2018 Environmental Monitoring for Indian Lake

Prepared for:

Indian Lake Borough

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Sampling Procedures and Analytical Methodology

Water samples and water quality data were collected on July 3 and August 31, 2018. The parameters that were used for the monitoring are listed in Table 1 below. There were three sampling locations on each of the visits. One site was near the dam and one was located further down each side of the lake. (See attached map)

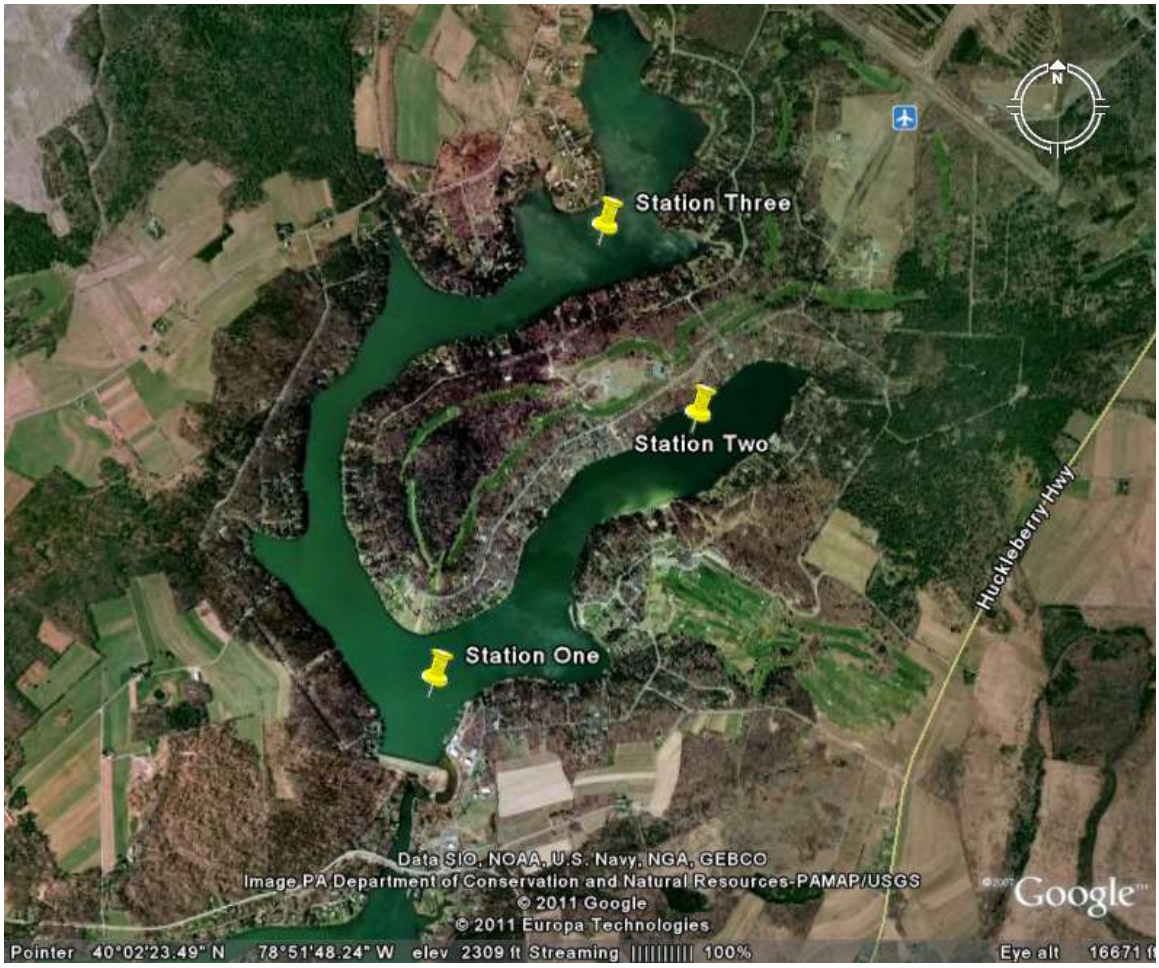
Table 1 – Water Quality Parameters Measured for 2018

