2015 Lake Massapoag Water Monitoring Data

The purpose of this memo is to document lake monitoring conducted during 2015 by the Lake Management Study Committee. In-situ measurements of water chemistry parameters were conducted off the boat launch dock, swim dock, and within the lake from a kayak. The monitoring was conducted using a YSI Professional Plus handheld multi-parameter meter (https://www.ysi.com/proplus) or YSI 556 handheld multi-parameter instrument (https://www.ysi.com/556).

These instruments are owned by a local environmental equipment firm which specializes in rentals of water quality meters. The instruments are serviced and calibrated by the environmental equipment firm prior to delivery to the end user. Prior to use, the end user (the Lake Management Study Committee) also performed a field calibration of the dissolved oxygen and pH probes following the equipment manufacturer's specification. At the end of each monitoring event, a calibration check was also conducted. Generally, these calibration checks did not identify any significant drift in meter measurements during the monitoring events.

Monitoring data is presented on Table 1, 1A, and 1B (temperature, dissolved oxygen, and pH measurements recorded off the boat launch dock and swim dock) and Table 2 (temperature, dissolved oxygen, and pH measurements recorded at specific locations within the lake). GPS coordinates of the sampling locations were recorded.

Generally, the monitoring measured dissolved oxygen levels ranging from about 5.7 milligrams per liter (mg/L) to 10 mg/L and pH ranging from about 6.6 to 8 standard units in surface water (0 to 2 meters below the lake surface).

For reference, historical pH measurements obtained from the Massachusetts Water Resources Research Center Acid Rain Monitoring Project and Lake Massapoag Diagnostic / Feasibility Report dated October 1982) are provided on Table 3.

For comparison purposes, warm water fish (perch and largemouth bass) need dissolved oxygen levels above 5 mg/L and cold water fish (trout) generally need dissolved oxygen levels above 6.5 mg/L. The measured pH is about neutral (for reference, "pure" rain that is not impacted by pollution has a pH of 5.6 and acid rain has a pH around 4; the lake's pH reflects the buffering capacity of the soil in the watershed).

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Lake Management Study Committee
December 1, 2015

Table 1: Boat Launch Dock Temperature, Dissolved Oxygen, and pH Measurements
Lake Massapoag, Sharon, MA

Sample Location: Boat Launch Dock, Surface Water (upper 1 meter)

Date	Temp (°C)	Temp (°F)	DO (mg/L)	pH
June 27, 2015	24.6	76.3	8.3	8
June 28, 2015	22.6	72.7	7.4	7.4
August 20, 2015	28.2	82.8	6.2	6.8
August 21, 2015	26.8	80.2	5.7	7
September 1, 2015	27.6	81.7	6.9	7.4
September 2, 2015	25.1	77.2	6.3	7.1
September 18, 2015	25.2	77.4	8	7.5
September 19, 2015 (7 AM)	22.9	73.2	6.7	6.9
September 19, 2015 (3:30 PM)	26.1	79.0	8.5	8
September 20, 2015	23.6	74.5	5.8	6.6
October 1, 2015	15.7	60.3	8.1	6.7
October 2, 2015 (10:45 AM)	15.3	59.5	8	7.3
October 2, 2015 (4:45 PM)	15.2	59.4	8	7.7
October 3, 2015 (9:45 AM)	14.4	57.9	8.5	7
October 3, 2015 (4:45 PM)	14.8	58.6	8.6	7.1

Table 1A: Swim Dock Temperature, Dissolved Oxygen, and pH Measurements
Lake Massapoag, Sharon, MA

Sample Location: Swim Dock, Surface Water (surface)

Date	Temp (°C)	DO (mg/L)	pH
June 27, 2015			
June 28, 2015			
August 20, 2015			
August 21, 2015			
September 1, 2015			
September 2, 2015			
September 18, 2015	25.3	8.2	7.4
September 19, 2015 (7 AM)	NM	NM	NM
September 19, 2015 (3:30 PM)	NM	NM	NM
September 20, 2015	23.6	7.2	7.1
October 1, 2015	16.4	8.2	6.9
October 2, 2015 (10:45 AM)	15.2	7.9	7.5
October 2, 2015 (4:45 PM)	15	8.3	7.1
October 3, 2015 (9:45 AM)	14.4	8.7	7.5
October 3, 2015 (4:45 PM)	14.9	9	7.2

Table 1B: Swim Dock Temperature, Dissolved Oxygen, and pH Measurements
Lake Massapoag, Sharon, MA

Sample Location: Swim Dock, Surface Water (1.5 meters)

