Appendix A. Current and historical Park Lake aerial views

Image from Google Earth, July 7, 2018 (accessed 8 Feb 2020).

Image from Google Earth, October 2016 (accessed 9 March 2016)

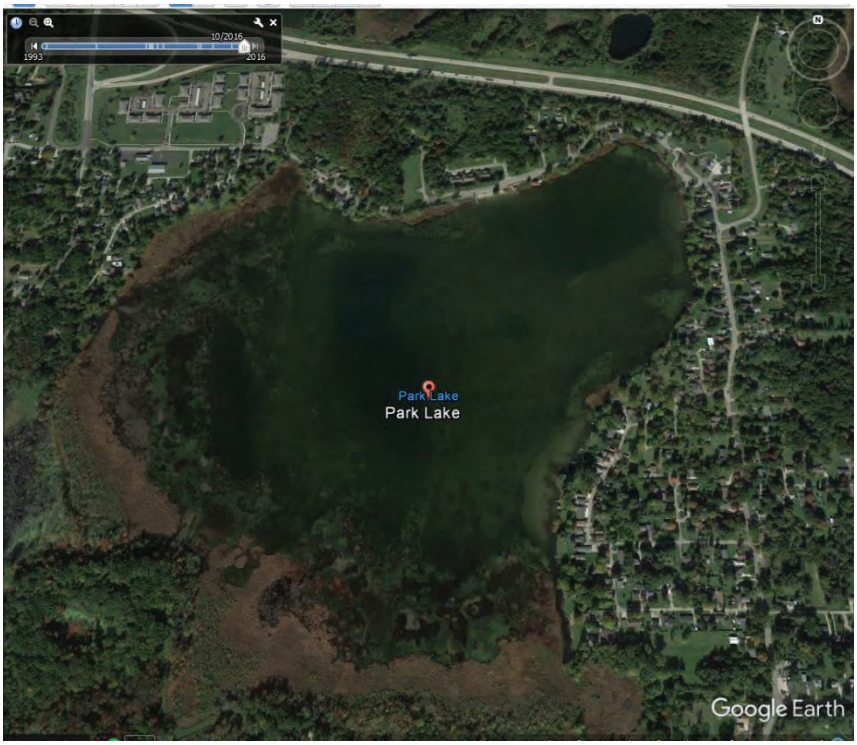
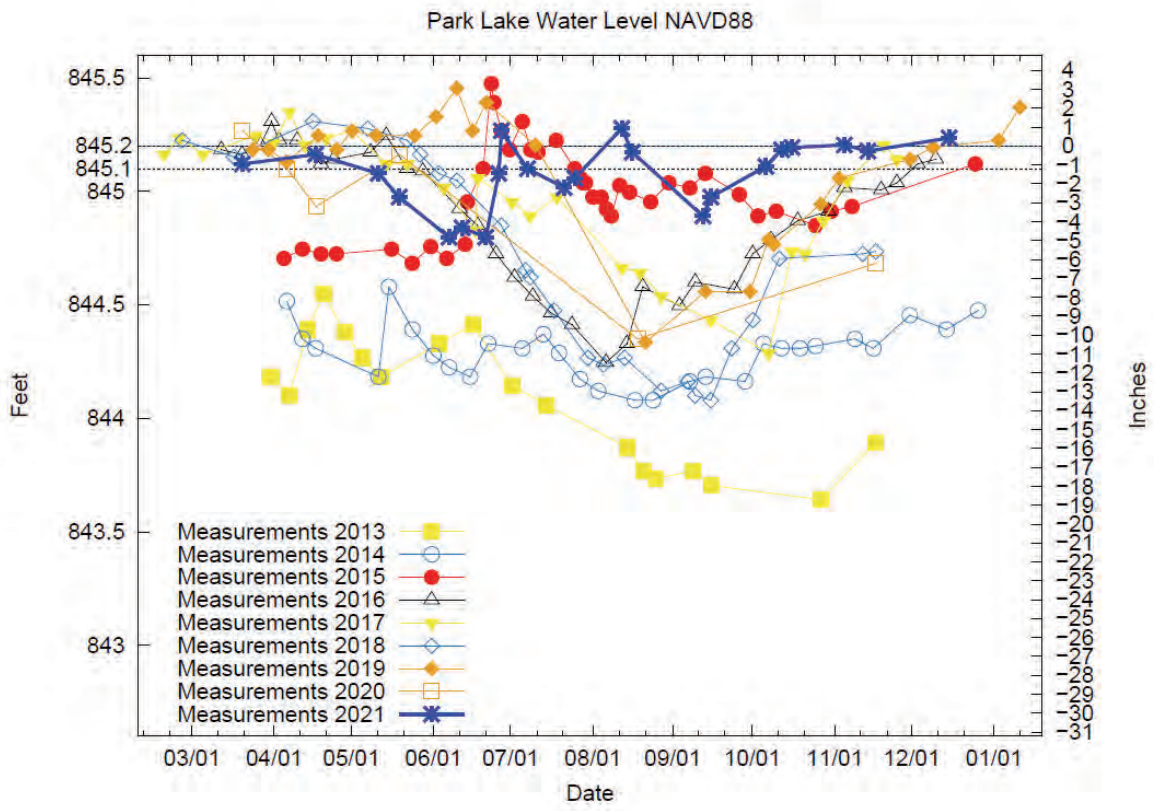


Image from Google Earth, April 2013 (accessed Feb 2015)

Image from Google Earth May 2005 (accessed Feb 2015)

Appendix B. Park Lake water levels (data provided by John Yurkon). Water control structure on the lake became operational in July 2014. Two boards were removed in early 2020 to facilitate repairs to a culvert located at the NW corner of the lake and were placed later in the summer.



Appendix C. Park Lake water clarity, 2012 - 2021. The Secchi disk depth is the depth at which the disk disappears from sight as it is lowered into the lake. Deeper Secchi disk readings (meaning more negative numbers) indicate clearer water. Data collection sponsored by Friends of Park Lake. Data collected by Don Parkey, Dan Hayes, John Yurkon, Emily Galassini, J. B. McCombs and Corey Higley.

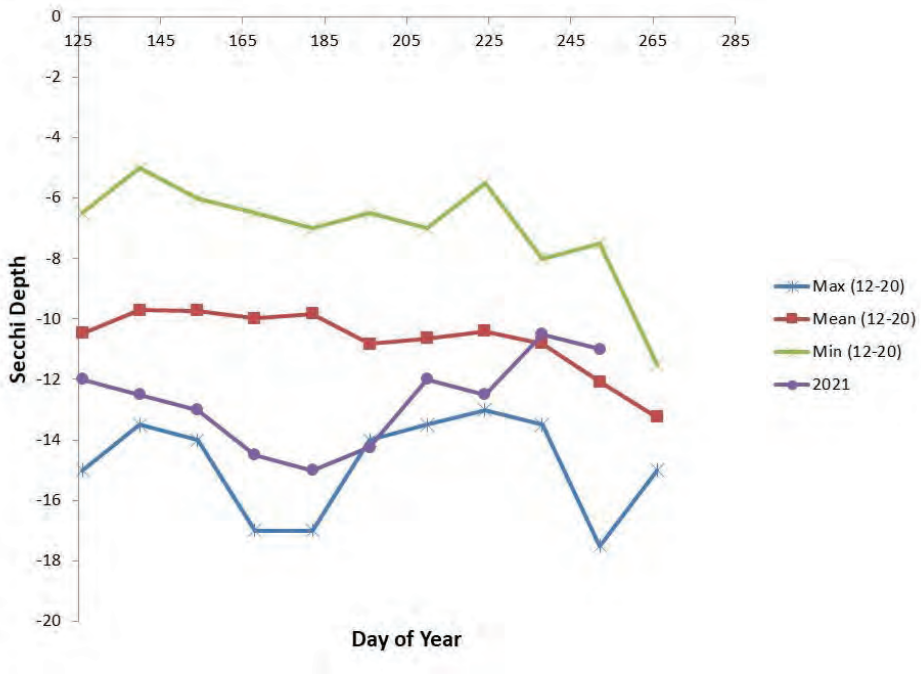


Table of Mean Secchi depth, May 15 to Sept 15

Year	Mean clarity (ft)
2012	9.8
2013	9.7
2014	11.1
2015	11.1
2016	8.5
2017	9.9
2018	10.1
2019	9.6
2020	13.1
2021	12.8

Appendix D. Aquatic Plants observed in Park Lake as part of exotic plant watch survey as part of the Citizen's Lake Monitoring Program, Friends of Park Lake. Conducted by Don Parkey and Dan Hayes, 1 July 2012; Dan Hayes, Elle Gulotty, and Chaoqun Su 14 August and 8 September 2013; Dan Hayes, John Yurkon, Emi Fergus, Angela DePalma-Dow 4-6 August 2014; Dan Hayes, Hollie Lane, Tim Klifman, Erick Elgin, Dwight Washington 8-10 August 2016; Dan Hayes, Dwight Washington, Mike Vasievich 15 August, 2017; Dan Hayes, Hollie Lane, Gary Schafer 23 July, 2018; Dan Hayes, Seth Gibson, Hollie Lane 6 August, 2019; Dan Hayes 18-25 August 2020; Dan Hayes, JB McComb, Josh Delanoy 24-25 August 2021.

