Upper Herring Lake
Benzie County, T 25N, R 16W.
Herring Creek Watershed, last surveyed 2015

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Environment

Upper Herring Lake (Figure 1) is 540 acres and located approximately five miles south of Frankfort, in Benzie County, Michigan, in the northwestern Lower Peninsula. Upper Herring Lake is located within the Central Lake Michigan Management Unit (CLMMU) of the Fisheries Division of the Michigan Department of Natural Resources (MDNR). Upper Herring Lake is part of the Herring Lakes watershed, comprised of Herring Creek and its tributaries, Upper Herring Lake, and Lower Herring Lake (Figure 2). Herring Creek flows through Upper Herring Lake, into Lower Herring Lake on the northeast shoreline, and then flows out of the southwestern shoreline. Lower Herring Lake is in very close proximity to Lake Michigan, as the outlet stream is less than ¼ mile in length before it joins Lake Michigan (Figure 2). The Herring Lakes watershed is roughly 25 square miles in size (Harrison 2003).

Herring Creek originates from wetlands approximately five miles east of Upper Herring Lake and flows generally west before entering the eastern shoreline of Upper Herring Lake (Figure 2). After exiting Upper Herring Lake, Herring Creek flows through an extensive wetlands complex, then under M-22 and into Lower Herring Lake. Herring Creek is a Designated Trout Stream with self-sustaining populations of Brook Trout, Brown Trout, Rainbow Trout (steelhead) (Walker 1993), and possibly Coho Salmon. Since the early 1900s, there has been a lake-level control structure on the outlet of Lower Herring Lake. However, during westerly wind events on Lake Michigan, a sandbar forms at the mouth of Herring Creek, often blocking the flow for periods of time and raising water levels in the lake by as much as several feet. During these times, the lake level control structure is often completely inundated. This allows for fish, even non-jumping species from Lake Michigan, to gain access to Lower Herring Lake. Without a lake-level control structure or dam on Upper Herring Lake, it is possible for fish to migrate from Lake Michigan all the way to Upper Herring Lake and into Herring Creek upstream of Upper Herring Lake.

The maximum depth of Upper Herring Lake is 26 feet, and approximately 70% of the lake is deeper than 15 feet. Upper Herring Lake does not typically stratify in the summer, but oxygen levels in the deeper waters of the lake tend to be low. The predominant substrates found in Upper Herring Lake are sand, gravel, marl, and organic. Herring Creek is the only tributary to the lake, flowing into the eastern shoreline of the lake. The shoreline is about 50% developed, with approximately 60 homes and cottages. The west shoreline of the lake is primarily undeveloped wetland, and is owned by the Grand Traverse Regional Land Conservancy as part of their Upper Herring Lake Nature Preserve. Much of the surrounding country is hilly and mostly forested with hardwoods, with predominately sandy soils. Upstream of Upper Herring Lake, Herring Creek flows through some significant wetlands complexes. Agriculture is also a prominent land use. In the Herring Lakes Watershed Management Plan (Harrison 2003), agriculture is discussed as one of the primary sources of pollution (nutrient enrichment and harmful bacteria) in the watershed. Neither Upper nor Lower Herring Lake has had issues with Eurasian milfoil. The Benzie County Conservation District has applied for aquatic nuisance permits for

both lakes in recent years for phragmites control. Both Herring Lakes have had zebra mussels in them for some time.

Public access to Upper Herring Lake is provided by an MDNR boat launch on the northern shore of the lake (Figure 1). The MDNR access site has a paved launch ramp and has parking spaces for ten vehicles with trailers. The launch is relatively shallow, so launching larger boats can be a problem, particularly if water levels are low. Shore fishing opportunities are very limited on Upper Herring Lake.

History

The first recorded fish stocking event for Upper Herring Lake occurred in 1929 when Bluegill were stocked by the Michigan Department of Conservation (MDOC, the precursor to today's MDNR; Table 1). Between 1930 and 1944, MDOC stocked a mix of warm/coolwater species including Bluegill, Largemouth Bass, Smallmouth Bass, Walleye, and Yellow Perch. In 1936, there was a one-time stocking of "Great Lakes Shiners", which were most likely Emerald Shiners. The modern Walleye stocking program for Upper Herring Lake began in 1987, and Walleye have been stocked on a regular basis since then.

Since 1994, a total of four exceptional fish caught from Upper Herring Lake have been entered into the MDNR Fisheries Division Master Angler program. Master Angler species caught from Upper Herring Lake have included Rock Bass and Black Crappie.

MDNR/MDOC Fisheries Surveys

The first known fisheries survey on Upper Herring Lake was conducted by the MDOC in 1955 (Taube 1956). Gear used in the survey included inland gill nets and seines. The survey was accompanied by a similar survey of Lower Herring Lake. In his report on the surveys, Taube (1956) reported that the lakes harbored a wide variety of game and non-game fish species (Table 2), but that Upper Herring Lake was more productive than Lower Herring Lake. Taube concluded that Walleye stocking was not necessary in the Herring Lakes at that time, and that natural reproduction would likely be sufficient to support the fishery. He also recommended against the construction of a dam on the outlet of Upper Herring Lake.

The next fisheries survey of Upper Herring Lake was conducted by the MDNR in June, 1975; this survey utilized trap nets and inland gill nets. Seventeen species were represented in the survey (Table 2). MDNR Fisheries Biologist Melvin Bonham commented that the lake provided good fishing for Walleye, and although the Bluegill were not abundant in Upper Herring Lake, they were of good size. He recommended no direct management actions at that time (MDNR files, Cadillac).

