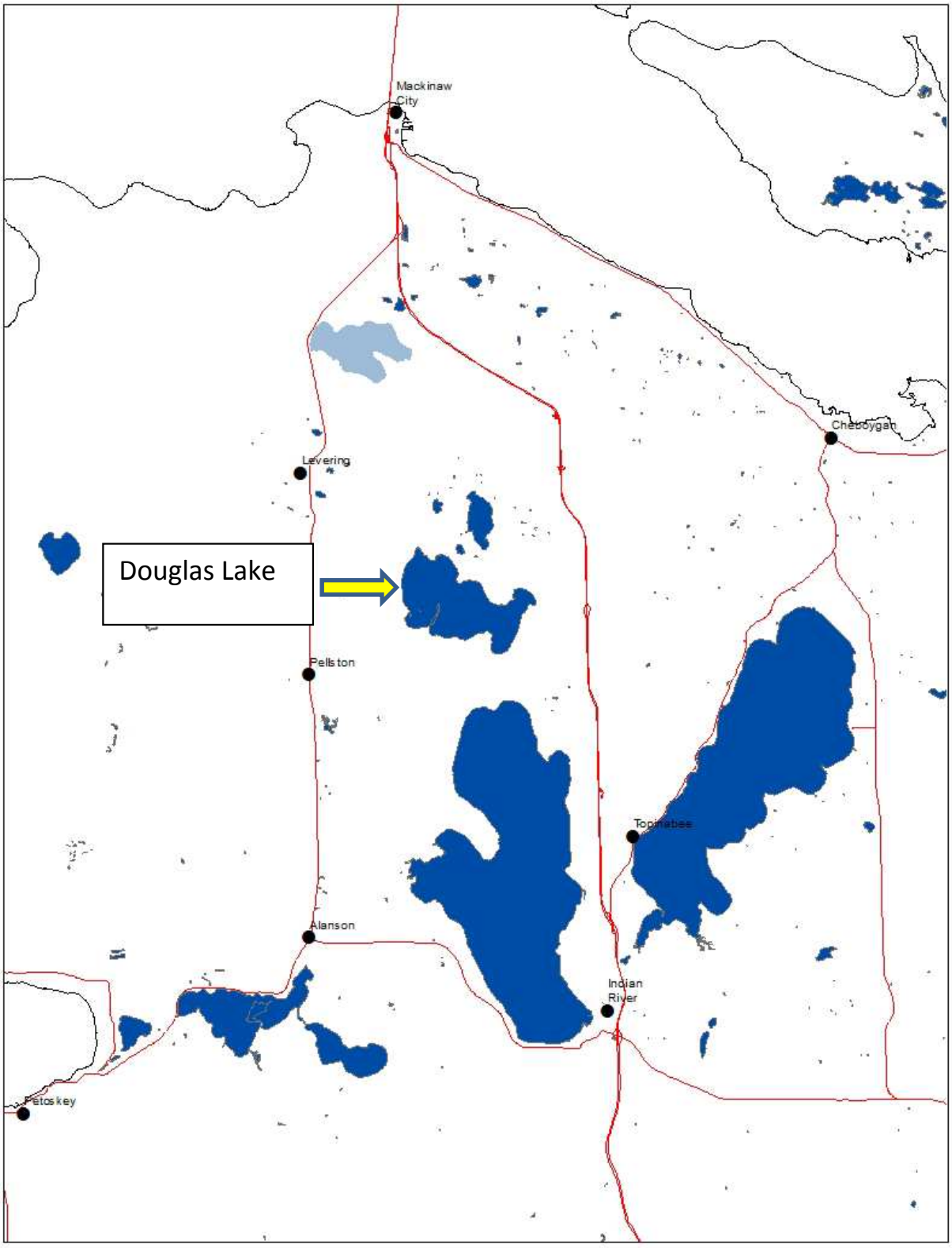

Figure 1. Locator map for Douglas Lake.

