



Orange Lake

Oakland County

Test Date: July 19th, 2012

Water Quality Test Results

Parameter	West End	East End	Target Range
Temperature	84.6 °F	87.3 °F	Less Than 80 °F
Transparency	6.65 feet	2.5 feet (Water too shallow for complete measurement)	More than 6.5 Feet
pH	8.11	8.02	7.0 – 10.0 S.U.
Total Dissolved Solids	324 ppm	315 ppm	0 – 1,000 ppm
Conductivity	642 µS	628 µS	0 – 1,500 µS
Alkalinity	128 ppm as CaCO ₃	114 ppm as CaCO ₃	0 – 250 ppm
Hardness	139 ppm as CaCO ₃	126 ppm as CaCO ₃	100 – 300 ppm
Salinity	330 ppm	330 ppm	0 – 500 ppm
Dissolved Oxygen – Concentration	6.6 mg/L	6.4 mg/L	4.0 – 12.0 mg/L
Phosphate	30 ppb	40 ppb	0 – 100 ppb
Nitrate	176 ppb	220 ppb	0 – 1,000 ppb
<i>E. coli</i>	None Detected	None Detected	0 – 300 CFU / 100 mL
Trophic State Index – Transparency	50	Water too shallow for complete measurement	Oligotrophic: 0 - 40 Mesotrophic: 40 – 50 Eutrophic: 50 – 70 Hypereutrophic: 70+
Trophic State Index – Phosphate	53	57	

Discussion

These results show that the water at Orange Lake remains healthy and suitable to support natural wildlife. As there are no signs of pollution, the water is safe for recreational uses, such as fishing and swimming.

The **pH, Total Dissolved Solids, Conductivity, Alkalinity, and Hardness** readings have varied slightly since the spring. There has been very little rain to bring new substances into the lake, so most of these parameters have decreased. All of these readings are within the target range.

The **Salinity** concentration has also decreased slightly since the spring testing. This shows us the salt in the lake is coming mainly from runoff entering the lake and not from the sediment at the bottom of the lake.

The **Dissolved Oxygen** is at adequate levels and show that the water remains suitable for a healthy fish population to survive.





The concentrations of **Nitrates and Phosphates** continue to remain at very low levels, continuing to prove that the large decreases since 2009 were not seasonal fluctuations. These results confirm that the Biological Augmentation is consuming enough nutrients to improve and maintain the health of the lake.

No *E. coli* were detected in the water samples collected.

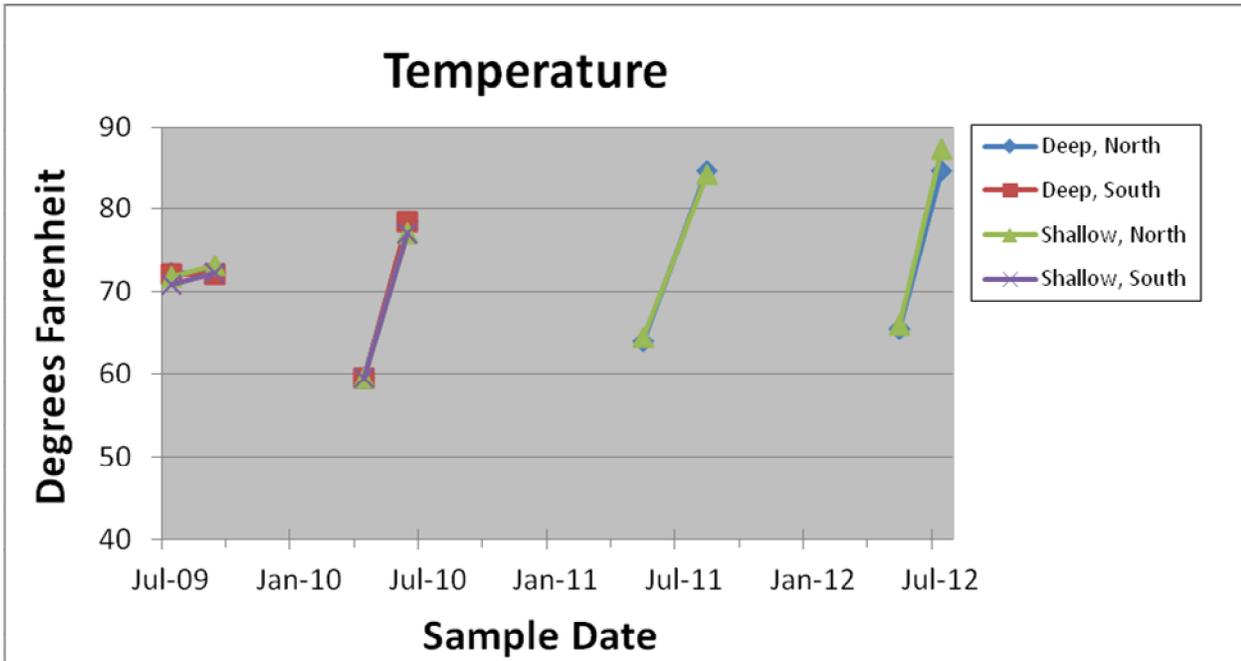
The **Trophic State Indices** show that the lake is moderately productive. TSI – Transparency uses the water clarity to approximate the amount of algae that clouds the water, but does not take into account other factors that may decrease transparency. The TSI – Phosphate indicate the amount of nutrients available to support nuisance algae growth.