Dissolved Oxygen (DO)	Total Phosphorus
Dissolved Oxygen Saturation (%)	Secchi Disk Transparency
Temperature	Chlorophyll *a*
pH	Salinity
Conductivity	Total Dissolved Solids
Specific Conductance	Total Suspended Solids

The parameters in Table 1 are indicators of the health of a water body and the ability to support aquatic life. These parameters also help to determine a lake's trophic state and relate interactions between the chemical and biological components of a lake and the ecosystem. The analyses performed during the monitoring process were conducted in accordance with Standard Methods, 1995. Dissolved oxygen and temperature were measured using a YSI Model 57 meter at one meter depths to the lake bottom at each site. Conductivity, specific conductance, total dissolved solids, salinity and pH were measured using a YSI ProPlus multi meter. Water samples taken from incremental depths were collected with a Wildco beta plus horizontal water sampler equipped with a stainless steel messenger.

Total phosphorous concentrations were measured from composite samples taken in the epilimnion of the lake at depths of 0, 1, 2 and 3 meters. Water samples for total phosphorous were placed in sample bottles containing preservative and then stored on ice while in the field. The samples were then shipped to a certified laboratory for analysis. The samples were analyzed using the colorimetric ascorbic acid method (Standard Methods, 1992, Method 4500-P E). Total suspended solids were analyzed using Method 2540-C.

One biological characteristic of the lake was ascertained through the analysis of chlorophyll *a*. The composite water taken for the total phosphorous samples was also used to take samples for the chlorophyll *a* analysis. A determined volume of water was filtered in the field for chlorophyll *a* analysis. The filter papers were then placed in glass vials and stored on ice while in the field until they could be frozen. Once frozen, the samples were shipped to Dr. Gregory Boyer of the Biochemistry Department, SUNY-ESF for analysis using the Welschmeyer fluorometric method (Welschmeyer, N.A. 1994).



Sampling Locations for Indian Lake

Parameters Measured During the 2018 Monitoring Program

Dissolved Oxygen (DO)

The amount of oxygen present in the water and the profile of this oxygen throughout the water column are important indicators as to the health of a lake. By studying this one parameter, a large amount of information can be determined. The DO content of water results from photosynthesis, diffusion at the air-water interface and distribution by wind-driven mixing. The amount of oxygen produced through photosynthesis is related to the amount of plant and algal life and thus the productivity of the lake. The profile of the DO in the water column can give insight into the mixing patterns and effectiveness of mixing processes in a lake. The DO will fluctuate with changes in temperature and changes in photosynthetic activity and diffusion. Surface waters are often supersaturated with DO during daylight hours. Oxygen is used continuously by the pond biota in respiration, but during the day photosynthesis normally produces oxygen faster than it is used in respiration so that DO concentrations remain high. Phytoplankton die-offs and sudden destratification of the water body can cause rapid oxygen depletion. If the DO falls below 4.0 mg/L, most desirable aquatic organisms will be stressed and may even die.

Dissolved Oxygen Saturation

Water containing the amount of DO which it should theoretically hold at a given temperature, pressure, and salinity is said to be saturated with oxygen. Likewise, waters containing less than or more than the theoretical concentration are said to be undersaturated or supersaturated with oxygen, respectively. The degree of oxygen saturation of water is expressed as percent saturation and water that is saturated with oxygen is at 100 percent. The amount of oxygen that can dissolve in water decreases with increasing temperature and salinity and with increased dissolved solids, therefore, dissolved oxygen saturation provides a better means of comparing oxygen concentrations from different sampling dates and depths in the water column.

