



Introduction

Wiggins Lake is a 345 acre impoundment of the Cedar River located in Sage and Grout townships northwest of Gladwin. The Cedar River is a tributary to the Tittabawassee River which flows to the Saginaw River which flows to Saginaw Bay of Lake Huron. In addition to the Cedar River inlet, Howland Creek and at least 4 intermittent and unnamed streams flow into Wiggins Lake. The drainage area of this sub-watershed is estimated to be 123 square miles. A small MDNR boat access site with concrete launch skids is maintained on the southwest shore adjacent to Chappel Dam and supports approximately 20 medium size boats. High speed boat restrictions are in effect between the hours of 6:30 pm and 10:00 am.

The water control structure of Wiggins Lake is Chappel Dam. Chappel Dam was constructed in 1910 for hydroelectric generation. The dam was operated by Consumers Power Company from 1929 to 1961. In 1962, power production ceased and the dam was sold to Gladwin County and is currently administered by the Gladwin County Drain Commission. Chappel Dam consists of two earthen embankments, a fixed crest spillway, a tainter gate system, and a power house (Spicer Group 2003). The main earthen dike is approximately 800 feet long. The concrete spillway and tainter gate system is approximately 100 feet wide. Chappel Dam has a structural height of 32 feet but normal head is maintained at 26 feet. Repairs to Chappel Dam were completed in 2009 and operation maintains a fixed crest surface water discharge maintaining a summer water level of 815 feet above mean sea level. Currently, Chappel Dam prevents upstream fish passage on the Cedar River.

The surrounding topography of Wiggins Lake is described as gently rolling hills vegetated by mixed hardwood forest. Soils in the area are of Nestor-Kawkawlin (loams), Iosco (sandy loam) and Lupton (muck) association. Groundwater inflow to Wiggins Lake is moderate and at the Lower Michigan mean. Land use in the drainage area is dominated by agriculture but the immediate shore of Wiggins Lake consists of residential housing.

Residential development is extensive on Wiggins Lake. In August, 2009, a total of 357 dwellings were counted around the perimeter of the lake yielding an estimated density of 67 dwellings/mile. Shoreline development was extensive with an estimated 67% of the shoreline displaying some sort of armoring mostly in the form of steel, concrete, or wood seawalls.

In general, Wiggins Lake is considered a medium-size shallow impoundment with warm-cool temperature characteristics. Maximum water depth is found at the face of Chappel Dam and is approximately 25 feet. An estimated 90% of the lake is less than 15 feet deep. The lake has an irregular shaped shoreline with three distinctly protected coves. Bottom substrate is dominated by sand but has considerable portions of clay and organic muck. Tree stumps are fairly abundant with a large concentration found at the mouth of the Cedar River inlet.

Aquatic vegetation is common to Wiggins Lake and, for extended periods, can achieve nuisance levels. Chemical treatments to control Eurasian milfoil have occurred on a regular basis. cursory observations made in August, 2009 found Eurasian milfoil, bladderwort, and chara abundant, and wild celery, water stargrass, curly and large leaf potamogeton and elodea were common. Water lily was sparsely distributed in the lake and emergent arrowhead, bulrush, and cattail were observed on undeveloped shorelines.

Limnological parameters measured in 2009 found characteristics of a mesotrophic lake. Measurements of secchi disk (11 ft.), total phosphorus (0.016 mg/l), and total chlorophyll-*a* (0.004 mg/l) yielded a Carlson Trophic Status Index of 44 on a scale of 0-80. Trophic status parameters collected in 2003 also yielded mesotrophic conditions (Fuller Minnerick 2008). Mesotrophic lakes are generally defined as those with



an intermediate level of productivity, greater than oligotrophic lakes, but less than eutrophic lakes. Mesotrophic lakes commonly have medium levels of nutrients, moderately clear water, a common occurrence of aquatic vegetation and they typically support diverse biological communities. Impoundments, like Wiggins Lake, function as sediment and nutrient traps within the river system. Nutrients and sediments from the drainage area typically accumulate in the impounded water at an accelerated rate. pH ranged from 7.1 in the lower water column to 7.9 at the surface which is typical for the region. Alkalinity was 156 mg/l indicating reasonably well buffered water.

