Four Mile Impoundment
Alpena County, T31N, R08E
Thunder Bay River watershed, last surveyed 2016

Tim Cwalinski, Senior Fisheries Biologist, Gaylord

Environment

Four Mile Impoundment is a 98 acre waterbody located within the lower reaches of the Thunder Bay River in Alpena County near the town of Alpena (Figure 1). The impoundment was created in 1902 on a stretch of Thunder Bay River that possesses relatively high gradient when compared to other parts of the lower watershed (Cwalinski et al. 2006). The dam has been used for hydroelectric power generation since it was built, with the most recent license settlement agreement established in 1998 between the Federal Energy Regulatory Commission (FERC) and Thunder Bay Power Company. Current ownership of the dam is North American Hydro, though it is still managed by Thunder Bay Power Company. The storage area of the pond is 1000 acre-feet. The dam has a head of 28 feet, and no operating fish passage structure exists. The structure is considered a high or significant hazard (failure results in danger to individuals downstream with the potential for loss of human life) by the Michigan Department of Enviornmental Quality. This dam is located between Ninth Street dam in the city of Alpena and the Norway Dam (Seven Mile Dam) that impounds Lake Winyah. Four Mile Impoundment is a relatively small and narrow impoundment between two larger impoundments and dams. One small tributary, Fall Creek, enters the impoundment on the north shore.

The shoreline of Four Mile Impoundment is relatively undeveloped, and under private ownership including some land owned by Thunder Bay Power Company. Bottom substrate of the pond is primarily sand, muck and some cobble/gravel. Most of the impoundment has depths less than 10 feet, with a maximum depth of 22 feet near Four Mile Dam. There is an approximate gradient of 30 feet per mile through the length of the impoundment. Aquatic vegetation, algae, and submersed trees are a common occurrence in the impoundment. There are six dwellings and four small docks on the impoundment as of summer 2016. The only public access, located halfway along the north shore on Long Rapids Road, offers a small boat launch site and shoreline fishing and is owned and maintained by the Thunder Bay Power Company. The concrete ramp allows for small-medium sized boats to be launched, and enough parking for approximately five boat trailers. The water color is stained dark from the slightly turbid Thunder Bay River which flows through it. Invasive rusty crayfish are prominent in the impoundment and their is not information available on the presence of other invasives.

History

The first aquatic community assessment of Four Mile Impoundment occurred in 1950 and was conducted by the Michigan Department of Conservation (MDOC). Many Michigan lakes were stocked prior to 1950 when this was a common practice. This occurred despite the fact that many of these lakes did not need to be stocked. Four Mile Impoundment was stocked with Walleye fry in both 1937 and 1938, and Largemouth Bass in 1949. In the 1950 survey, both the aquatic vegetation and fish communities were assessed. Fish were sampled with both experimental gill nets and seining and this was considered an initial "snap-shot" of the community. Deadhead stumps and aquatic vegetation were considered abundant. Alkalinity values of the impoundment were 155ppm. No thermal stratification

was measured in the water column. Game fish present were Yellow Perch, Pumpkinseed, Rock Bass, Northern Pike, Smallmouth and Largemouth bass. Non-game fish included bullheads and White Sucker, and a variety of minnows, chubs, shiners, and darters. Managers deemed the fish community satisfactory.

The next fish community assessment was made by the Michigan Department of Natural Resources (MDNR) in June 1977. Fish were sampled using small (3 foot) trap nets (15 lifts) along with 15 experimental gill net lifts. The most abundant fish species captured were White Sucker, Northern Pike, and bullheads. Northern Pike were considered slow growing and few were larger than 20 inches. Yellow Perch were present, but not in large numbers, though a relatively good percentage (24%) larger than 8 inches were captured. Other species captured, but in low numbers, were Smallmouth Bass, Rock Bass, Black Crappie, Pumpkinseed, and Golden Shiners. Only one management recommendation was made from the survey; that the improperly placed culvert on a tributary, Fall Creek, be replaced to allow for better pike spawning movement in the spring. The culvert was located on Long Rapids Road, approximately 50 feet upstream of the creek's confluence with the impoundment. As of today, this culvert remains a barrier to fish passage.

