Lake Angeline
Marquette County, T. 47N., R.26W., Sec. 10
Carp River watershed, last surveyed October 2021

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Environment

Lake Angeline is a deep coldwater inland lake created by a former open-pit and shaft iron mine located within the City of Ishpeming, Marquette, Michigan. Due to its bathymetry and cold nature, the lake has a long history of providing a trout fishery sustained by hatchery stocking. The proximity of this body of water to the city of Ishpeming, along with open areas of grass along the shoreline, make it popular among local residents for recreation, shore fishing, or small boat usage.

Lake Angeline is 96 acres in size with no inlets or outlets. The lake has a pronounced steep contour profile with numerous deep topographic pockets and a 162-foot depression created by an old mineshaft in the north basin of the lake. The riparian zone is almost entirely undeveloped with a few residences along the west shore (Figures 1 and 2). The water is moderately turbid containing a light brown stain, with clarity of approximately 14 feet. The riparian area has extensive shoals made up of boulders, logs, and vertical steep drop-offs. Aquatic vegetation is sparse.

History

Historical records show that a natural lake, one mile long, one-third mile wide, with a maximum depth of 40 ft. 40-feet deep occupied this site before iron mining operations were ever begun at the Lake Angeline location. As the City of Ishpeming developed, the lake was the source of water supply for the community. The lake was pumped dry in 1892 and 20 million tons of iron ore were removed from the rock layers beneath the lake through mining. Cave-ins after the mining was abandoned created many of the deep pockets now present.

In 1948, as the mined-out basin begin to refill, it was recommended (DNR fisheries managers in the 1950's, Cliff Long, Leon Anderson) that the lake be managed for Rainbow Trout, therefore the lake was stocked with 300 legal-sized Rainbow Trout of 7-10 inch length. Good Rainbow Trout fishing occurred during the 1950's and the lake became popular among the residents of Ishpeming as a result of hatchery stocking, A fish kill occurred on the lake in 1952, with the cause determined to be the use of dynamite by residents. Yellow Perch began to appear in the fishery in 1951 likely from the rising water of the lake eventually connecting to a neighboring pond. Splake (female Lake Trout x male Brook Trout) stocking began in 1966 and Rainbow Trout stocking continued through 1969. All trout stocking was ceased after 1969 because of the abundance of Yellow Perch which competed with and subsequently diminished the trout fishery. A partial chemical reclamation was scheduled for 1969 to eradicate the perch, however this management action was cancelled in favor of stocking tiger muskellunge instead.

The State of Michigan Department of Natural Resources (DNR) obtained ownership of a parcel of property from Cliffs Forest Products Company in November 1984 for use as a public boat launch site. Road access to this public boat launch crossed a private land parcel, and in 1994 the private land

easement to the boat launch was severed due to public dumping of trash on the private land. With the loss of the easement, public access to the State parcel was prohibited and anglers did not have access to the lake. A 2014 land acquisition at the southwest portion of Lake Angeline resolved the 20-year loss of legal public access to this lake. In the summer of 2015, a public boat launch was constructed by the Michigan Department of Natural Resources Parks and Recreation Division.

During the 1994-2014 closed period, some local residents still had use of the lake, gaining access by permission at private lake lots. Because of the loss of general public use of the lake during the 1994-2014 years, the Michigan DNR fish stocking programs were terminated. During the closed period Federal hatchery Lake Trout stocking continued, and the local sportfishing club purchased adult Rainbow Trout and Brown Trout for stocking

Gasoline-powered outboard motor use was always prohibited on Lake Angeline because this lake was identified as a back-up municipal water supply for the City of Ishpeming. The City of Ishpeming managers were concerned that gasoline motors could potentially pollute the water quality of the lake. If the main municipal water source for Ishpeming, Teal Lake, would become unusable then Angeline would be the area's water supply. In 2015 the gas-powered motor restriction was rescinded by the Ishpeming City commissioners; therefore, gasoline outboard motor use has been allowed since that time.

Lake Angeline was designated by the Michigan DNR as a Family Friendly Fishing Water, which is a designation for waters across Michigan that are easy to access and have a high likelihood of catching fish. The location of Lake Angeline as a Family Friendly water is ideal for enabling anglers, kayakers, canoeists, paddle boarders and others to enjoy water sports. The location also has the developed public access site with regularly maintained vault toilets and a concrete boat launch ramp.

