Gemini Lakes

Schoolcraft County, T47N, 16W, Sections 4, 9, and 10
Manistique River Watershed, last surveyed 2009

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Environment

Gemini Lakes is located in northwest Schoolcraft County about 21 miles northeast of the City of Munising. It has a watershed size of 417 acres, a surface area of 120 acres, and a maximum depth of approximately 20 feet (Figure 1). An un-named tributary forms the outlet of Gemini Lakes which drains to Canoe Lake and is a tributary to Marsh Creek in the Manistique River watershed. Lake substrates vary from mostly sand and organics with scattered patches of gravel in the nearshore areas to organic material found in the deeper offshore areas (Figure 1). Aquatic vegetation is generally scarce throughout the littoral zone and includes water lily, pipewort, and wild celery.

The immediate landscape surrounding Gemini Lakes consists of glacial outwash sand and gravels, post glacial alluvium, peat and muck. Principle soil associations are mostly sands that are moderately well drained. Land cover consists of northern hardwoods, mixed non-forest wetlands, scattered herbaceous open land, and lowland coniferous forest while land use surrounding the lake is primarily recreational in nature.

The perimeter of Gemini Lakes has been minimally developed with seasonal dwellings. A summer survey of the shoreline in 2009 documented 4 dwellings and 4 docks. Recent observations also indicate that natural riparian zone habitat such as downed trees and brush (deadwood) have not been extensively removed to improve swimming, boat dockage, and aesthetics over the vast majority of the shoreline. Two Michigan Department of Natural Resources (DNR) state forest campgrounds are located on Gemini Lakes (Figure 1). A boat launch is located near the northern campground while a carry-in access boat launch is located at the southern campground.

Secchi disk transparency, chlorophyll a (an indirect measure of phytoplankton), and total phosphorus (an important nutrient) are often used to define the degree of productivity, or trophic status of a lake. The trophic state of a lake refers to the total weight of living biological material (biomass). The concept is based on the fact that changes in nutrient levels (measured by total phosphorus) affect changes in algal biomass (measured by chlorophyll a) which in turn affect changes in lake clarity (measured by Secchi disk transparency). Oligotrophic, mesotrophic, and eutrophic lakes are respectively low, medium, and high in productivity.

To determine lake productivity, limnological characteristics were last measured during August 2009. The water was stained but had a relatively high Secchi disk reading of 11.0 feet. Within the water column, alkalinity was 7 milligrams per liter (mg/L), total phosphorus was 0.01 mg/L, total nitrogen was 0.33 mg/L, and chlorophyll a was 0.0072 mg/L. Water chemistry values indicate that the trophic state of Gemini Lakes is oligo-mesotrophic (low to moderate productivity). Calcium carbonate, which acts as a buffer against acidification and is a key component of the shells of crustacians such as crayfish, is the usual source of alkalinity. The alkalinity reading was exceedingly low, which indicates that Gemini Lakes are vulnerable to acidification and probably are not suited to shelled crustaceans.

The ph readings, fortunately, were neutral, meaning the lakes are not especially affected by acidification to date.

Temperature and dissolved oxygen profiles were also documented in August 2009 and can be found in Table 1. Water temperatures ranged from 75 ‖F (surface) to 63 ‖F (bottom). Dissolved oxygen ranged from 10.5 parts per million (ppm) at the surface to 0.4 ppm at the bottom. Minimum dissolved oxygen (DO) levels for suitable summer habitat are approximately 3.0 ppm for coldwater and coolwater fish and 2.5 ppm for warmwater fish (Schneider 2002). Dissolved oxygen levels were above the 3.0 ppm threshold from depths 0-12 feet (Table 1). Critical depth is defined as the point at which DO concentrations are less than 0.5 ppm and refers to a maximum depth that will support microorganisms like zooplankton. The critical depth in Gemini Lakes was measured at approximately 16 feet (Table 1).

History

Gemini Lakes has a long and varied history of fisheries management. The DNR Fisheries Division file records indicate that Gemini Lakes was stocked with largemouth bass and bluegill in 1941. No further stocking occurred until the implementation of a walleye stocking program in 1992 (Table 2). Previous fisheries assessment surveys were conducted by the DNR in 1957, 1966, 1977, 1985, 1991-1994, 1996, and 2003 to determine the status of the fish community and guide management. A total of 13 species have been captured during all Fisheries Division survey assessments with 12 species captured during the 2009 survey (Table 3).

