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Union Lake

Branch County (T5S, R7 and 8W, Sections 6, 7, 11, 12, 14)
Surveyed June 11 and 12, 1991

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In the early 1920s the cost of electricity produced by the burning of coal was thought to be prohibitively expensive in the community of Union City, Branch County. As the town grew in size and electrical demands increased, a hydroelectrical plant was suggested as a means to deliver cheaper electricity to the town. By 1923 Riley Dam was constructed on nearby St. Joseph River, and the backwater that formed behind the dam was known as Municipal Pond. This water body was later named Union Lake.

Environment

Union Lake lies in northwestern Branch County. The closest community is Union City which is less than a mile from the lake's northeastern shore. Coldwater is the closest large city (14 miles to the southeast). When traveling downstream, Union Lake is the first large reservoir (525 acres) on the St. Joseph River. The river and its tributaries above the dam drain approximately 534 square miles. The average discharge over the dam is 470 cubic feet per second (Richard Popp, Michigan Department of Natural Resources, personal communication, 1991).

This is a shallow lake with a maximum depth of only 16 feet (see map of Union Lake). Most of the lake is between 5 and 10 feet in depth. Approximately 1/4 of the lake (on the northeast end, near the inlet) is very shallow (less than 3 feet) and marshy with islands of cattails and other emergent aquatic plants. The lake is long (2.5 miles) and narrow (1/3 mile), typical of impoundments in this area. Basin substrates are composed almost entirely of sand and organic material. Some gravel is evident in a few shallow areas. Submerged tree stumps are scattered throughout the basin but are most heavily concentrated in the shallow northeast end.

The land near the shores of Union Lake is gently rolling (0 to 6% slopes) and composed mostly of sandy loam soils. However, there are some steep slopes to the waters edge along the immediate shoreline. Most of the shore area is developed with cottages and permanent homes, but landward from this development the land is heavily farmed. A state-owned access site with concrete boat launch allows year-around public access. This site is located on the northern shore.

History of the Fishery

There is a great deal of information in the Fisheries Division files regarding the history of Union Lake. This lake has been fortunate to have had considerable citizen interest and active involvement in the development of the fishery over the past 70 years.

Fish stocking began soon after the reservoir was formed. Records indicate yellow perch, bluegill, largemouth bass, smallmouth bass, and walleye were stocked at various times from 1922 through the mid-1940s. The most frequently stocked of these species were bluegills and largemouth bass. Later, research showed that, in most cases, stocking panfish species into already established

populations is inefficient and uneconomical. The fish population in Union Lake was probably well established within 6 to 8 years of it's creation.

It is apparent that for some time Union Lake, to which "anglers came from many states", was considered as one of the best fishing lakes in Southern Michigan. Typically, in a newly created water body, competition for food is minimal and fish grow very fast and attain unusually large sizes. The lake was fished so heavily, and so many fish were harvested, that the local citizens soon felt there was a need for restocking. The local Chamber of Commerce contacted the (then) Michigan Department of Conservation, and soon "tank wagons with fingerlings" were sent to Union Lake. These fingerlings were probably some of those referred to in the previous paragraph.

As time went on, the local perception was that even with the state plantings harvest was exceeding recruitment. In response, bluegill and bass rearing ponds were created and used to stock the lake for several years. Fishing was then said to be "unmatched at any place in Michigan".

In the late 1940's another perception was conceived: an over-population of fish. Fish plantings were discontinued and the rearing ponds fell into disrepair.

Complaints of poor bluegill fishing began in the 1950's, but for quite some time others claimed fishing was very good. By the early 1960's, however, so many people had been convinced of a declining fishery that a fish ladder over the dam was proposed. Alternatively, it was proposed to net and lift fish over the dam. The solution finally agreed upon was the reactivation of the bluegill rearing ponds near the dam. These ponds were sponsored by the Union City Betterment Association and the Union Lake Fisherman's League. Anglers were asked to donate part of their catch of bluegills and sunfish to the pond for broodstock. Apparently, the exact numbers of donated broodstock were not known. Even so, this system worked surprisingly well, and the first year of production yielded an estimated 500,000 fingerlings. This method of rearing and stocking bluegills was used throughout the 1960's with much enthusiasm and cooperation from area citizens.