There have been a variety of fish stocked in Lake Angeline (Table 1), with the focus largely being on trout, with the exception of the "muskie" era from 1969 to1990. All trout stocking was resumed after the acquisition of the State boating access parcel.

The introduction of Tiger Muskellunge (Northern Pike x Muskellunge) into this lake in 1969 and 1970's was highly successful with many trophy-sized (i.e., 45-in 25 lb.) fish produced. Tiger Muskellunge were introduced into the lake to serve as a predator on Yellow Perch. A July 1982 survey found good survival of stocked tiger muskellunge with fish from 14-33 in total length (TL) represented in the survey.

The largest reported Tiger Muskellunge in Michigan's history (31.4 lb) was caught in Lake Angeline in 1979. One angler commented that from 1969 to 1979 he caught 328 Tiger Muskellunge from Lake Angeline. Citizens were polarized about the opposition and/or support of the Tiger Muskellunge stocking. Numerous petitions and passionate letters were sent to State legislators and Governors voicing either support for continued Tiger Muskellunge stocking or demanding a cessation of Tiger Muskellunge stocking in favor of returning to trout management. Stocking continued until 1990, when the Michigan DNR Tiger Muskellunge rearing program was discontinued.

A June 1989 survey was made to evaluate Tiger Muskellunge stocking efforts. This survey showed that only 3 Tiger Muskellunge of 28-33 inches were collected in the survey. This survey was conducted for only one night due to the City of Ishpeming's concern over our motorized boat on their potential drinking water lake. Anglers reported that an occasional quality-sized Tiger Muskellunge was caught, but overall

fishing pressure was low. Residents also reported that fishing for crappie and sunfish species was productive. From the number of bobbers seen caught in shoreline trees, shorefishing appeared to be popular at this lake.

Rainbow Smelt were stocked into the lake in 1992-1993 to provide an additional fish species for anglers for the winter ice fishing season. Rainbow Smelt were transferred from a commercial purse net fishing operation in the northern waters of Green Bay (Cedar River), but transfers were discontinued after Rainbow Smelt catches declined at this facility.

A May 1994 general survey was conducted to assess the full fish community assemblage. One of the purposes of this survey was to determine the extent of the Yellow Perch spawning habitat within Lake Angeline. Yellow Perch manual removals were a popular fisheries management tool in the 1990's with the belief that thinning the numbers of stunted Yellow Perch would enable the remaining Yellow Perch to have more access to the available forage and thereby grow to a larger size.. Fisheries managers thought that if any concentrated spawning areas could be found in Lake Angeline, then it might have been feasible to capture a large percentage of them through netting. The thought was that a reduction in the perch population would ease forage competition with Rainbow Trout and would allow for more favorable growth and survival of stocked trout.

Yellow Perch were at the peak of their spawning period during the 1994 visit to this lake in the month of May. Egg deposition was extensive throughout the shoal areas. A high catch of Yellow Perch (N=5,437) of 3-8 in occurred in the fyke nets. Managers concluded that manual removal of Yellow Perch with nets would not capture a large enough percentage of the population to reduce density.

Low numbers of Rainbow Smelt, Rainbow Trout, and Brown Trout, were collected in the 1994 survey. Of the total catch of fish in this survey, the 6 trout caught made up 0.09 percent of the netting catch. Anglers commented favorably about the trout present and the fair catch rates. While no Lake Trout were collected in this survey, local anglers reported that Lake Trout were periodically caught.

From 2003 to 2022, success of trout stocking, including splake, Lake Trout, Brook Trout, Brown Trout, and Rainbow Trout, has varied widely (based on local angler comments). This lake, due to its easy access and proximity to the Marquette State Fish Hatchery, Thompson State Fish Hatchery, and Pendills Federal Trout Hatchery, served as a convenient stocking site for surplus hatchery trout. Stocking of Lake Trout, Rainbow Trout, Splake, or Brown Trout, had been conducted almost annually between 1990- 2022.

Current Status

The spring 2015 netting survey documented over-winter survival of trout (i.e., 2 Brook Trout, 4 Lake Trout) along with the presence of a diverse panfish fishery. The 2015 netting results were similar to what was found during the 1992 and 1994 surveys with light to moderate catches of Brook Trout, Splake, and Lake Trout with trout occupying less than 10 percent of the fish composition.