Water samples were taken on 7/19/2012 at 12:00 PM. Water tests were completed on 7/20/2012 at 6:00 PM. This report describes conditions at the time the samples were taken. The quality of the water was tested only to the parameters listed above.

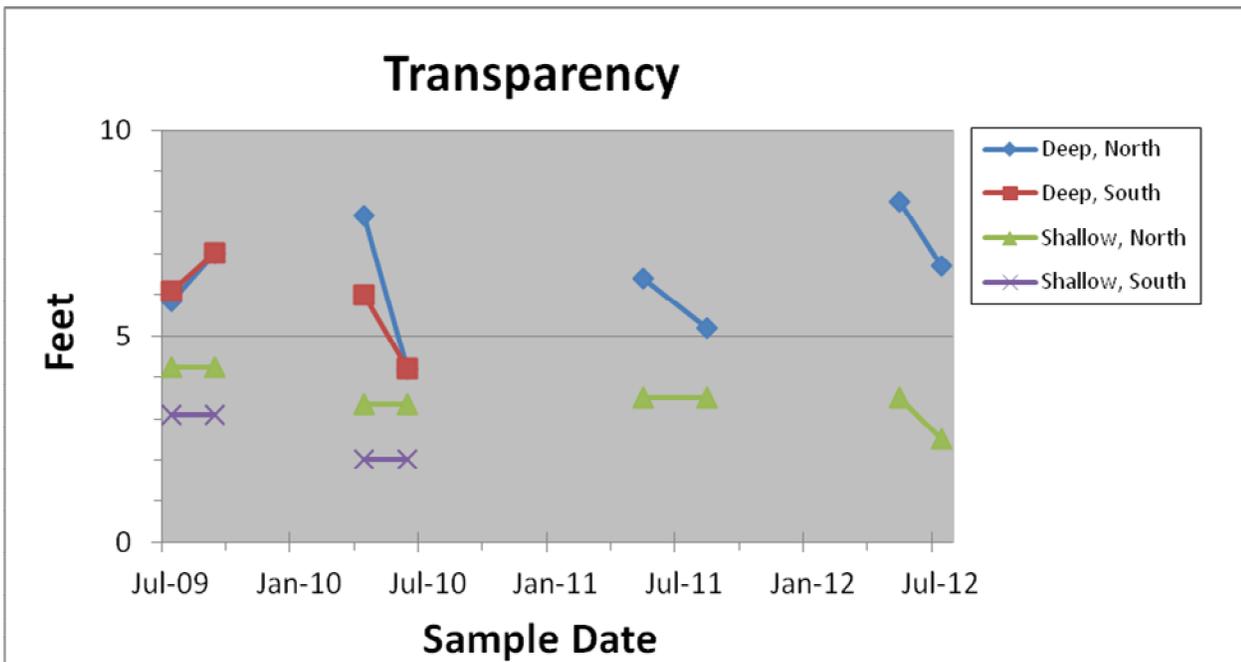
Completed and Certified by:  Date: July 23rd, 2012
Peter Filpansick, B.S.

Reviewed and Approved by:  Date: July 23rd, 2012
Paul Dominick, B.A.