The first data on the fishery appear as angler creel census interviews collected during mid- 1940's and 1950's. These data indicated that fishing in Union Lake was good for bluegill, largemouth bass, pumpkinseed, black crappie, yellow perch, and northern pike.

The first intensive fishery survey on record occurred in 1960. A large seine was used, but "many snags made it impossible to bring in a large haul." Not many fish were captured; however, all game fish species were found to be growing well above state average growth rates.

A better catch of fish was made in 1962 with trap and fyke nets. A large variety of fish were captured including bluegill, pumpkinseed, black crappie, largemouth bass, warmouth, northern pike, yellow perch, bullhead, redhorse, white sucker, bowfin (dogfish), and carp. By weight, this catch was predominately redhorse, white sucker, and carp. Yet, there were large numbers of good-sized game fish present. Bluegills averaged 6.9 inches, crappies 7.9 inches, largemouth bass 13.7 inches, and northern pike 27.5 inches in length.

In 1967, the Union Lake Fisherman's League stocked 7500 channel catfish averaging 6 inches long. Some of these apparently survived, since four catfish were captured during a gill net survey in 1971. In that survey a great variety of fish species were captured, including smallmouth bass (1), common shiner, and golden shiner-in addition to those species mentioned above.

A 1972 fyke net and boom shocker survey captured few fish and was rather inconclusive. However, some fish species were captured which were formerly not recorded at Union Lake, including: green sunfish, log perch, and brook silverside.

An extensive week-long, trap net survey was carried out in June of 1983. Twelve net-nights of trap net effort resulted in a good sample of fish. All game fish species (with the exception of young

black crappie) were found to be growing at rates exceeding state averages. This was especially true of bluegill and largemouth bass. However, these two species were in rather short supply. The number of fish caught per net per night (CPE) was rather low when compared to many other lakes in the area. For example bluegill CPE was 18.7. Bluegills averaged 7.1 inches, and 87% were 6 inches or longer. Several large channel catfish were captured and appeared to be in good condition. Carp, redhorse, and suckers made up 44% of the catch by weight.

Fisheries Division surveyed the fish population again in 1987. Trap nets and experimental gill nets were used in the collection of over 1000 fish. The survey indicated that Union Lake supported a fine gamefish fishery. However, it was obvious that the fish population in Union Lake was greatly influenced by the St. Joseph River. Nearly 48% of the trap net catch (by weight) was composed of rough fish (primarily carp, redhorse, and white sucker). These same species accounted for the vast majority of the standing crop in the St. Joseph River in l987 (Towns 1988).

Since the early 1980's the Union Lake Association has sponsored a "Carp Rodeo". This consists of a weekend carnival where teams of contestants catch, spear, or shoot (bow-and-arrow) as many carp as possible. Prizes are generally awarded to the team with the most carp. A few years ago, as many as 2000 carp were removed from the lake during this event. More recently, however, effort has been reduced resulting in the annual removal of approximately 300 adult carp.

The average size of the bluegills captured by trap nets in 1987 was excellent when compared to other lakes in southern Michigan. The 66 bluegills captured averaged 7.2 inches and nearly 1/3 pound. The 485 crappies taken with trap nets averaged an impressive 9.2 inches. Largemouth bass were also found to be doing well. Twenty were caught, ranging in length from 4.7 to 19.3 inches; six of these were 14.9 inches or larger. Rapid growth was indicated by scale analysis (1.4 inches above state average growth rates). Although of rather small average size (7.0 inches), a fair catch of yellow perch was made in 1987.