A comprehensive survey of Upper Herring Lake was conducted by the MDNR in May, 1986. This survey consisted of large mesh fyke nets, small mesh fyke nets, and inland gill nets. Modest numbers of gamefish (including Walleye, Northern Pike, and Smallmouth Bass) were caught. Yellow Perch and Rock Bass were numerous, although other panfish were rare. Growth rates for Walleye, Northern Pike, and Bluegill were excellent. No subsequent report or write-up was completed for the 1986 survey.

In May, 1996, a general fisheries survey of the Upper Herring Lake fish community was completed using large-mesh fyke nets, small-mesh fyke nets, and inland gill nets (Tonello 2000). Healthy populations of gamefish were found. A total of 20 Walleye ranging from 9 to 25 inches were caught. Age 5 walleye exhibited growth rates above the state average by 0.5 inches. Northern Pike and Smallmouth Bass were caught in moderate numbers, and Largemouth Bass were relatively rare, with only 10 caught in the survey. Panfish (Bluegill and Black Crappie in particular) were not overly abundant, but were of good quality and growing well. Yellow Perch were more abundant but were growing more slowly. Two Brown Trout, both over 20 inches, were also caught in the survey nets. Management recommendations from the 1996 survey included the continuation of Walleye stocking and protection of Herring Creek and all wetlands associated with Upper Herring Lake (Tonello 2000).

Another comprehensive fisheries survey of Upper Herring Lake was conducted by MDNR in 2004. Gear used included large-mesh fyke nets, experimental graded-mesh inland gill nets, seine, and a boom electrofishing boat. During the May netting portion of the 2004 survey, a total of 563 fish were caught, representing 17 different species (Table 3). Rock Bass were the most abundant species in the May portion of the survey, with 219 caught. Only 10 Walleye were caught, ranging from 11-19 inches in length. Largemouth Bass were much more abundant than in 1996, with a total of 63 from 10-16 inches caught. Smallmouth Bass and Northern Pike were less abundant in the netting portion of the survey and Black Crappie, which also had been well-represented in the 1996 survey, were rare, with only 1 caught (although the survey crew did note some anglers catching Black Crappie). Twenty-six Pumpkinseed Sunfish were caught in 2004, compared to only one in 1996. Growth rates for most species were near the State average, except for Walleye and Largemouth Bass, which were growing very well and exceeding the State average by 2.0 and 1.2 inches, respectively (Table 4).

In the July seining and electrofishing portion of the 2004 survey, 611 fish were caught, representing 19 species (Table 5). The majority of these were Bluntnose Minnows and Sand Shiners. Largemouth Bass were also well-represented in the seining and electrofishing catch, with 40 caught from 9-18 inches. Age I and II Largemouth Bass were growing -0.5 inches slower than the State average (Table 6). Age III Yellow Perch were growing 2.0 inches slower than the State average. This contrasted with the netting portion of the survey, where Age IV and V Yellow Perch were growing at approximately the State average.

Current Status

The most recent comprehensive fish community survey of Upper Herring Lake was conducted by the MDNR in the spring and summer of 2015. The netting portion of the survey took place from June 8-11. Survey gear used included trap nets (11 net-nights), one small-mesh fyke net (two net-nights), and experimental graded-mesh inland gill nets (six net-nights). The seining and electrofishing portion of the survey took place during the evening of June 30. In that effort, five seine hauls were conducted, and three ten-minute transects were sampled by electrofishing. Shoreline assessment and limnological data was collected on August 13. The primary purpose of this survey was to assess the status of all fish populations in Upper Herring Lake, with additional focus on the Walleye population. Yet another electrofishing effort was conducted on September 28. This effort targeted juvenile Walleye to evaluate year class strength and survival of spring fingerlings stocked in June of 2015.

During the 2015 June netting survey of Upper Herring Lake, a total of 556 fish were caught, representing 22 different species (Table 7). Rock Bass were the most abundant species collected, with a total of 172 caught and some individuals as large as 12 inches. Gamefish species caught included Brown Trout, Largemouth Bass, Northern Pike, Smallmouth Bass, and Walleye. A total of 39 Walleye from 7-23 inches were captured in this portion of the survey. A total of 39 Largemouth Bass from 7-18 inches were also caught. Three Brown Trout were caught, from 13 to 15 inches in length. Panfish numbers were relatively light, with 39 Black Crappie, 22 Bluegill, and 9 Pumpkinseed Sunfish caught. Yellow Perch were common as well, although most were small (Table 7).

In the 2015 seining and electrofishing portion of the Upper Herring Lake survey, a total of 307 fish were caught, representing 19 species (Table 8). Yellow Perch, Rock Bass, White Sucker, and Bluntnose Minnow were the most commonly collected species.

In the June 2015 survey of Upper Herring Lake, most species exhibited above state average growth (Table 9). Age III and IV Walleye growth was 1.1 inches above the State average. Largemouth Bass were also growing well. All panfish species (with the exception of Yellow Perch) exhibited good growth rates. Age III and VI Black Crappie were growing 2.3 inches above the State Average. Bluegill (Age III and IV) were growing 1.1 inches above the State average. Yellow Perch (Ages I-V) were growing 1.2 inches below the State average.