A similar survey conducted in October 2021 had catch rates of trout similar to past surveys; abundant numbers of panfishes were present and 18 Splake between 7-22 in TL and one 15-in Rainbow Trout. Trout represented 3.4 percent of the fish community. Despite the presence of trout in the fisheries survey summaries, anglers regularly commented that they had poor or no success catching stocked trout. It

might be just simply that Yellow Perch and Black Crappie strike hook and bobber baits more quickly than trout do, and the result of sport fishing yields more panfish catches than trout catches.

Analysis and Discussion

The sport fishery at Lake Angeline has largely been managed as a put-and-take stocked fishery. Overall, the mechanism for providing the public fishery here was to stock gamefish, often of legal size, on an annual basis. Natural reproduction of trout does not occur in this basin, therefore annual introductions of gamefish are needed to maintain a fishery. In review of the historic management efforts, it is clear that past trout stocking efforts have succeeded occasionally, but of the review of the recent 20-year history of this lake, these stockings provided marginal or poor to return to the sport fishery. Trout prefer water temperatures of 68F or colder for summer survival conditions. Trout also prefer dissolved oxygen levels of 6 parts per million as optimal conditions. An August 2021 limnological survey showed water temperatures from 70 degrees down to 20 feet, and oxygen conditions from 8.70 ppm at the surface to 5.22 ppm at 82 feet. Overall, prime trout occupancy is suitable from 20-82 feet.

Given the proximity to both State and Federal hatcheries, this lake served as a local stocking site for surplus hatchery trout. Stocking of Lake Trout, Rainbow Trout, Splake, or Brown Trout, was conducted almost annually over the past 20 years and longer. Retired hatchery broodstock occasionally stocked given the lack of suitable locations for these large fish; however, there was little evidence that these fish provided a return. As a consequence of stocking, in conversations with anglers and by evidence of fisheries surveys, the stocking of trout did not contribute to developing an attractive sport fishery.

Management Direction

Continued allocations of retired hatchery broodstock trout will be reduced. Trout stockings may still occur only when other lake sites are not available for hatchery surplus fish. At this time, Lake Angeline's fishery management will emphasize panfish as the sportfish feature for this lake. A 2021 Michigan DNR fisheries management prescription was approved for this lake, recommending the use of trout stocking only when hatchery production exceeds allocation needs of other State dedicated stocking sites.

Walleye management has been suggested for this lake, particularly since there historically was an abundant Yellow Perch component to the fishery. While the 2021 fish survey found that Yellow Perch comprised only 8 percent of the fishery, this survey effort found that forage fish consisting of centrarchids and minnows comprised 82 percent of the fish assemblage of the lake, which these fish could possibly support a Walleye component to the fishery. Muskellunge management will be a topic for local sport club and local angler discussions. For adding another predator fish species to this lake, Muskellunge (northern or Great Lakes Spotted strain) might be suited to occupy a small addition to the fishery here. Thoughts on Muskellunge management will be a discussion that will include all local stakeholders and sport groups.

Attachments

Table 1.- Lake Angeline fish stocking history, by year (1948 - 2022).

Lake Angeline fish stocking history (1948 - 2022)

Year	Tiger Muskie	Smallmouth Bass	Brook Trout	Rainbow Trout	Brown Trout	Splake	Lake Trout
1948 - 1969				legal, yearlings			
1970 - 1990	6-10 inch fall fing.						
1990 - 2000			legal, yearlings	legal, yearlings	legal		legal
2000		1,416					
2003				3,000			
2004				2,000	1,000		
2006							435
2010							1,890
2011				1,350			348
2012				650			
2014			9,469				
2015					5,000		
2016				6,561		10,000	
2017				51,683	9,500	10,000	
2018			9,458	9,575	10,000		350
2019				10,000	570	8,756	
2020			6,275				90
2021				10,660		11,000	983
2022						21,046	