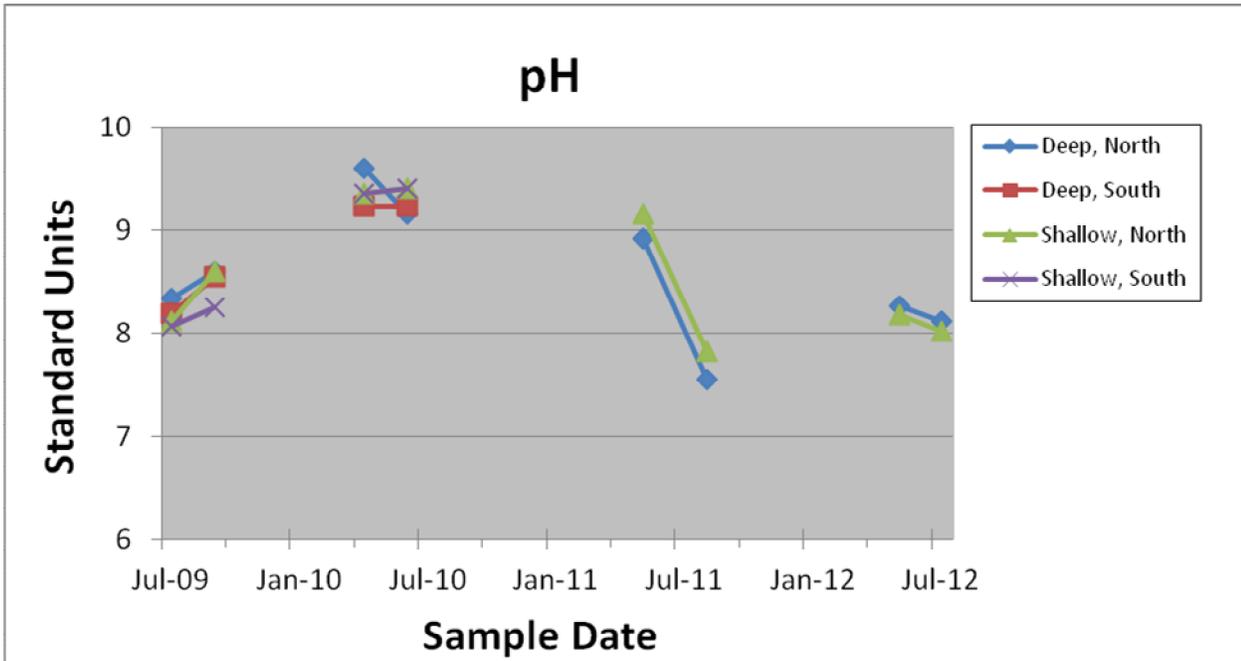


Target Range: Less Than 80 °F

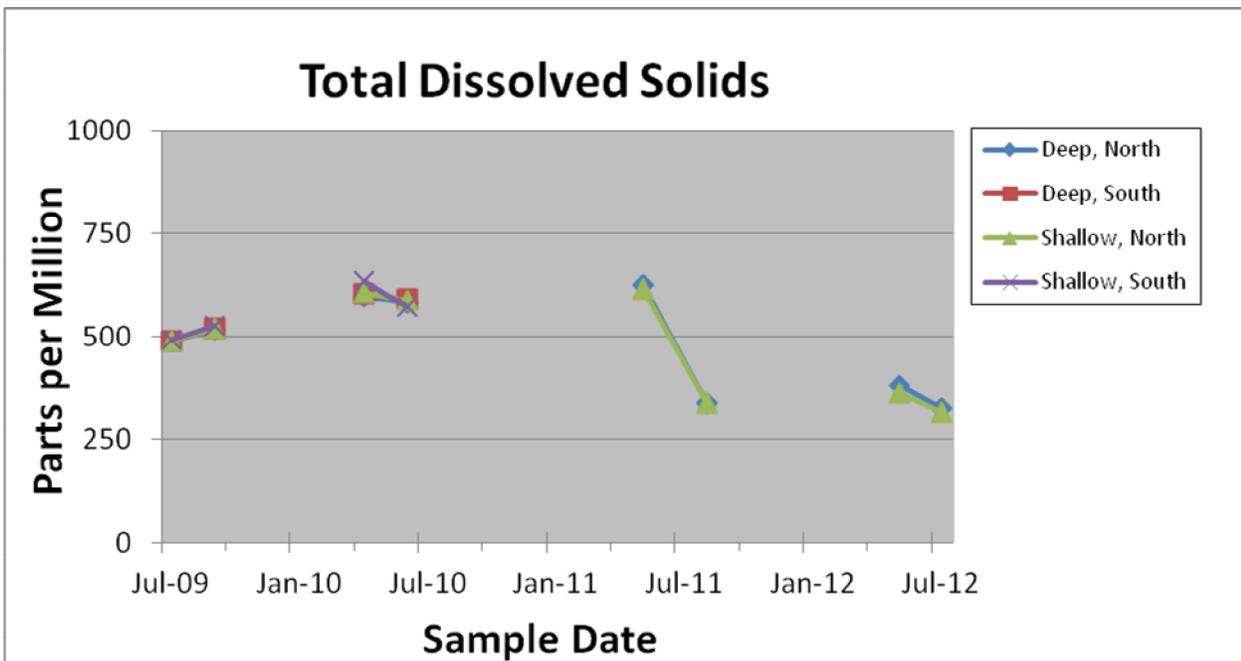


