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2015 Eight Point Lake Water Quality Report

Clare County, Michigan

Introduction

The goal of this testing protocol was to monitor various water quality parameters of the lake, compare results to historical data, and identify any potential risks to the health of Eight Point Lake. Water samples were taken at five different locations and tested for 12 different parameters. Tests were conducted with a Hanna Multiparameter Water Quality Meter or LaMotte SMART2 Colorimeter. Test results were compared to the "2014 Eight Point Lake Water Quality Report" by LakePro, Inc.

Testing Dates

Field tests and water samples were taken on June 9th, 2015. Laboratory tests were completed on June 10th, 2015. This report describes conditions at the times the samples were taken. Historical testing dates at the end of this report.

Analyses

Water samples were tested for Temperature, Dissolved Oxygen, Total Phosphorus, Nitrates, Transparency, pH, Total Dissolved Solids, Conductivity, Alkalinity, Hardness, Salinity, and E. coli.

Water Quality Sampling Sites

The following map shows the five water quality sampling locations.

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Water Quality Results

Parameter	2015 Lakewide Average	Target Range
Temperature	71.2 ˚F	Less Than 75 ˚F
Dissolved Oxygen	8.8 mg/L	4.0 – 12.0 mg/L
Total Phosphorus	40 ppb	0 – 100 ppb
Nitrate	194 ppb	0 – 1,000 ppb
Transparency	12.1 feet	More than 6.5 feet
pH	8.1	7.0 – 9.0 S.U.
Total Dissolved Solids	82 ppm	0 – 1,000 ppm
Conductivity	164 µS	0 – 1,500 ppm
Alkalinity	74 ppm	0 – 250 ppm
Hardness	88 ppm	100 – 300 ppm
Total Salinity	80 ppm	0 – 500 ppm
E. coli	0 CFU	0 – 300 CFU
Trophic State Index – Total Phosphorus	57	Oligotrophic: 0 - 40 Mesotrophic: 40 – 50 Eutrophic: 50 – 70 Hypereutrophic: 70+
Trophic State Index – Transparency	41	

Discussion:
The results of the 2015 testing indicate the water of Eight Point Lake remains very healthy with very few concerns. The data shows that the aquatic environment is very suitable to support natural wildlife. Also, the lake is safe for recreational uses, such as swimming, boating, fishing, etc., as there are no signs of pollution.

2015 is the eighth consecutive year that LakePro tested the lake water. The accumulation of data allows us to better identify the parameters that vary each year and the parameters that are trending in a certain direction. Each successive year of testing will continue to make the analysis more accurate.

The **Temperature** is slightly higher than this time last year. As expected with water temperatures near 70°F, there were many plants already growing at the time of testing, including various pondweeds and Eurasian Milfoil. As the temperatures rise, lake water is able to hold less oxygen. Therefore, we look for water temperatures to remain low through the summer.

The **Dissolved Oxygen** concentration was at a very healthy level. There is enough oxygen in the water to support a healthy fish population. It is important that the lake has sufficient oxygen in the spring to support the fishery through the warmer summer months.

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The **Total Phosphorus** spiked in 2010 and has remained low since then. The general decrease in phosphorus around the lake is a positive sign for the lake and shows good stewardship by the homeowners around the lake. **Nitrate** follows the same pattern. All of the nutrient concentrations are within the target ranges. However, it is important to ensure all residents are practicing lake-safe methods regarding lawn fertilizers, yard waste, tree leaves, pet droppings, septic systems, and any other possible source of nutrients that might reach the lake.

Transparency increased slightly since last year and is still trending upward since testing began in 2008. Water clarity is important to maintain the visual water quality of the lake. However, increased clarity allows more sunlight penetration, which warms the water and promotes and plant growth. The transparency is very good for a developed inland lake and is typical of a *mesotrophic lake*.

pH fluctuated from last year but is still decreasing over the course of our testing. Rain water is slightly acidic and decreases the pH as it enters into the lake in spring and early summer. Increases of dissolved oxygen and carbonate ions will drive the pH upward.

The **Total Dissolved Solids** and **Conductivity** decreased since last year, but have remained relatively steady since testing began. Heavy snowmelt and spring rains may have helped dilute and flush the lake of excess substances, lowering these parameters.

Alkalinity is a measure of the carbonate ions in the lake. These ions buffer against changes in pH, but are used up at acidic water comes into the lake. One of the most common sources of carbonate is groundwater that has come into contact with calcium carbonate (limestone). Calcium, magnesium, and other minerals are measured as **Hardness**, which normally changes similarly to alkalinity.