A follow-up to this survey was conducted by MDNR in 1982 in which daytime alternating current electrofishing was used to sample more than half of the shoreline length. Species most abundant in the survey were Rock Bass, White Sucker, and bullhead. No survey purpose could be found in the notes. Recommendations were made by MDNR in the late 1980s to attempt to build a Walleye population in Four Mile Impoundment through stocking efforts. Stocking spring fingerlings began in 1989 and ceased in 1995 (Table 1).

A fish community survey was conducted by MDNR in 1996 with an emphasis on evaluating recent Walleye stocking efforts. Sampling gear included fyke- and trap-nets. The most abundant game fish included Northern Pike and Black Crappie. Pike up to 33 inches were collected, though 22-23 inch fish were most prevalent, and were represented by five year classes. Nine Walleye were sampled and nearly all of them were legal size (15 inches or larger). Both Largemouth and Smallmouth bass were collected in low numbers, but angler reports remained positive for bass. Crappie up to 12 inches were surveyed and represented by six year classes. Bluegill, Pumpkinseed, Yellow Perch, and Rock Bass were all collected in low numbers. Non-game fish included White Sucker, bullheads, Bowfin, and Common Carp. Walleye stocking was discontinued by MDNR in Four Mile Impoundment following the survey based on the acceptable number of other predators found.

Current Status

In 2016, MDNR Fisheries Division conducted a fish community survey at Four Mile Impoundment. Effort consisted of 3 large-mesh trap-net lifts, 9 large-mesh fyke-net lifts, 4 small-mesh fyke-net lifts, 4 experimental gill-net lifts, 3 shoreline seine hauls, and 30 minutes of direct current nighttime electrofishing. Lead lengths for the larger mesh trap and fyke nets were variable depending on the amount of littoral zone. Sampling effort followed the Status and Trends sampling protocol established by Fisheries Division (Wehrly et al. in press). The netting survey was done from May 2-5, while the nighttime electrofishing was done on May 16. Water temperature during the survey ranged from 52-55 Fahrenheit. Rusty crayfish were noted as prevalent during the survey. Lake limnological parameters were recorded in late August of 2015 for Four Mile Impoundment (Table 2). Secchi disk (measure of clarity) was 12 feet. Water temperature on that date was nearly uniform (76-73F) from surface to the

bottom in 19 feet of water. Dissolved oxygen levels throughout the water column were between 7 and 9ppm, which is ample for fish growth and survival.

Twenty-four different species and a total of 532 fish were collected during the 2016 survey (Table 3). Large predator fish including Smallmouth Bass, Walleye, Northern Pike, and Muskellunge made up 18% of the catch by number, while non-game species such as Bowfin, bullheads, suckers, and Common Carp made up 39% of the catch by number. This proportion was weighted much higher towards non-game species in a 2015 survey at Lake Besser, the river impoundment directly downstream of Four Mile Impoundment (Cwalinski 2016). Weight was not collected for all fish, however, overall fish biomass in the lake was dominated by non-game species. The panfish community of Four Mile Impoundment is diverse but not abundant, and dominated by Yellow Perch and Rock Bass, and to a lesser degree Bluegill, Pumpkinseed, and Black Crappie. Because the survey was done early in the spring (cold period), we believe the relative proportions of panfish in the catch were skewed slightly lower. Panfish represented 17% of the total catch for this survey, which was similar to downstream Lake Besser (16%) and upstream Seven Mile Pond (20%). The 2016 Four Mile Impoundment catch at length for game fish is provided in Table 4.

Panfish catches were low during the 2016 survey, and likely lower than during previous surveys, with very few Black Crappie captured compared to past surveys. It is understandable that panfish are not prolific in Four Mile Impoundment since it has both lake and river characteristics. The panfish found in the waterbody today have been found historically. Despite the low abundances, some large panfish were collected including crappie over 10 inches, and perch over 8 inches (Table 4). Only two year classes of crappie were collected compared to previous surveys when more year classes were found (Table 5). Yellow Perch up through age 6 were found, but none older.

