Michigan Department of Natural Resources
Status of the Fishery Resource Report 2000-9, 2000.

PORTAGE LAKE

Manistee County (T23N, R16W, Sections 22, 25-28, 33- 36)

Surveyed June, 1999

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Environment

Portage Lake is in western Manistee County, in the northwestern Lower Peninsula of Michigan. The Village of Onekama is on the northeast shore of Portage Lake. Portage Lake is a natural lake, having been formed during the Wisconsinan glacial stage (10,000 to 75,000 years ago). The 15,808-acre watershed (Figure 1) includes a number of small, groundwater-fed tributary streams, all of which are designated trout streams. McGowan's, McCormick's, Hansen, Glen, Dare, and Schimke creeks, plus an unnamed tributary to Schimke Creek, all were found to have populations of brook trout in a 1966 electroshocking survey of the area. Schimke Creek, which is the largest tributary and empties into the east end of Portage Lake, was also found to have a population of brown trout.

The topography of the watershed is rolling hills. The soils are primarily well drained and sandy, classified as Kalkaska series. Adjacent to Portage Lake, there are some wetlands with organic soils, as well as some old dune formations near Lake Michigan. The watershed is primarily privately owned, including agricultural land, orchards, and forested areas (Figure 2). The majority of the lakeshore of Portage Lake is developed with homes and cottages. At least 10-15% of the shoreline has been modified with bulkheads, while roughly 20-25% remains as undeveloped wetland.

Portage Lake is 2,110 acres in size and up to 60 feet deep (Figure 3). Shoal areas (less than 20 feet deep) account for about 65% of the lake. Bulrushes and cattails are present in some areas less than 3 feet deep. Potamogeton crispus and coontail predominate in weedbeds from 5-15 feet deep; Chara and Elodea are also present along the bottom in some areas. Purple loosestrife and wild celery are also present in some areas. Substrates are mostly sand, gravel, and marl.

The original connection of Portage Lake to Lake Michigan, called Portage Creek, was located approximately 1 mile north of the present channel (Chaney 1960). It was supposedly a winding, fast-flowing stream. By the late 1860s, Portage Creek had been dammed to provide water power to a lumber mill. The dam actually raised the water level in Portage Lake by up to 6 feet in a "peaking" operation. Lake riparians legally contested the peaking operation because it flooded their lands. Although it appears they won their case in court, for some reason the mill refused to cease the peaking operation. Therefore, the riparians dug a ditch to Lake Michigan to drop the water level in Portage Lake. However, when the coffer dam holding back the water on the Portage Lake side was breached, water rushed out of Portage Lake until it reached the same level as Lake Michigan. A channel 500 feet wide and 12 feet deep was accidentally created. Before the mill dam on Portage Creek was built, the lake was supposedly 4-5 feet higher than Lake Michigan. Therefore, when the coffer dam was breached, Portage Lake must have dropped by at least that much, depending on how much water the mill operation was holding back at that time. The channel still exists today as the link between Portage Lake and Lake Michigan. Portage Creek no longer exists.

Water quality conditions were surveyed on July 29, 1999. The water was colorless and moderately clear, with a Secchi disk visible to a depth of 12 feet. Within the water column, alkalinity was from 132 to 135, and pH ranged from 8.9 at the surface, to 8.5 at 25 feet, to 7.7 at the bottom in 50 feet of water. Temperatures remained fairly constant around 26°C from the surface down to about 20

feet. A thermocline was located between 20 and 40 feet, where the temperature dropped to 16.3°C. From there down to the bottom, temperature dropped only a little more, to 15.4°C. Dissolved oxygen levels remained between 9 and 10 ppm from the surface down to about 15 feet. From there, oxygen dropped to 7.8 ppm at 20 feet and 6.6 ppm at 25 feet. At 30 and 35 feet, oxygen levels declined even further, to 3.4 ppm and 2.0 ppm, respectively. Oxygen levels remained very low from 35 feet to the bottom.

There are historical water quality data from two sites on Portage Lake from August 6, 1976. Site 1 was in the western basin of the lake, while Site 2 was in the middle of the lake, off Eagle Point. At both sites, water color was recorded as "clear", but no Secchi disc readings were taken. At Site 1, oxygen content ranged from 9 ppm at the surface to 1 ppm at the bottom, at a depth of 56 feet. Alkalinity ranged from 137 ppm at the surface to 86 ppm at the bottom. The temperature at Site 1 was 19.5°C from the surface down to about 16 feet. The thermocline was between 23 feet and 33 feet, where temperature dropped from 16°C to 10.5°C. Below 43 feet, temperatures were stable at 9°C. The oxygen profile at Site 2 was similar to that of Site 1, except that the concentration was 8 ppm at the surface. Alkalinity at Site 2 was lower at the surface, 120 ppm, but the same as Site 1 near the bottom. The temperature at Site 2 was slightly warmer than at Site 1. From the surface to 16 feet the temperature was 20°C. Below that, the temperature slowly dropped, reaching 13.5°C at 33 feet. From there, temperatures slowly dropped a little more, reaching 12°C at the bottom. At both sites, pH readings were the same, ranging from 8.5 at the surface to 7.5 at the bottom.