		Percent of sites									
Common Name	Genus	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Muskgrass	Chara	65%	71%	75%		83%	69%	71%	86%	81%	65%
White water lily	Nymphaea	63%	32%	29%		31%	36%	45%	40%	38%	35%
Pondweed	Potamogeton	60%	59%	86%		35%	77%	78%	79%	83%	80%
Eelgrass	Valisneria	52%	71%	32%		33%	38%	22%	36%	17%	39%
Bladderwort	Utricularia	33%	8%	39%		50%	21%	31%	24%	14%	20%
* Eurasian water milfoil	Myriophyllum	29%	59%	21%		0%	15%	49%	0%	5%	29%
Yellow water lily	Nuphar	17%	4%	11%		10%	3%	6%	5%	2%	0%
* Spiny naiad	Najas (minor?)	8%	3%	0%		0%	5%	6%	2%	0%	4%
Coontail	Ceratophyllum	4%	-	14%		0%	3%	8%	7%	0%	0%
* Starry Stonewort	Nitellopsis	2%	26%	18%		65%	85%	80%	62%	64%	80%
Bushy pondweed	Najas (gracillima?)	2%	45%	50%		0%	21%	12%	2%	17%	8%
Native milfoil	Myriophyllum	-	8%	43%		6%	18%	33%	5%	2%	0%
Elodea	Elodea	0%	1%	0%		0%	3%	4%	19%	57%	80%
Slender or southern naiad	Najas (flexilis?)	-	-	7%		0%	3%	4%	10%	14%	33%
Water bulrush (?)	Schoenoplectus subterminalis	-	-	18%		17%	15%	12%	7%	10%	10%
*Curly-leaf pondweed	Potamogeton crispus	0%	0%	0%		0%	0%	0%	2%	0%	0%

Notes:

* Non-native species highlighted in yellow.

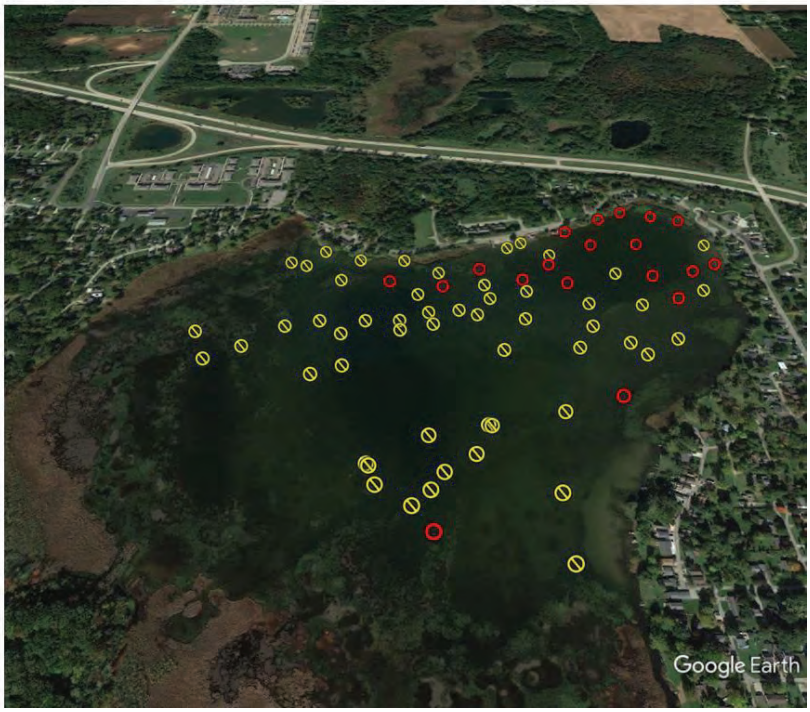
Extensive growth of water lilies in all years prevented some areas with particularly heavy growth of white and yellow water lilies from being sampled, and thus may lead to an under estimate of the prevalence of these species.

Sampling in 2014 was focused somewhat on the southern and western side of the lake, and as such percentages may not be directly comparable to other years.

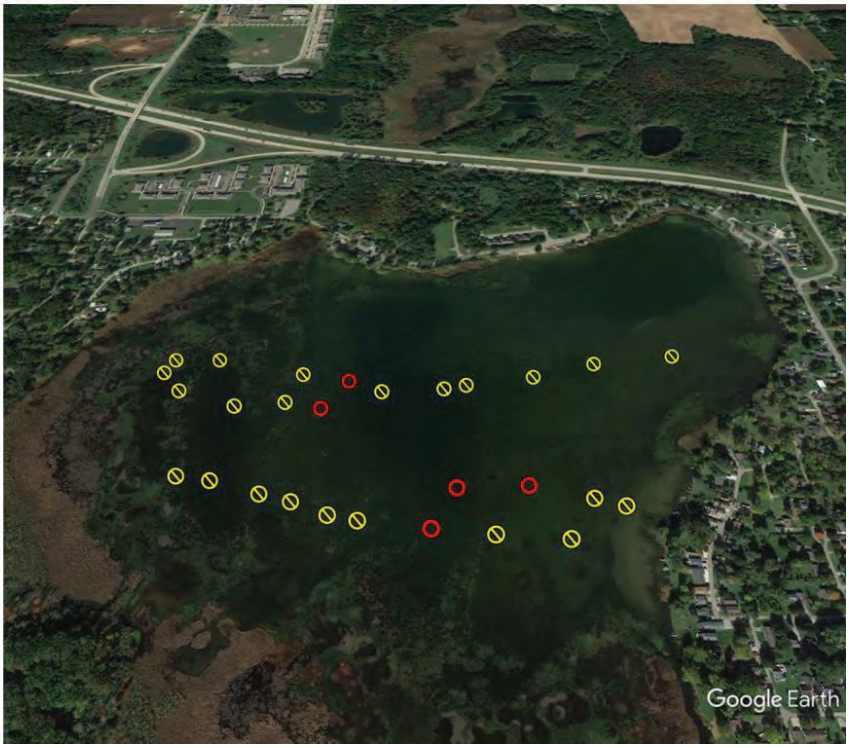
Appendix E. Map of starry stonewort distribution 2012-2018. Note that no substantial change was observed following this time, so data from those years are not mapped.