Both of these parameters decreased slightly from last year. This shows that the input of runoff (low pH rainwater) is outweighing the groundwater inputs of the lake (higher pH and carbonate).

The total **Salinity** increased slightly from last year, but is still much lower than when we began testing this parameter. During the strong winter, it is likely that more road salt was put down, which eventually entered the lake. But the snow melt and spring rains can help flush salts out of the lake before they have a chance to settle in the deep holes of the lake.

Finally, there were no ***E. coli*** present in any of the water samples collected.

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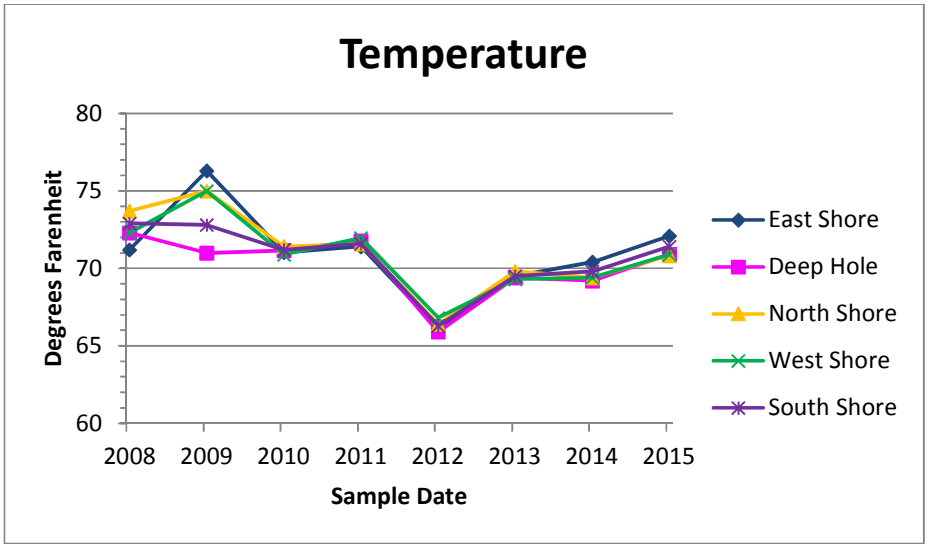
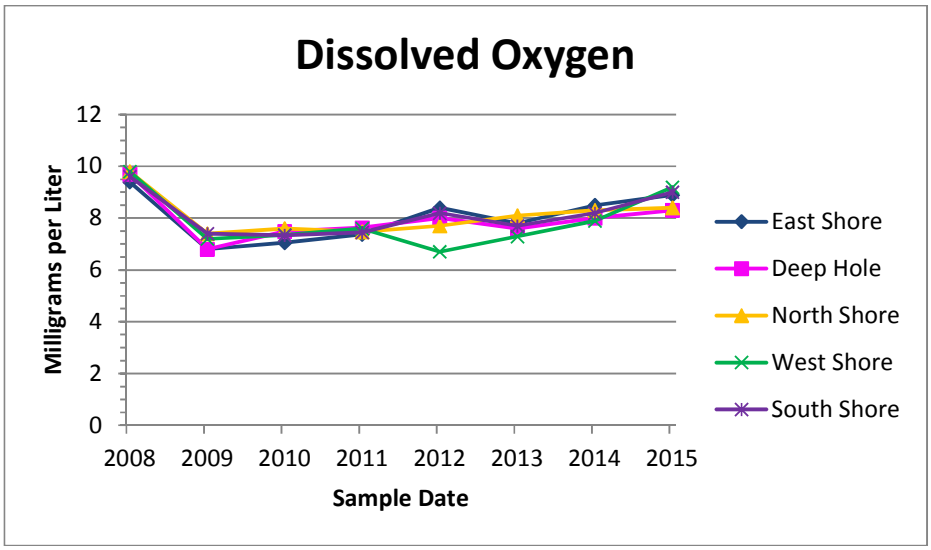
Parameter & Sampling Site Details



2015 Results	
East Shore	72.1 °F
Deep Hole	70.9 °F
North Shore	70.8 °F
West Shore	70.9 °F
South Shore	71.4 °F
Lakewide Average	**71.2 °F**