Temperature and oxygen profiles taken in August, 2009 were consistent with historical profiles and showed a thermocline develops between 15 and 20 feet (Table 1). In addition, during summer months and thermocline development, dissolved oxygen concentrations appear fish limiting (<3 mg/l) below the 19 ft. water depth.

Files indicate MDNR, Fisheries has been involved with monitoring and managing the Wiggins Lake fishery since 1940. In the 1940's, bluegill, smallmouth and largemouth bass, and walleye were stocked. In 1962, Wiggins Lake was drawn down and a partial treatment with the fish toxicant rotenone was conducted to remove undesirable rough fish species (bullheads, suckers). Post-treatment stocking included muskellunge, largemouth bass, walleye, and bluegill. Rainbow trout were briefly stocked to provide an interim fishery. By the late 1960's, bluegill, pumpkinseed, black crappie, largemouth bass, yellow perch, northern pike, rock bass, white suckers, and bullheads dominated the fish community.

During the 1970's through the 1990's, fisheries management concentrated on northern pike. From 1973 to 1999 a northern pike rearing marsh was cooperatively operated by MDNR, Fisheries and the Wiggins Lake Property Owners Association. Approximately 2,200 spring fingerling northern pike were released annually for the period 1981-1999 (Table 2). In addition, a spearing ban was placed on northern pike to protect from over harvest. Rearing marsh operations ceased in 1999 when the pike population reached a self sustaining level. With the development of a sustainable pike fishery, the spearing ban was lifted in 2001.

Other fish species have been stocked into Wiggins Lake (Table 2). Channel catfish and white bass were introduced in the 1980's but survival was poor. Bluegill, largemouth bass, and yellow perch have been stocked by the Property Association but the overall contribution to the fish community is unknown. A 1988 assessment found the Wiggins Lake fish community remained similar to that found in 1965 with the exception of an apparent increase of northern pike and carp.

Most recently (since 1989) establishing a walleye fishery has been the focus of fishery management on Wiggins Lake. Spring fingerling walleye stocking occurred from 1989 to 2006 on an alternate year schedule at rates ranging from 24/acre to 80/acre (Table 2). Walleye stocking was halted in 2007 when concerns for the spread of viral hemorrhagic septicemia (VHS) resulted in drastic reductions in statewide rearing pond production and stocking.

Fish community assessments conducted in 1987 and 1999 indicate the fish community has remained fairly stable (Table 3). Bluegill, black crappie, pumpkinseed, rock bass, northern pike, and largemouth bass are the dominant sport fish. Walleye and yellow perch occurred in lesser abundance but contributed to the overall recreational fishery. Bullheads (black, yellow, and brown) were fairly abundant. White suckers and carp were also found in appreciable numbers. Zebra mussels were detected in Wiggins Lake in the mid-1990's and a well established population exists.



Night electrofishing assessments specifically targeting walleye occurred in 1991 and 1996. Only 3 young of the year walleye were captured in 1991 suggesting poor survival of 1991 plant. The 1996 assessment captured 59 young of the year and 25 yearling walleye indicating good survival of the 1996 and 1995 plants. Unfortunately, the 1995 and 1996 walleye year classes did not show up in abundance in the 1999 assessment and their contribution to the harvestable fishery became a mystery.

Methods and Materials

This survey was in response to Fisheries Division's Status and Trends Monitoring Program. The Status and Trends Monitoring Program seeks to randomly sample various sized lakes, using similar protocol, to determine trends among lakes at the regional and statewide levels.

Status and Trends protocol incorporates a variety of gear to sample the fish community within a recommended temperature range (55°-80° F). Large mesh trap and fyke nets are used to capture larger (>3 inches) species that inhabit the littoral zone or that move inshore at night. Gill nets are used to sample fishes that occupy offshore waters and are particularly effective at capturing perch and northern pike. Night electrofishing is used to capture all size ranges of species and life stages that inhabit the littoral zone or that move inshore at night. Seining is used to capture representative samples of small-bodied nongame species and smaller size classes (<3 inches) of sport fishes that inhabit the littoral zone. Collectively, the catch from these gears present a general picture of the overall fish community.