Target Range: More than 6.5 Feet



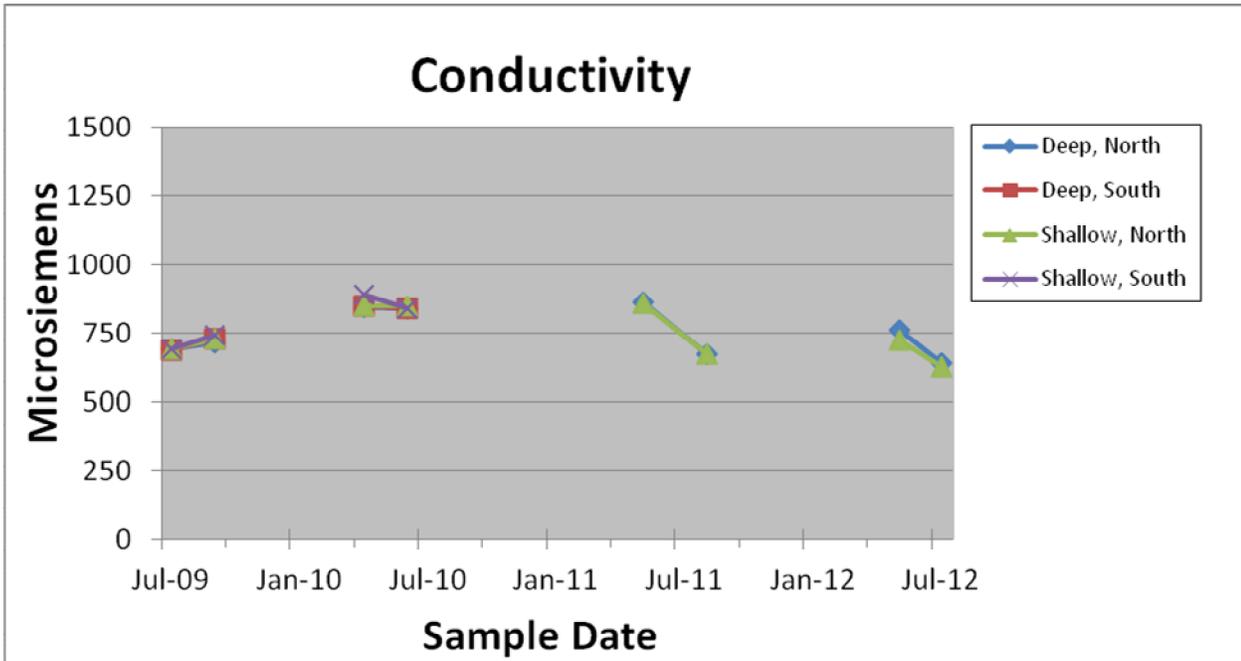


Target Range: 7.0 – 10.0 S.U.