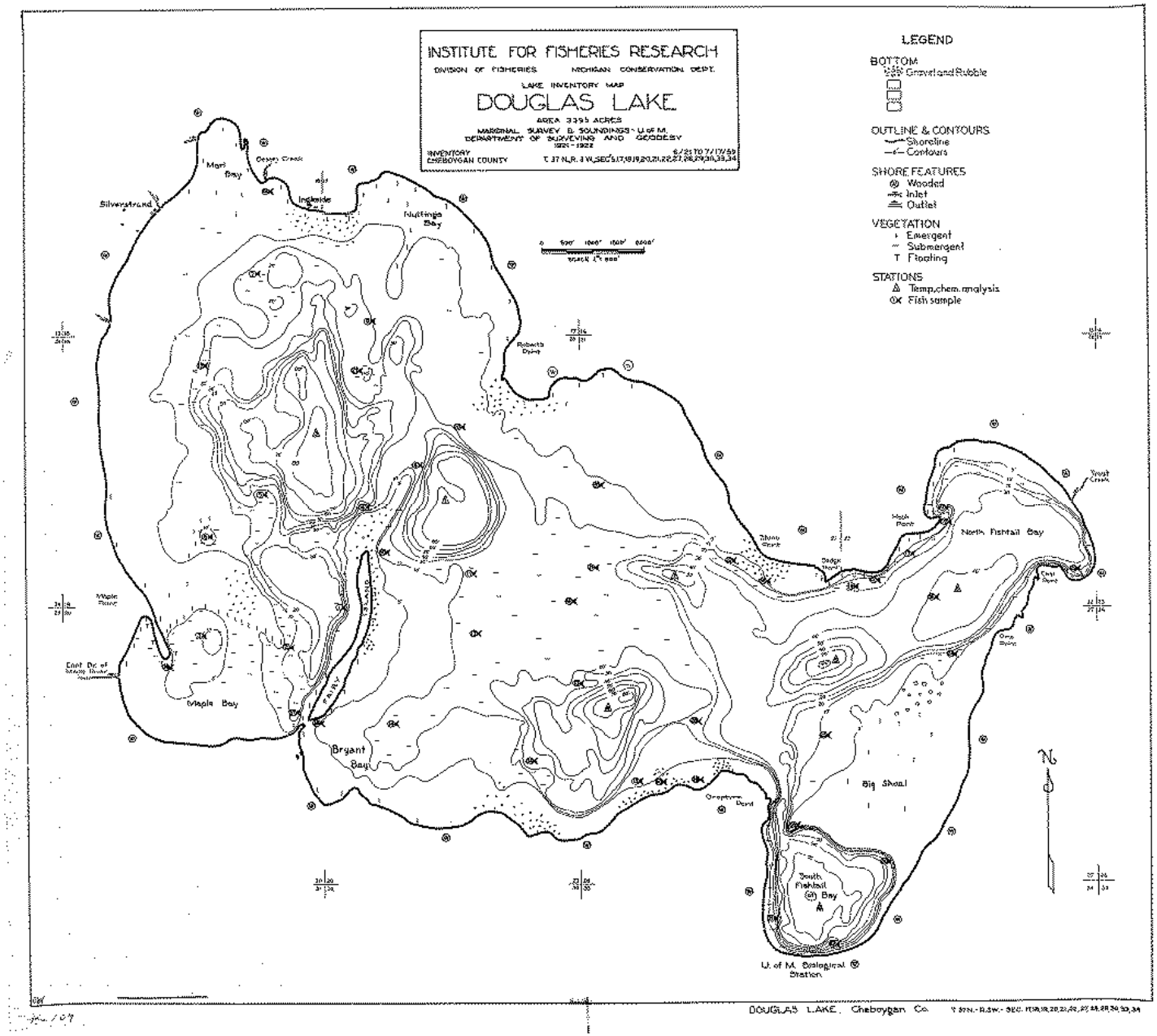

Figure 2. Bathymetry map of Douglas Lake.

Photo 1. Fisheries Technician Tom Adams holding Pumpkinseed Sunfish from the Douglas Lake survey.