Walleye fry were stocked in Union Lake in 1984, and a few fingerlings were stocked by the lake association in l986. In l987, Fisheries Division stocked 30,000 small (1.4 inch) and 18,700 larger (2.8 inch) walleye fingerlings. Three of these were captured during the 1987 survey. Scale analysis indicated very rapid growth. During a subsequent electrofishing survey on October 28, l987, five walleyes were captured, ranging in length from 9 to 16 inches.

Results of the 1987 survey indicated that channel catfish were doing well in Union Lake. Twenty-one were captured ranging in size from 9 to 24 inches. Good populations of channel cats had recently been found in the St. Joseph River below the lake (Towns 1988).

Individual game fish growth rates observed in 1987 were again impressive. Bluegills, for example, were found to be growing 2.4 inches above state average rates. However, once again, relatively few bluegills were captured (total = 66; CPE = 8.3).

In 1990, we stocked 35,100 bluegill fingerlings (averaging 2.2 inches) in Union Lake. These fingerlings were surplus stock made available through the termination of a fisheries research project at the Saline Fisheries Station.

Recent Rearing Pond Operations

In the late 1970's, the rearing pond was once again put into use, but this time for rearing northern pike. Since that time, the pond has been used for rearing pike, walleye, and redear sunfish fingerlings. In more recent years, a double-harvest system has been employed. Northern pike fry are stocked in the early spring and fingerlings are harvested in early summer. The pond is then refilled, and a second species is stocked and reared through the balance of the summer and early fall. In 1988, a Fisheries Division program (Inland Fisheries Cooperative Grants Program) provided a grant to deepen the pond via dredging. Approximately 7000 cubic yards of sediment were

removed from this 4-acre pond.

The Disappearance of Aquatic Vascular Plants

Union Lake was the subject of much controversy during the early 1980's because of the mysterious disappearance of profuse growths of aquatic plants. Complaints of "huge vegetation beds" date as far back as 1954. Apparently, the aquatic vegetation had been becoming more and more abundant to that point. But in the mid 1970's, the files contain references to disappearing weeds.

In 1982 and 1983, observations by DNR Water Quality Division staff indicated the absence of rooted, aquatic vegetation in Union Lake. A great deal of testing found no obvious chemical cause for this phenomenon. It was suggested that the most probable cause was excessive turbidity, resulting from resuspension of sediments by carp and redhorse suckers, and the dense phytoplankton algal growths that grew in response to the nutrient rich conditions (Wuycheck 1984). The feeding habits of these fish cause turbidity to increase as they scour and sift the bottom sediments for food. The resulting turbidity shaded out rooted vegetation. In addition, carp are known to uproot and consume plant materials during their feeding activities.

Fishery Resource in 1991

As with surveys in the past, the 1991 catch results indicated that the fish population in Union Lake is greatly influenced by the St. Joseph River (Table 1). Over 32% of the trap net catch and 67% of the gill net catch (by weight) were composed of rough fish (primarily carp, redhorse, and white sucker). These same species accounted for the vast majority of the standing crop in the St. Joseph River in l987 (Towns 1988). Yet, the present survey also indicated that Union Lake supported a fine game fish fishery.

The average size of the bluegills captured in 1991 was excellent when compared to other lakes in southern Michigan. The 118 bluegills captured in trap nets averaged 7.7 inches in length and nearly 1/3 pound in weight. By comparison an average length greater than 6.2 inches is considered good. Bluegill growth, determined by analysis of fish scales, was also exceptional (Table 2). These fish were growing 0.8 inches above the state average rate. However, the number of bluegills captured was low, only 14.8 per trap net.

Population characteristics of the bluegill in Union Lake have changed little over the last decade. In 1983, their average length was 7.1 inches, growth was 0.7 inches above the state average, and CPE was higher (18.7)-but still low compared to other area lakes. In 1987, the bluegills averaged 7.2 inches long, growth was 2.4 inches above the state average, and CPE was only 8.3. In recent years anglers have reported that bluegills are very low in number. Yet, the bluegill fishery during the winter of 1990-91 was said to be exceptional with limit catches reported.