Temperature

Sufficient and accurate temperature data are important. Temperature directly and indirectly exerts many fundamental effects on limnological phenomena such as lake stability, gas solubility and biotic metabolism. One of the most important relations of the temperature to water is the decrease in the solubility of oxygen in water as the temperature increases. Temperatures in a lake are a function of ambient air temperatures and the physical characteristics of the water itself. The turbidity of a water body can inhibit light from passing through the water column and warming the water. Light energy or the heat generated from the light is absorbed exponentially with depth, so most heat is absorbed within the upper layer of water. Since heat is absorbed more rapidly near the surface of a water body and the warm upper waters are less dense than cool lower water, bodies of water may stratify thermally. This occurs when differences in density of upper and lower strata become so great that the two cannot be mixed by wind action.

pH

The pH of a solution is a measure of its hydrogen ion activity and is expressed as the logarithm of the reciprocal of the hydrogen ion concentration. It is important to remember that a change of one pH unit represents a tenfold change in hydrogen ion

concentration. The pH scale ranges from 1.0 to 14.0 standard units. A pH of 7.0 indicates neutral conditions, while waters with a pH less than 7.0 are said to be acidic and those with a pH greater than 7.0 are said to be basic. The pH of most natural waters falls in the range of 4.0 to 9.0, and much more often in the range of 6.0 to 8.0. The desirable range for fish production is 6.5 to 9.0. The acid death point for fish is around 4.0 or less. In water bodies, deviation from the neutral pH 7.0 is primarily due to the hydrolysis of salts of acids and bases. Dissolved gases such as CO_2, H_2S, and NH_3 also have a significant effect on pH values. The majority of natural water bodies have a somewhat alkaline or basic pH due to the presence of carbonates. Values for pH and the changes in these values are important, since they may reflect biological activity and changes in natural chemistry of waters, as well as pollution.

Conductivity

Conductivity or specific conductance is a measure of water's capacity to conduct an electric current. Conductivity is the reciprocal of resistance for which the standard unit is an ohm. Since conductivity is the inverse of resistance, the standard unit for conductivity is the *mho*. In low-conductivity natural waters, the standard unit is the *micromho*. Because the measurement is made using two electrodes that are one centimeter apart, conductivity is generally reported as micromhos per centimeter (µmhos/cm). Different ions vary in their ability to conduct electricity, but, in general, the greater the concentration of ions in natural water, the higher the conductivity. Temperature also affects conductivity. Conductivity will generally increase two to three percent per degree Celsius. For comparison of values, conductivity is usually corrected to one standard temperature which is most often 25°C. The most useful information that can be gathered from conductivity readings is the estimation of the total concentration of dissolved ionic matter in the water, which in turn relates to water fertility.

Specific Conductance

Specific conductance is a conductivity measurement corrected to 25°C. This is the standardized method of reporting conductivity. As the temperature of water will affect conductivity readings, reporting conductivity at 25°C allows data to be easily compared.

Total Phosphorus

Phosphorous is a key metabolic nutrient and the supply of this element often regulates the productivity of natural waters. Total phosphorous is the sum of all forms of phosphorous present. Phosphorous is present in water in several soluble and particulate forms, including organically bound phosphorous, inorganic polyphosphates and inorganic orthophosphates. Orthophosphates, which are ionized forms of orthophosphoric acid (H_3PO_4), are the simplest forms of phosphorous present. The pH of the water will affect the degree of ionization and thus the amount of orthophosphates present. The natural source of phosphorous to waters is from leaching of phosphate containing rocks and from organic matter decomposition. Additional sources are found in manmade fertilizers, domestic sewage and detergents. Inorganic and organic phosphates may reach waters through effluent and runoff. Phosphorous is lost from the water by chemical precipitation to sediment and by adsorption on clays or sediment with high pH and carbonate levels. Phosphorous is usually found in low concentration in natural waters, but is used readily by plants for growth. The element present in the lowest concentration relative to demand is the element limiting the process at a given

time. This is why phosphorous is usually said to be the limiting factor of plant and algal growth and if found in excess is most likely to cause excessive plant or algal "blooms".