Starry Stonewort Distribution (red circles) 2012

Starry Stonewort Distribution (red circles) 2013



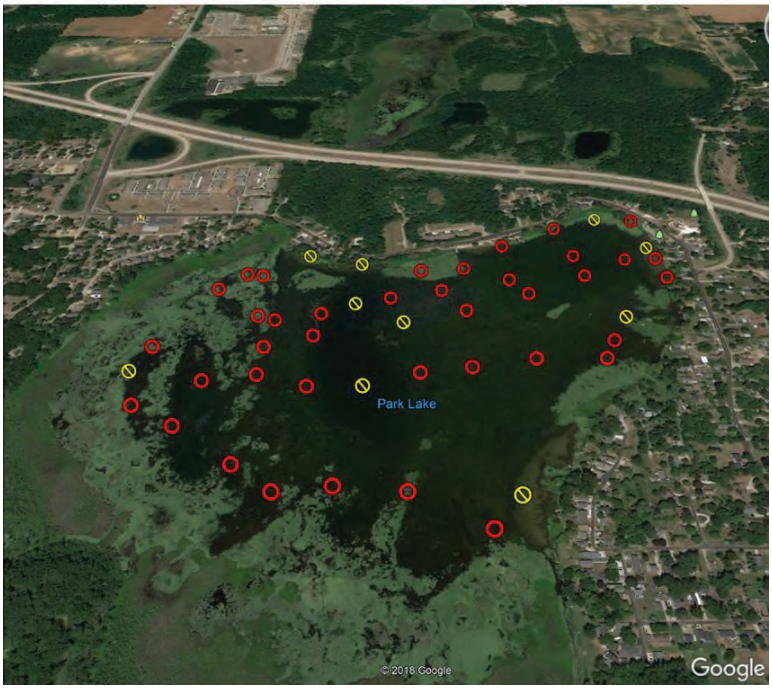
Starry Stonewort Distribution (red circles) 2014



Starry Stonewort Distribution (red circles) 2016

Starry Stonewort Distribution (red circles) 2017

Starry Stonewort Distribution (red circles) 2018



Appendix F. Results of water quality sampling conducted by Friends of Park Lake as part of the MICorps program (Michigan Clean Water Corps). Note no measurements were taken in 2020 due to COVID restrictions.

Date Sampled	Year	Month	Day	Chlorophyll (mg/L)
5/19/2013	2013	5	19	< 1.0
6/19/2013	2013	6	19	3.9
7/11/2013	2013	7	11	4.3
8/11/2013	2013	8	11	3.5
9/12/2013	2013	9	12	2.8
5/14/2014	2014	5	14	1.1
6/18/2014	2014	6	18	3.3
7/15/2014	2014	7	15	5.7
8/13/2014	2014	8	13	3.1
9/22/2014	2014	9	22	1.9
6/15/2015	2015	6	15	2.4
7/15/2015	2015	7	15	9.7
8/19/2015	2015	8	19	2.1
9/21/2015	2015	9	21	2.5
5/11/2016	2016	5	11	4.9
6/17/2016	2016	6	17	4
7/13/2016	2016	7	13	1
8/14/2016	2016	8	14	3.4
9/18/2016	2016	9	18	4.2
5/10/2017	2017	5	10	1.7
6/17/2017	2017	6	17	<1.0
7/11/2017	2017	7	11	1.1
8/10/2017	2017	8	10	1.3
9/14/2017	2017	9	14	<1.0
5/16/2018	2018	5	16	4
6/16/2018	2018	6	16	5.1
7/11/2018	2018	7	11	3.1
8/13/2018	2018	8	13	17
9/11/2018	2018	9	11	1.8
5/17/2019	2019	5	17	2.3
6/13/2019	2019	6	13	3
7/10/2019	2019	7	10	4.2
8/16/2019	2019	8	16	10
9/12/2019	2019	9	12	3.2
5/12/2021	2021	5	12	2
6/15/2021	2021	6	15	5.6
8/13/2021	2021	8	13	6.3
9/19/2021	2021	9	19	1.9

Date Sampled		Phosphorus (ug P/L)
9/16/2006	Late Summer	18
4/7/2012	Spring Overturn	33
9/15/2012	Late Summer	22
4/21/2013	Spring Overturn	18
9/12/2013	Late Summer	15
5/5/2014	Spring Overturn	15
9/22/2014	Late Summer	15
4/1/2015	Spring Overturn	14
9/21/2015	Late Summer	13
3/20/2016	Spring Overturn	17
9/19/2016	Late Summer	17
4/2/2017	Spring Overturn	26
9/19/2017	Late Summer	13
5/17/2018	Spring Overturn	14
9/15/2018	Late Summer	17
4/10/2019	Spring Overturn	20
9/14/2019	Late Summer	16
3/17/2021	Spring Overturn	17
9/17/2021	Late Summer	21

Appendix G. Michigan DNR Fisheries Division prescription for Park Lake

Michigan Department of Natural Resources
Fisheries Division

Printed: 02/17/2011
Page: 1

FISHERY MANAGEMENT PRESCRIPTION

Watershed **Grand**
Sub-Watershed **Looking Glass River**

Water **PARK LAKE**

PRESCRIPTION IDENTIFICATION

Unit **Southern Lake Michigan**
Number **2330**
Date **01/05/2011**

Prepared By **Scott Hanshue**
Valid From **02/01/2011**
Expires **01/31/2017**
Status **Approved**
Replaces No. **1205**
Dated **11/22/2004**

WATER IDENTIFICATION

Primary County **Clinton**

T / R / S **05N 01W 29**

Area (Ac) **185.0**

Last Yr. Surveyed **2004**

I. PROBLEM/OPPORTUNITY LIST

1. Bluegills in Park Lake were historically very small with slow growth rates. Since the introduction of channel catfish the bluegill population size structure has improved. Opportunity to further improve the bluegill fishery and provide angling opportunities for channel catfish.

II. ACTION LIST AND SCHEDULE

		Begin Date	End Date	EA Excl	GL Issue	Mark/ Tag
A.	Continue to stock yearling channel catfish at the rate of 10/acre on an alternate year basis.	01/01/2011	12/31/2016	Y	N	N

III. EXPECTED RESULTS, BENEFITS, AND LONGEVITY

Park Lake is a 185 acre lake located in Clinton County east of the City of Lansing in an area with few fishing lakes. It has a maximum depth of 25 feet, but half of the lake is less than 5 feet deep. It has a long history of small, slow growing bluegills. In 1994, adult channel catfish were transferred into the lake to control the stunted bluegill population. This management action was followed by alternate year plants of yearling catfish starting in 1999. Since the introduction of channel catfish the growth rates of bluegill have increased and the population size structure has improved. Bluegill collected during the 2004 survey included ages 0-IX and ranged in size from one to eight inches. Bluegill growth rates were slightly less than the state average.

The 2004 survey also showed that other fish species are doing well. The channel catfish ranged in size from 8 to 27 inches. Largemouth bass caught were 3-15 inches and northern pike were 19-31 inches. Black crappies were 5-12 inches and pumpkinseed sunfish were 2-8 inches.

It is unlikely that the channel catfish will reproduce naturally. But the survival of the planted fish appears to be good and their introduction has had a positive effect on the fish community and the fishery. Continuation of the alternate year stocking is recommend to maintain the fishery.

IV. ALTERNATIVE ACTIONS AND REASONS NOT SELECTED

A. Discontinue stocking of yearling channel catfish.

Reason Not Selected:
The size structure of the bluegill population would decline and a popular channel catfish fishery would be lost.

V. RESOURCE REQUIREMENTS - Fish Stocking, Capital Outlay, Other

Activity	Cost (All Years)
Capital Outlay	$0.
Fish Stocking	$833.

FISHERY MANAGEMENT PRESCRIPTION

Watershed **Grand**
Water **PARK LAKE**
Sub-Watershed **Looking Glass River**

PRESCRIPTION IDENTIFICATION
Unit **Southern Lake Michigan**
Number **2330**
Date **01/05/2011**

WATER IDENTIFICATION
Primary County **Clinton**

V. RESOURCE REQUIREMENTS - Fish Stocking, Capital Outlay, Other

Activity	Cost (All Years)
Other	$0.

VI. ENVIRONMENTAL CONSIDERATIONS

1. Threatened/Endangered Species	N	11. Farm and Forest Land	N
2. Designated Wild or Scenic Area	N	12. Federal Land	N
3. Historical	N	13. Habitat Alteration	N
4. Socio-Economic Considerations	N	14. Flood Plain	N
5. Public Opposition or Concern	N	15. Wetland	N
6. Health & Safety	N	16. Bottomland/Shoreland	N
7. Construction or Modification	N	17. Discharge	N
8. Toxicant	N	18. Energy	N
9. Species Introduction	N	19. Cumulative Impacts	N
10. Land Manager Approval Needed	N	20. State Forest Implication	N

VII. ENVIRONMENTAL ASSESSMENT

Prescription is Categorically Excluded (Y/N?):	Y
Public Involved and Supportive (Y/N?):	Y

VIII. COORDINATION OR OUTSIDE ASSISTANCE NEEDED (Specify and Describe)

Will need to coordinate with an out-of-state hatchery in St. Marys, Ohio.