In the September electrofishing effort, only Walleye were captured. A total of 110 Walleye from 5 to 21 inches were caught (Table 10). Of those, 84 were Age-0 fish from the 2015 year class. Nine other year classes were also represented. Age-0, I, and III Walleye from this portion of the survey were growing 0.9 inches above the State average. The Walleye that were stocked in Upper Herring Lake in 2015 were marked with oxytetracycline (OTC), which leaves a mark on bony structures of the fish, allowing researchers to determine whether a fish is stocked or of wild origin. Approximately 20% of the age-0 Walleye caught in the September 2015 effort were marked and presumably stocked. The remainder were unmarked and presumably of wild origin.

Fish species that were not caught in the 2015 survey of Upper Herring Lake but had been reported in previous surveys included Alewife, Banded Killifish, Black Bullhead, Logperch, Longear Sunfish, Mimic Shiner, and Spottail Shiner (Table 2). The only new species captured in the 2015 survey was Golden Shiner.

Shoreline data were collected on August 13, 2015 (Table 11). Upper Herring Lake had 8.3 docks/km, 9.4 dwellings/km, 26.8% shoreline armoring, and 393.3 submerged trees/km. A limnological profile of Upper Herring Lake was also conducted on August 13, 2015 (Table 12). At that time, temperature stratification was not documented, although oxygen levels declined with depth. The water temperature only dropped from 73.9°F on the surface to 68.6°F at the bottom in 24 feet of water. Dissolved oxygen levels were 10-11 ppm from the surface down to 19 feet, where they dropped to 6.6 ppm. At 22 feet, the dissolved oxygen level dropped below 1.0 ppm and remained that low to the bottom. Secchi depth was recorded as 3.9 feet.

Analysis and Discussion

The 2015 MDNR fisheries survey showed that Upper Herring Lake has relatively healthy fish populations. Numerically, Upper Herring Lake does not host the same population levels of panfish that other, more productive inland lakes host. However, those that are produced grow well and attain sizes that make them very attractive to anglers. Gamefish species like Northern Pike, Largemouth Bass, and Smallmouth Bass also do well in Upper Herring Lake and do not require any direct management.

Walleye were numerous in the 2015 fisheries survey of Upper Herring Lake. In the survey, nine different year classes were present, from both stocked and non-stocked years. Walleye stocking has recently occurred in 2015, 2012, 2010, 2009, 2008, and 2005 (ages 0, III, V, VI, VII, and X in Tables 9 and 10). Each of those year classes were represented in the survey, indicating that stocked Walleye are surviving and contributing to the Upper Herring Lake fishery. In particular, the 2015 and 2012 Walleye year classes were strong. Walleye were stocked into Upper Herring Lake in the same years that Lower Herring Lake was stocked, with additional Walleye stocked into Upper Herring Lake in 2009 and 2010 (Tonello 2016). It is likely that Walleye migrate from Upper Herring Lake into Lower Herring Lake, and vice-versa.

The presence of Walleye from non-stocked years indicates that natural reproduction continues to occur, with offspring surviving and contributing to the fishery. However, the non-stocked year classes tend to be weaker than the stocked year classes. If Walleye stocking were to be discontinued on the Herring Lakes, walleye would likely persist in the lakes, but at low levels that do not provide the level of sport fishery desired by the public.

Upper Herring Lake is moderately developed with cottages and residences along approximately half of its shoreline. Compared to other deep, medium-sized lakes in Michigan and in the CLMMU (basically the northwestern portion of the Lower Peninsula), Upper Herring Lake has an average number of docks and dwellings (Wehrly et al. 2015; Table 13). Upper Herring Lake did have substantially more submerged trees/km that provide habitat than other CLMMU lakes, and more than other medium, deep lakes statewide (Wehrly et al. 2015).

Management Direction

Herring Creek has not been sampled by MDNR in many years. Electrofishing surveys of this stream should be conducted as soon as possible at multiple locations. Such a survey effort would complement the recent surveys of the two lakes and would provide a more complete picture of the Herring Lakes watershed. While Brown Trout, Brook Trout, and Rainbow Trout (steelhead) have been documented in historical surveys of Herring Creek (MDNR files, Cadillac), the presence of Coho Salmon in the 2015 Lower Herring Lake survey indicates that they are most likely reproducing in Herring Creek as well. To verify this, at least several locations between the two lakes should be surveyed, in addition to as many locations as possible upstream of Upper Herring Lake.

The 2015 survey showed that Upper Herring Lake has relatively healthy and diverse fish populations. Species like Largemouth Bass, Smallmouth Bass, Bluegill, Black Crappie, Yellow Perch, Rock Bass, and Northern Pike will continue to be present and provide fishing opportunities without direct management. Salmonids like Brown Trout will be present during seasons when water temperatures allow. Rainbow Trout (steelhead) and possibly Coho Salmon may also provide seasonal fisheries during migration periods.

Both the 2004 and 2015 fisheries surveys of Upper Herring Lake showed robust Walleye populations. Though not a "trophy" fishery, good numbers of legal Walleye are available for anglers, with several year classes of sublegal fish that will recruit into the fishery within a few years. Based on the results of the fall 2015 electrofishing survey, the 2015 stocking event was successful. Stocking clearly plays a role in the Upper Herring Lake Walleye fishery, and should continue. Upper Herring Lake consistently produces a low level of natural reproduction as well that will continue to supplement the stocked fish. The stocking regime should include stocking 19,000 (35.2/acre) spring fingerling Walleye on an every-third-year basis, with the next stocking event occurring in 2018.