Secchi Disk Transparency

Visibility is a measure of the depth to which one can see into the water. The Secchi disk is a simple device used to estimate this depth. The disk is a weighted circular plate, 20 cm in diameter, with a painted surface consisting of alternate opposing black and white quarters. The disk is attached to a depth-calibrated chord attached to a ring in the center of the disk, so the disk is horizontal when lowered into the water. To determine the Secchi disk visibility, the disk is lowered into the water until the disk disappears and the depth is noted. The disk is lowered further then slowly raised until it is visible again and this depth is noted. The final Secchi depth is the average of these two readings. Secchi depth corresponds to the depth where light penetration is ten percent or less and approximates the lower level of photosynthetic activity. The transparency is based on the transmission of light through the water and is related to the amount of natural light, amount of inorganic suspended solids and the amount of organic suspended solids. The Secchi disk measures the turbidity of water. Plankton is usually the major source of turbidity, so Secchi depth can give an estimate of plankton density. When compared with data on chlorophyll *a*, particulate organic matter and phytoplankton counts, Secchi depth correlates most with particulate organic matter. Particulate organic matter is a measurement which includes living zooplankton and phytoplankton as well as dead organic particles. For northern lakes, a Secchi depth of greater than 30 feet is considered oligotrophic while the eutrophic lakes may have a reading of 3 to 4 feet or less during summer algal blooms (Moore, 1988). Secchi depths of less than two meters are usually considered undesirable for recreational lake uses and even lower values may indicate the onset of an algal bloom.

Chlorophyll *a*

Chlorophyll is a green pigment in algae and other green plants that is essential for the conversion of sunlight, carbon dioxide and water to sugar that may then be used as food. Chlorophyll *a* is a type of chlorophyll present in all types of algae, sometimes in direct proportion to the biomass of the algae. The values may also be used to characterize the age, structure, quantification of the phytoplankton and photosynthetic rates.

Salinity

By definition, salinity is the total concentration of dissolved salts in water. Most freshwater lakes have earth metal salts containing calcium, magnesium, sodium, carbonates and chlorides. These salts form ions as they dissolve that have a charge, so salinity is a contributor to conductivity. Most often, salinity is not measured directly but extrapolated from the conductivity reading.

Total Dissolved Solids

Total dissolved solids (TDS) is a total of all ion particles smaller than 2 microns in a water sample. In "clean" water, TDS would be nearly equal to salinity. Naturally occurring water bodies contain other dissolved organic matter though. Dissolved solids help keep the cell density of an aquatic organism balanced. In pure (distilled or de-ionized water), the cells of an organism could swell because water would diffuse into the cell where there is a lower ion concentration. In water with excessive TDS, just the opposite could happen and cells would shrink as water would diffuse out of the cell. For

example, excessive TDS can have toxic effects on fish and fish eggs. TDS is also derived from conductivity readings most commonly.

Total Suspended Solids

Total suspended solids (TSS) are solids in water that are measured by filtering a determined volume of water then drying and weighing the filter paper to determine the increase in weight. TSS can include materials such as silt, decaying plant and animal material, industrial waste and sewage. High TSS will reduce the amount of light that passes through the water and thus reduce the photosynthetic rate of plants. Reduced photosynthesis can then lead to lower oxygen levels. High TSS can also cause an increase in water temperature as suspended particles absorb sunlight.

Trophic State Indices

The trophic state of a lake is a relative expression of the biological productivity of the lake. The Trophic State Index (TSI) developed by Carlson (1977) is among the most commonly used indicators of lake trophic states. This index is actually composed of three separate indices based on concentrations of total phosphorous, chlorophyll *a* and the Secchi depth readings from a variety of lakes.

Mean values of total phosphorous, chlorophyll *a*, and Secchi depth for an individual lake are logarithmically converted to a scale of relative trophic state ranging from 1 to 100. A TSI of less than 35 indicates oligotrophic conditions, a TSI between 35 and 50 indicates mesotrophic conditions and a TSI greater than 50 indicates eutrophic conditions. Oligotrophic comes from the Greek for "poorly nourished" and describes a lake of low plant productivity and high transparency. Mesotrophic comes from the Greek for "moderately nourished" and describes a lake of moderate photosynthetic activity and transparency. Eutrophic comes from the Greek for "well-nourished" and describes a lake of high photosynthetic activity and low transparency. Hypereutrophic, or excessively productive lakes, have TSI values greater than 70. Higher numbers are associated with increased probabilities of encountering nuisance conditions such as aesthetic problems i.e. algal scums.