IX. ATTACHMENTS

Stocking Request Number	984
E.A.R. (Y/N)	N
Public Involvement Plan (Y/N)	N
Maps (Y/N)	N
Plans (Y/N)	N
Other (List)	N/A

XI. APPROVALS

Approval Level	Approved By	Approval Date
FMU Approval	Jay Wesley	02/01/2011

FISHERY MANAGEMENT PRESCRIPTION

Watershed **Grand**
Sub-Watershed **Looking Glass River**

Water **PARK LAKE**

PRESCRIPTION IDENTIFICATION
Unit **Southern Lake Michigan**
Number **2330**
Date **01/05/2011**

WATER IDENTIFICATION
Primary County **Clinton**

PRESCRIPTION COMMENTS

FMU Review Comments — III. EXPECTED RESULTS, BENEFITS, AND LONGEVITY — SOM_waybrantj 01/10/2011 10:04:00

I recommend approval.

Statewide Comments — X. PRESCRIPTION COMMENTS — SOM_lesagec 01/27/2011 16:46:00

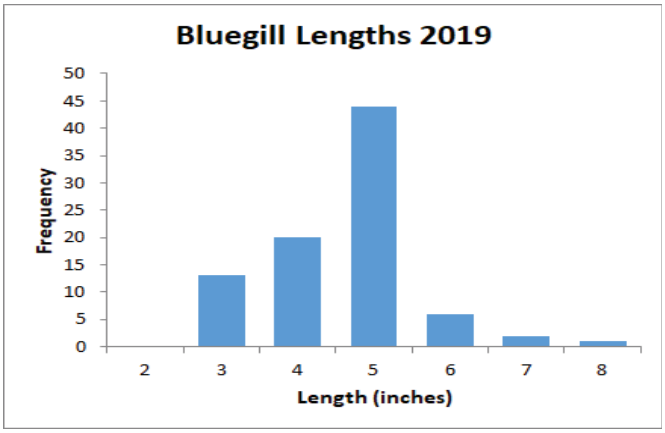
Sounds like a good plan. In other places, channel cat survival has been so good that eventually a stocking reduction has been needed because of the high predation on panfish. Just something to consider.

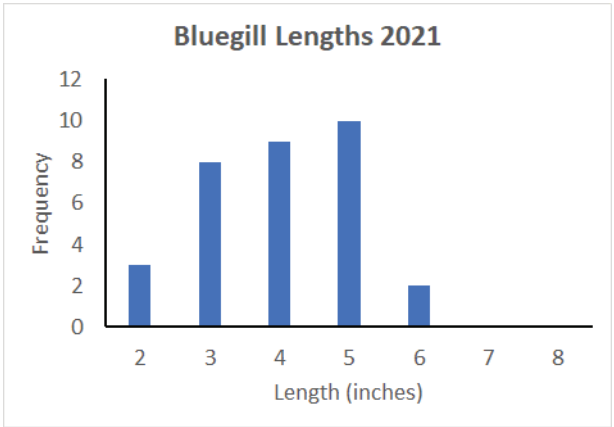
Statewide Comments — X. PRESCRIPTION COMMENTS — SOM_lesagec 01/28/2011 16:47:00

All set. I recommend approval.

Appendix H. Summary of fish seen or captured in Park Lake by MSU students in FW101L (Introduction to Fish and Wildlife Lab) and FW474 (Field Techniques in Fisheries and Limnology). Length-frequency of Bluegill in 2019 and 2021, based on samples from netting. No data were collected in 2020 due to COVID restrictions.

									June	Septembe
Fish Species	2011	2012	2013	2014	2015	2016	2018	2019	2021	2021
Blackchin shiner					X				X	
Black Crappie	X	X	X	X	X	X	X	X	X	X
Bluegill	X	X	X	X	X	X	X	X	X	X
Bowfin	X		X	X	X					
Brown Bullhead					X	X		X		X
Channel Catfish	Seen	Seen	X	Seen	X	X	X	X		X
Common Carp	X	Seen	X	Seen	Seen		X	X		X
Golden Shiner	X				X					
Grass Pickerel	X		X	X	X	X	X	X		
Green Sunfish										X
Iowa Darter					X					
Lake Chubsucker	X				X	X	X	X		
Largemouth Bass	X	X	X	X	X	X	X	X	X	X
Minnows		X	X	X		X	X	X		
Northern Pike	X	X			X	X	X	X		X
Pumpkinseed	X	X	X	X	X	X	X	X	X	X
Spot-tailed							X			
Warmouth	X	X	X	X	X	X	X	X	X	X
White Sucker					X	X				
Yellow Bullhead	X				X		X	X	X	X
Yellow Perch	X	X	X	X	X	X	X	X	X	X





Appendix I. Roster of the Park Lake Advisory Board.

Year	Chair	Secretary	Committee Members
2012	Rick Price	Dan Hayes	Ray Kotke, Don Parkey, Leon Puttler, John Yurkon
2013	Dan Hayes	Cheryl Murphy	Ray Kotke, Don Parkey, Rick Price, Leon Puttler, John Yurkon
2014	Dan Hayes	Cheryl Murphy	Ray Kotke, Don Parkey, Rick Price, Leon Puttler, John Yurkon
2015	Dan Hayes	Emi Fergus	Ray Kotke, Don Parkey, Rick Price, Leon Puttler, John Yurkon
2016	Dan Hayes	Emi Fergus, Cheryl Murphy	Ray Kotke, Don Parkey, Rick Price, Leon Puttler, John Yurkon
2017	Dan Hayes	Cheryl Murphy	Ray Kotke, Don Parkey, Rick Price, Denise McCrimmon, John Yurkon
2018	Dan Hayes	Cheryl Murphy	Ray Kotke, Don Parkey, Rick Price, Denise McCrimmon, John Yurkon
2019	Dan Hayes	Cheryl Murphy	Ray Kotke, Don Parkey, Rick Price, Denise McCrimmon, John Yurkon
2020	Dan Hayes	Cheryl Murphy	Don Parkey, Rick Price,Leon Puttler, John Yurkon
2021	Dan Hayes	Cheryl Murphy	Joe Benzie, Don Parkey, Rick Price,Leon Puttler, Mary Schaefer, John Yurkon

Appendix J. Climatological record for Lansing area, 2021. Accessed through https://w2.weather.gov/climate/index.php?wfo=grr , selecting for annual climate report (CLA).

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...THE LANSING CLIMATE SUMMARY FOR THE YEAR OF 2021...

CLIMATE NORMAL PERIOD: 1991 TO 2020
CLIMATE RECORD PERIOD: 1864 TO 2022

WEATHER         OBSERVED          NORMAL  DEPART   LAST YEAR`S
                VALUE   DATE(S)   VALUE   FROM     VALUE DATE(S)
                                          NORMAL
.............................................................
TEMPERATURE (F)
RECORD
 HIGH            103   07/06/2012
 LOW             -37   02/02/1868
HIGHEST           94   06/11         MM      MM       95  07/03
                                                         07/07
                                                         07/09
LOWEST            -9   02/17         MM      MM       -1  02/14
AVG. MAXIMUM    60.4               57.9     2.5     59.0
AVG. MINIMUM    41.5               39.2     2.3     40.6
MEAN            51.0               48.6     2.4     49.8
DAYS MAX >= 90    12                9.0     3.0       15
DAYS MAX <= 32    39               52.6   -13.6       30
DAYS MIN <= 32   134              142.5    -8.5       98
DAYS MIN <= 0      5                8.4    -3.4        1

PRECIPITATION (INCHES)
RECORD
 MAXIMUM       48.41   1883
 MINIMUM       18.50   1930
TOTALS         34.56              33.33    1.23    36.21
DAILY AVG.      0.10               0.09    0.01     0.10
DAYS >= .01      139              137.7     1.3       23
DAYS >= .10       68               70.6    -2.6       12
DAYS >= .50       17               20.4    -3.4        1
DAYS >= 1.00       5                6.0    -1.0        1
GREATEST
 24 HR. TOTAL   3.72