Photo 2. Fisheries employee Joe Stutsman holding a Smallmouth Bass from the Douglas Lake survey.

Photo 3. Fisheries employee Kynzie House holding a Largemouth Bass from the Douglas Lake survey.

Table 1.-Estimated number of fingerling Northern Pike released into Douglas Lake from the adjacent pike rearing marsh, 1970-2014.

Date released	Estimated number released *	Average length (in.)
1970	3,000	--
1971	2,500	--
1972	100,000	--
1973	5,000	--
1974	0	--
1975	20,000	--
1976	20,000	--
1977	40,000	--
1978	20,000	--
June 10, 1979	5,000	4.2
June 14, 1980	2,000	3.2
1981	--	--
June 19, 1982	18,000	2.1
June 10, 1983	5,000	2.2
June 2, 1984	5,150	1.5
June 2, 1985	50,000	2.0
June 2, 1986	20,000	2.0
1987	--	--
May 27, 1988	10,000	3.0
June 10, 1989	10,000	3.0
1990-1992	--	--
June 10, 1993	100,000	2.0
May 15, 1994	80,000	3.0
May 17, 1995	3,000	1.7
May 31, 1996	100,000	1.2
June 11, 1997	2,000	3.0
1998	--	--
May 20, 1999	6,000	2.0
May 20, 2000	2,000	1.8
May 30, 2001	2,500	2.0
May 30, 2002	1,500	2.0
2003	<500	
May 24, 2004	137	--
May 22-25, 2004	3,395	--
2005	>8,000	--
2006	<100	--
2007	--	--
2008	<100	--
2009	>100	--
2010	<100	--
2011	--	--
2012	--	--
2013	--	--
2014	--	--

* Associated variability is high for these estimates; estimates may be overestimated in some years, and underestimated in others. Based on marsh operator counts and/or estimation.

Table 2.-Number of Smallmouth Bass tagged per inch group during the 1977 fish community survey at Douglas Lake.

Length	10"	11"	12"	13"	14"	15"	16"	17"	18"	19"
Number collected	5	9	42	64	52	57	78	58	29	9

Table 3.-Species catch and relative abundance of fishes collected during the Douglas Lake Status and Trends fish survey June and August, 2014.

Species	Number	Percent by number	Weight (lb.)	Percent by weight	Length range (in.)
Black Crappie	122	3.4	47.3	3.4	4-14
Black Bullhead	271	7.6	256.4	18.4	5-15
Bluegill	609	17.1	38.0	2.7	1-9
Bluntnose Minnow	1	0.0	0.0	0.0	2-2
Bowfin	11	0.3	61.6	4.4	21-27
Brown Bullhead	111	3.1	109.1	7.8	9-14
Cisco (Lake Herring)	1	0.0	0.1	0.0	6-6
Common Shiner	26	0.7	0.6	0.0	2-4
White Sucker	46	1.3	118.0	8.5	9-21
Fathead Minnow	1	0.0	0.0	0.0	1-1
Green Sunfish	17	0.5	0.7	0.0	2-4
Iowa Darter	23	0.6	0.1	0.0	1-3
Largemouth Bass	64	1.8	74.7	5.4	4-20
Logperch	109	3.1	2.0	0.1	2-5
Mimic Shiner	1,072	30.0	5.4	0.4	2-3
Central Mudminnow	1	0.0	0.0	0.0	4-4
Northern Pike	116	3.2	277.7	20.0	2-28
Pumpkinseed	372	10.4	119.9	8.6	2-10
Rock Bass	223	6.2	83.0	6.0	4-10
Sand Shiner	3	0.1	0.0	0.0	2-3
Smallmouth Bass	291	8.2	185.5	13.3	2-20
Spottail Shiner	53	1.5	0.3	0.0	2-4
Walleye	1	0.0	6.1	0.4	26-26
Yellow Perch	22	0.6	0.7	0.1	2-7
Yellow Bullhead	5	0.1	3.7	0.3	9-13
Total	3,571		1,391		

Table 4.-Number per inch group of important game fishes collected during the 2014 Douglas Lake fish survey.