Fisheries management planning for Upper Herring Lake should also include discussion about Lower Herring Lake (Tonello 2016). The two lakes are connected by a stream without barriers to fish passage. Because fish freely move between both lakes, management actions or stocking conducted on one of the lakes could certainly affect the other.

The presence of woody debris in the form of submerged trees likely contributes to the health of the overall Upper Herring Lake ecosystem, including its fish populations. Woody debris provides numerous ecological benefits for many species. Aquatic insects utilize woody debris for food and shelter, many fish species use submerged wood for cover, and both Largemouth and Smallmouth Bass spawn in nests protected by woody debris. Mammals, birds, reptiles, and amphibians also use woody debris for basking, perching, hunting, etc. Therefore, all efforts should be made to protect the woody cover that currently exists in Upper Herring Lake.

The remaining undeveloped shoreline of Upper Herring Lake should be protected and considered critical to the continued health of the lake's aquatic community. Future unwise riparian development and wetland loss may result in deterioration of the water quality and aquatic habitat. Healthy biological communities in inland lakes require suitable natural habitat. Human development within the lake watershed, along the shoreline, and in the lake basin has a tendency to change and diminish natural habitat. Appropriate watershed management is necessary to sustain healthy biological communities, including fish, invertebrates, amphibians, reptiles, birds and aquatic mammals. Generally for inland lakes this includes maintenance of good water quality, especially for nutrients; preservation of natural shorelines, especially shore contours and vegetation; and preservation of bottom contours, vegetation, and wood debris within a lake. Guidelines for protecting fisheries habitat in inland lakes can be found in O'Neal and Soulliere (2006). Upper Herring Lake holds substantially more woody structure than most other lakes in the CLMMU or statewide. This condition will help maintain healthy fish populations and should be protected.

References

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Figure 1. Upper Herring Lake, Benzie County, Michigan.

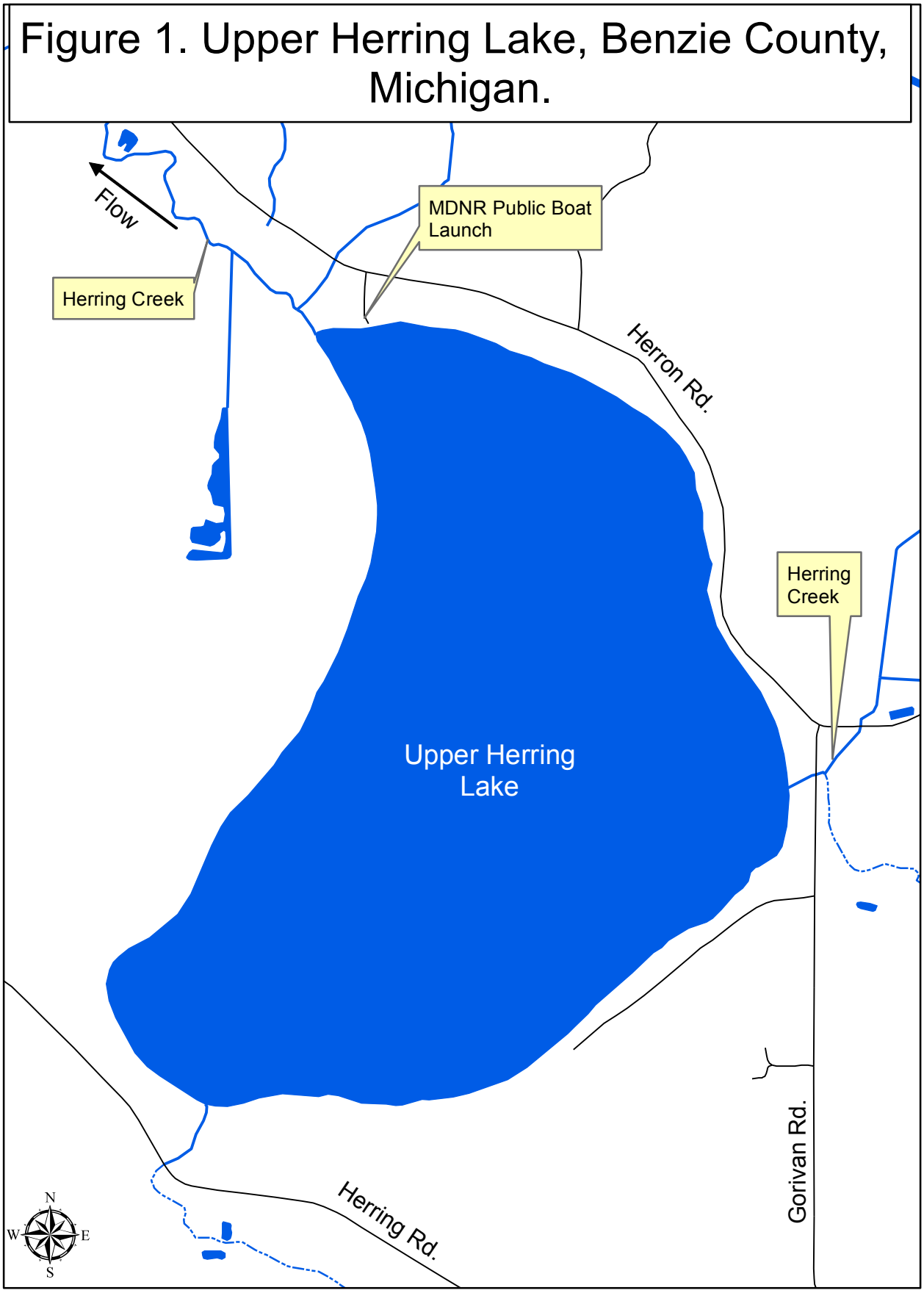

Figure 2. Herring Lakes watershed, Benzie County, Michigan.