Bluegills are targeted for sampling in inland lakes because of their role in determining fish community structure and overall sportfishing quality (Schneider 1981). Recently, a ranking system has been developed that allows fish managers to get an idea of the relative quality of a lake's fish population (Schneider 1990). On a scale of 1 to 7 (with 7 the highest rank) the quality of the bluegill population in Union Lake was calculated as 6.8, "superior".

The 1991 survey indicated that the black crappie population continues to be one of the best in the six-county area of Fisheries District 13. This species is known to thrive in turbid reservoirs. The 108 crappie caught in trap nets averaged a very impressive 9.9 inches in length. Crappie growth rate was slightly above the state average rate. This population appears to be unstable because there was a large year-class of age V fish (Table 3); however, the average length in 1987 was nearly the same, 9.2 inches.

Only four largemouth bass were captured during this survey. These ranged in length from 10 to

more than 17 inches. Bass tend to avoid capture by trap nets and this low catch should not be considered a reliable estimate of bass abundance. In 1987, 20 bass were caught with total lengths from 4.7 to 19.3 inches. Six of those were 14.9 inches or larger. Rapid growth was indicated by scale analysis (1.4 inches above the state average growth rate).

Channel catfish continue to flourish in Union Lake. In 1991, trap nets captured 53 catfish which were from 4 to over 18 inches long. This population may be expanding. Anglers have begun to report multiple catches of catfish; one pair of anglers harvested 14 channel catfish in 2 days of fishing. Twenty-one catfish were captured in the 1987 survey.

Apparently, these fish were reproducing successfully in Union Lake since we know of no public or private stocking effort prior to that date (except for 1967). Since 1987 Fisheries Division has been stocking from 3,300 to 12,000 channel catfish fingerlings annually into Union Lake. However, these fingerlings have averaged only 3.5 inches at the time of stocking. Recent studies have indicated that the survival of channel catfish stocked into lakes with established largemouth bass populations can be maximized by stocking fingerlings at least as large as 7.9 inches (Storch and Newman 1988).

Management Direction

Historically, bluegill growth rates have been considerably above the state average, while bluegill CPE has been far below average when compared to other lakes in the area. Also, in the late 1980's anglers reported that bluegills seemed to be very low in number. These same observations in the 1960's prompted local sportsman to raise bluegills and stock them into Union Lake. Being a large reservoir, Union Lake is rather unique in this area of the state. However, similar bluegill numbers and growth rates have been observed in Ford Lake, another large reservoir, in Washtenaw County (Towns 1988).

In many waters bluegills tend to overpopulate due to highly efficient reproduction. For Union Lake, however, survey data indicate that bluegill recruitment to acceptable angling size (6 inches) is less than desirable. With the large river entering this system, it is possible that sedimentation, rapid water temperature changes, or fluctuating water levels during bluegill spawning periodically cause poor spawning success. Undoubtedly, bluegills are continually lost over the dam and cannot migrate upstream into the lake. In addition, the high incidence of bottom-feeding rough fish may have a detrimental impact on bluegill nesting success.

Because of the unusual composition of the Union Lake fish community, and the low population and recruitment of bluegills, this lake should be considered for additional bluegill stocking. The ideal stocking rate would sustain the maximum number of catchable bluegills while maintaining bluegill growth at, or slightly above, the state average rate. However, the fishery should be closely monitored. If bluegill natural recruitment improves substantially, any bluegill stocking efforts should be immediately re-evaluated. Perhaps the lake association could raise bluegills in their rearing pond. A more costly and less desirable option would be to trap-and-transfer bluegills from other waters where overpopulation of this species is a problem.

The channel catfish population is apparently increasing and doing very well; stocking should continue. However, if the size of stocked fingerlings were increased to 8 inches, survival would increase and the number stocked could be decreased.