SNOWFALL (INCHES)
RECORDS
 TOTAL          86.3   2008
 24 HR TOTAL    15.4   01/26/2014 TO 01/26/1967
 SNOW DEPTH       24   01/27/1978
                       01/28/1978
TOTALS          53.9               50.2     3.7     37.9
SINCE 7/1       12.5               15.4    -2.9       MM
SNOWDEPTH AVG.     1                                   0
DAYS >= TRACE     62               42.1    19.9       16
DAYS >= 1.0       19               15.3     3.7        1
GREATEST
 SNOW DEPTH       16   02/16                           6  02/14
                       02/17
                       02/19
                                                          02/15
```

DEGREE DAYS

HEATING TOTAL	5910	6612	-702	6257
SINCE 7/1	1963	2482	-519	MM
COOLING TOTAL	971	656	315	827
SINCE 1/1	971	657	314	MM

FREEZE DATES

RECORD

EARLIEST	08/03/1894
LATEST	07/15/1863

EARLIEST	10/24
LATEST	05/12

.....

WIND (MPH)

AVERAGE WIND SPEED	8.1		
RESULTANT WIND SPEED/DIRECTION	3/240		
HIGHEST WIND SPEED/DIRECTION	46/270	DATE	08/10
HIGHEST GUST SPEED/DIRECTION	59/270	DATE	08/10

SKY COVER

POSSIBLE SUNSHINE (PERCENT)	MM
AVERAGE SKY COVER	0.46
NUMBER OF DAYS FAIR	160
NUMBER OF DAYS PC	111
NUMBER OF DAYS CLOUDY	93

AVERAGE RH (PERCENT) 70

WEATHER CONDITIONS. NUMBER OF DAYS WITH

THUNDERSTORM	37	MIXED PRECIP	0
HEAVY RAIN	36	RAIN	48
LIGHT RAIN	122	FREEZING RAIN	1
LT FREEZING RAIN	4	HAIL	0
HEAVY SNOW	3	SNOW	14
LIGHT SNOW	59	SLEET	0
FOG	208	FOG W/VIS <= 1/4 MILE	24
HAZE	123		

- INDICATES NEGATIVE NUMBERS.
R INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T INDICATES TRACE AMOUNT.

Appendix K. Water quality testing results from samples collected in 2014-2019 by Daniel Hayes and submitted to MSU laboratory in the Department of Fisheries and Wildlife. No E. coli samples were collected in 2020 due to COVID restrictions. Data from 2021 were collected by Mid-Michigan District Health Department and taken from Beach Guard web site (https://www.egle.state.mi.us/beach/).

Date	Geometric Mean E. coli /100 ml
11 June 2014	75.2
6 July 2016	53.0
27 June 2017	32.9
5 July 2018	89.9
22 July 2019	135.2

Sample Year	Sample Date	Sample Type	Analysis Method	Result Value
2021				
Right	08/31/2021 10:15 AM	Individual	Colilert-18 hour	206.4
Center	08/31/2021 10:12 AM	Individual	Colilert-18 hour	191.8
Left	08/31/2021 10:10 AM	Individual	Colilert-18 hour	238.2
	08/31/2021	30-Day Mean	Colilert-18 hour	109.414
	08/31/2021	Daily Mean	Colilert-18 hour	211.268
Right	08/26/2021 11:38 AM	Individual	Colilert-18 hour	2419.6
Left	08/26/2021 11:35 AM	Individual	Colilert-18 hour	>2419.6
Center	08/26/2021 11:32 AM	Individual	Colilert-18 hour	61.3
	08/26/2021	Daily Mean	Colilert-18 hour	710.639 *
	08/26/2021	30-Day Mean	Colilert-18 hour	82.8662
Right	08/24/2021 10:05 AM	Individual	Colilert-18 hour	224.7
Center	08/24/2021 10:02 AM	Individual	Colilert-18 hour	231
Left	08/24/2021 10:00 AM	Individual	Colilert-18 hour	1046.2
	08/24/2021	30-Day Mean	Colilert-18 hour	53.9166
	08/24/2021	Daily Mean	Colilert-18 hour	378.684 *
Right	08/17/2021 10:05 AM	Individual	Colilert-18 hour	4.1
Center	08/17/2021 10:02 AM	Individual	Colilert-18 hour	1
Left	08/17/2021 10:00 AM	Individual	Colilert-18 hour	25.3
	08/17/2021	Daily Mean	Colilert-18 hour	4.6986
	08/17/2021	30-Day Mean	Colilert-18 hour	40.8644
Right	08/10/2021 10:05 AM	Individual	Colilert-18 hour	57.3

Center	08/10/2021 10:02 AM	Individual	Colilert-18 hour	40.8
Left	08/10/2021 10:00 AM	Individual	Colilert-18 hour	95.9
	08/10/2021	30-Day Mean	Colilert-18 hour	59.0708
	08/10/2021	Daily Mean	Colilert-18 hour	60.7497
Right	08/03/2021 10:04 AM	Individual	Colilert-18 hour	107.6
Center	08/03/2021 10:02 AM	Individual	Colilert-18 hour	104.6
Left	08/03/2021 10:00 AM	Individual	Colilert-18 hour	105
	08/03/2021	Daily Mean	Colilert-18 hour	105.725
	08/03/2021	30-Day Mean	Colilert-18 hour	67.7077
Right	07/27/2021 10:04 AM	Individual	Colilert-18 hour	41.4
Center	07/27/2021 10:02 AM	Individual	Colilert-18 hour	29.9
Left	07/27/2021 10:00 AM	Individual	Colilert-18 hour	51.2
	07/27/2021	30-Day Mean	Colilert-18 hour	86.438
	07/27/2021	Daily Mean	Colilert-18 hour	39.8701
Left	07/20/2021 10:05 AM	Individual	Colilert-18 hour	157.6
Right	07/20/2021 10:04 AM	Individual	Colilert-18 hour	66.3
Center	07/20/2021 10:02 AM	Individual	Colilert-18 hour	81.3
	07/20/2021	Daily Mean	Colilert-18 hour	94.708
	07/20/2021	30-Day Mean	Colilert-18 hour	139.903 *
Right	07/13/2021 10:04 AM	Individual	Colilert-18 hour	22.8
Center	07/13/2021 10:02 AM	Individual	Colilert-18 hour	24.6
Left	07/13/2021 10:00 AM	Individual	Colilert-18 hour	46.5
	07/13/2021	30-Day Mean	Colilert-18 hour	211.975 *
	07/13/2021	Daily Mean	Colilert-18 hour	29.6557
Center	07/06/2021 10:02 AM	Individual	Colilert-18 hour	104.3
Left	07/06/2021 10:00 AM	Individual	Colilert-18 hour	149.7
Right	07/06/2021 10:00 AM	Individual	Colilert-18 hour	111.2
	07/06/2021	Daily Mean	Colilert-18 hour	120.19
	07/06/2021	30-Day Mean	Colilert-18 hour	364.079 *
Right	06/29/2021 10:04 AM	Individual	Colilert-18 hour	325.5
Center	06/29/2021 10:02 AM	Individual	Colilert-18 hour	410.6
Left	06/29/2021 10:00 AM	Individual	Colilert-18 hour	344.8
	06/29/2021	Daily Mean	Colilert-18 hour	358.519 *
Right	06/22/2021 10:04 AM	Individual	Colilert-18 hour	325.5
Center	06/22/2021 10:02 AM	Individual	Colilert-18 hour	435.2
Left	06/22/2021 10:00 AM	Individual	Colilert-18 hour	613.1
	06/22/2021	Daily Mean	Colilert-18 hour	442.85 *

Right	06/16/2021 10:04 AM	Individual	Colilert-18 hour	727
Center	06/16/2021 10:02 AM	Individual	Colilert-18 hour	866.4
Left	06/16/2021 10:00 AM	Individual	Colilert-18 hour	686.7
	06/16/2021	Daily Mean	Colilert-18 hour	756.264 *
Right	06/09/2021 10:02 AM	Individual	Colilert-18 hour	488.4
Center	06/09/2021 10:01 AM	Individual	Colilert-18 hour	344.8
Left	06/09/2021 10:00 AM	Individual	Colilert-18 hour	517.2
	06/09/2021	Daily Mean	Colilert-18 hour	443.269 *

* Indicates that the value exceeds Michigan Water Quality Standards (P323.1062) as a daily geometric mean for full body contact.