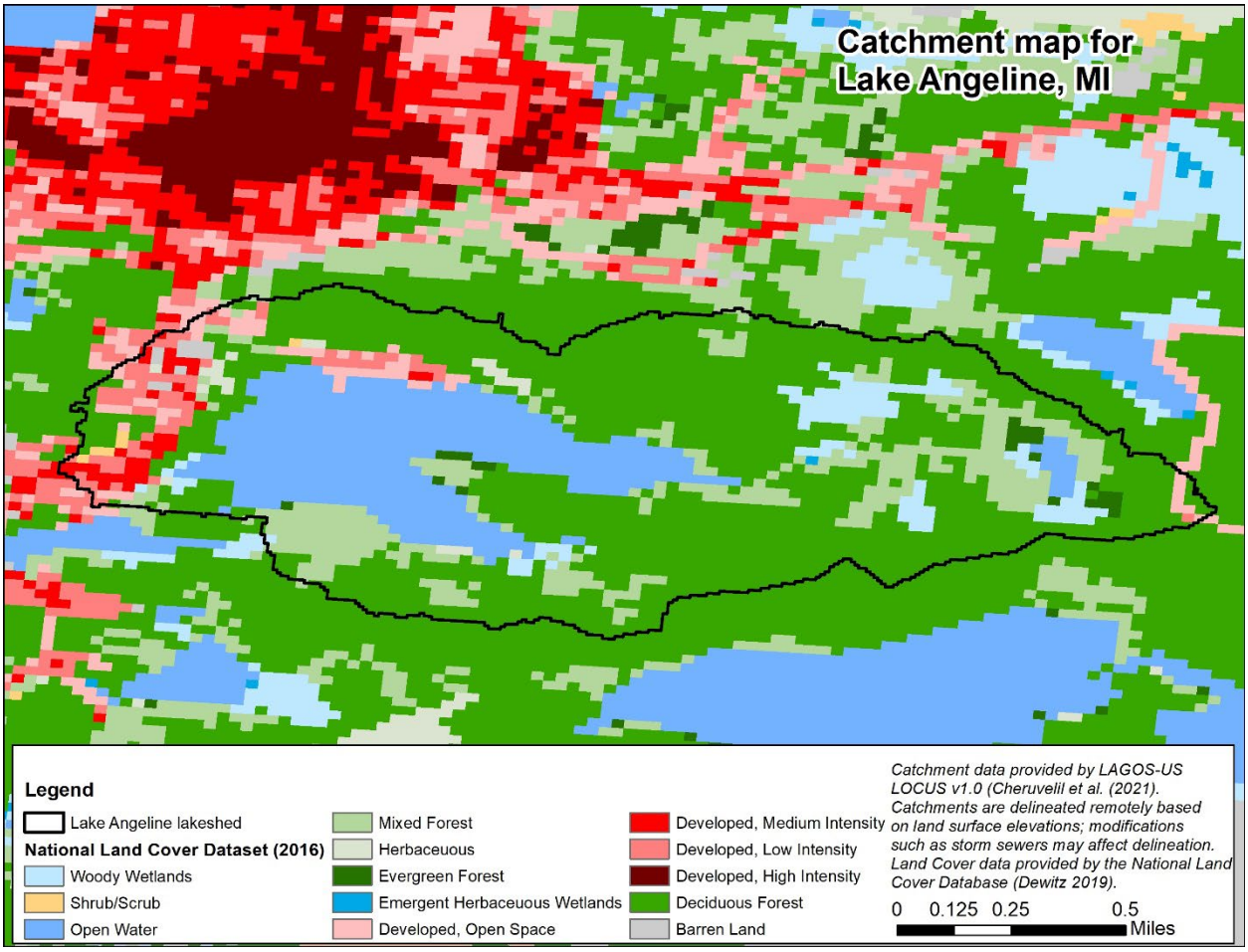
Table 2.- Lake Angeline fish community history, 1949 - 2021. An “x” indicates a species occurrence documentation.

Lake Angeline fish community history

	1949 - 1969	1970 - 1981	1982	1989	1994	2015	2021
Smallmouth Bass						X	X
Largemouth Bass						X	X
Pumpkinseed Sunfish			X	X	X	X	X
Yellow Perch	X	X	X	X	X	X	X
Black Crappie			X	X	X	X	X
Bluegill						X	X
Green Sunfish					X		X
Walleye							X
Brown Bullhead					X		
Bluntnose Minnow					X		X
Creek Chub					X		
Common Shiner			X		X		
Golden Shiner					X	X	
Rainbow Smelt			X		X		
White Sucker				X	X	X	X
Tiger Muskie		X	X	X	X		
Walleye							X
Brook Trout						X	
Rainbow Trout	x	X			X		X
Brown Trout					X		
Splake	X (1966)						X
Lake Trout						X	

Figure 1. Catchment map of Lake Angeline.

Figure 2. Land use map for the catchment area of Lake Angeline.



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