Water Quality Summary

Testing Date: **6/29/2010**

Orange Lake

Oakland County

Water Quality Test Results

Deep North

Temperature:	78.4 °F
Transparency:	4'2"
pH:	9.15
TDS:	582 ppm
Conductivity:	840 µS
Alkalinity:	190.5 ppm
Hardness:	203.5 ppm
Salinity:	392 ppm
Dissolved Oxygen:	6.6 mg/L
Nitrate:	217.0 ppb
Phosphate:	45.0 ppb
Fecal Coliforms:	None Detected

Deep South

Temperature:	78.4 °F
Transparency:	4'2"
pH:	9.23
TDS:	591 ppm
Conductivity:	539 µS
Alkalinity:	187.5 ppm
Hardness:	200.0 ppm
Salinity:	386 ppm
Dissolved Oxygen:	6.1 mg/L
Nitrate:	224.0 ppb
Phosphate:	40.0 ppb
Fecal Coliforms:	None Detected

Shallow North

Temperature:	77.0 °F
Transparency:	3'4" (Bottom)
pH:	9.40
TDS:	586 ppm
Conductivity:	847 µS
Alkalinity:	194.0 ppm
Hardness:	211.5 ppm
Salinity:	394 ppm
Dissolved Oxygen:	6.0 mg/L
Nitrate:	253.0 ppb
Phosphate:	38.0 ppb
Fecal Coliforms:	None Detected

Shallow South

Temperature:	77.0 °F
Transparency:	2'0" (Bottom)
pH:	9.40
TDS:	572 ppm
Conductivity:	839 µS
Alkalinity:	193.5 ppm
Hardness:	208.5 ppm
Salinity:	394 ppm
Dissolved Oxygen:	5.8 mg/L
Nitrate:	239.0 ppb
Phosphate:	35.0 ppb
Fecal Coliforms:	None Detected

Trophic State Indices

	Transparency	Trophic State	Total Phosphorus	Trophic State
Deep North	56	Eutrophic	57	Eutrophic
Deep South	56	Eutrophic	59	Eutrophic
Shallow North	60	Eutrophic	57	Eutrophic
Shallow South	67	Eutrophic	55	Eutrophic

Discussion

These results show that the water at Orange Lake is 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 testing event. Slight decreases suggest the lake is flushing out molecules that flowed in during the spring melt and rain events.

The **Salinity** concentration has also decreased since spring. This suggests there is no natural source of salts and the lake is flushing out the salts that came in during the spring melting.

The **Dissolved Oxygen** is at adequate levels and show that the water remains suitable for a healthy fish population to survive. As water warms, it is able to hold less oxygen than at cooler temperatures. It is important to ensure the water is well oxygenated during the warmest summer months.

The concentrations of **Nitrates and Phosphates** continue to remain at very low levels, proving that the large decrease last year was a seasonal fluctuation. These results confirm that the Biological Augmentation is consuming enough nutrients to improve and maintain the health of the lake.

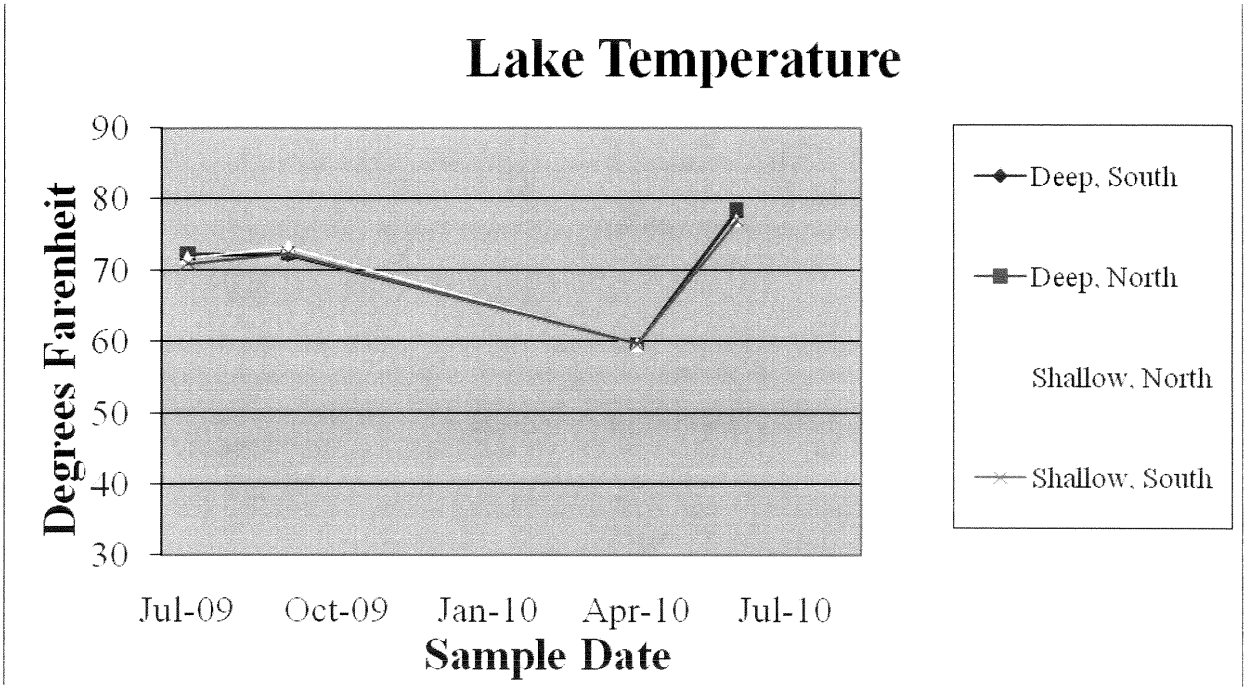
No ***E. coli*** were detected in the water samples collected. E. coli are very sparse in the open water. Furthermore, our crews have noted fewer waterfowl on the lake than in previous years.