Target Range: < 75˚F



2015 Results	
East Shore	8.9 mg/L
Deep Hole	8.3 mg/L
North Shore	8.4 mg/L
West Shore	9.2 mg/L
South Shore	9.0 mg/L
Lakewide Average	**8.8 mg/L**

Target Range: 4.0 – 12.0 mg/L

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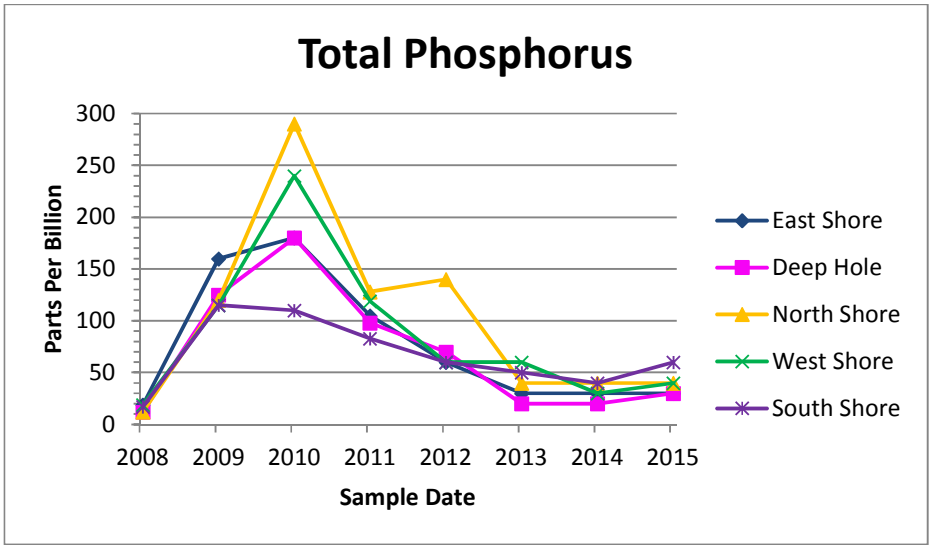
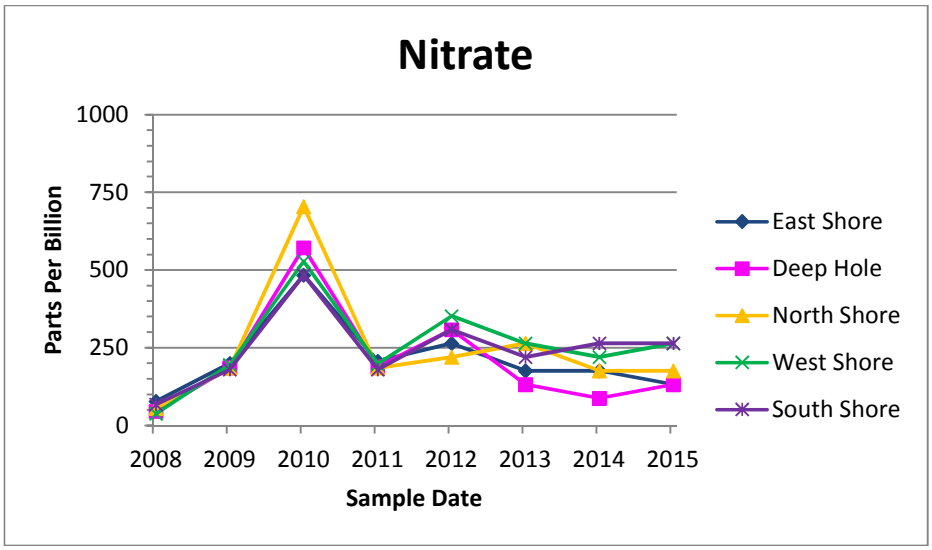


2015 Results	
East Shore	30 ppb
Deep Hole	30 ppb
North Shore	40 ppb
West Shore	40 ppb
South Shore	60 ppb
Lakewide Average	**40 ppb**

Target Range: 0 – 100 ppb



2015 Results	
East Shore	132 ppb
Deep Hole	132 ppb
North Shore	176 ppb
West Shore	264 ppb
South Shore	264 ppb
Lakewide Average	**194 ppb**