Survey assessment results in 1991 documented what was perceived to be a highly-abundant population of yellow perch that was comprised of mostly small fish. A walleye stocking program was implemented as a measure to control the abundance of yellow perch and lead to increases in both growth rates and population size structure. Spring fingerling walleyes have been stocked in 1992-1994, 1996, 1998, 2000, 2002, and 2004 (Table 2). Walleye stocking was suspended after 2004 to determine if natural reproduction would support the population without supplemental stocking.

Current Status

In June and July of 2009, DNR Fisheries Division conducted a fish community survey using Status and Trends protocols on Gemini Lakes. Assessment gear included fyke nets, trap nets, gill nets, mini-fyke nets and an electrofishing boat. From June 1-4, 5 fyke nets were fished at 13 locations over 3 nights. On trap net was fished at 3 locations over 3 nights. Two experimental gill nets were fished at 6 locations over 3 nights. Two mini-fyke nets were fished at 5 locations over 3 nights. On July 28, 3 ten-minute night electrofishing transects were conducted at 3 separate locations around the shoreline. All fish captured were measured for length and a sample of scales was collected from sportfish for age and growth analysis.

A total of 455 fish representing 12 species were collected from the combined June netting and electrofishing efforts (Table 4). Rock bass, walleye, white sucker, and yellow perch were the most numerically abundant comprising 78% of the total catch. Other fish species collected included bluegill, bluntnose minnow, golden shiner, Iowa darter, northern pike, pumpkinseed sunfish, smallmouth bass, spottail shiner, and yellow perch.

Bluegill (N=16) averaged 7.1 inches in total length and comprised 3% of the total survey catch by number (Table 4). Bluegills ranged from 4 to 10 inches (Table 5) with 63% of the fish meeting or exceeding an acceptable harvest length of 6 inches. Age-growth data indicated that bluegills were growing above state average having a mean growth index of +0.9 inches (Table 6). The age distribution indicated variable recruitment with good representation of bluegill aged 2-6 in the survey catch (Table 6).

Northern pike (N=17) averaged 20.5 inches in total length and comprised 12% of the total survey catch by number (Table 4). Northern pike ranged from 12 to 25 inches (Table 5) with 29% of the fish meeting or exceeding minimum harvest length of 24 inches. Age-growth data indicated that northern pike were growing above the state average having a mean growth index of +0.9 inches (Table 6). The age distribution indicated variable recruitment with representation of northern pike aged 1-6 (Table 6).

Rock bass (N=50) averaged 6.4 inches in total length and comprised 10% of the total survey catch by number (Table 4). Rock bass ranged from 2 to 8 inches (Table 5) with 74% of the fish meeting or exceeding the acceptable harvest length of 6 inches. Age-growth data indicated that rock bass were growing at the state average (Table 6). The age distribution indicated representation of rock bass aged 2-7 (Table 6).

Walleye (N=71) averaged 15.5 inches in total length and comprised 15% of the total survey catch by number (Table 4). Walleyes ranged from 3 to 21 inches (Table 5) with 59% of the fish meeting or exceeding the minimum harvest length of 15 inches. Age-growth data indicated that walleyes were growing above state average having a mean growth index of +1.0 inches (Table 6). The age distribution indicated variable recruitment with representation of walleyes aged 1-8 in the survey catch (Table 6).

White sucker (N=44) averaged 19.4 inches in total length and comprised 9% of the total survey catch by number (Table 4). White suckers ranged from 14 to 22 inches (Table 5).

Yellow perch (N=208) averaged 3.3 inches in total length and comprised 43% of the total survey catch by number (Table 4). Yellow perch ranged from 1 to 12 inches (Table 5) with 5% of the fish meeting or exceeding the acceptable harvest length of 7 inches. Age-growth data indicated that yellow perch were growing near the state average having a mean growth index of -0.3 inches (Table 6). The age distribution indicated variable representation of yellow perch aged 1 through 6 (Table 6).

Analysis and Discussion

While the Gemini Lakes provides habitats to support populations of 12 fish species, outside of walleye and perhaps white suckers those population abundances appear to be rather low. Gemini Lakes general overall low trophic state or productivity influences the amount of fish community biomass that can be supported. Additionally, limited or missing habitat features needed for various life stages of a particular species (such as bluegill, northern pike, pumpkinseed sunfish, and smallmouth bass) also could explain low population abundance.