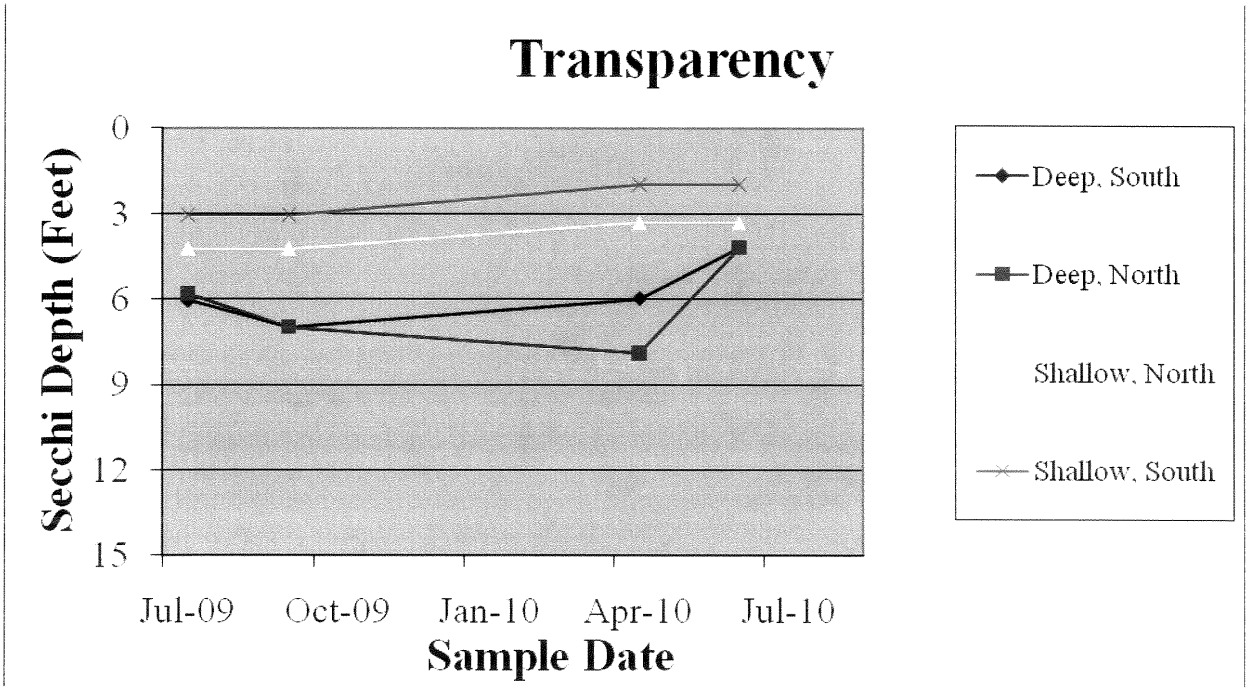
The **Trophic State Indices** show that the lake is moderately productive. TSI – Transparency uses the water clarity to approximate the amount of algae that clouds the water, but does not take into account other factors that may decrease transparency. The TSI – Total Phosphorus indicate the amount of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