Portage Lake is an extremely popular recreational lake. It receives large amounts of sailboating, pleasure boating, and fishing-related boating traffic due to its connection with Lake Michigan. Several charter boats targeting Lake Michigan fish operate out of Onekama. There are two public boat launches on Portage Lake, a MDNR-owned boat launch in the northwest corner of the lake, and one owned by the Village of Onekama, right in town. At times, the parking lots at these launches are filled to capacity. Portage Lake also hosts several bass tournaments each summer. The lake is also an extremely popular ice fishing lake, hosting large crowds of anglers on the weekends.

Fishery Resource

It appears that there was very little fisheries management on Portage Lake until the 1970s. Prior to that, there are records of some sporadic stocking and the addition of 70 brush shelters to the lake in 1952. Stocked fish included smallmouth bass, bluegill, and rainbow trout; there was reportedly no evidence of success.

It was during the salmon craze of the 1970s that Portage Lake began to receive much more attention. Coho salmon were first stocked in 1971, and have been stocked in most years since then (Table 1). In the 1970s, coho plants ranged between 100,000 and 270,000. In the 1980s, the plants were reduced somewhat, ranging from 165,000 in 1980 to between 50,000 and 100,000 for the rest of the decade. In the 1990s, coho plants were right around 50,000. In the year 2000, 55,000 coho salmon were stocked. Chinook salmon stocking began in 1974, and 25,000 to 125,000 have been stocked in most years since then. In the year 2000, 49,245 chinook salmon were planted. The primary goal of these salmon plants has been to create a fishery on Lake Michigan, but they also have created limited seasonal opportunities in Portage Lake itself.

Brown trout fingerlings were first planted in 1977, and since 1983 from 10,000 to 15,000 yearlings they have been planted annually (Table 1). Fall fingerlings were also added in some years in the 1980s, although it is not known if these fish contributed to the fishery. In the year 2000, 19,600 yearling brown trout were stocked. As with the salmon, many of the brown trout stocked in Portage Lake migrate to Lake Michigan, where they provide an excellent pier and boat fishery. However, some browns are caught in the deeper west basin of Portage Lake, especially in late spring when alewives migrate into Portage Lake to spawn.

Lake trout have been stocked in Portage Lake once. In 1989, 174,000 fingerlings were added.

The salmonid fish populations in (and related to) Portage Lake are maintained primarily through stocking. However, in some years there may be some limited natural reproduction of coho salmon, chinook salmon, and steelhead in some of the tributaries of Portage Lake. Schimke Creek is the largest tributary and has the most spawning habitat. McGowan's Creek also was found to have coho smolts present, along with resident brook trout (Creal 1987). However, the development of a golf course (Links of Portage) was extremely detrimental to McGowan's Creek and may have destroyed salmonid spawning and rearing habitat (Sayles 1988). Schimke Creek also reportedly hosts smelt spawning runs in some years. Other Portage Lake tributaries may host smelt runs as well.

Walleyes may have been native to Portage Lake but were sparse until stocking by MDNR began in 1987 and 1988. Since 1990, 14,364 -104,150 fingerling walleye have been stocked every year (except 1991 and 1994). In the year 2000, 48,664 fingerling walleye were stocked. An extremely popular walleye fishery has developed as a result of the stocking program.

The first fish survey of Portage Lake was in 1948. It involved gillnets and nighttime spearing. The survey was fairly inconclusive, with less than 100 fish observed. Longnose gar were the best-represented species, with 28 individuals taken. Other species observed included yellow perch, rock bass, white sucker, redhorse, cisco, smallmouth bass, and carp, as well as one walleye, one bluegill, and one bowfin.

The next survey was in 1976, was more extensive, and included gill netting, trap netting, and electroshocking. Twenty-two species of fish were identified in the survey, as well as "shiners", which were not identified to species. Alewives were the most numerous species encountered in the survey. There is an annual migration of alewives into Portage Lake for spawning, and some may inhabit the lake year-round. Bluegill and pumpkinseed sunfish were also very well represented in the survey, and most exceeded 6 inches in length. Other panfish species included rock bass, yellow perch, and black crappie. Growth rates for all panfish species were greater than the State of Michigan average. Although only a few yellow perch were seen in the survey, individuals up to almost 14 inches were observed. It is likely that yellow perch migrate back and forth between Portage Lake and Lake Michigan.