The fish community of Wiggins Lake was sampled May 26-29, 2009 with a seine and trap, fyke, and gill nets. Three electrofishing stations were sampled the evening of July 2. Habitat sampling occurred in August.

Results

A total of 1,783 fish representing 18 species were collected in this assessment (Table 4). Night electrofishing accounted for 52% of the total catch, while trap nets, fyke nets, gill nets, and seine accounted for 31%, 12%, 3%, and 1%, respectively. Bluegill were the most abundant species collected comprising 49% of the catch. Black and yellow bullheads comprised 13% of the catch, black crappie 7%, yellow perch 5%, pumpkinseed 4%, rock bass 4%, largemouth bass 3%, white sucker 3%, and northern pike 2%. Species caught in lesser abundance included blackside darters, bluntnose minnows, golden redhorse, green sunfish, iowa darters, and walleye.

A total of 992 bluegill averaging 3.9 inches were collected in this assessment (Table 4). Night electrofishing accounted for 75% of the catch while trap and fyke nets accounted for 24% of the catch. Average size of the electrofishing catch was 3.1 inches compared to 6.3 inches for the trap and fyke nets. Three percent of the electrofishing catch met or exceeded the acceptable harvest size of 6 inches compared to 58% of the trap and fyke net catch. Age and growth analysis indicated bluegill were growing near State average having a mean growth index of -0.2. Multiple year classes (ages 1-11) were found suggesting acceptable reproduction and recruitment into the harvestable fishery. Bluegill longevity appears to peak at 8 years of age.

A total of 84 black bullhead averaging 11.5 inches and 151 yellow bullhead averaging 11.3 inches were collected in this assessment (Table 4). Ninety-four percent of the bullhead catch was captured with trap and fyke net gear. Ninety-six percent of the bullhead catch met or exceeded the acceptable harvest size of 7 inches. Age and growth analysis was not conducted for these species.

A total of 123 black crappie averaging 7.7 inches were collected in this assessment (Table 4). Ninety-five percent of the black crappie were captured with trap and fyke net gear. Fifty-four percent of the black



crappie catch met or exceeded the acceptable harvest size of 7 inches. Age and growth analysis indicated black crappie were growing near State average having a mean growth index of -0.3. Multiple year classes (ages 1-10) were found suggesting acceptable reproduction and recruitment into the harvestable fishery.

A total of 88 yellow perch averaging 5.5 inches were collected in this assessment (Table 4). Sixty-seven percent of the yellow perch catch was captured with electrofishing gear, 15% with gill nets, and 13% with trap and fyke net gear. Average size of the electrofishing catch was 4.4 inches compared to 7.7 inches for gill nets and 9.8 inches for trap and fyke nets. Age and growth analysis indicated yellow perch were growing near State average having a mean growth index of -0.2. Multiple year classes (ages 1-9) were found but high mortality was observed after age two.

A total of 77 pumpkinseed sunfish averaging 5.5 inches were collected in this assessment (Table 4). Fifty-seven percent of the pumpkinseed were captured with trap and fyke nets and 27% were captured with electrofishing gear. Average size of pumpkinseeds from the trap and fyke nets was 6.6 inches compared to 3.7 inches for the electrofishing catch. Age and growth analysis indicated pumpkinseed sunfish were growing above State average having a mean growth index of +0.7. Multiple year classes (ages 1-8) were found suggesting acceptable reproduction and recruitment into the harvestable fishery.

A total of 68 rock bass averaging 7.1 inches were collected in this assessment (Table 4). Seventy-four percent of the rock bass were captured with trap and fyke nets and 23% with electrofishing gear. Average size of rock bass from the trap and fyke nets was 7.4 inches compared to 6.3 inches from the electrofishing catch. Age and growth analysis indicated rock bass were growing near State average having a mean growth index of +0.1. Multiple year classes (ages 1-9) were found suggesting acceptable reproduction and recruitment into the harvestable fishery.