Date	Temp (°C)	DO (mg/L)	pH
June 27, 2015			
June 28, 2015			
August 20, 2015			
August 21, 2015			
September 1, 2015			
September 2, 2015			
September 18, 2015			
September 19, 2015 (7 AM)			
September 19, 2015 (3:30 PM)			
September 20, 2015	23.5	7.4	7.1
October 1, 2015	NM	NM	NM
October 2, 2015 (10:45 AM)	15.1	7.9	7.4
October 2, 2015 (4:45 PM)	15	8.6	7.3
October 3, 2015 (9:45 AM)	14.4	8.7	7.3
October 3, 2015 (4:45 PM)	14.9	8.9	7.2

Table 2: Temperature, Dissolved Oxygen, and pH Measurements
Lake Massapoag, Sharon, MA

Sample Location: "Deep Hole" east of MYC

	June 27, 2015			August 20, 2015			September 1, 2015			September 2, 2015			September 19, 2015			November 7, 2015		
Depth (meters)	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH
Surface	24	8.3	NM	27.2	6.6	6.8	26.4	7.8	7.9	not measured			23.4	8.2	7.2	12.8	10	6.6
1	24	8.3	NM	27.2	6.6	6.8	26.3	7.9	7.9				23.3	8.2	7.1	12.8	10	6.6
2	23.9	8.3	7.2	27.2	6.5	6.8	25.8	7.9	7.7				22.8	7.8	7.1	12.8	10	6.6
3	23.8	8.3	NM	27.2	6.7	6.9	25.6	7.7	7.7				22.7	7.9	6.9	12.8	10	6.6
4	23.5	8.2	NM	27.2	6.7	6.9										12.8	10	6.6
5	21.2	6.5	7.2	24.2	4	6.9	(not measured below 3						(not measured below 3			12.8	9.9	6.5
6	19.5	4.7	7.1	23	2.45	6.9	meters due to device						meters due to device			12.8	9.9	6.5
7	17.9	3.1	6.8	20.7	0.75	6.7	limitations)						limitations)			12.8	9.9	6.4
8	15.7	2.4	6.6	16	0.1	6.7										12.8	9.8	6.3
9	14.2	2.2	6.4	13.6	0.1	6.6										12.7	9.8	6.2
10	12.6	2	6.2	12.9	0.1	6.4										12.2	9.8	6
11	12	1.9	NM													11.5	9.8	6.4

Sample Location: About 0.25 miles south of Memorial Park Beach and Boat Launch

	June 27, 2015			August 20, 2015			September 1, 2015			September 2, 2015			September 19, 2015			November 7, 2015		
Depth (meters)	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH
Surface	NM	NM	NM	27.4	6.7	NM	26.9	7.7	7.4	26	7.1	7.1	23.9	8.5	7.3	12.9	10	6.7
1	24	8.2	NM	27.4	6.7	NM	26.9	7.5	7.4	26	7.4	7.1	23.9	8.3	7.3	12.9	10.1	6.8
2	23.9	8.2	NM	27.5	6.8	NM	26.7	8	NM	25.9	7.3	7.1	23.9	8.5	7.3	12.9	10	6.8
3	23.7	8.2	NM	27.4	6.4	NM				25.3	6.4	7.1	23.8	8.3	7.3			
4	23.5	8	NM															
5	22.9	7.9	NM															

Sample Location: Orange buoys off Memorial Park Beach

	June 27, 2015			August 20, 2015			September 1, 2015			September 2, 2015			September 19, 2015			November 7, 2015		
Depth (meters)	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH	Temp (°C)	DO (mg/L)	pH
Surface	NM	NM	NM	28	6.8	NM	27.4	7.8	7.4	26	6.7	7.1	24.3	8.5	7.6	12.7	10	6.7
1	24	8.1	NM	28	6.7	NM	27.3	7.6	7.4	26	6.8	7.1	24	8.3	7.5	12.8	10	6.7
2							27.2	7.9	7.5	25.9	7	7	24.2	8.2	7.5	12.8	10	6.7

Table 3: Historic Surface Water pH Measurements
Lake Massapoag, Sharon, MA

Year	# of Measurements	pH		
		Minimum	Maxium	Median
1981	5	5.6	6.5	6.2
1982	2	6.2	6.3	-
1983	14	5.26	6.96	6.5
1985	1	6.92	6.92	-
1986	4	6.71	7.01	6.84
1987	4	6.65	7.31	7
1988	4	7	7.22	7.07
1989	4	7.07	7.22	7.11
1990	4	6.64	7.13	6.85
1991	4	7.04	7.28	7.17
1992	3	6.77	7.14	7.06
1993	2	5.08	6.69	-

Sources:

1 Massachusetts Water Resources Research Center Acid Rain Monitoring Project

2 Lake Massapoag Diagnostic , Feasibility Study (1982)