Largemouth bass, smallmouth bass, and northern pike comprised the warm/coolwater gamefish component of the 1976 survey catch. Largemouth bass up to 18 inches, smallmouth bass up to almost 17 inches, and northern pike up to 32 inches long were observed. As with the panfish, growth for all three of these species was greater than the state average. Three brown trout were observed in the catch, 18-27 inches long. Other species encountered in the catch in large numbers included bowfin, brown bullhead, carp, redhorse, and white sucker. Other species present in smaller numbers included lake whitefish, menominee whitefish, cisco, rainbow smelt, gizzard shad, quillback carpsucker, black bullhead, and the aforementioned "shiners." Walleyes were notably absent from the 1976 survey.

There is currently an MDNR Creel Census Clerk stationed at the port of Onekama to monitor the Lake Michigan non-charter sport fishery. In 1999, between April 1 and October 30, almost 50,000 angler hours were spent by pier, shore, and boat anglers on Lake Michigan out of Onekama (Rakoczy, unpublished data, study 427). Yellow perch comprised the largest percentage of the Lake Michigan sport catch, followed by chinook salmon, rainbow trout, menominee whitefish, and lake trout. Other species showing up in the catch in lesser numbers included coho salmon, brown trout, and lake herring (cisco). These estimates do not include anglers fishing on Portage Lake itself.

Charter fishing on Lake Michigan for salmonids is also extremely popular out of Onekama. In

1999, 135 charter excursions took place out of Onekama, resulting in 4,555 angler hours (Rakoczy, unpublished data, study 462). Salmonids comprised the bulk of the catch, with chinook salmon comprising almost 40% the total catch. The average number of chinook salmon caught per excursion was just over three. Lake trout comprised 26% of the catch, and an average of just over two lake trout were caught per charter excursion. Rainbow trout, coho salmon, and brown trout made up the remainder of the charter catch.

Recent fish survey

The most recent Portage Lake fish survey was conducted in June 1999, using four 5'x8'x3'x2" large-mesh trap nets, one 4'x6'x3/4" small-mesh fyke net and two 125' experimental inland gill nets. All nets were set for 3 nights, except for one inland gill net, which was pulled after 2 nights. Results are given in Tables 2-4.

Panfish species such as rock bass, yellow perch, bluegill, and pumpkinseed sunfish comprised the numerical majority of the fish sampled in the 1999 survey (Table 2). Rock bass were the most numerous species in the 1999 survey, with 339 individuals from 2 to11 inches in length observed. Only 39 rock bass were taken in 1976. Rock bass length at age was 1.1 inches greater than the Michigan average (Table 3). Yellow perch were also abundant in the survey, with 232 individuals from 4 to almost 12 inches in length taken. The vast majority of the yellow perch were between 5 and 8 inches in length, and growth rates were about even with the state average. Bluegill were also observed in the 1999 survey in decent numbers, however they were not as abundant as in many other northwest Michigan lakes. We captured 119 bluegills from 4 to 9 inches. Bluegill growth was good, as they exceeded the state average by almost an inch. Bluegill seemed to be more abundant in the 1976 survey. At that time, there were very few or no walleyes present in the lake. It is possible that the walleye population now present in Portage Lake has resulted in a smaller bluegill population. Pumpkinseed numbers from this survey seemed to be comparable with those from the 1976 survey.

Smallmouth bass numbers in 1999 are comparable with those from 1976, while largemouth bass numbers have dropped off a bit. However, an important fact regarding this survey is that trap and fyke nets are generally not effective for largemouth and smallmouth bass, therefore the bass numbers observed in the survey may not be representative of the bass populations in Portage Lake. Indeed, angler reports indicate excellent populations of both largemouth and smallmouth bass in Portage Lake. In fact, Portage Lake is a popular destination for bass fishing clubs, and a number of tournaments are held there each year. Not enough largemouth or smallmouth bass were captured in the 1999 survey to make statistical inferences regarding growth, but all sampled fish appeared to be growing well and in good condition. Considering the amount of forage fish present in Portage Lake, growth of either species should not be a problem.

Only eight northern pike were captured in the 1999 survey, but they ranged from 23 to 28 inches in length (Table 2). Six of the eight northern pike captured were from age group 4 (the 1994 year class), and those fish exceeded the state average for growth by 1 inch (Tables 3 and 4). This is not surprising due to the excellent forage that Portage Lake provides. The catch of northern pike in the 1999 survey was comparable with that in the 1976 survey.