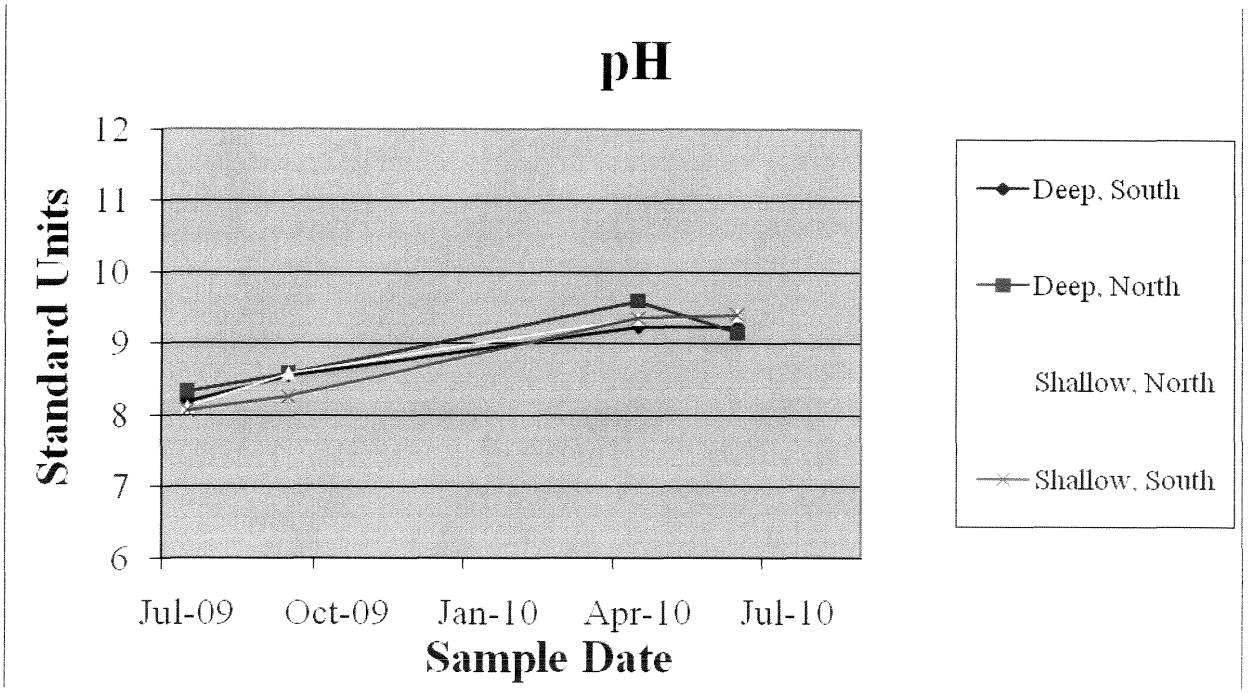
Water samples were taken on 6/29/2010 at 1:30 PM. Water tests were completed on 6/30/2010 at 7:00 AM. This report describes conditions at the time the samples were taken. The quality of the water was tested only to the parameters listed above.

Completed and Certified by: _____ Date: 7/7/2010
Peter Filpansick, B.S.

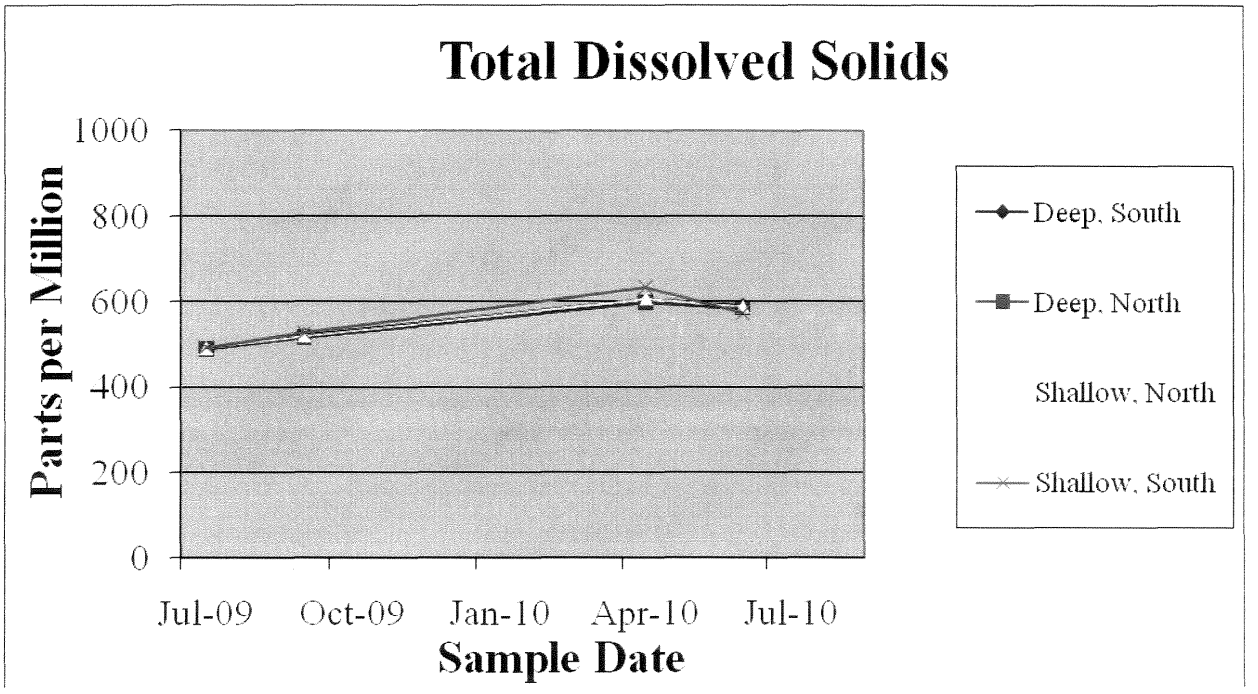
Reviewed and Approved by: _____ Date: 7/7/2010
Paul Dominick, B.A.