The walleye fishery in the St. Joseph River below the lake is developing quite well. However, very few walleye catches within the lentic environment of Union Lake have been reported. Lake surveys have also produced very few walleyes (none in 1991). It is possible that many small walleye fingerlings migrate downstream (over the dam) soon after stocking. Our experience with walleye fry and small fingerlings in other Michigan flow-through ponds and reservoirs has been that significant numbers move downstream soon after stocking. Further Union Lake walleye stocking

efforts should include the largest possible fingerlings (6 inch+) in hopes of preventing walleye migration out of the system.

Despite several years of northern pike stocking, recent surveys have produced few pike. Only five were captured in 1991. To thoroughly evaluate the pike population, however, surveys should be done in early spring during the pike spawning run.

Union Lake is maintaining a good game fish fishery despite the large population of rough fish. A large-scale fishery manipulation, such as a treatment with a piscicide, is not advised at this time. To have a significant measure of success, such a treatment would have to include much of the St. Joseph River and its tributaries within the Union Lake watershed. It would be nearly impossible to exclude carp, redhorse, and white suckers from this system for an extended period of time after such a treatment.

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Table 1.-Number, weight, and length indices of fish collected from Union Lake with trap nets, June 11 and 12, 1991.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Bluegill	118	32.1	36.6	7.7	4.5-9.5	7.7	94.1
Largemouth bass	4	1.1	5.4	1.1	10.5-17.5	13.8	50.0
Northern pike	2	0.5	1.9	0.4	15.5-17.5	16.5	0.0
Channel catfish	53	14.4	211.2	44.3	4.5-18.5	14.3	92.5
Black crappie	108	29.3	61.2	12.9	6.5-11.5	9.9	99.1
Bullhead	4	1.1	3.3	0.7	9.5-12.5	11.3	100.0
Smallmouth							

bass	1	0.1	0.3	0.1	8.5	8.5	0
Pumpkinseed	3	0.8	1.2	0.3	7.5	7.5	100.0
Yellow perch	4	1.1	0.3	0.1	9.5-12.5	11.3	100.0
Carp	13	3.5	96.1	20.2	22.5-29.5	26.0	
Redhorse spp.	56	15.2	58.2	12.2	8.5-17.5		
Golden shiner	2	0.5	0.5	0.1	7.5-8.5	8.0	
Total		100.0		100.0			

[1]Note some fish were measured to 0.1 inch, others to inch group: e.g., "5" = 5.0 to 5.9 inches; "12" = 12.0 to 12.9 inches; etc.

[2]Percent legal size or acceptable size for angling.

Table 2.-Average total length (inches) at age, and growth relative to the state average, for three species of fish sampled from Union Lake with trap and gill nets, June 11 and 12, 1991. Number of fish aged is given in parentheses.

	Age								Mean growth
Species	I	II	III	IV	V	VI	VII	VIII	index[1]
Bluegill	-	-	6.0	7.0	7.8	8.1	-	-	+0.8
	-	-	(11)	(17)	(8)	(10)			
Black crappie	4.2	6.9	8.0	8.8	10.0	10.2	11.6	11.2	+0.2
	(1)	(2)	(5)	(3)	(18)	(3)	(1)	(2)	
Yellow perch	-	6.0	6.1	7.4	8.2	9.3	-	-	+0.1
		(18)	(2)	(5)	(14)	(1)			

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

Table 3.-Estimated age frequency (percent) of two species of fish caught from Union Lake with trap and gill nets, June 11 and 12, 1991.