Seventeen walleye from 12 to 23 inches in length were captured in the 1999 survey (Table 3). Growth for age-2 walleye was phenomenal, as they exceeded the Michigan average by 2.3 inches. In fact, one age-2 walleye was 15.7 inches in length. Not enough walleye were captured from any other age group to make statistical inferences regarding growth, but all walleye captured appeared to be very healthy and in good condition. Age-2 walleye comprised over half of the walleye catch, indicating a strong 1996 year class. The age-2 fish averaged 13.7 inches in length, and most of those should recruit to the fishery by next summer. It should be noted that 1996 was one of the few times since 1993 that Portage Lake has received its full complement of over 50,000 fingerling

walleyes. Clearly, stocking plays a strong role in supporting the Portage Lake walleye fishery and it is important that Portage Lake receive its full complement of fingerling walleye every year.

Other species captured in the 1999 Portage Lake survey included bowfin, brown bullhead, yellow bullhead, hybrid sunfish, shorthead redhorse, golden redhorse, common carp, and white sucker (Table 3). Bowfin are an important native predator species; they help to thin panfish populations and keep panfish from stunting. Bullheads are most likely underutilized as a fisheries resource. Smaller white suckers and redhorse can be utilized as forage by predator species, but large populations of adult suckers and redhorse can compete for food with young walleye and other more desired species.

The fish community found in 1999 differed substantially from that in the 1976 survey. In 1999, many fewer bluegill were captured and many more yellow perch and rock bass were netted than in 1976. A decent number of walleye were taken in the 1999 survey, compared to none in 1976. In the 1976 survey, alewives were the most numerous species observed, while only six were seen in 1999. Largemouth bass and black crappie numbers seemed to be down somewhat from 1976 levels. Pumpkinseed, northern pike, and smallmouth bass numbers were relatively comparable for the two surveys.

Species that were seen in 1976 but not in 1999 included black bullhead, brown trout, cisco, rainbow smelt, round (menominee) whitefish, lake whitefish, trout-perch, gizzard shad, and quillback carpsucker. Salmonids were not observed in the 1999 survey, most likely because the survey was targeting walleye and no gillnets were set in very deep water. Also, during the 1976 survey (which took place in early July), lake conditions must have been just right to support those species. An upwelling may have occurred in Lake Michigan that forced cold Lake Michigan water into Portage Lake. Although temperature and oxygen profiles indicate that Portage Lake may offer marginal habitat for coldwater species in the summer, anglers rarely catch them then. Most trout and other coldwater species are taken from Portage Lake in the fall, winter, and spring.

Species that were observed in 1999 but not in 1976 included banded killifish, a bluegill/pumpkinseed hybrid, and yellow bullhead. Redhorse were not identified to species in 1976, but in 1999, both golden and shorthead redhorse were recorded. Species that have not been seen in any MDNR surveys but are known to inhabit the lake include burbot, and channel catfish. In fact, there is reportedly an excellent sportfishery for channel catfish available on Portage Lake. Burbot most likely inhabit the lake seasonally when colder water temperatures are present.

Management Direction

Going into the 21st century, Portage Lake will continue to be managed for two fisheries purposes. The first will be to maintain the excellent warmwater/coolwater fisheries currently found in Portage Lake. The second will be to maintain the salmonid fishery found in Lake Michigan waters in the Onekama area, and seasonally in Portage Lake itself. As long as the fish are available, walleyes will continue to be stocked at a rate of 25 fingerlings per acre (53,000 fish) annually. Salmonids will also continue to be stocked at present rates, including 50,000 chinook salmon, 50,000 coho salmon, and 15,000 brown trout, annually. These stocking rates should continue to uphold the fisheries in Portage Lake and nearby Lake Michigan. The next general survey of Portage Lake should include electrofishing to get better panfish and bass data, as well as more information on the forage base in Portage Lake. Sern's index surveys (fall nighttime electrofishing) should be done to better assess walleye year class strength and natural reproduction.

Another goal for Portage Lake in the 21st century should be to maintain the health of the aquatic ecosystem. Currently, Fisheries Division does not stock such species as bluegill, smallmouth bass, and northern pike because they are able to reproduce on their own. Therefore, all remaining riparian wetlands should be protected from development. Such wetlands are a critical component to

the lake ecosystem and should remain in a natural state. Important shallow water habitats should remain in a natural state and not be dredged or altered in any way. Aquatic macrophyte reduction attempts should also be closely monitored by DNR and DEQ. The tributary streams to Portage Lake and their associated wetlands should also be protected from unwise development. One final goal for Portage Lake must include educating riparian landowners about ecologically wise management practices for their lands and shoreline.

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References

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Table 1.-Fish stocked in Portage Lake, Manistee County, 1929-2000.