Target Range: 0 – 1,000 ppb

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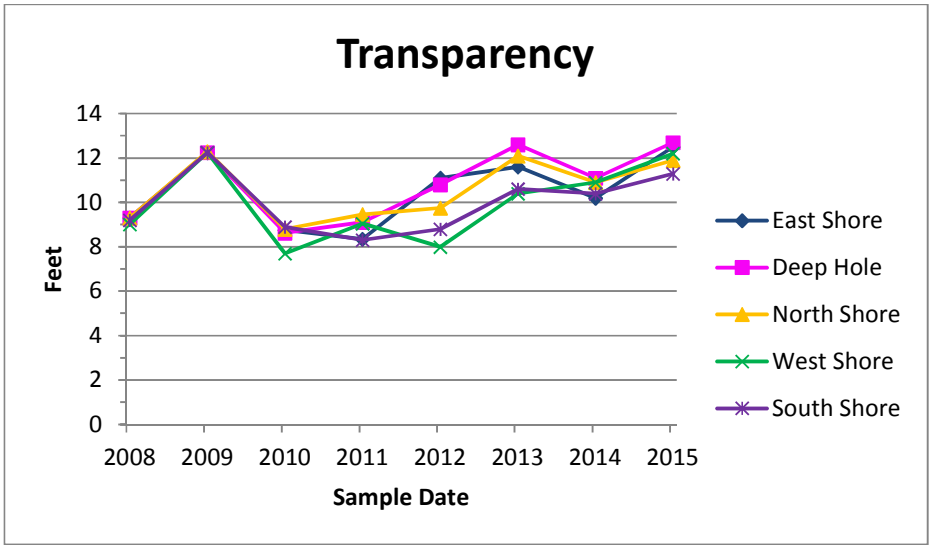
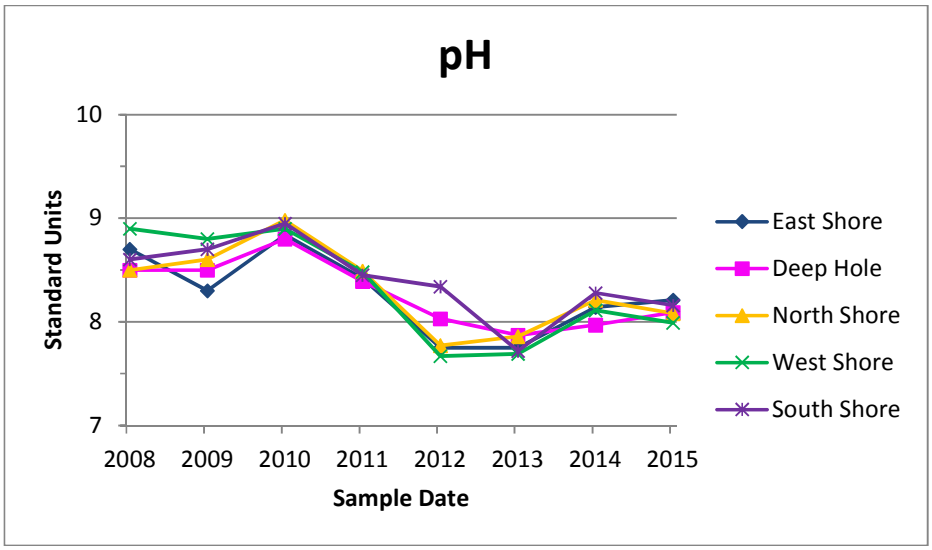


2015 Results	
East Shore	12.5 feet
Deep Hole	12.7 feet
North Shore	11.9 feet
West Shore	12.2 feet
South Shore	11.3 feet
Lakewide Average	**12.1 feet**