Lake Temperature
Degrees Farenheit
90
80
70
60
50
40
30
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Sample Date
Deep, South
Deep, North
Shallow, North
Shallow, South

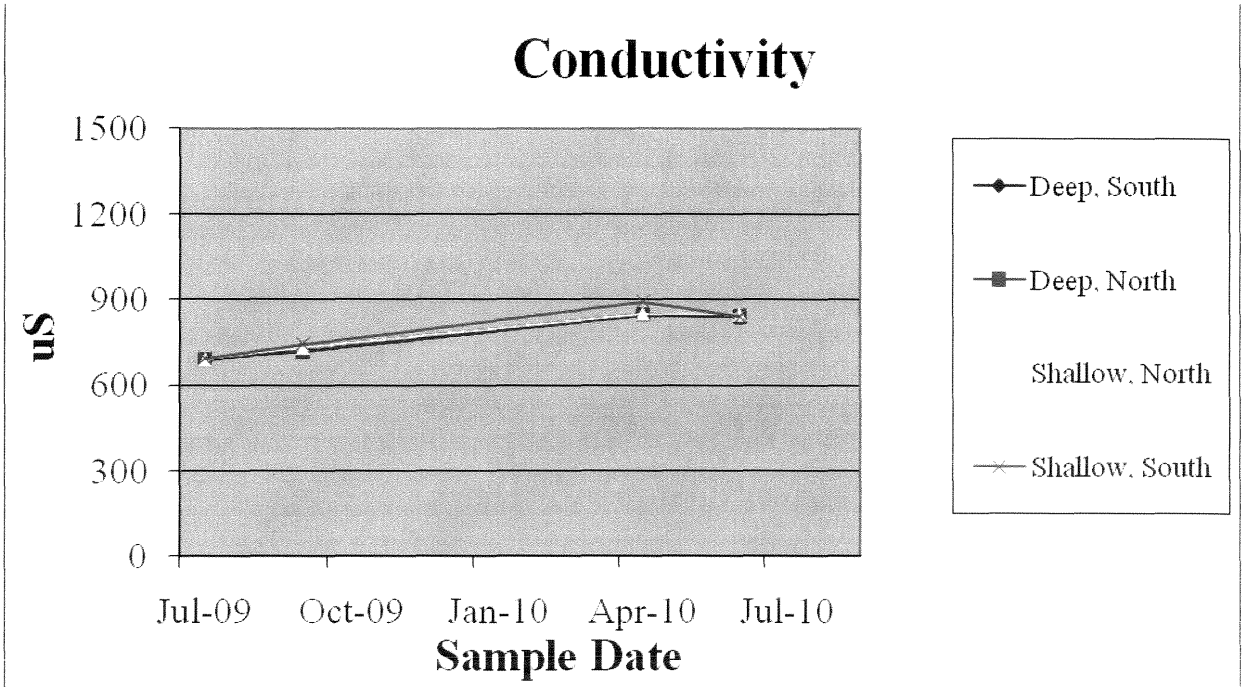

Transparency
Secchi Depth (Feet)
0
3
6
9
12
15
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Sample Date
Deep, South
Deep, North
Shallow, North
Shallow, South