A total of 53 largemouth bass averaging 13.7 inches were collected in this assessment (Table 4). Sixty-four percent of the largemouth bass were captured with electrofishing gear and 33% with trap and fyke net gear. Forty-nine percent of the total largemouth bass catch met or exceeded the legal harvest size of 14 inches. Age and growth analysis indicated largemouth bass were growing above State average having a mean growth index of +1.3. Multiple year classes (ages 1-12) were found suggest acceptable reproduction and recruitment into the harvestable fishery.

A total of 51 white suckers averaging 18.8 inches were collected in this assessment (Table 4). Eighty percent of the white suckers were collected with trap and fyke net gear. Age and growth was not conducted on this species.

A total of 32 northern pike averaging 21.2 inches were collected in this assessment (Table 4). Fifty-three percent of the northern pike were captured with gill nets and 38% were captured with trap and fyke nets. Twenty-five percent of the total catch met or exceeded the legal harvest size of 24 inches. Age and growth analysis indicated northern pike were growing below State average having a mean growth index of -1.3. Multiple year classes (ages 1-10) were found suggesting acceptable reproduction but poor growth appears to reflect less than acceptable recruitment into the harvestable fishery.

Other fish species collected in this assessment were found in low abundance. Four walleye averaging 22.8 inches were collected. Fourteen common carp averaged 24.7 inches. Seven golden redhorse averaged 15.5 inches. Other minnow species collected included bluntnose minnows, blackside and iowa darters, and golden shiners. One three inch green sunfish was captured.

Discussion



Net catches from 1987, 1999, and 2009 indicate the fish community of Wiggins Lake has remained fairly stable (Table 3). Bluegill, bullhead (sp.), and black crappie have consistently shown to be the most abundant species. Pumpkinseed sunfish, rock bass, largemouth bass, yellow perch, northern pike, and white sucker are found in moderate abundance. Walleye occur in low abundance.

The bluegill population of Wiggins Lake has displayed a progressively improved size structure over the years and appears in a satisfactory state (Table 5). Using the Schneider Index (Schneider 1990) for classifying bluegill populations, Wiggins Lake scored 4.25 compared to 3.75 in 1999 and 2.75 in 1987. Bluegill appear fairly long lived and exhibit acceptable growth allowing them to achieve lengths up to 8 inches. Presently, the recreational fishery for bluegill is considered good.

The black crappie, pumpkinseed sunfish, and rock bass populations also appear satisfactory. Each of these species displayed good size structure, acceptable growth, and are found in relatively good abundance. This assessment captured 28 black crappie ≥ 10 inches suggesting good opportunities to catch large fish. Pumpkinseed sunfish may be in lesser abundance than bluegill or black crappie but are still found in sufficient numbers to contribute to the recreational fishery. Although rock bass are not popular for table fare among some anglers, they do contribute to the recreational fishery.

The sample of largemouth bass collected in this survey indicates a very good sport fishery. Relative abundance was very good and the size structure was dominated by largemouth bass ≥ 14 inches with good representation of younger fish which should recruit into the legal size fishery. Largemouth bass growth was very good and longevity was good with several specimens aged beyond age 7 allowing them to achieve a large size.

A good deal of effort has gone into establishing a northern pike fishery in Wiggins Lake. The management decision to discontinue stocking on an annual basis appears to have been a good one based upon declining growth patterns. Presently, northern pike are found in appreciable numbers and appear as a self-sustaining population. The size structure found in this assessment is acceptable with 25% of those captured exceeding the 24 inch size and good numbers of younger fish which should recruit into the harvestable fishery. However, the slow growth being observed is a concern as it relates to recruitment into the harvestable fishery. Poor growth rates were also detected in Wiggins Lake in 1999 (mean growth index = -2.4) and 1994 (mean growth index = -1.2). More information is needed to fully understand the dynamics of this northern pike population. It is possible the observed growth patterns are biased toward male fish which typically do not achieve greater lengths and are prone to stunting. A subsample of 32 unknown sex fish and no creel information presents tenuous data to substantiate additional management actions and perhaps regulation changes for the pike fishery.