Target Range: More than 6.5 feet



2015 Results	
East Shore	8.2
Deep Hole	8.1
North Shore	8.1
West Shore	8.0
South Shore	8.2
Lakewide Average	**8.1**

Target Range: 7.0 – 9.0

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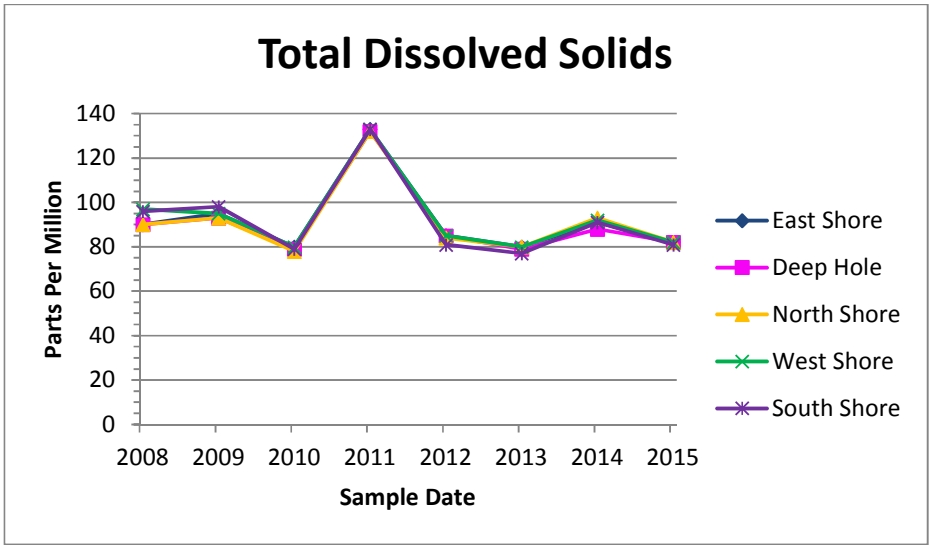
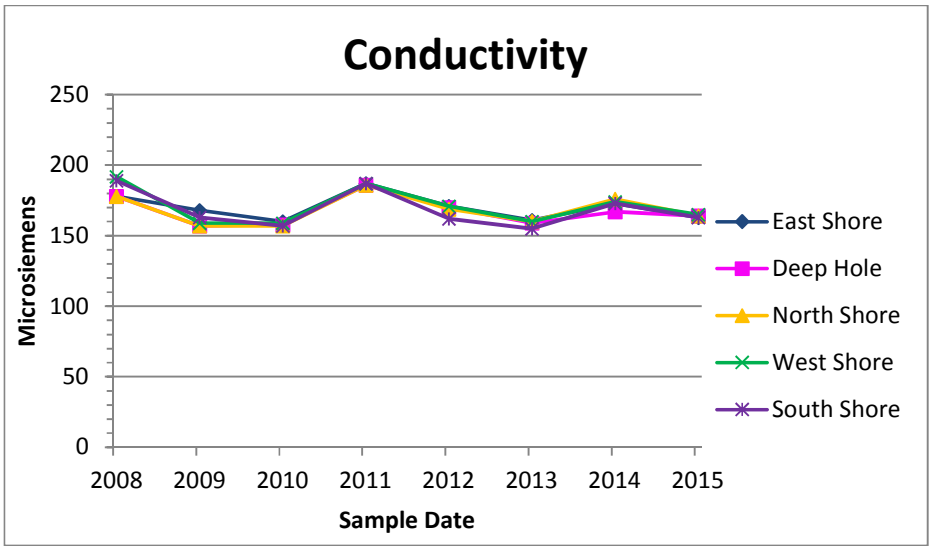


2015 Results	
East Shore	82 ppm
Deep Hole	82 ppm
North Shore	82 ppm
West Shore	82 ppm
South Shore	81 ppm
Lakewide Average	**82 ppm**

Target Range: 0 – 1,000 ppm



2015 Results	
East Shore	163 µS
Deep Hole	164 µS
North Shore	164 µS
West Shore	165 µS
South Shore	163 µS
Lakewide Average	**164 µS**