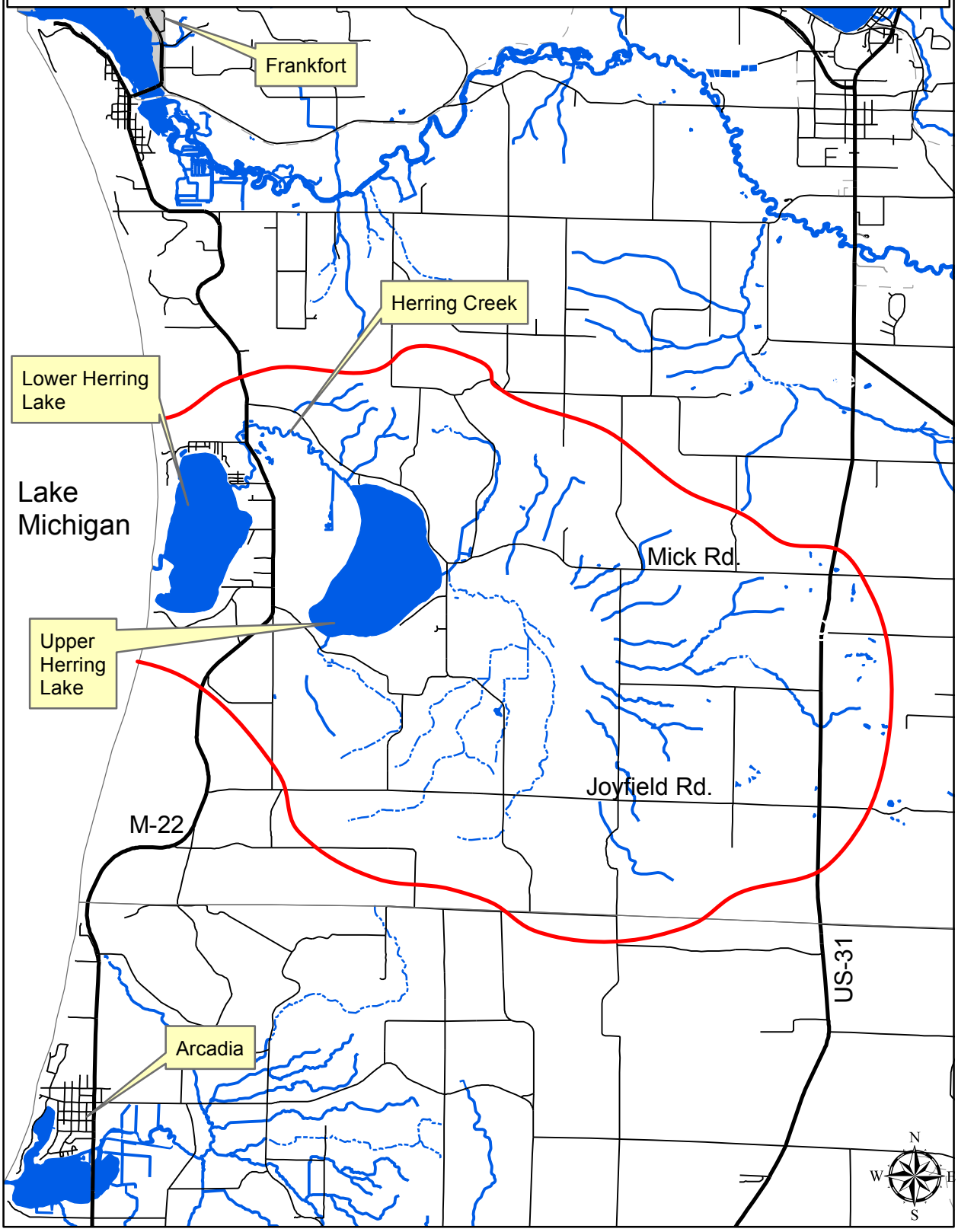

Table 1. Fish stocked in Upper Herring Lake, Benzie County, 1929-2015.

Year	Species	Number	Size	Strain
1929	Bluegill	5,000		
1930	Bluegill	700	yearlings	
	Walleye	250,000	fry	
1932	Largemouth Bass	500		
	Largemouth Bass	600	1 mo.	
1933	Walleye	200,000	fry	
1934	Bluegill	5,000	3 mo.	
	Yellow perch	5,000	7 mo.	
1935	Bluegill	5,000	4 mo.	
	Walleye	85,000	fry	
1936	Bluegill	200	yearlings	
	Great Lakes Shiners*	250,000		
	Largemouth Bass	200	yearlings	
	Walleye	375,000	fry	
1937	Bluegill	5,000	5 mo.	
	Largemouth Bass	1,300	3 mo.	
	Smallmouth Bass	800	3 mo.	
	Walleye	225,000	fry	
1938	Bluegill	15,000	3-5 mo.	
	Largemouth Bass	1,000	3 mo.	
	Walleye	200,000	fry	
	Yellow perch	20,000	7 mo.	
1939	Bluegill	20,000	4 mo.	
	Smallmouth Bass	1,000	5 mo.	
	Walleye	180,000	fry	
1940	Bluegill	34,260	4 mo.	
	Smallmouth Bass	600	4 mo.	
	Walleye	100,000	fry	
1941	Bluegill	23,000	4 mo.	
	Largemouth Bass	1,250	4 mo.	
1942	Bluegill	15,000	4 mo.	
	Smallmouth Bass	600	4 mo.	
	Walleye	100,000	fry	
1943	Bluegill	600	yearlings	
	Largemouth Bass	700	4 mo.	
	Smallmouth Bass	200	4 mo.	
1944	Bluegill	500	yearlings	
	Largemouth Bass	500	3 mo.	
1987	Walleye	400	spring fingerlings	Manistique
1989	Walleye	1,299	spring fingerlings	Bay De Noc
1990	Walleye	4,720	spring fingerlings	Bay De Noc
		7,167	spring fingerlings	Muskegon
1991	Walleye	4,224	spring fingerlings	Muskegon
1992	Walleye	16,623	spring fingerlings	Bay De Noc
1993	Walleye	20,547	spring fingerlings	Bay De Noc
1996	Walleye	24,075	spring fingerlings	Bay De Noc
1999	Walleye	18,863	spring fingerlings	Muskegon