Year	Species	Number	Size	Strain
1929	Bluegill	2,400	?	
	Smallmouth bass	5,000	?	
1931	Bluegill	4,200	?	
1957	Rainbow trout	3,000	Legal (7"+)	
1958	Rainbow trout	3,600	Legal (7"+)	
1964	Rainbow trout	5,000	Legal (7"+)	
1971	Coho salmon	200,000	Yearlings	
1972	Coho salmon	200,000	Yearlings	
1973	Coho salmon	266,477	Yearlings	
1974	Coho salmon	244,653	Yearlings	
	Chinook salmon	50,456	Fingerlings	
1975	Chinook salmon	51,840	Fingerlings	
1976	Coho salmon	151,549	Yearlings	
	Chinook salmon	50,374	Fingerlings	
1977	Coho salmon	138,809	Yearlings	
	Chinook salmon	25,200	Fingerlings	
	Brown trout	20,000	Yearlings	
1978	Coho salmon	100,600	Yearlings	
	Chinook salmon	50,344	Fingerlings	
1979	Coho salmon	150,000	Yearlings	
	Chinook salmon	50,000	Fingerlings	
1980	Coho salmon	165,290	Yearlings	
	Chinook salmon	100,164	Fingerlings	
1981	Coho salmon	90,013	Yearlings	
	Chinook salmon	100,000	Fingerlings	
1982	Coho salmon	45,360	Yearlings	

	Chinook salmon	100,768	Fingerlings	
1983	Chinook salmon	100,000	Yearlings	
	Brown trout	10,000	Yearlings	
	Brown trout	20,000	Fall fingerlings	
1984	Chinook salmon	125,010	Fingerlings	
	Brown trout	10,000	Yearlings	
	Brown trout	17,000	Fall fingerlings	
1985	Chinook salmon	75,000	Fingerlings	
	Brown trout	9,260	Yearlings	
	Brown trout	15,000	Fall fingerlings	
1986	Chinook salmon	75,007	Fingerlings	
	Brown trout	10,000	Yearlings	
	Brown trout	15,000	Fall fingerlings	
1987	Coho salmon	41,811	Yearlings	
	Chinook salmon	78,896	Fingerlings	
	Brown trout	10,000	Yearlings	
	Brown trout	9,240	Fall fingerlings	
	Walleye	1,000	Spring fingerlings	
1988	Coho salmon	50,009	Yearlings	
	Chinook salmon	55,000	Fingerlings	
	Brown trout	15,000	Yearlings	
	Walleye	2,468	Fall fingerlings	
	Walleye	100	Spring fingerlings	
1989	Coho salmon	50,022	Yearlings	
	Chinook salmon	77,290	Fingerlings	
	Brown trout	15,000	Yearlings	
	Lake trout	174,000	Fall fingerlings	
1990	Coho salmon	32,007	Yearlings	
	Chinook salmon	82,543	Fingerlings	
	Brown trout	15,000	Yearlings	
	Walleye	45,400	Spring fingerlings	Muskegon
1991	Coho salmon	49,503	Yearlings	
	Chinook salmon	62,937	Fingerlings	
	Brown trout	14,700	Yearlings	
1992	Coho salmon	50,339	Yearlings	Michigan
	Chinook salmon	75,023	Fingerlings	Michigan
	Brown trout	14,700	Yearlings	Soda Lake
	Walleye	83,178	Fall fingerlings	Bay De Noc
1993	Coho salmon	50,020	Yearlings	Michigan
	Chinook salmon	67,500	Fingerlings	Michigan
	Brown trout	14,900	Yearlings	Wild Rose
	Walleye	104,150	Fall fingerlings	Bay De Noc
1994	Chinook salmon	72,594	Fingerlings	Michigan
	Brown trout	14,900	Yearlings	Saint Croix
1995	Chinook salmon	100,010	Fingerlings	Michigan
	Brown trout	13,300	Yearlings	Seeforellen
	Walleye	18,147	Fall fingerlings	Bay De Noc
1996	Coho salmon	50,008	Yearlings	Michigan
	Chinook salmon	82,805	Fingerlings	Michigan
	Brown trout	12,780	Yearlings	Wild Rose
	Walleye	50,115	Fall fingerlings	Bay De Noc

1997	Coho salmon	50,040	Yearlings	Michigan
	Chinook salmon	64,390	Fingerlings	Michigan
	Brown trout	13,495	Yearlings	Seeforellen
	Walleye	21,103	Spring fingerlings	Muskegon
1998	Brown trout	14,550	Yearlings	Seeforellen
	Walleye	14,364	Spring fingerlings	Muskegon
1999	Coho salmon	55,000	Yearlings	Michigan
	Chinook salmon	49,704	Fingerlings	Michigan
	Brown trout	15,000	Yearlings	Seeforellen
	Walleye	52,977	Spring fingerlings	Muskegon
2000	Coho salmon	55,000	Yearlings	Michigan
	Chinook salmon	49,245	Fingerlings	Michigan
	Brown trout	19,600	Yearlings	Seeforellen
	Walleye	48,664	Spring fingerlings	Muskegon