Target Range: 0 – 1,500 µS

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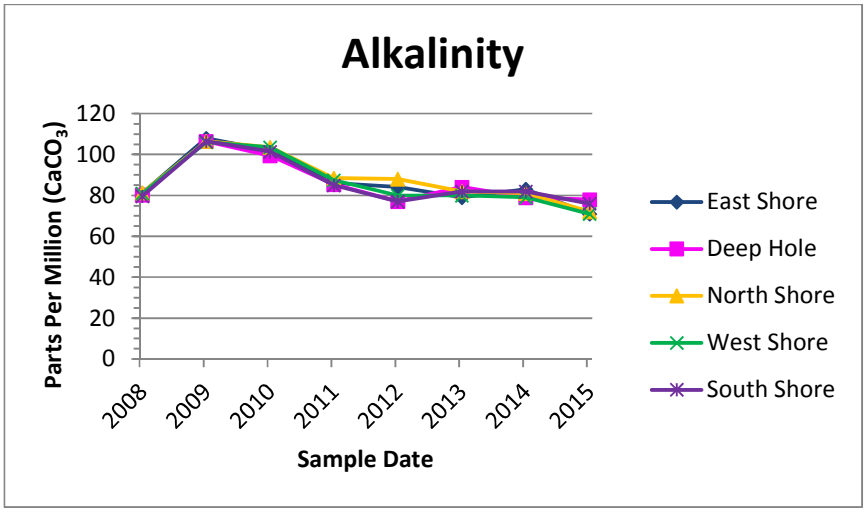
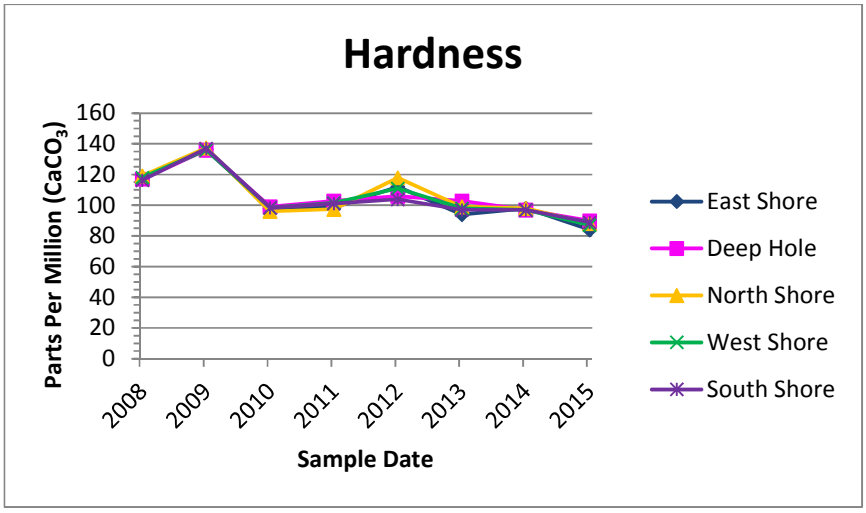


2015 Results	
East Shore	71 ppm
Deep Hole	78 ppm
North Shore	72 ppm
West Shore	71 ppm
South Shore	76 ppm
Lakewide Average	**74 ppm**

Target Range: 0 – 250 ppm



2015 Results	
East Shore	84 ppm
Deep Hole	90 ppm
North Shore	88 ppm
West Shore	87 ppm
South Shore	89 ppm
Lakewide Average	**88 ppm**

Target Range: 100 – 300 ppm

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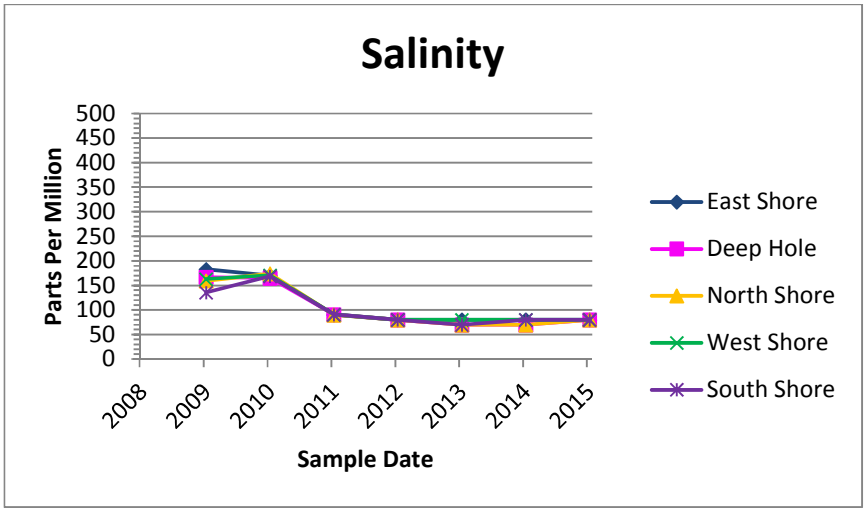
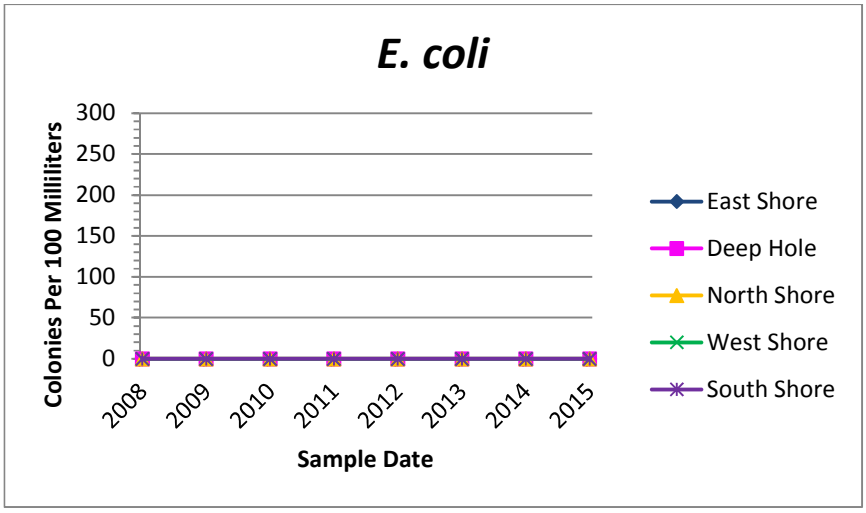