Table 1 continued. Fish stocked in Upper Herring Lake, 1929-2015.

Year	Species	Number	Size	Strain
2002	Walleye	19,660	spring fingerlings	Muskegon
2005	Walleye	24,809	spring fingerlings	Muskegon
2008	Walleye	22,614	spring fingerlings	Muskegon
2009	Walleye	15,382	spring fingerlings	Muskegon
2010	Walleye	19,968	spring fingerlings	Muskegon
2012	Walleye	23,229	spring fingerlings	Muskegon
2015	Walleye	19,108	spring fingerlings	Muskegon

*Most likely Emerald Shiners

Table 2. Presence/absence of fish species in historical fisheries surveys of Upper Herring Lake, Benzie County.

	Year					
Species	1955	1975	1986	1996	2004	2015
Alewife		x				
Banded Killifish	x					
Black Bullhead		x			x	
Black Crappie			x	x	x	x
Bluegill	x	x	x	x	x	x
Bluntnose Minnow	x				x	x
Bowfin		x	x	x	x	x
Brown Bullhead	x	x	x	x	x	x
Brown Trout				x	x	x
Common Carp		x			x	x
Golden Shiner						x
Iowa Darter					x	x
Johnny Darter	x				x	x
Largemouth Bass		x	x	x	x	x
Logperch					x	x
Longear Sunfish	x					x
Longnose Gar	x	x		x	x	x
Mimic Shiner	x				x	
Northern Pike	x	x	x	x	x	x
Pumpkinseed	x	x	x	x	x	x
Redhorse spp.		x	x			
Rock Bass	x	x	x	x	x	x
Sand Shiner	x				x	x
Shorthead Redhorse				x	x	x
Smallmouth Bass	x	x	x	x	x	x
Spottail Shiner	x		x	x		x
Walleye	x	x	x	x	x	x
White Sucker	x	x	x	x	x	x
Yellow Bullhead	x	x	x		x	x
Yellow Perch	x	x	x	x	x	x

Table 3. Number, weight, and length of fish collected from Upper Herring Lake with large-mesh fyke nets and inland gillnets, May 24-27, 2004.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Black Bullhead	6	1.1	3.7	0.7	6-12	10.7	83 (7")
Black Crappie	1	0.2	0.9	0.2	11-11	11.5	100 (7")
Bluegill	32	5.7	9.1	1.7	5-8	7.4	97 (6")
Bowfin	15	2.7	75.2	14.1	20-29	24.0	
Brown Bullhead	85	15.1	65.5	12.3	8-14	11.7	100 (7")
Brown Trout	1	0.2	3.2	0.6	19-19	19.5	100 (8")
Largemouth Bass	63	11.2	84.2	15.8	11-16	13.6	38 (14)
Longnose Gar	6	1.1	15.9	3.0	28-33	30.7	
Northern Pike	2	0.4	6.9	1.3	24-25	25.0	100 (24")
Pumpkinseed	26	4.6	8.7	1.6	6-8	7.3	100 (6")
Rock Bass	219	38.9	100.3	18.8	5-10	8.4	99 (6")
Shorthead Redhorse	4	0.7	11.3	2.1	18-20	19.3	
Smallmouth Bass	6	1.1	8.1	1.5	9-16	13.3	50 (14")
Walleye	10	1.8	17.3	3.2	11-19	17.2	90 (15")
White Sucker	47	8.3	112.8	21.2	11-22	18.0	
Yellow Bullhead	5	0.9	2.7	0.5	9-11	10.3	100 (7")
Yellow Perch	35	6.2	6.8	1.3	5-12	7.4	49 (7")
Total	563	100	532.6	100			

[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 4. Average total weighted length (inches) at age, and growth relative to the State average, for fish sampled from Upper Herring Lake with large-mesh fyke nets and inland gill nets, May 24-27, 2004. Number of fish aged is given in parenthesis.