Values for the trophic state indices based on total phosphorous, Chlorophyll *a* and Secchi depth are calculated for Indian Lake using the surface water data. The current trophic state indices are listed in the tables and can be compared in the charts.

Discussion

After reviewing the data from each of the sampling events and calculating the trophic state indices, the results show that Indian Lake is a lake with low to moderate nutrients, lower plant growth and good clarity. The lowest trophic state was 24.2 for total phosphorus at multiple stations on both sampling events and the highest trophic state was 53.2 for Secchi at station three during July. Overall the average trophic state for both months at all three stations was as follows: Total Phosphorus was 26.1; Secchi Depth was 46.3 and Chlorophyll a had an average of 38.2 for all values. The total phosphorus trophic state would fall into the oligotrophic category while chlorophyll and Secchi would be considered mesotrophic.

Indian Lake Monitoring

Date: 7-3-18 Location: Station 1 Weather: Sunny Secchi Depth (m): 2.2

Depth (m)	Dissolved Oxygen (mg/L)	Dissolved Oxygen %Saturation	Temp (ºC)	pH	Conductivity (µs/cm)	Specific Conductance (µs/cm)	Salinity (ppt)	Total Dissolved Solids (g/L)
Surface	8.2	101.1	25.0	7.8	206	206	0.10	0.139
1	8.1	99.9	25.0	7.5	205	205	0.10	0.133
2	8.0	98.6	25.0	7.4	205	205	0.10	0.133
3	7.8	94.5	24.0	7.3	209	212	0.10	0.139
4	6.2	70.0	19.9	7.5	204	232	0.11	0.150
5	5.3	56.4	16.9	6.8	198	239	0.11	0.155
6	5.4	53.1	13.2	6.7	182	234	0.11	0.152
7	5.6	52.6	11.1	6.6	167	227	0.11	0.148
8	6.0	54.9	10.0	6.6	162	228	0.11	0.148
9	6.5	58.1	9.0	6.5	159	230	0.11	0.150
10	6.5	57.2	8.4	6.5	154	227	0.11	0.148
11	6.0	52.4	8.1	6.5	154	229	0.11	0.149
12	5.8	50.4	7.9	6.5	153	228	0.11	0.148
13	5.6	48.6	7.8	6.4	152	228	0.11	0.148
14	5.1	44.1	7.7	6.4	151	228	0.11	0.148
15	4.4	37.9	7.5	6.4	151	228	0.11	0.148
16	0.6	5.1	7.2	6.4	151	229	0.11	0.149
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Notes: Heavy boat traffic. 0,1,2,3m composite used for Chlor. a, TSS and Phos.

Indian Lake Monitoring

Date: 7-3-18 Location: Station 2 Weather: Sunny Secchi Depth (m): 1.7

Depth (m)	Dissolved Oxygen (mg/L)	Dissolved Oxygen %Saturation	Temp (ºC)	pH	Conductivity (µs/cm)	Specific Conductance (µs/cm)	Salinity (ppt)	Total Dissolved Solids (g/L)
Surface	7.8	97.6	26.0	7.3	227	223	0.10	0.145
1	7.7	96.1	25.8	7.3	225	223	0.10	0.145
2	7.5	93.3	25.6	7.2	222	222	0.10	0.144
3	7.6	92.6	24.3	7.1	230	235	0.11	0.156
4	6.7	77.5	21.2	7.1	335	373	0.18	0.241
5	5.0	51.2	15.0	6.7	204	257	0.12	0.166
6	4.0	38.1	11.7	6.4	178	239	0.11	0.156
7	4.4	40.3	10.0	6.3	168	237	0.11	0.154
8	3.9	34.9	9.0	6.3	162	234	0.11	0.152
9	3.6	32.0	8.8	6.2	159	233	0.11	0.151
10	2.6	22.7	8.0	6.2	157	232	0.11	0.151
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Notes: Heavy boat traffic. 0,1,2,3m composite used for Chlor. a, TSS and Phos.