The three primary predator game fish in Four Mile Impoundment are Smallmouth Bass, Northern Pike, and Walleye (Table 3). Smallmouth Bass up to 18 inches were collected with an abundance of fish in the 11-17 inch size range and represented by nine year classes (Table 5). This species was more abundant in 2016 than in past surveys. Northern Pike were common in the survey catch, with most fish sub-legal in size (less than 24 inches; Table 4). Pike year classes and growth are similar to past surveys (Table 5). Walleye are relatively common in Four Mile Impoundment, despite the lack of direct stocking efforts. Multiple sizes and year classes of this species were present in 2016, unlike past surveys (Table 5). One sub-legal sized Muskellunge (36 inches, age 5) was captured during the survey. The fish's color pattern was typical of the northern strain variation.

Non-game fish such as Bowfin, bullheads, Common Carp, and suckers were prevalent in the Four Mile Impoundment environment. Redhorse Suckers, common downstream in Lake Besser, were not captured during the 2016 survey at Four Mile Impoundment. All three species of bullhead were prolific. Bullheads in the 10-13 inch size range were particularly abundant. Bowfin were also common and reached lengths up to 24 inches. These are large predators which undoubtedly impact the other species in Four Mile Impoundment. White Suckers were present and reached lengths up to 19 inches. The shiner population was made up of four species: Blackchin, Common, Rosyface, and Golden.

Analysis and Discussion

The 2016 fish community of Four Mile Impoundment may be characterized as having the following: 1) a diverse panfish community demonstrating slightly above average growth but overall low abundance,

2) a diverse game fish predator population dominated by Smallmouth Bass, Northern Pike, and Walleye, all of which are considered in acceptable numbers to provide a fishery, 3) a fair Walleye population that is likely built from upstream stocking efforts in Lake Winyah and with fish able to reach older ages, 4) a low density Muskellunge population that is also likely present from fingerlings stocked upstream in Lake Winyah and which survive entrainment at the upstream dam, 5) a prolific non-game fish community composed of bullheads, Bowfin, Common Carp, and suckers.

The Four Mile Impoundment panfish community is high in diversity but poor in abundance according to recent survey results. Species available to anglers include Black Crappie, Yellow Perch, Pumpkinseed Sunfish, Rock Bass, and Bluegill. Overall panfish growth rates appear to be acceptable.

The game fish predator base of Four Mile Impoundment is dominated by Smallmouth Bass, Northern Pike, and Walleye. Bass are in good numbers and sizes, and angler reports suggest they provide a quality fishery. They are an important predator in managing rusty crayfish numbers in this impoundment. Northern Pike density and sizes in this waterbody are typical for northern Michigan small impoundments. Walleye are more abundant in Four Mile Impoundment today than in previous surveys. Consistent upstream (Lake Winyah) stocking efforts are likely the reason for this increased abundance (Cwalinski 2009). This species can live a long time in this environment and attain quality sizes. Muskellunge are also stocked upstream in Lake Winyah, which would likely explain the presence of one specimen in Four Mile Impoundment in 2016.

The non-game warm water fish community within Four Mile Impoundment is typical for a northern river impoundment. A variety of suckers, carp, Bowfin and bullheads dominate the backwaters and river channels and likely reduce other species through predation and competition.

Management Direction

1) The aquatic community of Four Mile Impoundment should be monitored on a less frequent basis. A complete fish community survey documenting further changes should be accomplished every 30-40 years. Surveys at the impoundments adjacent to Four Mile Pond (Lake Winyah and Lake Besser) should be more frequent since there are stocking programs at these waters. Future sampling effort at Four Mile Impoundment should duplicate the 2016 survey for more comparable results. Four Mile Impoundment has a half riverine environment with a river channel and diverse bottom hydrography. The fish populations more adapted to this type of environment are Smallmouth Bass and Walleye as predators, and Rock Bass in the panfish category.

2) Continue to rely on natural reproduction or downstream migration of Walleye into Four Mile Impoundment. The proportion of wild fish to stocked fish is currently unknown. Regardless, enough fish are found in the impoundment to offer a small fishery. Little is known if a significant targeted fishery actually exists or if anglers catch them incidentally. Legal-sized Walleye are available to anglers. Consistent upstream stocking efforts into Lake Winyah (Seven Mile Impoundment) and the Thunder Bay River have likely created this Walleye population. There is no reason to stock Four Mile Impoundment directly with Walleye since a population already exists from other means. Walleye numbers were higher as of the 2016 survey than following direct stocking efforts of this species from 1989 through 1995.