Panfish such as bluegill have never been very abundant in Gemini Lakes, and the catch sampled in 2009 indicated little change in the population as compared to previous surveys. Age classes 2-6 were

captured during the survey indicating some successful but limited natural reproduction on an annual basis. Rock bass up to 8 inches are available to the angler as 75% of the survey catch was comprised of fish 6 inches or longer. Yellow perch are providing forage for walleye and northern pike, and any concern of over-population (as noted during the early 1990's) is not warranted at this time.

Walleyes now comprise the main predator in the Gemini Lakes fish community. Walleye fingerlings were stocked at moderate rates of 14-42/acre on eight occasions between 1992 and 2004 to control potential over-abundance by yellow perch. . Analyses from the 2003 survey indicated that there could be some natural reproduction occurring and, at that time, walleye stocking was suspended to determine if natural reproduction would support the population. Since walleye stocking suspension after 2004, growth rates, average total length, and fyke net catch rates have remained almost identical from the 2003 survey to the 2009 survey. Walleye growth rates are very fast indicating plenty of available forage for fish. A total of eight year classes (1-8) were captured during the 2009 survey. Further analyses of the ageing data indicates that naturally reproduced walleyes are contributing to the population as walleyes are present from non-stocked years (i.e. from 2005-2008, ages 1-4).

Management Direction

1) It is recommended that the walleye stocking suspension remain in effect for the near future as natural reproduction appears able to support the walleye population without supplemental stocking. Future management should focus on surveying the fish community and walleye population to monitor growth rates of predators and abundance of forage resources. If walleye densities become too high, their predation can significantly reduce the abundance of both small and large panfish (MDNR 2004).

2) A fish community survey should be scheduled within 10 years to monitor the forage and predator populations. Additinally, Gemini Lakes would be an appropriate candidate for a walleye population estimate to start gathering abundance information on this species in small lakes in the Northern Lake Michigan Management Unit.

3) Fall Sern's index surveys should be scheduled in the future to track and monitor trends in walleye natural reproduction and guide future management efforts for walleyes.

4) Anglers are encouraged to report sport catches of all species to the NLMMU. Reports are useful to track population trends and aid further management of the fishery for current and future mangers as well.

References

MDNR (Michigan Department of Natural Resources) 2004. Stocking guidelines for various species of fish. Chapter 5 in Dexter, J. L., Jr., and R. P. O'Neal, editors. Michigan fish stocking guidelines II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 32, Ann Arbor.

Schneider, J. C. 2002. Fish as indicators of lake habitat quality and a proposed application. Michigan Department of Natural Resources, Fisheries Research Report 2016, Ann Arbor.

Figure 1. –Bathymetric contour map for Gemini Lakes, Schoolcraft County.