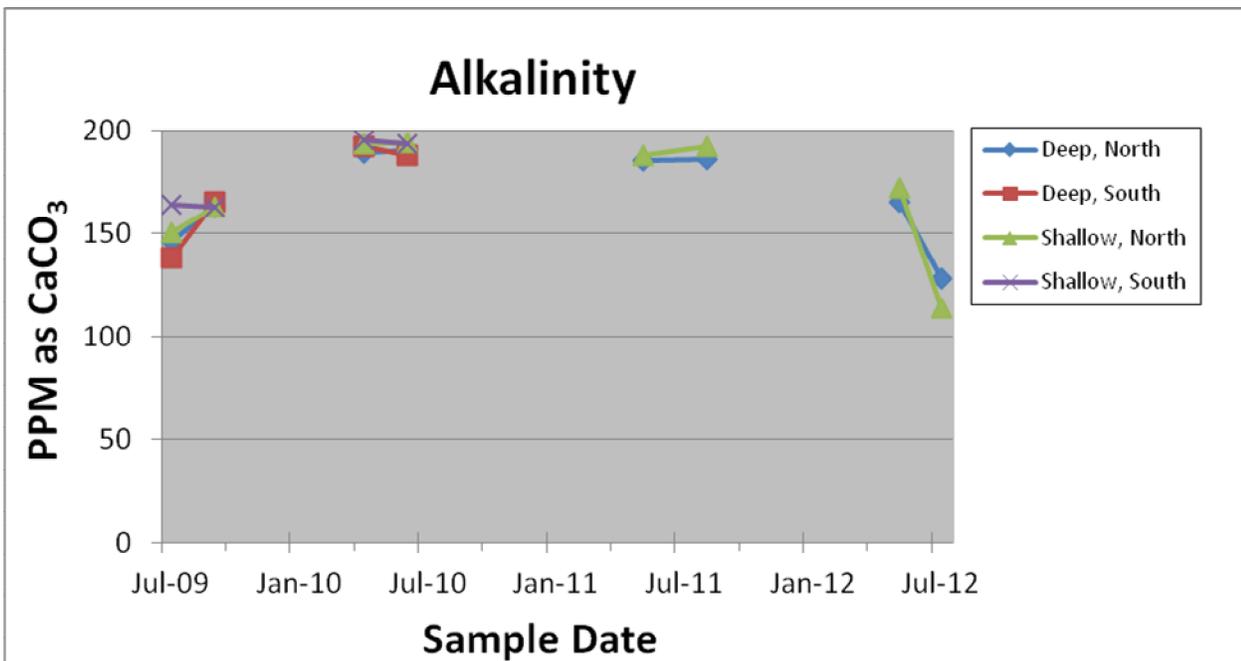


Target Range: 0 – 1,000 ppm



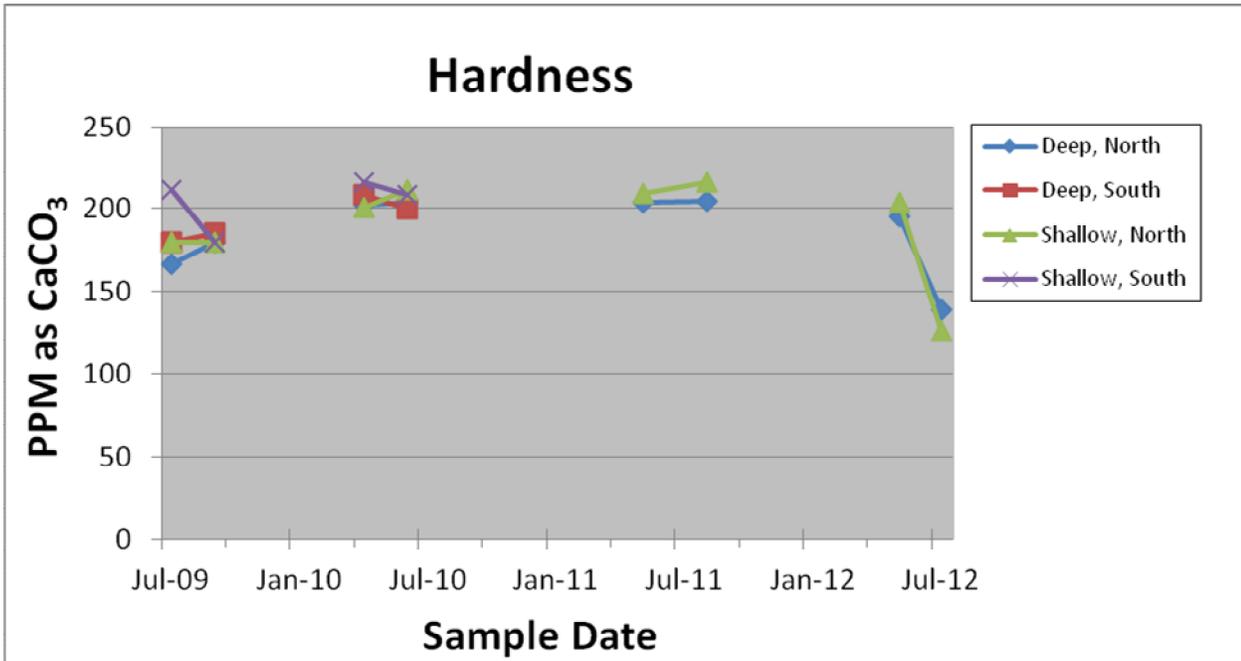


Target Range: 0 – 1,500 μ S

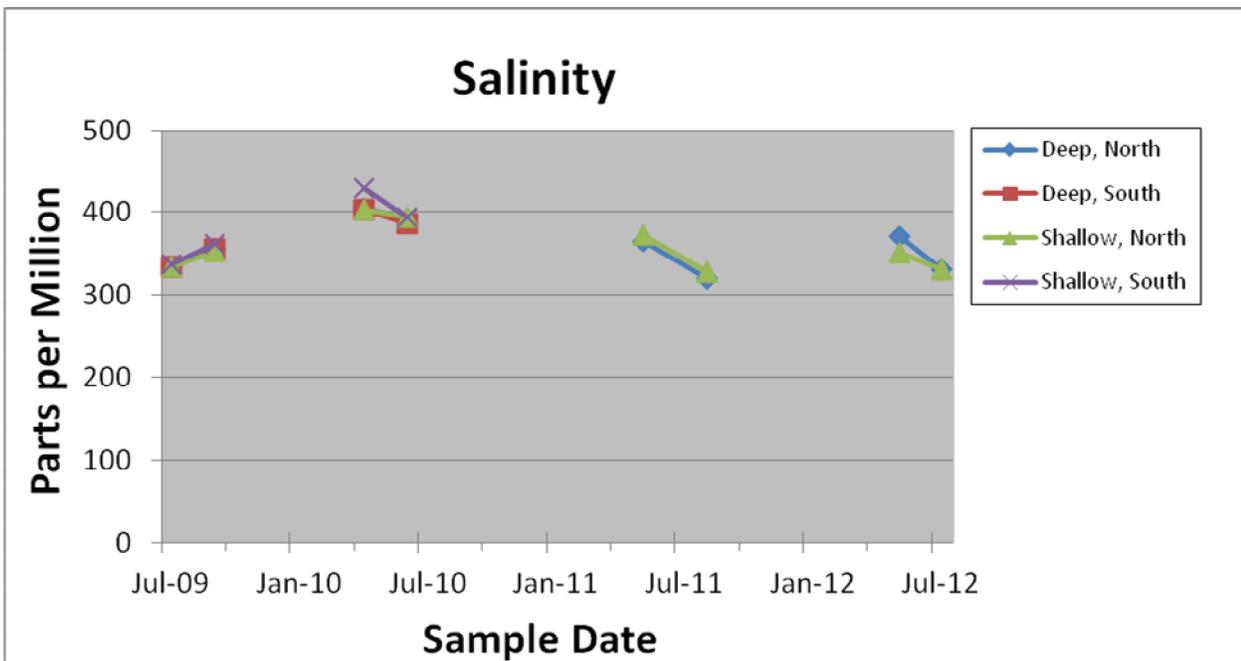


Target Range: 0 – 250 ppm



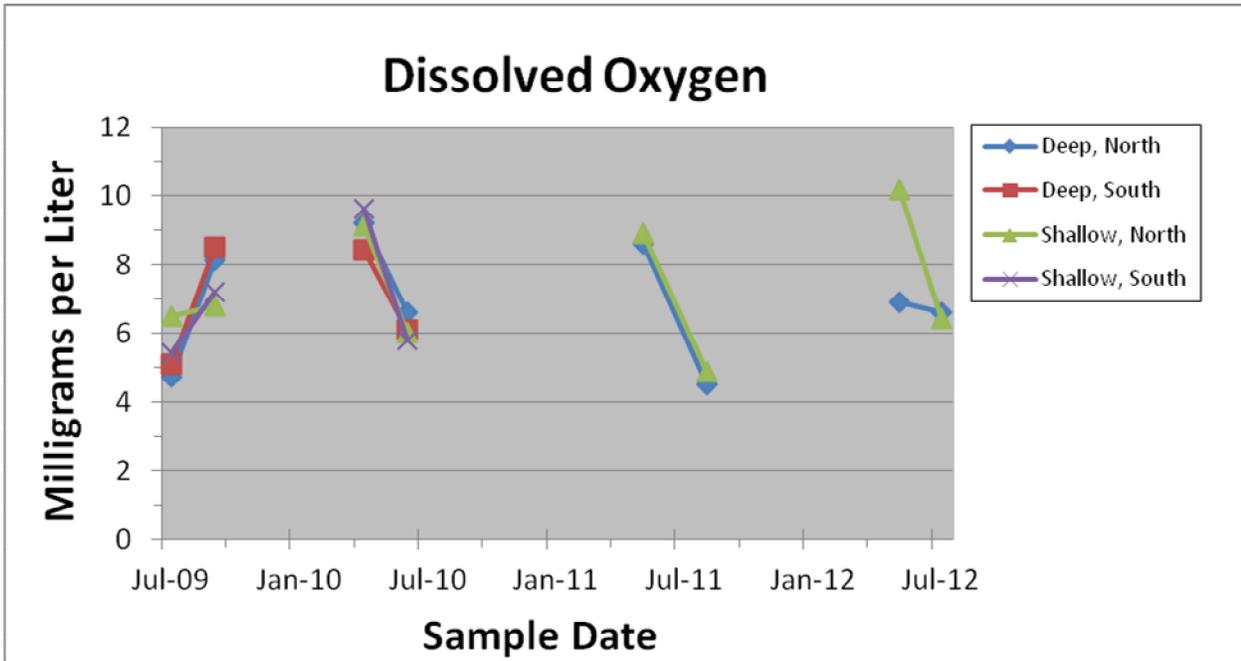


Target Range: 100 – 300 ppm

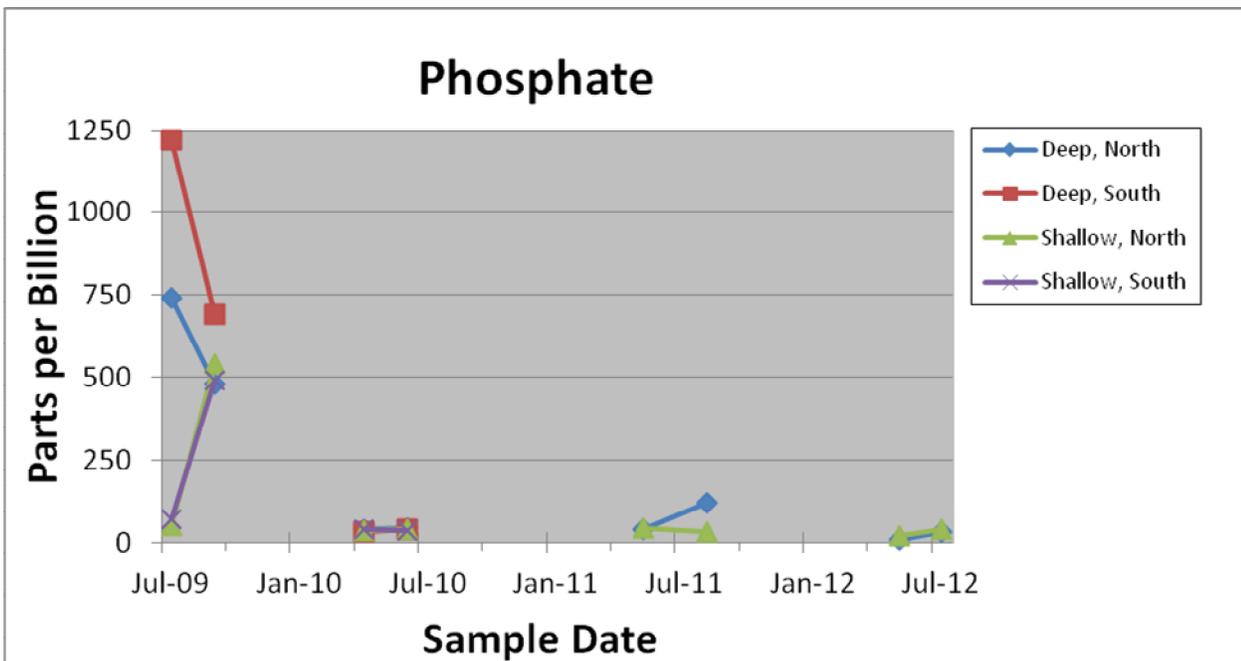