	Age										Mean Growth
Species	I	II	III	IV	V	VI	VII	VIII	IX	X	Index
Black Crappie						11.5 (1)					--
Bluegill					5.9 (2)	6.7 (9)	7.7 (8)	8.0 (3)			-0.4
Brown Trout							19.3 (1)				--
Largemouth Bass				12.6 (30)	14.5 (10)	16.7 (4)					+1.2
Northern Pike				25.1 (1)	24.0 (1)						--
Rock Bass				5.8 (5)	6.7 (8)	7.4 (15)	8.8 (17)	9.9 (2)	10.3 (6)	10.4 (2)	-0.1
Smallmouth Bass			10.6 (1)		13.8 (2)	15.6 (1)					--
Walleye		11.2 (1)	15.9 (1)	17.8 (6)	19.9 (1)						+2.0
Yellow Perch			6.1 (3)	6.8 (24)	9.2 (7)				12.0 (1)		0.0

Table 5. Number, weight, and length of fish collected from Upper Herring Lake by electrofishing and seining, June 30, 2004.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Black Crappie	2	0.3	0.1	0.1	3-4	4.0	0 (7")
Bluegill	9	1.5	1.9	1.3	2-8	6.0	56 (6")
Bluntnose Minnow	221	36.2	1.2	0.8	1-2	2.5	
Bowfin	2	0.3	9.4	6.5	21-25	23.5	
Brown Bullhead	2	0.3	1.1	0.8	10-10	10.5	100 (7")
Common Carp	2	0.3	23.2	15.9	27-31	29.5	
Iowa Darter	1	0.2	0.0	0.0	1-1	1.5	
Johnny Darter	2	0.3	0.0	0.0	2-2	2.5	
Largemouth Bass	40	6.5	43.5	29.9	9-18	12.3	23 (14)
Logperch	3	0.5	0.0	0.0	2-3	3.2	
Longnose Gar	5	0.8	5.0	3.4	20-27	23.0	
Mimic Shiner	1	0.2	0.0	0.0	1-1	1.5	
Pumpkinseed	1	0.2	0.1	0.1	4-4	4.5	0 (6")
Rock Bass	15	2.5	5.4	3.7	1-10	7.3	85 (6")
Sand Shiner	226	37.0	0.7	0.5	1-2	2.0	
Smallmouth Bass	4	0.7	2.5	1.7	7-11	10.5	0 (14")
Walleye	3	0.5	5.0	3.4	15-18	17.2	100 (15")
White Sucker	27	4.4	45.5	31.3	1-18	13.1	
Yellow Perch	45	7.4	1.0	0.7	2-10	3.0	2 (7")
Total	611	100	145.6	100			

[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 6. Average total weighted length (inches) at age, and growth relative to the State average, for fish sampled from Upper Herring Lake by seining and electrofishing, June 30, 2004. Number of fish aged is given in parenthesis.

	Age								Mean Growth
Species	I	II	III	IV	V	VI	VII	VIII	Index
Black Crappie	3.8 (1)								--
Bluegill			4.1 (1)	5.8 (1)				8.7 (1)	--
Largemouth Bass		7.7 (5)	10.7 (12)		15.2 (2)	16.6 (2)	16.8 (1)	18.8 (1)	-0.5
Pumpkinseed				5.8 (1)					--
Rock Bass			4.2 (1)	5.5 (1)					--
Smallmouth Bass		7.5 (1)	11.9 (1)	13.0 (2)					--
Walleye			15.8 (1)		17.9 (1)	18.5 (1)			--
Yellow Perch		3.3 (2)	4.8 (5)	5.9 (1)		10.3 (1)			-2.0

Table 7. Number, weight, and length of fish collected from Upper Herring Lake with trap nets, a small mesh fyke net, and inland gillnets, June 8-11, 2015.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Black Crappie	39	7.0	36.1	5.9	6-13	11.4	95 (7")
Bluegill	22	4.0	7.7	1.2	1-10	7.8	86 (6")
Bluntnose Minnow	1	0.2	0.0	0.0	1-1	1.5	
Bowfin	13	2.3	64.1	10.4	21-28	24.0	
Brown Bullhead	26	4.7	21.1	3.4	10-13	12.0	100 (7")
Brown Trout	3	0.5	4.3	0.7	13-15	14.8	100 (8")
Common Carp	1	0.2	10.4	1.7	28-28	28.5	
Golden Shiner	1	0.2	0.0	0.0	1-1	1.5	
Iowa Darter	1	0.2	0.0	0.0	2-2	2.5	
Johnny Darter	1	0.2	0.0	0.0	2-2	2.5	
Largemouth Bass	39	7.0	70.1	11.4	7-18	14.8	77 (14)
Longnose Gar	46	8.3	110.8	18.0	24-35	29.7	
Northern Pike	13	2.3	23.2	3.8	13-26	19.6	8 (24")
Pumpkinseed	9	1.6	3.8	0.6	4-9	7.6	89 (6")
Rock Bass	172	30.9	103.0	16.7	1-12	8.6	83 (6")
Sand Shiner	29	5.2	0.1	0.0	1-2	2.1	
Shorthead Redhorse	1	0.2	4.5	0.7	22-22	22.5	
Smallmouth Bass	15	2.7	38.8	6.3	13-18	17.0	93 (14")
Walleye	39	7.0	53.4	8.7	7-23	15.6	90 (15")
White Sucker	23	4.1	52.0	8.4	9-22	17.3	
Yellow Bullhead	7	1.3	4.8	0.8	6-12	11.1	86 (7")
Yellow Perch	55	9.9	7.9	1.3	2-10	6.5	38 (7")
Total	556	100	616.1	100			