Table 2.-Number, weight and length (inches) of fish collected from Portage Lake with small-mesh fyke nets, large-mesh fyke nets, and inland gill nets, June 21-24, 1999.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)*1*	Average length	Percent legal size*2*
Alewife	6	0.5	0.5	0.1	3-7	6.5	100
Banded Killifish	1	0.1	0.0	0.0	3-3	3.5	100
Black crappie	6	0.5	1.7	0.2	7-9	8.0	100
Bluegill	119	9.9	21.7	2.5	2-9	6.1	57
Hybrid bluegill	1	0.1	0.0	0.0	6-6	6.5	100
Bowfin	27	2.3	148.7	16.9	20-29	24.8	100
Brown bullhead	123	10.3	72.3	8.2	9-13	10.7	100
Common carp	26	2.2	237.8	27.0	9-32	26.5	100
Golden redhorse	27	2.3	97.3	11.0	17-24	21.8	100
Largemouth bass	7	0.6	11.9	1.4	3-18	12.8	33
Northern pike	8	0.7	31.6	3.6	23-28	26.0	88
Pumpkinseed	103	8.6	17.0	1.9	2-8	5.7	35
Rock bass	339	28.3	51.0	5.8	2-11	5.3	33
Shorthead redhorse	22	1.8	46.8	5.3	13-19	17.4	100
Smallmouth bass	10	0.8	21.8	2.5	3-20	15.1	67
Walleye	17	1.4	24.3	2.8	12-23	15.5	17
White sucker	18	1.5	50.9	5.8	16-22	19.2	100
Yellow bullhead	59	4.9	9.5	1.1	2-14	4.9	60
Yellow perch	280	23.4	36.6	4.2	4-11	6.6	46
Total	1,199	100.0	881.3	100.0			

1 Note some fish were measured to 0.1 inch, others to inch group: e.g., "5"=5.0 to 5.9 inch,

"12"=12.0 to 12.9 inches; etc.

2 Percent legal size or acceptable size for angling. Legal size or acceptable size for angling is given in parentheses.

Table 3.-Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from Portage Lake with small-mesh fyke nets, large-mesh fyke nets, and inland gill nets, June 21-24, 1999.

Species	Age 1	2	3	4	5	6	7	8	9	10	11	Mean growth index
Black crappie	...	6.6 (1)	7.8 (6)	...	...	...	...	...	...	...	...	-0.1
Bluegill	...	4.7 (1)	5.8 (18)	7.2 (15)	8.1 (2)	9.1 (2)	8.6 (2)	9.5 (1)	...	...	...	+0.8
Hybrid sunfish	...	...	...	...	6.6 (1)	...	...	...	...	...	...	...
Largemouth bass	5.2 (2)	...	11.1 (1)	13.5 (1)	...	...	18.3 (1)	18.5 (1)	18.5 (1)	...	...	...
Northern pike	...	...	...	25.2 (6)	27.8 (1)	...	...	28.3 (1)	...	...	...	+1.0
Pumpkinseed	...	4.4 (4)	5.5 (17)	6.8 (10)	6.7 (1)	8.6 (1)	...	...	...	...	...	+0.7
Rock bass	...	4.7 (18)	6.5 (16)	7.8 (12)	9.0 (10)	11.0 (2)	...	11.4 (1)	11.5 (1)	...	11.7 (1)	+1.1
Smallmouth bass	3.8 (1)	...	15.4 (3)	16.4 (1)	17.0 (2)	18.5 (1)	...	20.1 (1)	...	...	11.4 (1)	...
Walleye	...	13.7 (10)	14.9 (4)	...	...	21.8 (1)	...	23.1 (2)	...	...	...	+2.3
Yellow perch	...	4.7 (12)	6.3 (24)	8.2 (17)	9.7 (7)	10.2 (5)	...	...	...	...	...	+0.1

Table 4.-Estimated age frequency (percent) of fish caught from Portage Lake with small-mesh fyke nets, large-mesh fyke nets, and inland gill nets, June 21-24,1999.