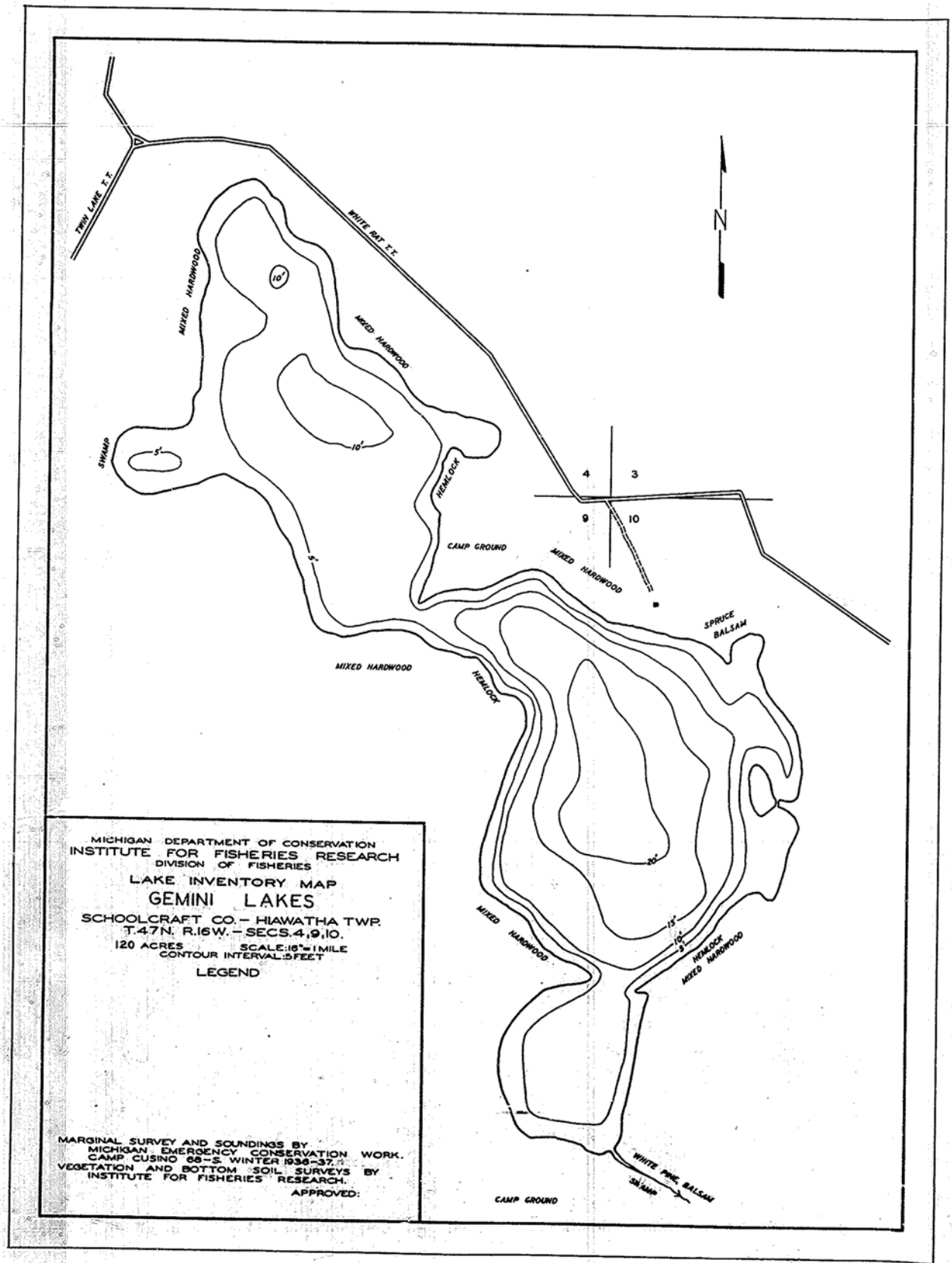

Table 1.-Temperature, dissolved oxygen, and pH profiles collected on August 12, 2009 from Gemini Lakes, Schoolcraft County. Data from DNR, Fisheries Division records.

Depth (feet)	Temperature (ºF)	Dissolved Oxygen (ppm)	pH
0	75	10.5	7.7
3	75	10.6	7.5
6	75	10.5	7.5
9	74	10.5	7.5
11	71	10.2	7.3
12	69	10.2	7.4
15	65	1.1	6.6
16	63	0.4	6.4

Table 2.-Fish stocked into Gemini Lakes, Schoolcraft County (1941 to 2004). Data from DNR, Fisheries Division records.

Year	Species	Number	Rate (#/acre)	Size (in.) or Age
1941	Largemouth bass	1,000	8	4 months
	Bluegill	4,000	33	4 months
1992	Walleye	10,080	84	1.7
1993	Walleye	1,002	8	4.7
1994	Walleye	4,500	38	1.7
1996	Walleye	5,000	42	1.7
1998	Walleye	3,000	25	1.7
2000	Walleye	3,024	25	1.9
2002	Walleye	2,718	23	1.9
2004	Walleye	1,730	14	1.4

Table 3.-List of fishes captured during surveys (1957-2009) from Gemini Lakes, Schoolcraft County. Origin: Native=N, I=Introduced. Status: Present=P(recent observations). Data from DNR, Fisheries Division records.