2015 Results	
East Shore	80 ppm
Deep Hole	80 ppm
North Shore	80 ppm
West Shore	80 ppm
South Shore	80 ppm
Lakewide Average	**80 ppm**

Target Range: 0 – 500 ppm



2015 Results	
East Shore	0 CFU
Deep Hole	0 CFU
North Shore	0 CFU
West Shore	0 CFU
South Shore	0 CFU
Lakewide Average	**0 CFU**

Target Range: 0 – 300 CFU

Completed and Certified by: _____ Date: July 7th, 2015

Peter Filpansick, B.S.

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Historical Test Results

Date	Sample Station	Temperature ˚F	Dissolved Oxygen mg/L	Total Phosphorus ppb	Nitrate ppb	Transparency feet	pH	TDS ppm	Conductivity µS	Alkalinity ppm	Hardness ppm	Salinity ppm	*E. coli* CFU
6/30/2008	ES	71.2	9.4	19	78	9.3	8.7	90	178	81	118	-	0
	DH	72.3	9.7	12	46	9.3	8.5	90	178	80	117	-	0
	NS	73.7	9.8	12	56	9.3	8.5	90	178	81	119	-	0
	WS	72.3	9.8	19	38	9.0	8.9	97	192	81	118	-	0
	SS	72.9	9.6	17	68	9.2	8.6	96	189	80	116	-	0
6/22/2009	ES	76.3	6.8	160	200	12.3	8.3	95	168	108	137	183	0
	DH	71.0	6.8	125	186	12.3	8.5	93	157	107	136	167	0
	NS	75.0	7.4	120	185	12.3	8.6	93	157	107	138	159	0
	WS	75.0	7.2	115	195	12.3	8.8	95	159	106	136	163	0
	SS	72.8	7.4	115	180	12.3	8.7	98	163	107	137	136	0
6/16/2010	ES	71.0	7.1	180	484	8.8	8.8	80	160	102	98	170	0
	DH	71.2	7.5	180	572	8.6	8.8	79	158	100	99	165	0
	NS	71.4	7.6	290	704	8.8	9.0	78	157	104	96	174	0
	WS	70.9	7.4	240	528	7.7	8.9	80	159	104	99	171	0
	SS	71.2	7.3	110	484	8.9	9.0	79	157	102	99	169	0
6/21/2011	ES	71.4	7.4	105	207	8.4	8.4	133	187	86	99	90	0
	DH	71.8	7.6	98	189	9.1	8.4	132	186	86	103	91	0
	NS	71.6	7.5	128	185	9.5	8.5	132	186	89	98	90	0
	WS	72.0	7.6	119	198	9.1	8.5	133	187	88	102	91	0
	SS	71.6	7.5	83	180	8.3	8.5	133	187	85	101	91	0
6/4/2012	ES	66.1	8.4	60	264	11.1	7.8	85	171	84	112	80	0
	DH	65.9	8.0	70	308	10.8	8.0	85	170	77	106	80	0
	NS	66.4	7.7	140	220	9.8	7.8	84	169	88	118	80	0
	WS	66.8	6.7	60	352	8.0	7.7	85	171	80	111	80	0
	SS	66.3	8.2	60	308	8.8	8.3	81	162	77	104	80	0
6/4/2013	ES	69.5	7.8	30	176	11.6	7.8	80	161	79	94	80	0
	DH	69.4	7.6	20	132	12.6	7.9	79	159	84	103	70	0
	NS	69.8	8.1	40	264	12.1	7.9	80	160	82	99	70	0
	WS	69.3	7.3	60	264	10.4	7.7	80	160	80	98	80	0
	SS	69.5	7.7	50	220	10.6	7.7	77	155	82	97	70	0
6/10/2014	ES	70.4	8.5	30	176	10.2	8.1	91	173	83	98	80	0
	DH	69.2	8.0	20	88	11.1	8.0	88	167	79	97	70	0
	NS	69.4	8.3	40	176	10.9	8.2	93	176	81	98	70	0
	WS	69.4	7.9	30	220	10.9	8.1	92	174	79	97	80	0
	SS	69.8	8.2	40	264	10.4	8.3	91	173	82	97	80	0
6/9/2015	ES	72.1	8.9	30	132	12.5	8.2	82	163	71	84	80	0
	DH	70.9	8.3	30	132	12.7	8.1	82	164	78	90	80	0
	NS	70.8	8.4	40	176	11.9	8.1	82	164	72	88	80	0
	WS	70.9	9.2	40	264	12.2	8.0	82	165	71	87	80	0
	SS	71.4	9.0	60	264	11.3	8.2	81	163	76	89	80	0