The survival of stocked walleye has met with limited success in Wiggins Lake. Although fall indexing in 1995 and 1996 indicated good initial survival of the stocked fish, they did not show up in quantities in the 1999 or 2009 assessments. The current stocking regime does not appear to be creating a significant (3-5 adults/acre) walleye fishery. A few walleye have consistently shown up in assessments which indicates survival potential. At best, the current fishery offers potential for incidental catch or perhaps more frequent catch for those anglers specifically targeting walleye.

Although yellow perch were found in appreciable numbers, their size structure and age distribution was relatively poor. Only 16 of 88 specimens were ≥ 7 inches. Age distribution indicates a high mortality after age 2. This mortality is most likely due to natural causes and predation from other piscivorous species may play a role. At best, the current fishery only offers an opportunity for incidental catch of yellow perch of harvestable size.



Recommendations

The overall fish community of Wiggins Lake appears to be satisfactory. Recreational opportunities to catch several sportfish including bluegill, pumpkinseed sunfish, black crappie, rock bass, largemouth bass, and northern pike exist. Walleye and yellow perch are available in lesser abundance but still contribute to the overall recreational fishery.

The current fisheries prescription for Wiggins Lake calls for stocking 17,250 spring fingerling walleye (50/acre) on a tri-annual basis with the next stocking scheduled for 2011. This is a change in historical stocking which was scheduled on an alternate year basis. Based upon the findings of this survey and a review of past surveys, management recommendations concur with this prescription. It should be emphasized that the goal of this stocking effort is not to create a "significant" walleye fishery but rather, to provide an additional and highly desirable sportfish for recreational angling.

Walleye stocking in Michigan has always been dependent upon available stock. Wiggins Lake is one of many lakes in Southern Lake Huron Management Unit stocked with a limited number of available walleye. In recent years, concerns with the spread of VHS has greatly reduced statewide production and stocking efforts. As a result, several Michigan lakes which are routinely stocked with walleye have not been stocked. Wiggins Lake was not stocked in 2008 as scheduled and whether it will be stocked in 2011 will depend on whether Statewide VHS concerns have been addressed. MDNR, Fisheries is hopeful ongoing research will enhance the ability to detect VHS and allow for a resumption of stocking at previous levels with an assurance of a "disease-free" product.

Table 1. Oxygen, temperature, and pH profiles from Wiggins Lake, August 2009.



Depth (ft.)	Temperature (F)	Oxygen (mg/l)	pH
0	73	9.0	7.9
1	73	9.4	7.9
2	73	9.6	7.8
3	73	9.6	7.9
4	73	9.6	7.9
5	73	9.6	7.9
6	73	9.5	7.9
7	72	9.7	7.8
8	70	9.7	7.7
9	69	9.1	7.6
10	68	8.7	7.6
11	68	7.8	7.5
12	67	7.5	7.5
13	67	6.7	7.4
14	67	6.6	7.4
15	67	6.5	7.4
16	66	6.6	7.4
17	64	6.5	7.4
18	63	4.7	7.3
19	61	2.0	7.2
20	60	1.3	7.2
21	59	0.6	7.1
22	57	0.4	7.1
23	56	0.3	7.1
24	56	0.2	7.1
25	55	0.2	7.1

Table 2. Fish stocking in Wiggins Lake, 1981 to 2009.



Year	Species	Number	Number/acre	Size (inches)
1981	Northern pike	3,500	10	2.1
1982	Northern pike	4,000	12	4.1
1983	Northern pike	2,100	6	2.9
1984	Northern pike	1,200	3	3.0
1985	Northern pike	4,000	12	3.5
1986	Northern pike	5,500	16	3.8
1987	Channel catfish	29	<1	19.2
	Northern pike	700	2	4.1
1988	Channel catfish	83	<1	10.2
	Northern pike	4,000	12	4.6
	White bass	256	<1	12.2
1989	Northern pike	2,500	7	4.0
	Walleye (MU)	18,056	52	1.8
1990	Northern pike	5,500	16	3.6
1991	Walleye (MU)	13,113	38	2.3
1992	Northern pike	1,500	3	4.1
	Walleye (BN)	10,667	24	2.0
1993	Bluegill*	590	2	7.1
	Largemouth bass*	31	<1	12.2
	Northern pike	1,300	5	3.8
1994	Northern pike	2,000	6	3.4
	Walleye (MU)	8,662	25	1.8
	Yellow perch*	1,700	5	6.4
1995	Largemouth bass*	840	2	8.4
	Walleye (MU)	21,264	62	1.8
1996	Largemouth bass*	1,000	3	6.4
	Northern pike	1,200	3	3.0
	Walleye (MU)	23,842	69	1.7
1998	Walleye (TI)	8,289	24	1.8
1999	Bluegill*	1,300	4	4.0
	Northern pike	2,400	7	3.0
	Yellow perch*	1,200	3	3.0
2000	Walleye (TI)	18,315	53	1.3
2002	Walleye (TI)	18,837	55	1.4
2004	Walleye (TI)	21,034	61	1.5
2006	Walleye (TI)	27,520	80	1.8