Target Range: 0 – 500 ppm



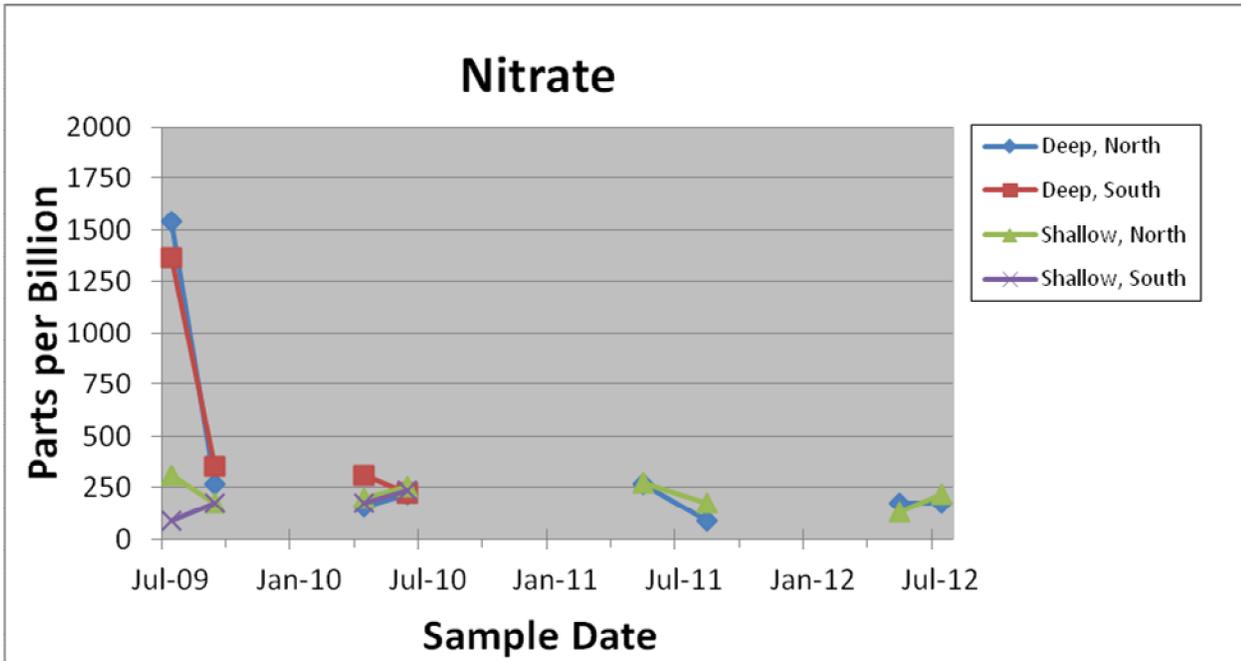


Target Range: 6 – 12 mg/L

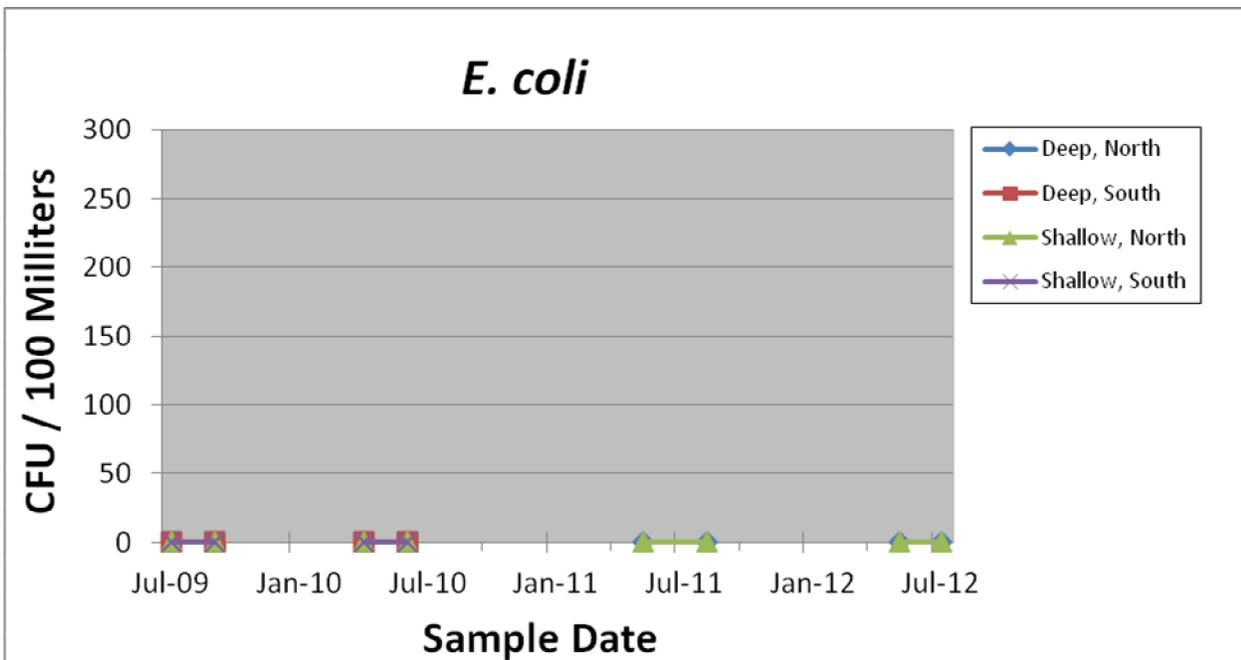


Target Range: 0 – 100 ppm





Target Range: 0 – 1,000 ppm



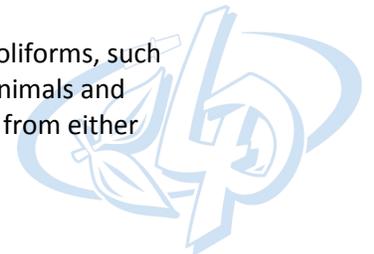
Target Range: 0 – 300 CFU / 100 mL





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.
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 bottom 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 .
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.
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.
Phosphates:	Phosphorus is an essential nutrient for plant growth. Phosphate is the form of phosphorus that is most readily available to plants and algae.
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.
Fecal Coliforms:	Non-fecal coliforms are naturally found as soil organisms. Fecal Coliforms, such as <i>E. coli</i> , 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.