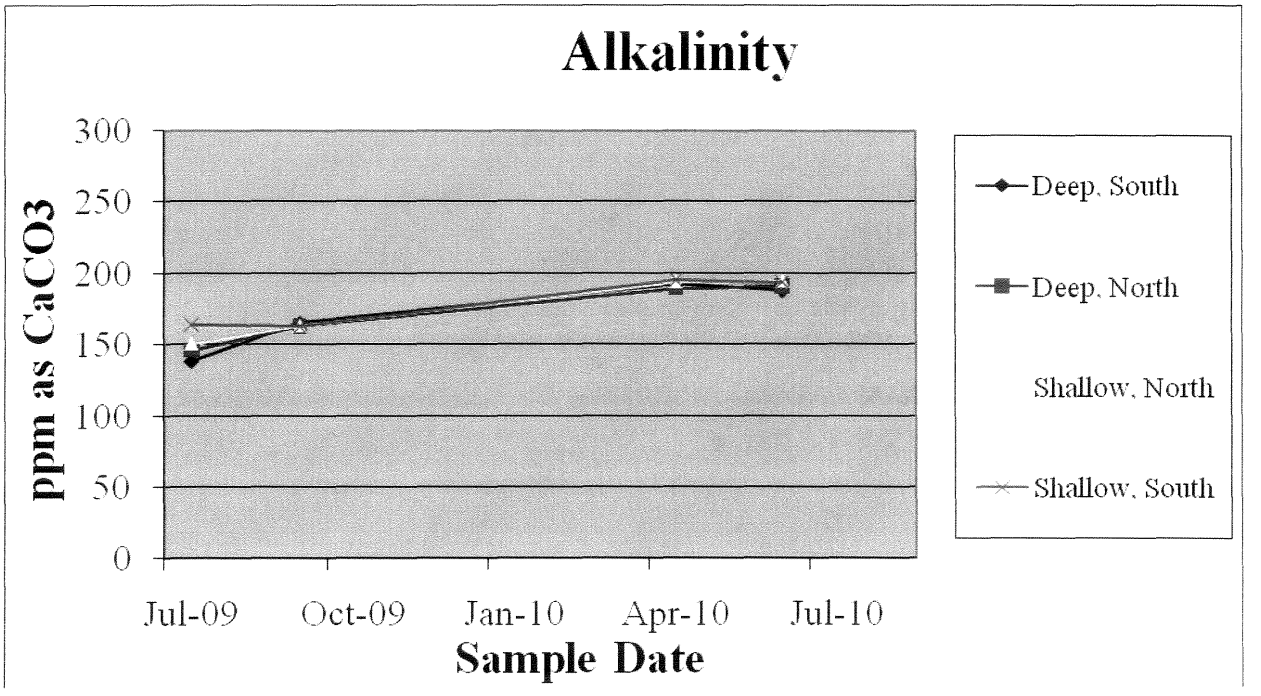
Target Range: **7.0 – 10.0**



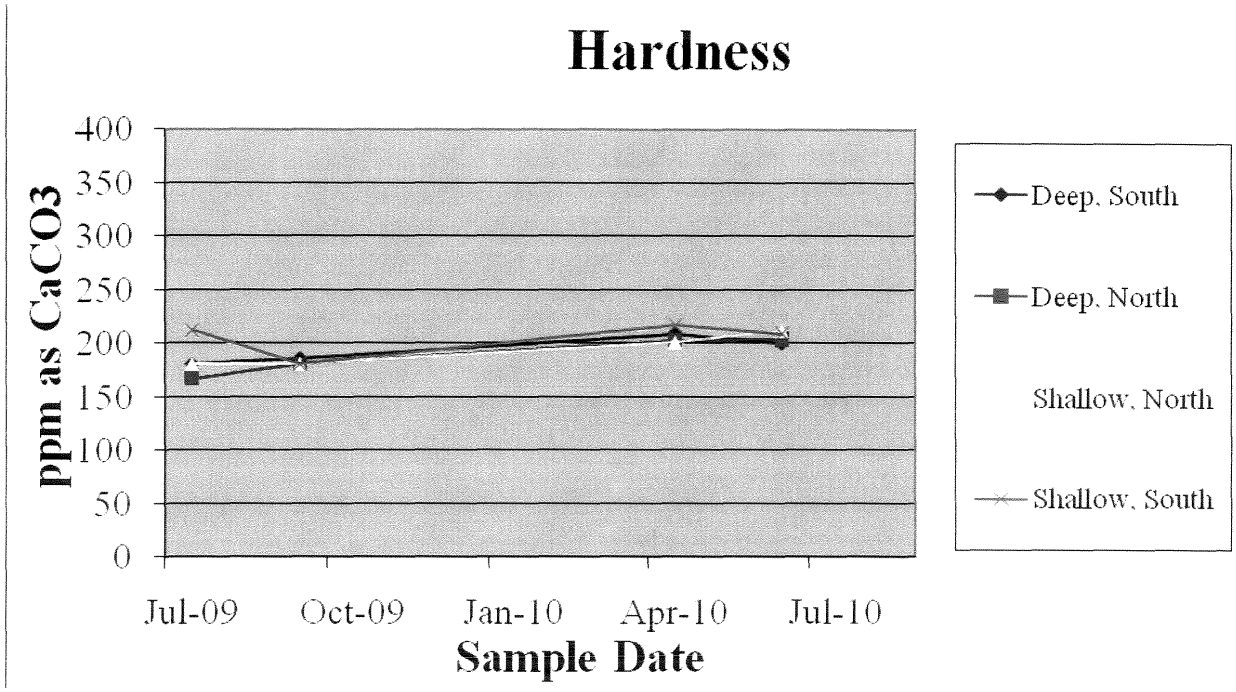
Target Range: **0-1,000 ppm**



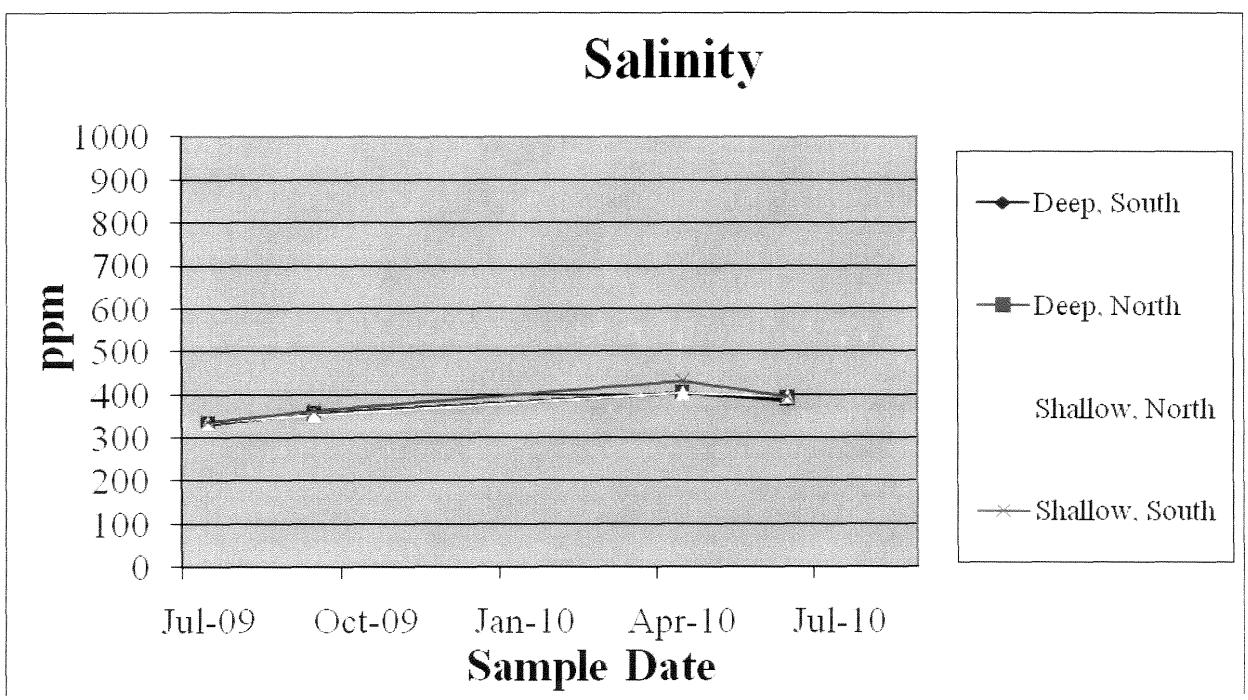
Target Range: **0 – 1500 µS**



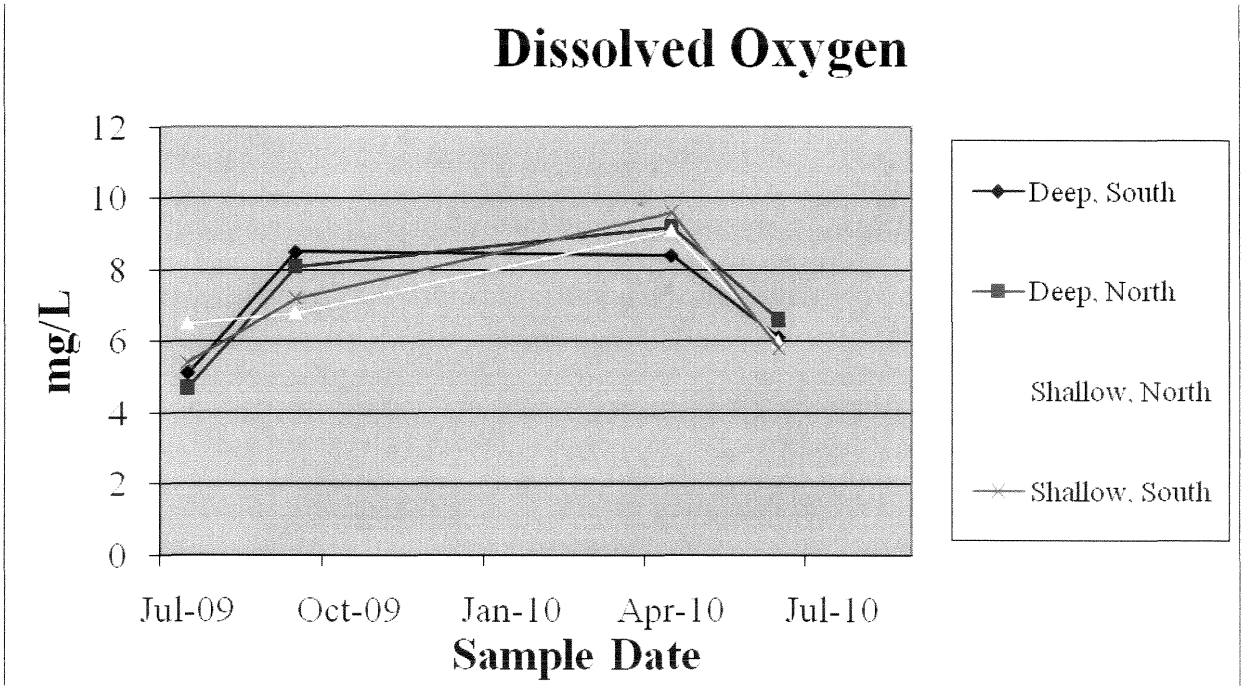
Target Range: **0 – 250 ppm**