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Analysis Information

Temperature: The water temperature directly affects the amount of oxygen that is able to dissolve into the water. The temperature of surface waters is not indicative of the entire water column.

Dissolved Oxygen: D.O. is a measure of the amount of oxygen dissolved in the water. This oxygen is available to fish and other animals for respiration. Vegetation generally increases DO, particularly during the day and early evening. Animals and other respiring organisms consume the oxygen, mostly during the day. Oxygen is also added to the lake through wave action, rain, fountains and aerators.

Total Phosphorus: Phosphorus is an essential nutrient for plant growth. However, concentrations exceeding 100 ppb can impair the water and results in nuisance vegetation growth.

Nitrate: Nitrogen is also essential for plant growth. Nitrate is the predominant form of nitrogen in water. Excessive nitrate concentrations may also result in pollution and increased vegetation.

Transparency: The ability of light to penetrate the water column is determined by the amount of dissolved and suspended particles in the water. Although aesthetically desirable, transparent water allows increased light to reach the lake bed and may result in vegetation growth.

pH: pH is a measure of acidity or alkalinity. pH is a general measure of lake health and can roughly indicate the range of other measurements such as alkalinity and hardness.

TDS: Total Dissolved Solids is the amount of all organic and inorganic substances in the water in a molecular or ionized state. Higher values generally indicate richer and more productive water. Lower values usually indicate cleaner and less productive water.

Conductivity: Conductivity is a measure of the ability of water to conduct electricity. Dissolved ions in the water increase conductivity, thus TDS and Conductivity are closely related.

Alkalinity: Alkalinity refers to the ability of the water to neutralize acids, mainly through the hydrogenation of carbonate ions. This is why the alkalinity is expressed as “ppm as $CaCO_3$”. However, other basic molecules in the water can also contribute to alkalinity.

Hardness: Hardness is very closely related to alkalinity. It is a measure of the dissolved salts and metals in the water, including but not limited to $CaCO_3$.

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Salinity: Salinity is the measure of the dissolved salt content of water. Salinity influences the types of organisms that are able to survive in the water. Salinity also affects the chemistry of the water, and including conductivity and potability.

Fecal Coliforms: Non-fecal coliforms are naturally found as soil organisms. Fecal Coliforms, such as *E. coli*, are coliforms found in the intestines of warm-blooded animals and humans. The presence of fecal coliforms indicates contamination from either animals or humans.

Trophic States

Oligotrophic: Water is very clear. Nutrient levels are generally low. Plant and algae productivity is also low. Sufficient dissolved oxygen in the bottom, cooler waters allows cold-water fish to survive, such as salmon and trout.

Mesotrophic: Water is moderately clear. Nutrient levels are slightly elevated. Plant and algae productivity is present, but generally not a nuisance. Oxygen and temperature in the lower portion of the lake allow walleye and perch to survive.

Eutrophic: Water is not clear due to high nutrients levels, increased turbidity, and excessive algal growth. There is no oxygen in the bottom, cooler waters, restricting the lake to warm water species, such as bass and bluegill.

Hypereutrophic: Nutrient levels are extremely high, promoting very high algae productivity. Blue-green algae blooms are likely. High turbidity and algae growth make the water opaque. Little plant growth is restricted to invasive plants. The only fish that can survive this environment are rough fish, such as carp, catfish, and mudminnows.