Length (in.)	Black Crappie	Bluegill	Pumpkin-seed	Rock Bass	Walleye	Yellow Perch	Largemouth Bass	Smallmouth Bass	Northern Pike
1		8							
2		102	1			4		2	1
3		275	8			7		4	
4	1	108	46	22		8	1	1	
5	24	67	42	18		2	2	1	
6	4	19	52	39			6	35	
7		14	125	42		1	1	75	
8	51	10	89	54			5	34	
9	28	6	8	36			3	31	
10	1		1	12			7	38	
11	6						10	19	
12	6						7	4	
13							2	12	
14	1						5	5	2
15							5	9	1
16							3	9	5
17							3	6	5
18							1	4	6
19							2	1	7
20							1	1	13
21									18
22									13
23									21
24									10
25									6
26					1				3
27									3
28									2

Table 5.-Comparison of mean length (inches) at age for various game fishes of Douglas Lake from 1959 to 2014. Number in parentheses represents number aged. Growth comparison was across all ages.

Species	Age group	1959	1967	1977	2000	2014	2014 growth compared to state average
Largemouth	I	4.3	--	--	--	4.0 (1)	+1.2
Bass	II	7.1	--	--	7.9 (6)	9.1 (23)	
	III	9.9	--	--	11.2 (4)	12.5 (21)	
	IV	12.3	--	13.4	--	16.0 (4)	
	V	--	--	--	--	17.4 (2)	
	VI	--	--	--	--	--	
	VII	--	--	--	--	16.3 (1)	
	VIII	--	--	--	--	17.7 (1)	
	IX	--	--	--	--	19.4 (3)	
Smallmouth	I	5.4	4.9	--	5.5 (10)	3.1 (3)	+0.9
Bass	II	7.5	--	8.0	8.4 (31)	7.6 (60)	
	III	10.4	--	11.9	11.2 (8)	11.6 (41)	
	IV	13.2	--	13.4	13.7 (13)	15.3 (12)	
	V	14.2	14.5	15.2	15.4 (3)	16.6 (7)	
	VI	--	15.5	16.3	16.7 (4)	17.4 (4)	
	VII	17.4	--	17.1	17.6 (3)	17.5 (3)	
	VIII	--	16.7	--	18.0 (1)	21.5 (3)	
	IX	--	--	18.7	19.0 (5)	--	
	X	--	--	19.7	19.7 (2)	18.7 (1)	
Walleye	II	14.2	16.0	--	--	--	--
	III	--	18.9	--	--	--	
	IV	18.9	20.9	--	--	--	
	V	21.5	23.0	--	--	--	
	VI	--	23.5	--	--	--	
	VII	--	25.0	--	--	--	
	VIII	--	25.0	25.4	--	26.0 (1)	
	IX	--	--	--	--	--	
	X	--	25.5	--	--	--	
	XI	--	--	--	--	--	
Northern Pike	I	11.5	13.1	--	13.2 (4)	15.2 (2)	-2.4
	II	18.9	18.1	19.3	17.6 (12)	17.9 (17)	
	III	20.9	19.9	21.1	21.1 (36)	20.9 (19)	
	IV	23.3	24.9	23.4	23.3 (26)	21.5 (17)	
	V	24.2	22.5	25.1	26.0 (4)	23.6 (17)	
	VI	29.4	--	28.1	29.5 (1)	25.6 (13)	
	VII	30.7	--	31.0	--	25.1 (7)	
	VIII	--	--	--	--	25.7 (1)	