	Age								Number
Species	I	II	III	IV	V	VI	VII	VIII	caught
Bluegill	-	-	12	36	27	26	-	-	124
Black crappie	1	2	4	3	75	12	1	2	110

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Questions, comments and suggestions are always welcome! Send them to
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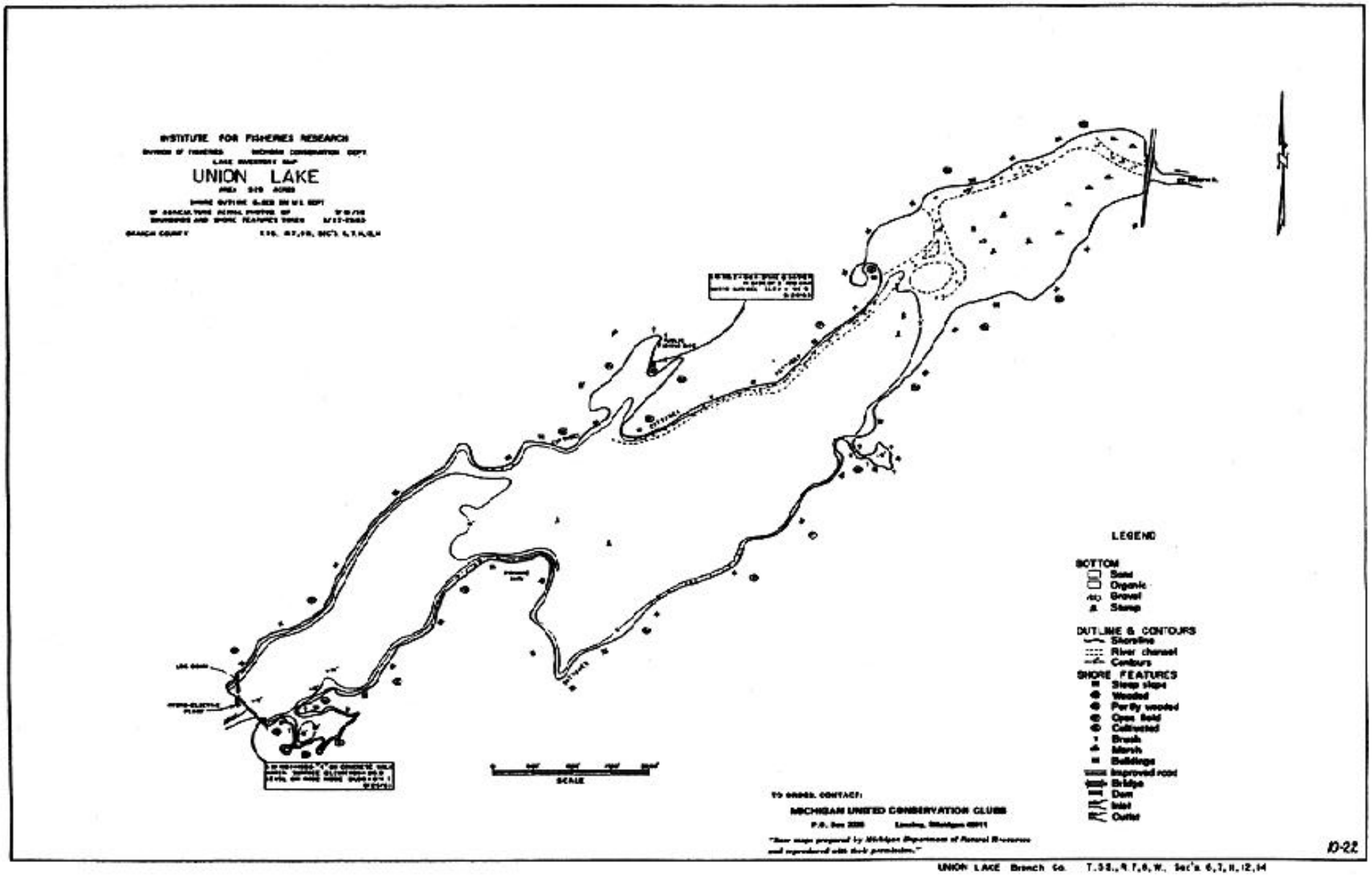

Figure 1. A hydrographic map of Union Lake, Branch County.