[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 8. Number, weight, and length of fish collected from Upper Herring Lake by electrofishing and seining, June 30, 2015.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Bluegill	2	0.7	0.1	0.2	4-4	4.5	0 (6")
Bluntnose Minnow	41	13.4	0.2	0.4	1-3	2.3	
Brown Bullhead	1	0.3	0.4	0.8	9-9	9.5	100 (7")
Brown Trout	1	0.3	0.5	1.0	10-10	10.5	100 (8")
Iowa Darter	4	1.3	0.0	0.0	1-2	2.0	
Largemouth Bass	1	0.3	1.6	3.0	14-14	14.5	100 (14)
Logperch	8	2.6	0.1	0.2	3-3	3.5	
Longear Sunfish	4	1.3	0.1	0.2	2-3	3.0	
Longnose Gar	2	0.7	5.7	10.8	27-34	31.0	
Mimic Shiner	14	4.6	0.0	0.0	1-2	1.7	
Pumpkinseed	7	2.3	0.6	1.1	3-5	4.8	0 (6")
Rock Bass	52	16.9	29.2	55.5	2-11	8.4	79 (6")
Sand Shiner	22	7.2	0.0	0.0	1-2	1.8	
Smallmouth Bass	2	0.7	3.6	6.8	8-18	13.5	50 (14")
Spottail Shiner	9	2.9	0.1	0.2	2-3	3.3	
Walleye	1	0.3	0.2	0.4	8-8	8.5	0 (15")
White Sucker	47	15.3	7.7	14.6	1-20	2.8	
Yellow Bullhead	26	8.5	1.0	1.9	1-7	3.4	8 (7")
Yellow Perch	63	20.5	1.5	2.9	1-10	3.1	3 (7")
Total	307	100	52.6	100			

[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 9. Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from Upper Herring Lake with trap nets, a small-mesh fyke net, and inland gillnets, June 8-11, 2015; and by seining and electrofishing, June 30, 2015. Number of fish aged is given in parenthesis.

	Age															Mean Growth
Species	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XVIII	Index
Black Crappie		7.3 (3)	10.3 (6)		11.9 (4)	12.5 (11)	12.8 (1)		13.4 (1)			13.4 (1)				+2.3
Bluegill			5.9 (8)	7.8 (11)				9.2 (1)		10.1 (1)	9.3 (1)					+1.1
Brown Trout			14.4 (2)		15.6 (1)											--
Largemouth Bass		7.3 (1)	11.8 (2)	12.9 (5)	14.3 (7)	15.0 (8)	16.0 (2)	15.0 (1)	16.6 (3)		18.8 (1)	17.7 (2)		17.5 (1)	18.9 (1)	+0.8
Northern Pike	16.8 (1)	17.4 (6)	21.6 (5)	26.0 (1)					40.0 (1)							-0.9
Pumpkinseed		3.3 (2)	5.5 (8)	8.5 (1)	6.9 (3)	9.0 (3)										+0.3
Rock Bass		3.6 (9)	5.7 (24)	7.3 (29)	9.0 (24)	10.2 (11)	10.5 (8)	11.2 (11)	11.2 (9)	11.6 (1)	12.2 (1)	11.3 (1)				+1.1
Smallmouth Bass		8.8 (1)		14.0 (2)	15.7 (3)	16.3 (1)		17.8 (3)	17.5 (3)	18.2 (3)			18.3 (1)			--
Walleye	7.8 (4)	12.0 (4)	15.5 (17)	17.3 (5)	17.2 (2)	17.7 (1)	18.8 (4)		22.2 (1)		23.7 (1)					+1.1
Yellow Perch	2.3 (14)	3.8 (11)	5.6 (20)	7.0 (18)	8.5 (8)	7.5 (1)										-1.2

Table 10. Results of a fall electrofishing effort targeting Walleye on Upper Herring Lake on September 28, 2015, Benzie County, Michigan. During the survey, 4.1 miles of shoreline were sampled in 2.05 hours of electrofishing. The surface water temperature was 72.8°F.

Year Class	Age	# Walleye captured	Number of Walleye/mile of shoreline sampled	Number of Walleye/hour of electrofishing)
2015*	0	84	20.49	40.98
2014	I	8	1.95	3.9
2013	II	1	0.24	0.5
2012*	III	8	1.95	3.9
2011	IV	1	0.24	0.5
2010*	V	1	0.24	0.5
2009*	VI	1	0.24	0.5
2007	VIII	4	0.98	2.0
2005*	X	1	0.24	0.5
2000	XV	1	0.24	0.5

*stocked

Table 11. Shoreline data for Upper Herring Lake, Benzie County, compared with that for other medium, deep lakes in the Central Lake Michigan Management Unit (CLMMU) and statewide (from Wehrly et al. 2015). Upper Herring Lake sampling was conducted by MDNR Fisheries personnel on August 13, 2015.

	Total docks per km	Dwellings per km	Percent shoreline armoring	Submerged trees per km
Upper Herring Lake	8.3	9.4	26.8	393.3
Average for medium, deep lakes in the CLMMU	10.5	16.3	19.2	4.9
Michigan statewide average for medium, deep inland lakes	12.7	16.7	25.3	14.5

Table 12. Water temperature, dissolved oxygen and pH profile for Upper Herring Lake, Benzie County, August 13, 2015.

Depth (ft)	Temperature (°F)	Dissolved oxygen (ppm)	pH
0	73.9	10.8	8.6
3	73.9	11.2	8.7
6	73.9	11.2	8.7
9	73.9	11.1	8.7
12	73.9	11.0	8.7
15	73.9	10.8	8.7
18	73.8	10.3	8.7
19	72.7	6.6	8.5
20	71.2	3.7	8.2
21	70.5	3.1	8.1
22	69.2	0.9	8.0
23	68.9	0.8	7.9
24	68.6	0.1	7.7