Table 5-continued

Species	Age group	1959	1967	1977	2000	2014	2014 growth compared to state average
Cisco	II	--	7.8	--	7.0 (3)	--	--
	III	8.1	9.5	9.5	--	--	
	IV	--	12.1	--	--	6.9 (1)	
	V	--	--	--	--	--	
	VI	--	14.6	--	--	--	
Pumpkinseed	I	--	3.4	--	--	--	+1.2
Sunfish	II	--	4.2	--	3.4 (5)	3.1 (2)	
	III	--	--	4.9	4.4 (18)	4.9 (27)	
	IV	5.1	--	6.3	6.1 (19)	7.2 (29)	
	V	6.2	--	6.8	7.3 (7)	7.9 (7)	
	VI	6.9	--	--	7.7 (3)	8.5 (6)	
	VII	7.0	--	--	--	8.7 (10)	
	VIII	--	--	--	--	8.6 (5)	
	IX	--	--	--	--	--	
	X	--	--	--	--	9.5 (1)	
	XI	--	--	--	--	--	
	XII	--	--	--	--	10.3 (1)	
Bluegill	I	--	--	--	--	2.7 (1)	+0.1
	II	--	--	--	3.9 (23)	3.0 (27)	
	III	--	--	--	5.5 (9)	5.0 (52)	
	IV	--	--	--	6.5 (13)	7.1 (12)	
	V	--	--	--	7.1 (4)	8.4 (2)	
	VI	--	--	--	7.8 (5)	8.2 (9)	
	VII	--	--	--	7.8 (1)	9.0 (1)	
	VIII	--	--	--	--	8.2 (1)	
Rock Bass	II	--	--	--	4.0 (4)	--	
	III	--	--	--	4.8 (10)	--	
	IV	--	--	--	6.3 (14)	--	
	V	--	--	--	7.6 (35)	--	
	VI	--	--	--	9.0 (14)	--	
	VII	--	--	--	9.8 (6)	--	
	VIII	--	--	--	10.4 (1)	--	
	IX	--	--	--	10.7 (3)	--	
	X	--	--	--	11.0 (2)	--	
Yellow Perch	I	3.2	3.2	--	--	3.8 (5)	-0.2
	II	4.2	4.5	4.0	--	4.3 (2)	
	III	5.2	5.9	6.3	5.0 (1)	5.1 (1)	
	IV	5.9	7.2	7.2	6.1 (34)	--	
	V	6.4	--	8.6	7.7 (7)	--	
	VI	7.5	8.7	--	8.7 (8)	7.5 (1)	
	VII	8.7	--	--	10.1 (3)	--	
	VIII	9.8	10.0	--	--	--	

Species	Age group	1959	1967	1977	2000	2014	2014 growth compared to state average
Yellow Perch -cont.	IX	10.2	10.3	--	--	--	
	X	11.3	--	--	--	--	
	XI	--	--	--	--	--	
	XII	--	11.7	--	--	--	

Table 6. Water temperature profile of Douglas Lake, Cheboygan County, measured on August 25, 2014.

Reading Depth	Temperature	Oxygen	pH
0	21.90	8.96	8.47
3	21.90	9.04	8.31
6	21.86	9.03	8.23
9	21.80	9.06	8.14
12	21.66	9.05	8.12
15	21.28	9.05	8.07
18	20.78	9.07	8.05
21	20.06	9.25	7.99
24	19.83	8.72	7.92
27	19.41	8.34	7.83
30	18.80	7.07	7.63
33	16.65	5.70	7.50
36	12.38	5.20	7.40
39	10.62	5.50	7.33
42	10.24	5.50	7.30
45	9.58	5.20	7.26
48	9.22	4.88	7.23
51	8.83	4.10	7.18
54	8.56	3.26	7.13
57	8.42	2.86	7.09
60	8.34	2.76	7.05
63	8.30	2.69	7.03
66	8.25	2.59	7.01
69	8.22	2.56	6.99
72	8.16	2.53	6.97
75	8.14	2.49	6.96
78	8.10	2.46	6.95

Table 7. Water chemistry measurements for Douglas Lake, Cheboygan County. Water samples collected August 25, 2014.

Parameter	Int. epilimnetic sample
Alkalinity, total (mg/L)	108.0000
Chlorophyll a (ug/L)	.4
Nitrate	.0088
Nitrogen, ammonia (mg/L)	.0300
Nitrogen, total Kjeldahl (mg/L)	.5460
Phosphorus, total (mg/L)	.0082