Table 3. Comparison of trap and fyke net catches from Wiggins Lake, 1987-2009.

Species	1987		1999		2009	
	% of catch	Average size (in.)	% of catch	Average size (in.)	% of catch	Average size (in.)
Bluegill	39	5.4	49	5.9	32	6.3
Bullhead sp.	10	10.0	14	10.1	28	11.7
Black crappie	24	7.5	18	9.3	14	8.0
Pumpkinseed	9	5.5	5	5.7	6	6.6
Rock bass	6	6.1	2	7.6	6	7.4
White sucker	11	17.8	2	18.7	5	19.5
Largemouth bass			<1	10.2	5	13.8
Northern pike	<1	19.0	2	18.7	2	21.9
Carp	<1	28.0	4	20.5	2	25.0
Yellow perch	1	9.6	2	10.5	1	9.8
Walleye			<1	21.8	<1	22.8
Redhorse sp.	<1	17.0	2	18.2	<1	18.5
Common shiner			<1	3.5		
Total catch (#)	545		1,274		770	



Table 4. Total catch (all gear) from Wiggins Lake, May-July, 2009

Common name	Number	Percent by number	Length range (inches)	Weight (lbs.)	Percent by weight	Percent legal size	Average size (inches)
Black bullhead	84	5	1-15	64.2	8	96	11.5
Black crappie	123	7	3-12	40.5	5	54	7.7
Blackside darter	5	<1	2-3		<1		2.7
Bluegill	992	56	1-9	68.1	9	16	3.9
Bluntnose minnow	18	1	2-3	0.1	<1		2.7
Common carp	14	<1	13-29	104.9	14		24.7
Golden redhorse	7	<1	11-18	10.0	1		15.5
Golden shiner	9	<1	3-7	0.5	<1		5.4
Green sunfish	1	<1	3		<1		3.5
Iowa darter	6	<1	2		<1		2.5
Largemouth bass	53	3	3-18	83.2	11	49	13.7
Northern pike	32	2	11-35	79.1	10	25	21.2
Pumpkinseed	77	4	2-8	13.6	2	38	5.5
Rock bass	68	4	2-10	20.9	3	75	7.1
Walleye	4	<1	20-27	16.2	2	100	22.8
White sucker	51	3	11-23	140.6	19		18.8
Yellow bullhead	151	8	1-13	106.6	14	97	11.3
Yellow perch	88	5	2-13	10.8	1	18	5.5



Table 5. Wiggins Lake bluegill classification using trap and fyke net data and the Schneider Index (Schneider 1990). Size score is given in parentheses.

Sample date	5/12/87	6/21/99	5/26/09
Sample size	216	514	243
Average length (inches)	5.4 (2)	5.8 (3)	6.3 (4)
% \geq 6 inches	42 (3)	35 (3)	58 (4)
% \geq 7 inches	5 (3)	10 (4)	27 (4)
% \geq 8 inches	<1 (2)	2 (5)	5 (5)
Schneider Index Rank ¹	2.5 Poor-acceptable	3.75 Acceptable-Satisfactory	4.25 Satisfactory

¹Rank: 1 = Very poor, 2 = Poor, 3 = Acceptable, 4 = Satisfactory, 5=Good, 6 = Excellent, 7 = Superior

References

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