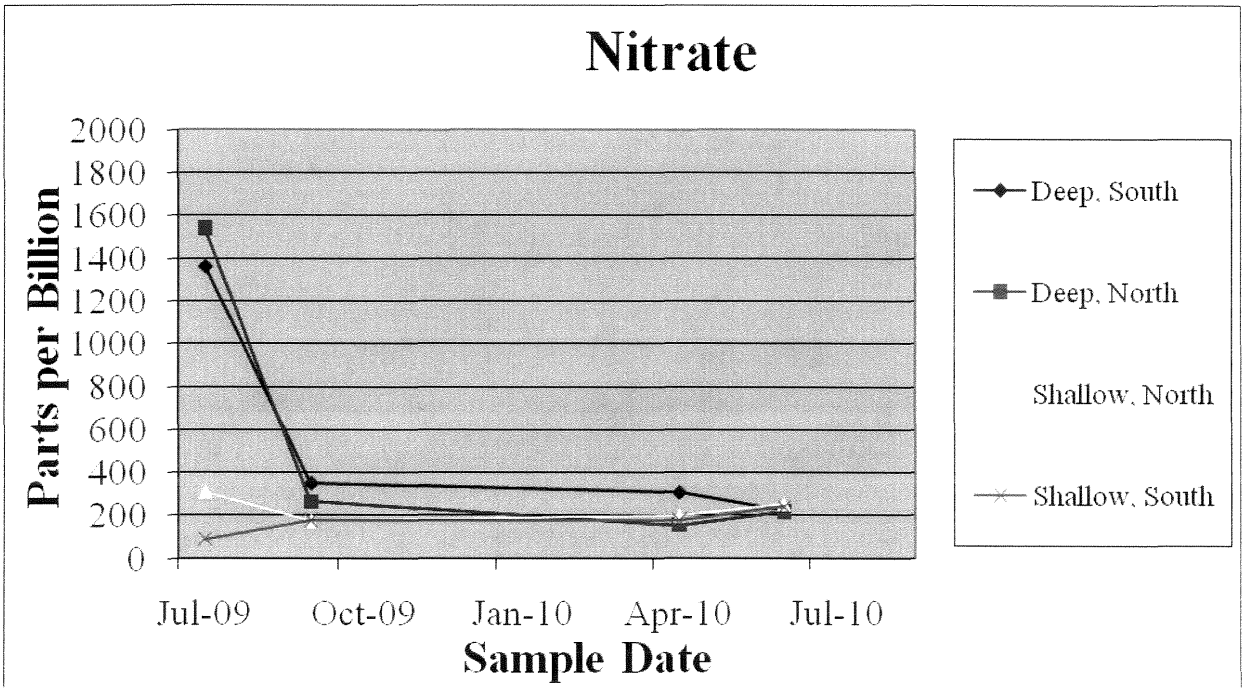
Target Range: **100–300 ppm**



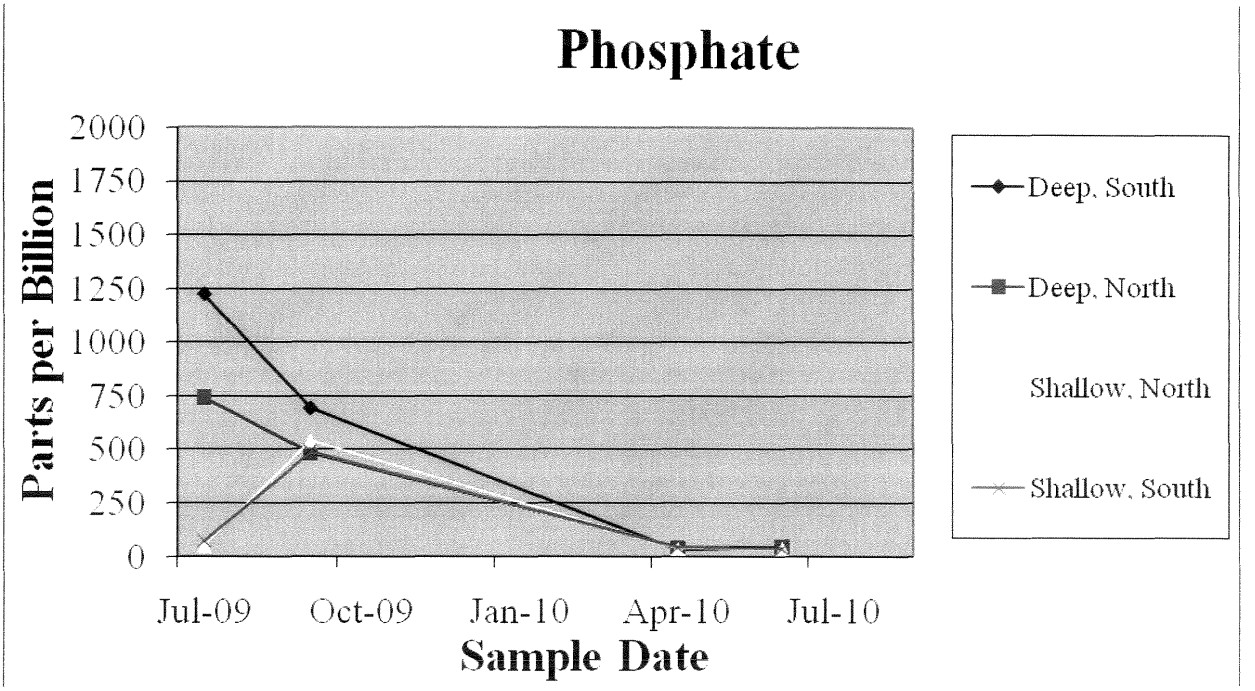
Target Range: **0 – 500 ppm**



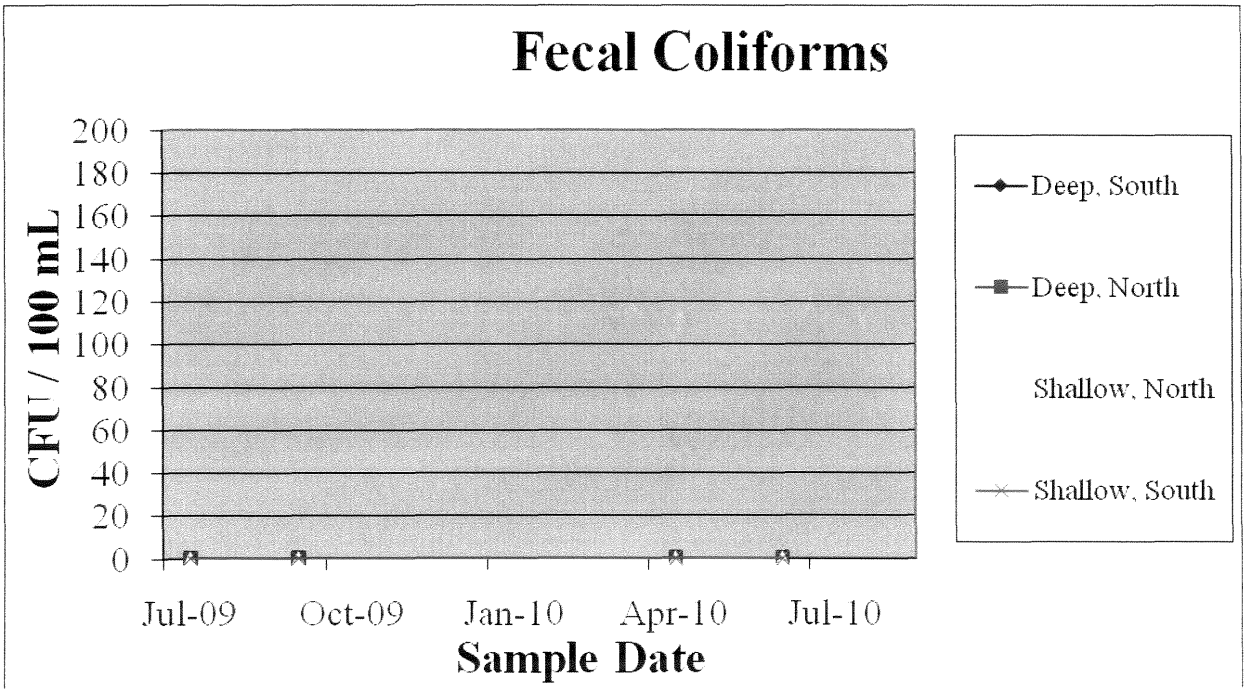
Target Range: **6 – 12 mg/L**



Target Range: **0 – 1,000 ppb**



Target Range: **0 – 100 ppb**



Target Range: **0 – 100 CFU/100mL**

Analysis Information

DANGEROUS | CRITICAL | HIGH | HEALTHY

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 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 $CaCO_3$.
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.
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.
Phosphates:	Phosphate is the form of phosphorous that is most readily available to plants and algae.
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.
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.