Appendix L. Approximate annual payments for Park Lake management by Bath Township

Year	Cost	Notes
2009	$9,731	Includes plant harvesting and vegetation survey, but not DEQ permit
2010	$17,069	Includes plant harvesting and vegetation survey, and DEQ permit
2011	$11,097	Itemized listing not available
2012	$10,888	Includes treatment, vegetation suvery, and DEQ permit
2013	$15,767	Includes treatment, vegetation suvery, and DEQ permit
2014	$15,630	Includes treatment, vegetation suvery, and DEQ permit
2015	$7,338	Includes treatment, vegetation suvery, and DEQ permit
2016	$20,409	Includes regular treatment plus whole-lake milfoil treatment, veg. survey, and DEQ permit
2017	$3,352	Includes treatment, vegetation suvery, but not DEQ permit. Costs much lower due to whole lake treatment previous year
2018	$6,303	Includes costs of treatment, vegetation survey, and DEQ permit paid to PLLM, and cost of lake survey by Restorative Lake Sciences.
2019	$25,000	Township budget allocated
2020	$25,000	Township budget allocated
2021	$25,000	Township budget allocated

Appendix M. Water temperature and dissolved oxygen profiles, 15 August 2018. Sampling conducted by Daniel Hayes and Susan Macias.

Deep Site: Latitude 42.790961 Longitude 84.441035					
	Dissolved Oxygen (ppm)			Temperature (°F)	
Depth (ft)	6:00 AM	6:00 PM		6:00 AM	6:00 PM
0	8.5	8.9		79.3	82.8
-3	8.4	8.7		80.4	82.8
-6	8.2	8.6		80.8	82.4
-9	5.3	4.7		79.7	79.9
-12	0.2	0.3		75.4	76.5
-15	0			71.4	
Shallow Site: Latitude 42.792083 Longitude 84.435203					
	Dissolved Oxygen (ppm)			Temperature (°F)	
Depth (ft)	6:00 AM	6:00 PM		6:00 AM	6:00 PM
0	9.3	10.1		80.8	82.8
-3	9.2	10.9		81.5	82.9

Appendix N. Results of genetic testing of watermilfoil for hybridization

Michigan Hybrid Watermilfoil Project

2018 Report for Park Lake, Clinton County

Thank you for participating in this research project! Our goals are to better understand the extent of hybrid watermilfoil in Michigan's inland lakes, and to develop effective management strategies. By collecting and submitting samples from your lake, you have helped us towards those goals. In return, we are providing these genetic analysis results for the samples you submitted.

Below, you will find a table summarizing the genetic analyses, and a map showing the locations and identity of each analyzed sample. Map points may represent multiple occurrences of a species from a single location. Locations of samples that were submitted but not analyzed, or that failed analysis, may not be included.

Hybrid watermilfoil is a cross between invasive Eurasian watermilfoil (*Myriophyllum spicatum*) and native Northern watermilfoil (*M. sibiricum*). In some cases, other native milfoil species were identified, such as variable watermilfoil (*M. heterophyllum*) or whorled watermilfoil (*M. verticillatum*). Some lakes submitted samples that were not watermilfoils at all. Occasionally, genetic analysis failed for unknown reasons; this could mean that the sample was not handled appropriately in the field, or the sample was not a milfoil. To minimize these failed analyses, careful adherence to the sampling protocol is important, including ensuring that only milfoils are submitted for analysis. Finally, for lakes that submitted many samples, we chose to analyze only a subset. That subset was enough for us to understand the extent of hybrid watermilfoil in that lake.

2018 Milfoil Genetic Analysis Summary for Park Lake, Clinton County.	
No. of samples submitted	39
No. of samples analyzed	21
Total Eurasian watermilfoil	15
Total hybrid watermilfoil (Eurasian x Northern)	0
Total Northern watermilfoil	0
Total Variable watermilfoil	0
Total Whorled watermilfoil	0
Total Failed analyses	6

Appendix O. Information on goose, swan, and sandhill crane nests along Park Lake, 2019-2021. The location of all nests (or broods) visible from kayak. Data collected by Dan Hayes 28 April 2019, 24 April 2020, and 14 April 2020.

Goose nest summary - all goose nests (or broods) visible from kayak. Dan Hayes. 28 April 2019

Nest_ID	Latitude	Longitude
Swan_A	42.787664	-84.436578
Sandhill_Crane_A	42.786353	-84.443358
Goose_2019_A	42.787664	-84.436578
Goose_2019_B	42.785606	-84.437492
Goose_2019_C	42.784881	-84.440506
Goose_2019_D	42.785511	-84.441628
Goose_2019_E	42.785869	-84.442489
Goose_2019_F	42.786522	-84.442178
Goose_2019_G	42.793503	-84.449111
Goose_2019_H	42.789250	-84.446517
Goose_2019_I	42.791961	-84.432358

Goose nest summary - all goose nests (or broods) visible from kayak. Dan Hayes. 24 April 2020

Nest_ID	Latitude	Longitude
Goose_2020_A	42.788913	84.435681
Goose_2020_B	42.787101	84.436953
Goose_2020_C	42.785574	84.437430
Goose_2020_D	42.784968	84.438198
Goose_2020_E	42.784872	84.439904
Goose_2020_F	42.784982	84.441164
Goose_2020_G	42.785558	84.441638
Goose_2020_H	42.791972	84.439853
Goose_2020_I	42.793459	84.435038

Goose nest summary - all goose nests (or broods) visible from kayak. Dan Hayes. 14 April 2021

Total route = 2.76 miles

Nest_ID	Latitude	Longitude
Goose_2021_A	42.784744	84.436972
Goose_2021_B	42.785031	84.438208
Goose_2021_C	42.784772	84.439033
Goose_2021_D	42.784819	84.441078
Goose_2021_E	42.785336	84.441528
Goose_2021_F	42.787483	84.445519
Goose_2021_G	42.789475	84.446450
Goose_2021_H	42.791461	84.445122
Goose_2021_I	42.793594	84.434311

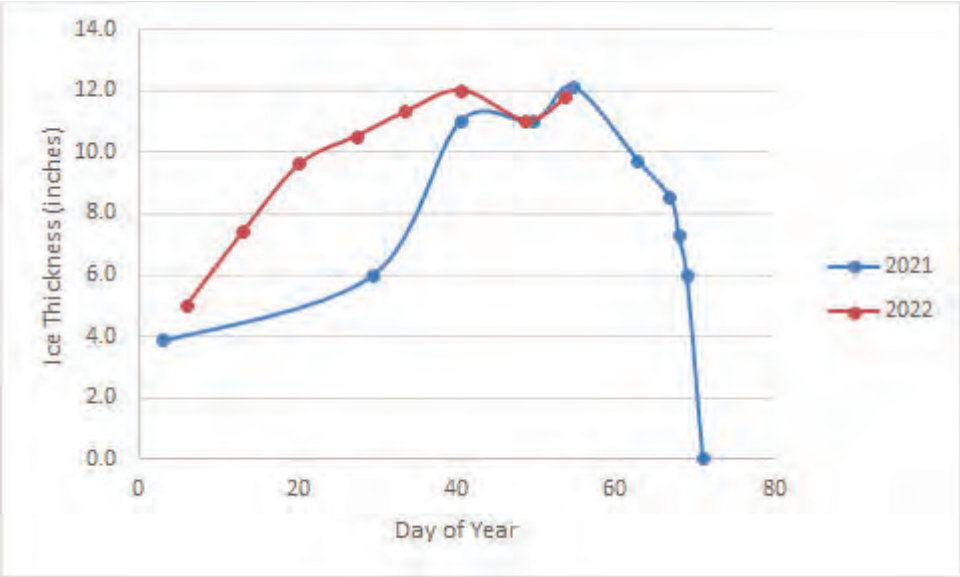
Appendix P. Annual planning calendar.

Park Lake Advisory Board Annual Planning Cycle 2022

Month	Planned Priority
January	Start preparations for annual report
February	Work on annual report
March	Finalize annual report
April	Discussion of macrophyte treatment and lake sampling
May	Generally cancel meeting
June	
July	
August	Submit budget request for following year Discuss results of plant survey
September	
October	
November	Plan for issues in upcoming year
December	Generally cancel meeting

Appendix Q. Approximate dates of continuous ice on and ice out on Park Lake, and graph of ice thickness 2021 and 2022.