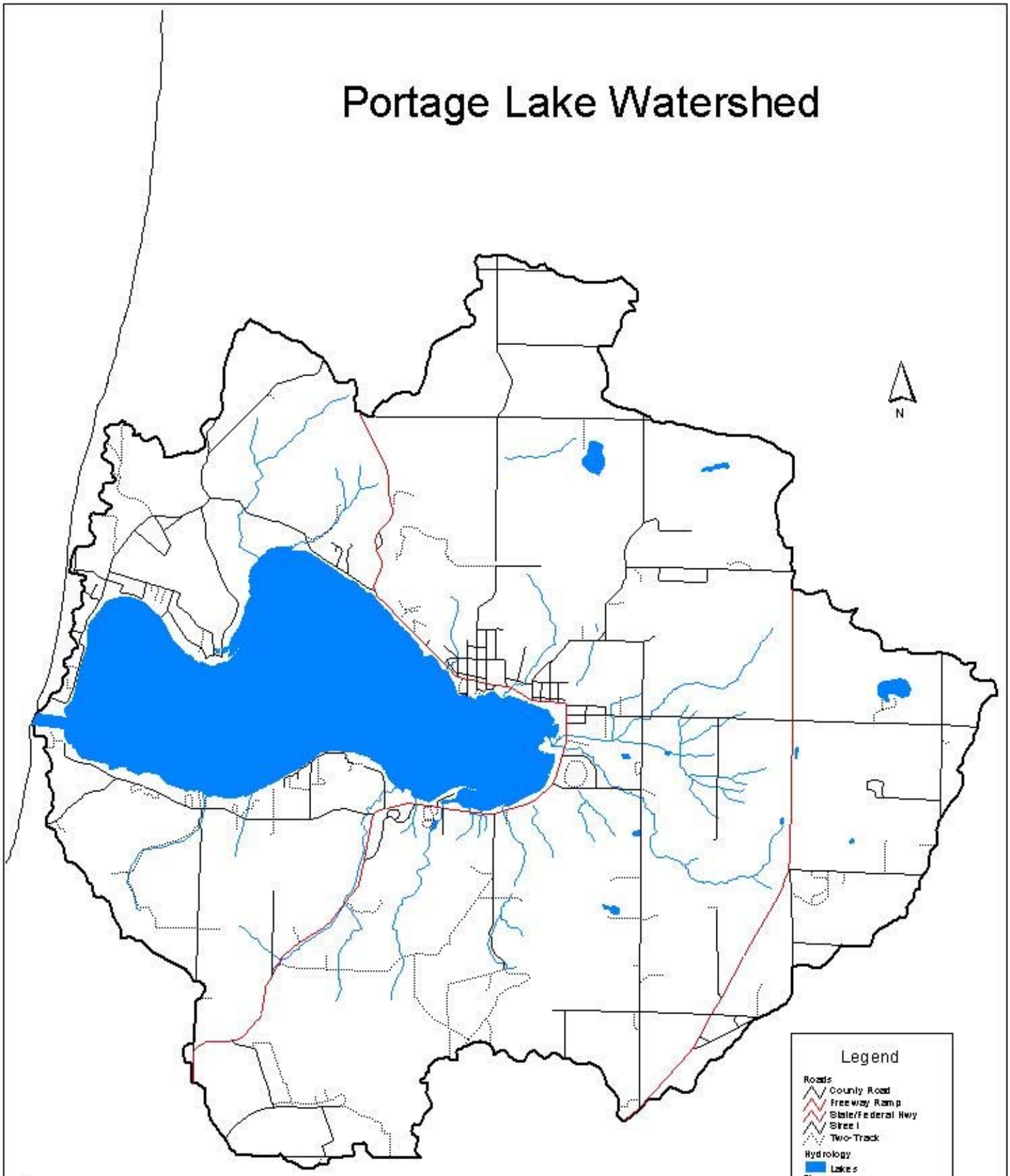
Species	Age 1	2	3	4	5	6	7	8	9	10	11	Number caught
Black crappie	...	14	86									6
Bluegill	...	2	44	37	5	5	5	2	...	...	...	119
Hybrid sunfish	...	...	...	...	100	...	...	...	...	...	...	1
Largemouth bass	29	...	14	14	...	...	14	14	14	...	...	7
Northern pike	...	...	...	75	13	...	...	13	...	...	...	8
Pumpkinseed	...	12	52	30	3	...	3	...				103

Rock bass	...	30	26	20	16	3	...	2	2	...	2	339
Smallmouth bass	10	...	10	30	10	20	...	10	...	...	10	10
Walleye	...	59	24	...	...	6	...	12	...	...	...	16
Yellow perch	...	18	37	26	11	8	...	...	...	...	...	280

Last Update: 08/07/2002
Web Author: *Tina M. Tincher, Librarian*

Questions, comments and suggestions are always welcome! Send them to
tinchert@michigan.gov