3) Northern Pike and Smallmouth Bass are native to Four Mile Impoundment and important parts of the fish community. Smallmouth Bass are more prolific today than in past decades and their densities may be increasing with their food source of rusty crayfish (invasive species). The panfish community lacks quality in this water, likely due to the lack of nutrients that are retained in upstream Lake Winyah, or flushed out in the riverine environment of Four Mile Impoundment. Densities of panfish in this impoundment will likely fluctuate with natural panfish densities upstream.

4) Anglers should be encouraged to report catches of fish in Four Mile Impoundment to the local DNR biologist, particularly for bass, pike, Walleye, and Muskellunge.

5) The non-game large fish community of Four Mile Impoundment is prolific and diverse and includes White Suckers, bullheads, carp, and Bowfin. Bow and spear fishing opportunities are available at this waterbody and this type of activity should be promoted.

6) The standard suite of State of Michigan fishing regulations is appropriate for Four Mile Impoundment and I recommend no changes.

References

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Wehrly, K.E., G.S. Carter, and J.E. Breck (in press). Standardized sampling methods for the inland lakes status and trends program. Michigan Department of Natural Resources, Fisheries Special Report, Ann Arbor.

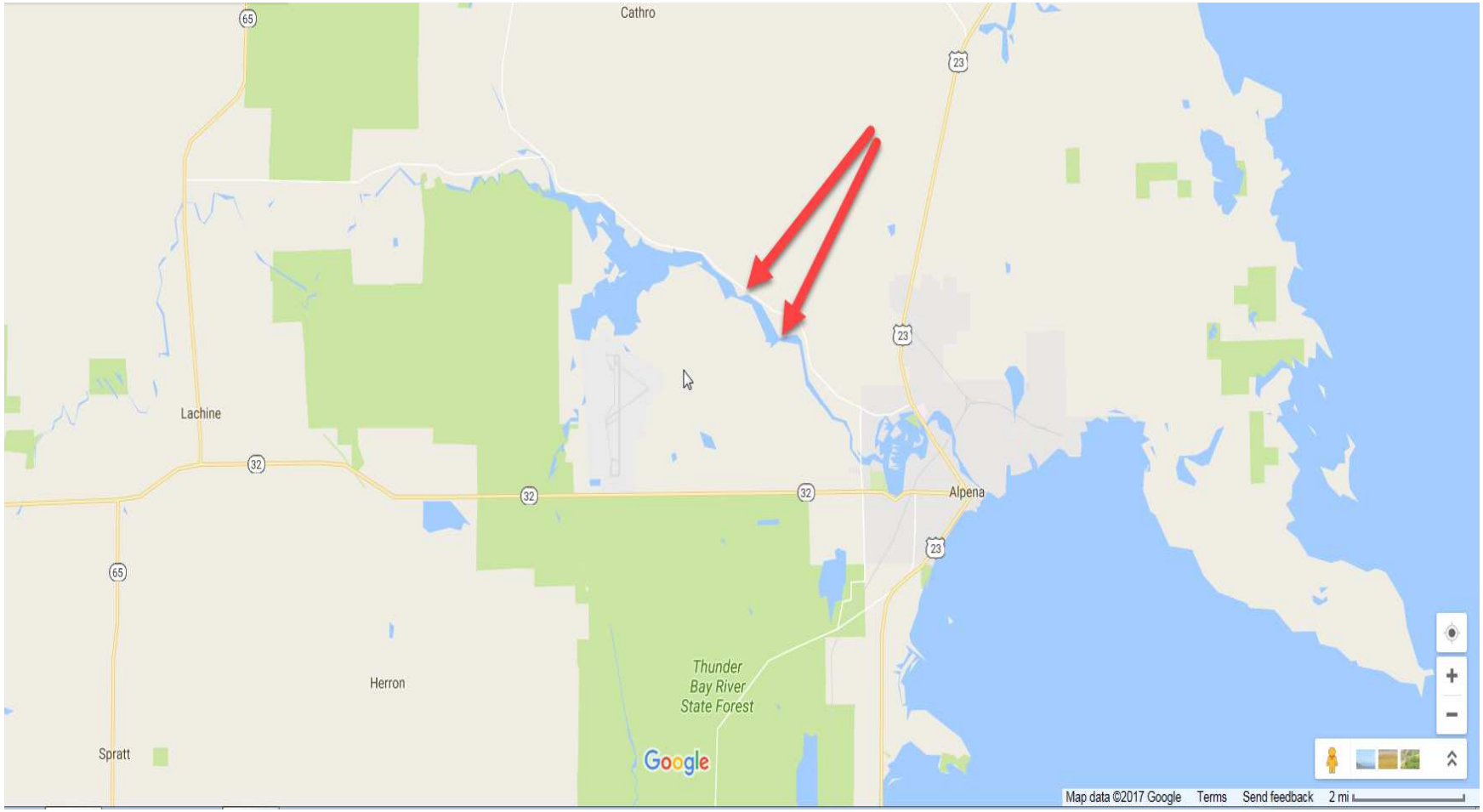

Figure 1. Regional location of Four Mile Impoundment in Alpena County, Michigan. Arrows indicate upper and lower ends of pond. Upstream of impoundment is Seven Mile Dam and Lake Winyah. Downstream of impoundment from Four Mile Dam is the Thunder Bay River, Lake Besser, the town of Alpena, and Thunder Bay on Lake Huron.