Ice on	Ice out
	30-Mar-05
	19-Mar-11
	24-Feb-12
	29-Mar-13
	8-Apr-14
	25-Mar-15
2-Jan-16	8-Mar-16
10-Dec-16	21-Feb-17
10-Dec-17	25-Feb-18
11-Jan-19	24-Mar-19
8-Jan-20	9-Mar-20



Appendix R. Total of boat counts and percent of images with a boat present on Park Lake, May-Oct 2019 - 2021. Counts conducted via game camera mounted at 15486 Park Lake Road. Images were captured every ½ hour 6 am to 8:30 pm daily. All photographs were evaluated for 2019 and 2020, but only photos on hourly basis for 2021. Summaries exclude photographs where light conditions were too dark, or too foggy to see boats on the lake.

2019 Summaries

Count of Total Watercraft								
Month	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Grand Total
5	93	46	22	28	14	47	42	292
6	235	36	90	103	47	109	233	853
7	288	140	105	137	174	115	184	1143
8	221	84	61	52	100	177	205	900
9	70	102	20	31	28	11	67	329
10	8	9	7	9	24	19	24	100
Grand Total	915	417	305	360	387	478	755	3617

Month	Total Number of Photographs Evaluated
5	927
6	891
7	929
8	883
9	766
10	670
Grand Total	5066

Month	Percent of Time with Boat Present
5	20.2%
6	46.8%
7	60.7%
8	52.3%
9	27.8%
10	12.7%
Grand Total	38.1%

2020 Summaries

Count of Total Watercraft								
Month	Sunday	Monday	Tuesday	Wednesd	Thursday	Friday	Saturday	Grand Tot
5	149	92	49	89	59	111	151	700
6	281	149	121	82	134	91	221	1079
7	240	128	124	126	131	146	255	1150
8	185	90	64	99	57	76	236	807
9	70	50	27	29	24	36	48	284
10	10	9	3	2	2	21	15	62
Grand Total	935	518	388	427	407	481	926	4082

Month	Total Number of Photographs Evaluated		Month	Percent of Time with Boat Present
5	913		5	39.2%
6	900		6	58.2%
7	866		7	62.0%
8	838		8	52.9%
9	729		9	29.1%
10	706		10	7.1%
Grand Total	4952		Grand Total	42.9%

2021 Summaries

Month	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Grand Total
5	78	52	21	23	24	24	46	268
6	69	11	23	26	31	22	45	227
7								
8	63	26	15	15	22	26	56	223
9	38	13	8	5	10	17	9	100
10	5	9	1	5	4	3	3	30
Grand Total	**253**	**111**	**68**	**74**	**91**	**92**	**159**	**848**

Month	Total Number of Photos Evaluated
5	460
6	446
7	
8	428
9	373
10	199
Grand Total	**1906**

Month	Percent of Time with Boat Present
5	32.6%
6	32.3%
7	
8	36.9%
9	20.1%
10	13.1%
Grand Total	**29.0%**

Appendix S. Recommendation from PLAB to BOT regarding options for goose management, 26 October 2021.

October 26, 2021

Board of Trustees, Bath Township
Township Superintendent, Bath Township

Dear Members of the Board of Trustees and Superintendent Hildebrant,

The Park Lake Advisory Board met last week and discussed the issue of the prolonged beach closure that occurred this summer. All indications are that the excessive concentration of geese at the beach were the cause of the E. coli contamination detected. We offer the following recommendations to help alleviate this problem and hopefully avoid closures in the future. The following actions are listed in what we view as a priority order:

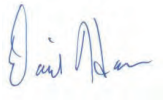
1. Consider a township ordinance prohibiting the feeding of waterfowl at the beach. This was the first year we've noted continuous feeding of geese at the beach, and sampling of E. coli in prior years did not show an elevated level. As such, simply reducing the number of geese concentrated at the beach may help to a large degree.

2. Consider employing a private company to either destroy nests or oil the eggs to reduce the production of young geese on the lake. Surveys for the past three years indicate there is a minimum of 9 goose nests on the lake each year. Because the young are flightless for a good part of the summer, this retains the adults in the area throughout the summer as well.

3. If the above two actions are insufficient to keep E. coli levels below the action limit, consider employing a private company to do a "goose round-up" to remove goose, or use dog hazing to deter them from using the beach. We feel that these actions should be considered, but only if items 1 and 2 are insufficient. Moving geese to other parts of the state may reduce the problem at Park Lake, but seems to simply displace the problem to another area. Likewise, dog hazing simply pushes geese to another part of our lake where they may cause problems on peoples' lawns.

I'd be happy to talk to the board or superintendent about these options at any time, as well as discuss potential private companies to do this work. The cost of employing a private company vary depending on the services, but preliminary indications are that it would be in the range of $500 to $2,000 per year.

Sincerely,



Daniel Hayes, Chair, Park Lake Advisory Board

Cc:
Judith Gardii, President, Friends of Park Lake

Appendix T. Recommendation by PLAB to BOT in support of funding nature trail, 26 October 2021.

October 26, 2021

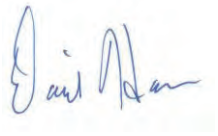
Board of Trustees, Bath Township
Township Superintendent, Bath Township

Dear Members of the Board of Trustees and Superintendent Hildebrant,

The Park Lake Advisory Board met last week and discussed the issue of the proposed nature trail along the southern edge of Park Lake. It is our understanding that some of the long-standing disputes about property rights along the terminus of Webster Road have been resolved, with the result that the landowners now acknowledge the public right of way along Webster Road and across the culvert adjacent to the water control structure. This resolution greatly reduces some of the expenses that were anticipated, and in our view makes this strong proposal increasingly feasible.

Moreover, it is our understanding that there is a substantial surplus in the line item for the 2021 Parks and Recreation budget due to the limitations that COVID put on many activities. As such, we strongly recommend that in the upcoming quarterly budget review, that a budget amendment be instituted whereby funds be dedicated toward the creation of the nature trail, in alignment with the CIP requests have been submitted, reviewed, and approved by the Planning Commission.