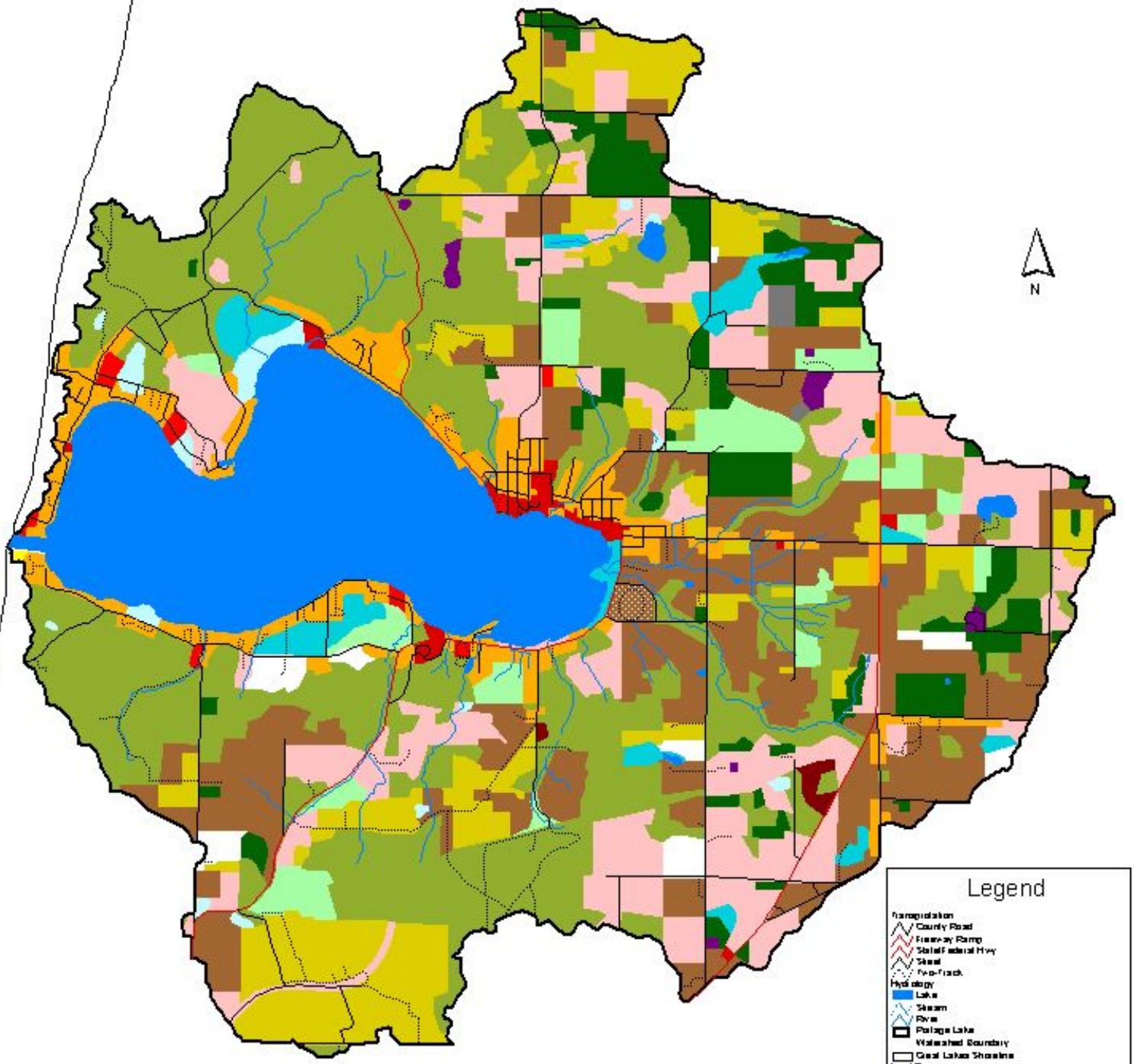
Portage Lake Watershed



Sources:
Watershed Boundary provided by MDEQ (1:24,000 Scale)
Hydrology provided by RHRP (MIRIS 1:24,000 Scale)
Transportation provided by RHRP (MIRIS 1:24,000 Scale)
Great Lakes Shoreline provided by RHRP (MIRIS 1:24,000 Scale)
SRC Service Number: MT20005_01

DNR

Portage Lake Watershed: Landcover



Sources:
NLCD Land Cover provided by RHRP (1:24,000 Scale)
Watershed Boundary provided by MDEQ (1:24,000 Scale)
Hydrology provided by RHRP (MIRIS, 1:24,000 Scale)
Transportation provided by RHRP (MIRIS, 1:24,000 Scale)
Great Lakes Shoreline provided by RHRP (MIRIS, 1:24,000 Scale)

DNR

INSTITUTE FOR FISHERIES RESEARCH

DIVISION OF FISHERIES — MICHIGAN CONSERVATION DEPT.

LAKE INVENTORY MAP

PORTAGE LAKE

AREA 2110 ACRES

COPIED AND CONTOURS ADDED, FROM U.S. LAKE SURVEY, WAR DEPARTMENT CHART NO. 777, DATED 1947. CONTOURS CORRESPOND TO SURFACE ELEVATION OF 578.5 FT. MEAN SEA LEVEL

MANISTEE COUNTY — T. 23 N., R. 16 W. SEC'S 22, 25, 26, 27, 28, 33, 34, 35, 36

LEGEND

OUTLINE & CONTOURS
- Shoreline
- 6'— Contours

SHORE FEATURES
- Road
- Railroad
- Marsh