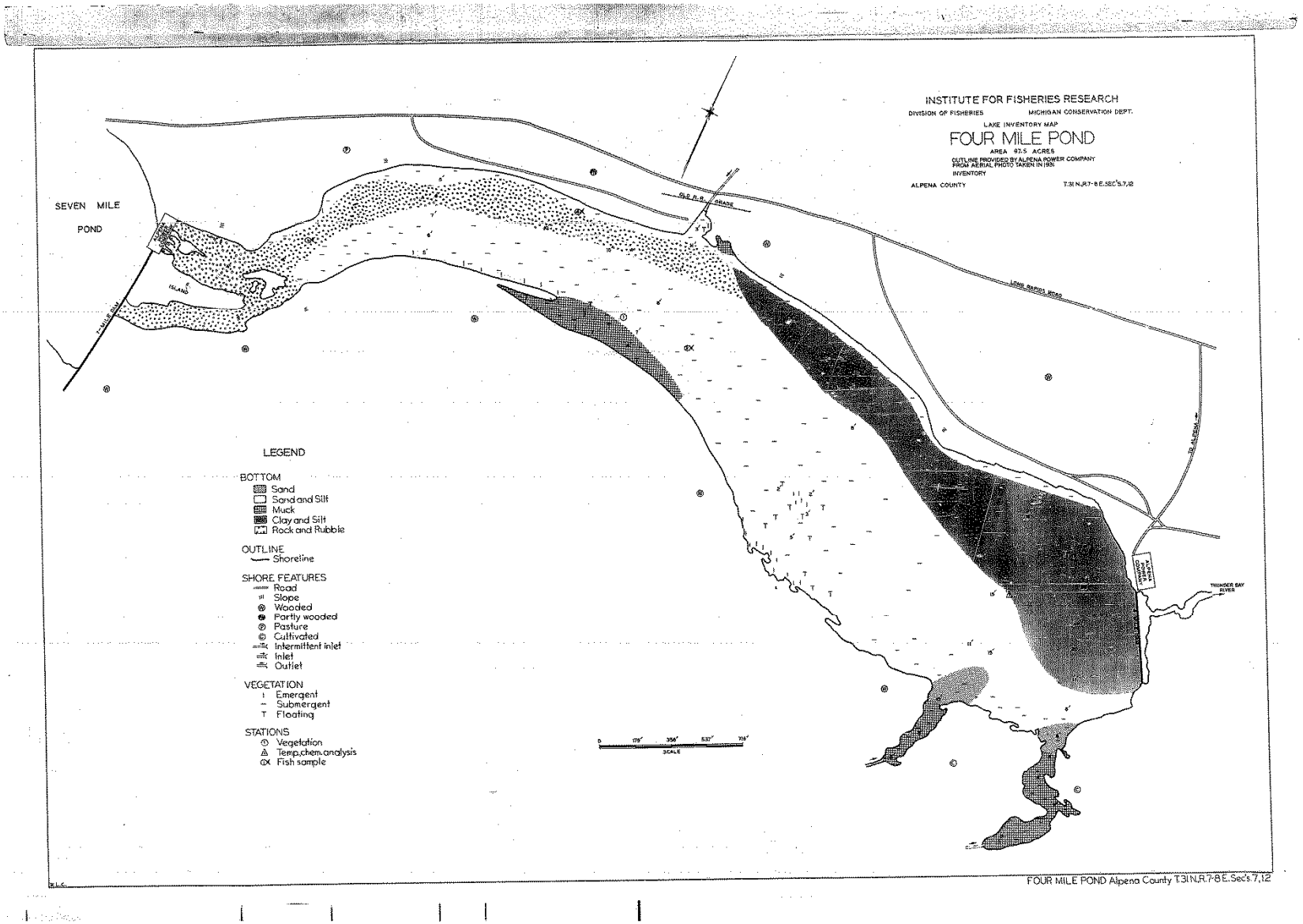

Figure 2. Original bathymetric map of Four Mile Impoundment.

Table 1.-Recent spring fingerling walleye stocking history for Four Mile Impoundment, Alpena County. All fish stocked by MDNR.

Year	Number	Strain	Avg. Length (in)	OTC marked?
1995	10,200	Bay De Noc	1.7	No
1993	10,000	Muskegon	1.6	No
1991	10,000	Muskegon	1.6	No
1990	21,000	Muskegon	1.4	No
1989	10,000	Muskegon	1.5	No

Table 2.-Water temperature and dissolved oxygen profile for Four Mile Impoundment, August 30, 2016.

Depth (ft)	**Temperature (F)**	**Dissolved Oxygen (ppm)**
Surface	76	9.0
1	76	9.0
2	75	9.1
3	75	9.1
4	75	9.1
5	75	9.0
6	75	8.6
7	75	9.0
8	75	8.6
9	75	8.4
10	74	8.3
11	74	8.2
12	74	8.0
13	74	7.9
14	74	7.9
15	73	7.8
16	73	7.7
17	73	7.6
18	73	7.6
19	73	7.6

Table 3.-Species catch and relative abundance of fishes collected during the Four Mile Impoundment fish community survey, May 2-5 and May 16, 2016. Weight is calculated.

Species	Number	Percent by number	Weight (lb.)	Percent by weight	Length range (in.)