Common Name	Scientific Name	Origin	Status
Bluegill	*Lepomis macrochirus*	I	P
Bluntnose minnow	*Pimephales notatus*	N	P
Brown bullhead	*Ameiurus nebulosus*	N	
Golden shiner	*Notemigonus crysoleucas*	N	P
Iowa darter	*Etheostoma exile*	N	P
Northern pike	*Esox lucius*	N	P
Pumpkinseed sunfish	*Lepomis gibbosus*	N	P
Rock bass	*Ambloplites rupestris*	N	P
Smallmouth bass	*Micropterus dolomieu*	N	P
Spottail shiner	*Notropis hudsonius*	N	P
Walleye	*Sander vitreius*	I	P
White sucker	*Catostomus commersoni*	N	P
Yellow perch	*Perca flavescens*	N	P

Table 4.-Number, weight, length, and percentages of fishes collected with fyke, gill, and mini-fyke nets and electrofishing gear from Gemini Lakes, Schoolcraft County, in June and July, 2009. Data from DNR, Fisheries Division records.

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
Bluegill	16	5.1	7.1	4-10	3	2	63 (≥ 6”)
Bluntnose minnow	28	<1	2.2	1-3	6	<1	-
Golden shiner	10	<1	2.8	1-4	2	<1	-
Iowa darter	1	<1	2.5	-	<1	<1	-
Northern Pike	17	36.6	20.5	12-25	4	12	29 (≥ 24”)
Pumpkinseed sunfish	1	<1	2.5	-	<1	<1	0 (≥ 6”)
Rock bass	50	11.4	6.4	2-8	10	4	74 (≥ 6”)
Smallmouth bass	6	3.6	9.5	4-15	1	1	17 (≥ 14”)
Spottail shiner	3	<1	3.5	3-4	<1	<1	-
Walleye	71	105.8	15.5	3-21	15	35	59 (≥ 15)
White sucker	44	130.2	19.4	14-22	9	44	-
Yellow perch	208	6.5	3.3	1-12	43	2	5 (≥ 7)

Table 5.-Length range of selected species of fish collected with fyke, gill, mini-fyke nets and electrofishing gear from Gemini Lakes, Schoolcraft County, in June and July, 2009. Data from DNR, Fisheries Division records.

	Species						
Inch group	Bluegill	Northern pike	Rock bass	Smallmouth bass	Walleye	White sucker	Yellow Perch
0	-	-	-	-	-	-	-
1	-	-	-	-	-	-	1
2	-	-	1	-	-	-	152
3	-	-	4	-	2	-	16
4	2	-	7	1	-	-	17
5	4	-	1	-	-	-	9
6	4	-	17	-	1	-	3
7	2	-	13	-	4	-	2
8	-	-	7	1	1	-	4
9	1	-	-	3	-	-	-
10	3	-	-	-	-	-	2
11	-	-	-	-	3	-	1
12	-	1	-	-	8	-	1
13	-	1	-	-	7	-	-
14	-	3	-	-	3	2	-
15	-	-	-	1	2	1	-
16	-	-	-	-	4	4	-
17	-	-	-	-	11	-	-
18	-	-	-	-	9	5	-
19	-	1	-	-	9	15	-
20	-	1	-	-	3	9	-
21	-	2	-	-	4	5	-
22	-	1	-	-	-	3	-
23	-	2	-	-	-	-	-
24	-	1	-	-	-	-	-
25	-	4	-	-	-	-	-

Table 6.-Weighted mean length (inches) at age and growth relative to the state average for selected species of fish sampled with fyke, gill, mini-fyke nets and electrofishing gear from Gemini Lakes, Schoolcraft County, in June and July, 2009. Number of fish aged is in parentheses. Data from DNR, Fisheries Division records.

	Age/Length									
Species	0	1	2	3	4	5	6	7	8	Mean growth index[1]
Bluegill			5.1 (5)	5.3 (2)	6.7 (3)	8.6 (3)	10.2 (3)			+0.9
Northern pike		14.2 (5)	20.8 (4)	23.9 (5)	24.1 (1)	25.7 (1)	25.7 (1)			+0.9
Rock bass			3.9 (3)	5.0 (8)	6.9 (17)	7.2 (12)	8.1 (4)	8.5 (2)		0.0
Walleye		7.4 (6)	12.9 (20)	16.7 (13)	18.5 (14)	19.6 (2)	18.7 (4)	20.4 (7)	20.4 (3)	+1.0
Yellow perch		3.8 (9)	5.0 (16)	6.5 (2)	7.9 (6)	11.2 (3)	11.5 (1)			-0.3

[1]Mean growth index is the average deviation from the state average length at age.