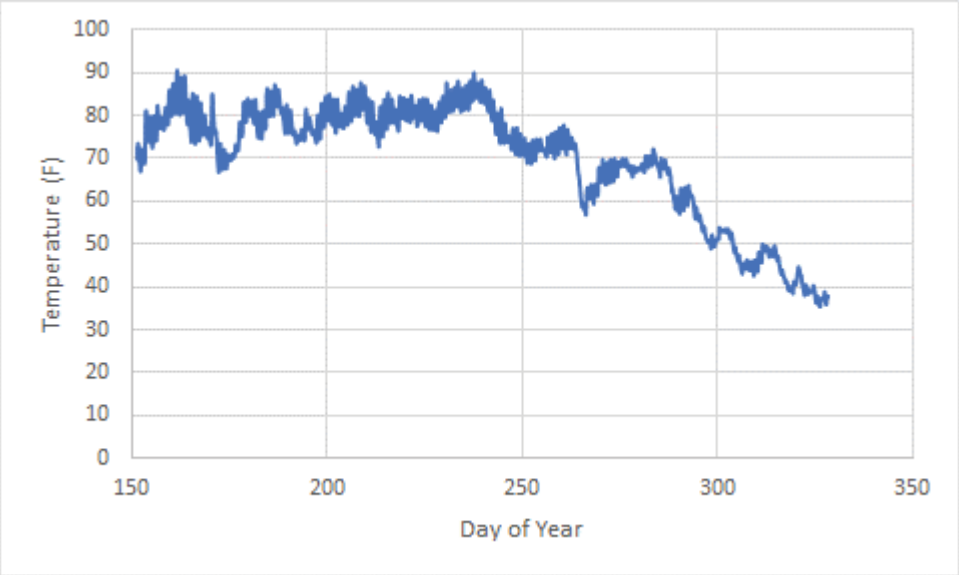
Sincerely,



Daniel Hayes, Chair, Park Lake Advisory Board

Cc:
Judith Gardii, President, Friends of Park Lake

Appendix U. Park Lake surface water temperature (measured at dock using HOBO pendant water temperature monitoring device, 15486 Park Lake Road), 2021.



Month	Mean Temperature
6	77.0
7	79.6
8	81.6
9	70.5
10	61.7
11	43.0

Appendix V. Water quality and vegetation sampling results from PLM, 2021. In the aquatic vegetation summary sheet, density category A is low, B is 2-20%, C is 20-60% and D > 60%.

Lake: Park Lake County: Clinton Survey Date : 9/16/2021

Standard Aquatic Vegetation Summary Sheet

	Sunny 65 Degrees	Total number of AVAS's for each Density Category					Calculations				Sum of Columns 5-8	Total No. of AVAS	Col 9 divided by Col 10
Code		A	B	C	D		A x 1	B x 10	C x 40	D x 80			
No	Plant Name	1	2	3	4		5	6	7	8	9	10	11
1	Eurasian watermilfoil	1	14	3	1		1	140	120	80	341	41	8.32
2	Curly leaf pondweed	0	0	0	0		0	0	0	0			
3	Chara	7	1	0	0		7	10	0	0	17	41	0.41
4	Thinleaf pondweed	0	0	0	0		0	0	0	0			
5	Flatstem pondweed	0	0	0	0		0	0	0	0			
6	Robbins pondweed	0	0	0	0		0	0	0	0			
7	Variable pondweed	2	12	2	0		2	120	80	0	202	41	4.93
8	White stem pondweed	0	0	0	0		0	0	0	0			
9	Richardsons pondweed	0	0	0	0		0	0	0	0			
10	Illinois pondweed	3	20	8	0		3	200	320	0	523	41	12.76
11	Large leaf pondweed	2	5	0	0		2	50	0	0	52	41	1.27
12	American pondweed	0	0	0	0		0	0	0	0			
13	Floating leaf pondweed	3	5	0	0		3	50	0	0	53	41	1.29
14	Water stargrass	0	0	0	0		0	0	0	0			
15	Wild celery	2	22	6	0		2	220	240	0	462	41	11.27
16	Sagittaria (submersed)	0	0	0	0		0	0	0	0			
17	Northern watermilfoil	0	0	0	0		0	0	0	0			
18	Green watermilfoil	0	0	0	0		0	0	0	0			
19	Two-leaved watermilfoil	0	0	0	0		0	0	0	0			
20	Coontail	0	0	0	0		0	0	0	0			
21	Elodea	0	7	13	6		0	70	520	480	1070	41	26.10
22	Bladderwort	4	6	0	0		4	60	0	0	64	41	1.56
23	Mini Bladderwort	0	0	0	0		0	0	0	0			
24	Buttercup	0	1	0	0		0	10	0	0	10	41	0.24
25	Naiad	6	14	1	0		6	140	40	0	186	41	4.54
26	Brittle naiad	0	0	0	0		0	0	0	0			
27	Sago Pondweed	8	21	0	0		8	210	0	0	218	41	5.32
28	Cabomba	0	0	0	0		0	0	0	0			
29	Starry Stonewart	1	10	11	4		1	100	440	320	861	41	21.00
30	Water Lily	2	8	14	10		2	80	560	800	1442	41	35.17
31	Spatterdock	0	0	3	0		0	0	120	0	120	41	2.93
32	Water shield	0	0	0	0		0	0	0	0			
33	Lemna minor	0	0	0	0		0	0	0	0			
34	Greater duckweed	0	0	0	0		0	0	0	0			
35	Watermeal	0	0	0	0		0	0	0	0			
36	Arrowhead	4	3	0	0		4	30	0	0	34	41	0.83
37	Pickerelweed	0	0	0	0		0	0	0	0			
38	Arrow arum	0	0	0	0		0	0	0	0			
39	Cattail	1	15	0	0		1	150	0	0	151	41	3.68
40	Bulrush	0	2	0	0		0	20	0	0	20	41	0.49
41	Iris	0	0	0	0		0	0	0	0			
42	Swamp loosestrife	0	6	0	0		0	60	0	0	60	41	1.46
43	Purple loosestrife	0	1	0	0		0	10	0	0	10	41	0.24
44													
45													

Total cumulative cover **143.80**

2021317

Water Quality Monitoring Report

Customer
Park Lake

Waterbody
Park Lake

Sample Information
Date: 4/22/2021

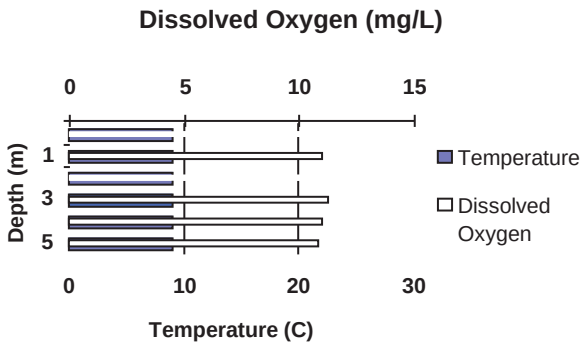
Site: Deep Hole

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen mg/L	Dissolved Oxygen %
0	9.1	11.4	99
1	9.1	11.0	96
2	9.0	11.0	96
3	9.0	11.3	98
4	9.0	11.0	95
5	9.0	10.9	94

Secchi Disk Depth 3.0 meters

Thermocline Depth meters



Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli		CFU/100 mL	N/A
Conductivity	453	uS/cm	Moderate concentration of dissolved salts
Total Dissolved Solids	294	mg/L	
pH	889.0	S.U.	ERROR
Alkalinity	149	mg CaCO3/L	Water is hard
Total Phosphorus	10	ug/L	Slightly phosphorus enriched
Nitrates	230	ug/L	Not nitrogen enriched
Chlorophyll	N/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	44	mesotrophic
Based on Total Phosphorus	33	meso-oligotrophic
Based on Chlorophyll	N/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Phosphorus and Nitrogen are within acceptable limits.
- No remedial action recommended at this time.
- Repeat LakeCheck in Fall.

- WARNING, condition requires immediate attention.
- CAUTION, condition requires further evaluation.
- OK, condition within acceptable limits.
- NEUTRAL, condition neither good nor bad.

Notes

Report describes conditions at the time the sample was collected.

Approved by Jaimee Desjardins Date 12/2/2021

Mrs. Jaimee Desjardins, Technical Services Manager

FROM YOUR WQ PRO DEALER

PLM Lake & Land Management Corp
P.O. Box 132
Caledonia MI 49316-
Phone: (616) 891-1294

2021318

Water Quality Monitoring Report

Customer
Park Lake

Waterbody
Park Lake

Sample Information
Date: 9/16/2021

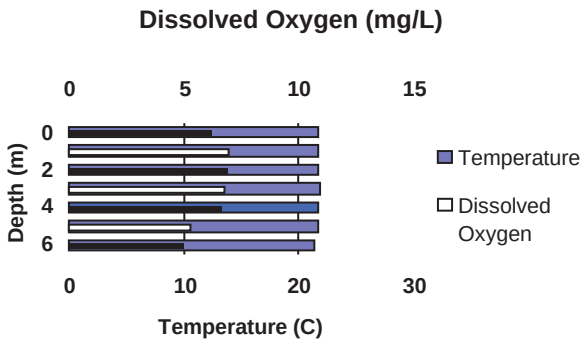
Site: Deep Hole

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen mg/L	Dissolved Oxygen %
0	21.7	6.2	70
1	21.7	6.9	79
2	21.7	6.8	80
3	21.8	6.7	78
4	21.7	6.6	75
5	21.7	5.3	66
6	21.3	5.0	57

Secchi Disk Depth 4.0 meters

Thermocline Depth meters



Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli		CFU/100 mL	N/A
Conductivity	436	uS/cm	Moderate concentration of dissolved salts
Total Dissolved Solids	283	mg/L	
pH	8.1	S.U.	Water is slightly alkaline
Alkalinity	115	mg CaCO3/L	Water is soft
Total Phosphorus	15	ug/L	Moderately phosphorus enriched
Nitrates	100	ug/L	Not nitrogen enriched
Chlorophyll	N/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	40	mesotrophic
Based on Total Phosphorus	39	mesotrophic
Based on Chlorophyll	N/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Phosphorus and Nitrogen are within acceptable limits.
- No remedial action recommended at this time.
- REPEAT LakeCheck NEXT YEAR!

- WARNING, condition requires immediate attention.
- CAUTION, condition requires further evaluation.
- OK, condition within acceptable limits.
- NEUTRAL, condition neither good nor bad.

Notes

Report describes conditions at the time the sample was collected.

Approved by Jaimee Desjardins Date 12/2/2021

Mrs. Jaimee Desjardins, Technical Services Manager

FROM YOUR WQ PRO DEALER

PLM Lake & Land Management Corp
P.O. Box 132
Caledonia MI 49316-
Phone: (616) 891-1294