Black Bullhead	115	21.6	96.1	23.6	2 – 14
Blackchin Shiner	74	13.9	0.3	0.1	1 – 3
Brown Bullhead	54	10.2	44.0	10.8	6 – 14
Smallmouth Bass	49	9.2	79.3	19.5	5 – 18
Rock Bass	40	7.5	6.9	1.7	4 – 8
Yellow Perch	37	7.0	5.4	1.3	2 - 10
Northern Pike	29	5.5	63.5	15.6	14 – 27
Common Shiner	20	3.8	0.3	0.1	1 - 5
Rosyface Shiner	20	3.8	0.1	0.0	2
Yellow Bullhead	18	3.4	9.1	2.2	5 – 12
Walleye	17	3.2	25.6	6.3	9 – 20
Iowa Darter	15	2.8	0.0	0.0	1 – 2
White Sucker	10	1.9	12.6	3.1	4 – 19
Bowfin	8	1.5	31.1	7.6	20 – 24
Johnny Darter	6	1.1	0.1	0.0	1 – 4
Pumpkinseed	5	0.9	1.6	0.4	5 – 8
Black Crappie	4	0.8	2.9	0.7	9 – 11
Bluegill	4	0.8	0.0	0.0	1
Golden Shiner	2	0.4	0.0	0.0	2 – 3
Bluntnose Minnow	1	0.2	0.0	0.0	1
Common Carp	1	0.2	15.1	3.7	32
Creek Chub	1	0.2	0.1	0.0	5
Central Mudminnow	1	0.2	0.0	0.0	3
Muskellunge	1	0.2	13.3	3.3	36
TOTAL	**532**		**407.5**		

Table 4.-Length-frequency distribution of important game fishes collected during the 2016 netting survey at Four Mile Impoundment.

Length (in)	Black Crappie	Rock Bass	Northern Pike	Smallmouth Bass	Yellow Perch	Walleye
1						
2					1	
3					4	
4		6			9	
5		16		1	6	
6		11			1	
7		6			7	
8		1			4	
9	1				2	1
10	1			2	3	
11	2			6		2
12				6		1
13				11		
14			1	6		
15				1		2
16				6		2
17			1	9		4
18			3	1		3
19			5			1
20			6			1
21			1			
22			5			
23			2			
24			2			
25			2			
26						
27			1			
28						
29						
30						
31						
32						
33						
34						
35						
36						

Table 5.-Mean length (inches) at age for various game fishes of Four Mile Impoundment. Number in parentheses is number aged. Growth comparison in last column was across all ages.

Species	Age group	1977 June	1996 April/May	2016 June
Black Crappie	I	--	3.0 (7)	--
	II	6.8 (1)	4.9 (16)	--
	III	8.0 (13)	7.1 (33)	--
	IV	9.5 (12)	8.5 (2)	10.1 (2)
	V	11.1 (1)	10.0 (24)	11.6 (2)
	VI	--	11.9 (3)	--
	VII	--	--	--
	VIII	12.4 (1)	--	--
Pumpkinseed sunfish	I	--	--	--
	II	3.4 (5)	3.3 (2)	--
	III	5.3 (16)	4.6 (13)	5.8 (1)
	IV	5.7 (31)	--	7.2 (3)
	V	6.6 (5)	6.3 (1)	--
	VI	--	--	--
	VII	7.4 (2)	--	8.9 (1)
Yellow Perch	I	--	3.3 (12)	3.2 (5)
	II	5.9 (2)	4.7 (2)	5.6 (22)
	III	6.3 (4)	5.8 (1)	8.3 (2)
	IV	7.7 (5)	7.7 (2)	8.7 (5)
	V	8.6 (4)	--	10.2 (1)
	VI	9.8 (3)	--	10.4 (1)
	VII	10.5 (5)	13.1 (1)	--
	VIII	10.7 (8)	--	--
	IX	11.8 (7)	--	--
	X	13.4 (1)	--	--
	XI	12.7 (6)	--	--
	XII	14.4 (1)	--	--
Northern Pike	I	12.8 (2)	--	14.0 (1)
	II	17.0 (15)	12.3 (1)	18.8 (6)
	III	19.8 (16)	19.4 (8)	21.3 (14)
	IV	24.4 (8)	21.9 (29)	22.5 (5)
	V	--	23.5 (18)	25.8 (1)
	VI	28.2 (1)	30.7 (3)	27.5 (1)
	VII	--	--	--
	VIII	39.2 (1)	--	--

Table 5.-continued.

Species	Age group	1977 June	1996 April/May	2016 June
Walleye	I	--	--	9.3 (1)
	II	--	--	11.5 (2)
	III	--	14.8 (2)	14.2 (2)
	IV	--	--	15.7 (2)
	V	--	18.4 (3)	17.2 (3)
	VI	--	19.5 (3)	19.8 (1)
	VII	--	21.5 (1)	18.0 (4)
	VIII	--	--	18.9 (2)
Smallmouth	I	--	--	3.8 (1)
Bass	II	8.0 (1)	--	5.6 (2)
	III	9.9 (2)	--	11.3 (4)
	IV	12.1 (3)	--	12.7 (18)
	V	--	--	15.0 (15)
	VI	17.1 (1)	--	17.1 (5)
	VII	--	16.3 (1)	17.7 (4)
	VIII	18.6 (2)	--	17.6 (1)
	IX	--	17.1 (1)	17.5 (1)

Photo 1. Access site/boat launch for Four Mile Impoundment off Long Rapids Road.

Photo 2. Typical Smallmouth Bass captured at Four Mile Impoundment during the 2016 fish survey.

Photo 3. Muskellunge captured during the 2016 fish survey at Four Mile Impoundment.