Indian Lake Monitoring

Date: 7-3-18 Location: Station 3 Weather: Sunny Secchi Depth (m): 1.6

Depth (m)	Dissolved Oxygen (mg/L)	Dissolved Oxygen %Saturation	Temp (ºC)	pH	Conductivity (µs/cm)	Specific Conductance (µs/cm)	Salinity (ppt)	Total Dissolved Solids (g/L)
Surface	8.7	109.3	26.2	6.7	193	188	0.09	0.122
1	8.6	107.4	25.8	6.7	190	188	0.09	0.122
2	8.1	99.9	25.0	6.7	187	188	0.09	0.123
3	6.3	73.9	22.0	6.6	165	171	0.08	0.119
4	4.9	55.4	20.0	6.4	109	117	0.06	0.082
5	1.8	18.9	16.1	6.4	181	220	0.10	0.143
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Notes: Heavy boat traffic. 0,1,2,3m composite used for Chlor. a, TSS and Phos.

Indian Lake Monitoring

Date: 8-31-18 Location: Station 1 Weather: Cloudy Secchi Depth (m): 4.2

Depth (m)	Dissolved Oxygen (mg/L)	Dissolved Oxygen %Saturation	Temp (ºC)	pH	Conductivity (µs/cm)	Specific Conductance (µs/cm)	Salinity (ppt)	Total Dissolved Solids (g/L)
Surface	7.9	97.4	25.0	7.0	251	252	0.12	0.164
1	7.9	97.4	25.0	7.0	250	252	0.12	0.163
2	7.5	92.5	25.0	7.2	246	249	0.12	0.162
3	7.5	90.8	23.9	7.3	244	251	0.12	0.164
4	7.1	83.9	22.5	7.2	242	256	0.12	0.166
5	6.2	71.4	21.0	7.0	259	283	0.13	0.184
6	1.3	13.9	17.1	6.7	230	270	0.13	0.178
7	1.1	10.8	13.0	6.4	180	234	0.12	0.153
8	1.8	16.9	11.0	6.1	169	229	0.11	0.150
9	2.6	23.8	10.0	6.1	162	227	0.11	0.149
10	1.8	16.1	9.1	6.0	160	230	0.11	0.150
11	1.5	13.2	8.5	6.0	156	230	0.11	0.150
12	1.3	11.4	8.1	5.9	155	230	0.11	0.150
13	0.7	6.1	8.0	5.9	154	230	0.11	0.150
14	0.6	5.2	7.9	5.9	153	229	0.11	0.150
15	0.3	2.6	7.8	5.9	154	231	0.11	0.150
16	0.3	2.6	7.5	5.9	154	233	0.11	0.151
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Notes: Composite: 0,1,2,3 meters. Chlorophyll: 500ml filtered.

Indian Lake Monitoring

Date: 8-31-18 Location: Station 2 Weather: Cloudy Secchi Depth (m): 4.0

Depth (m)	Dissolved Oxygen (mg/L)	Dissolved Oxygen %Saturation	Temp (ºC)	pH	Conductivity (µs/cm)	Specific Conductance (µs/cm)	Salinity (ppt)	Total Dissolved Solids (g/L)
Surface	8.1	99.9	25.0	7.0	261	264	0.12	0.172
1	8.1	99.9	25.0	7.2	261	264	0.12	0.172
2	8.1	99.8	24.9	7.3	261	263	0.12	0.171
3	8.1	98.3	24.1	7.1	248	255	0.12	0.165
4	7.6	89.7	22.4	7.0	250	264	0.12	0.171
5	4.8	54.8	20.5	6.9	258	283	0.13	0.185
6	1.6	17.1	17.0	6.6	224	268	0.13	0.174
7	0.9	8.8	13.0	6.3	183	240	0.11	0.155
8	0.6	5.6	10.9	6.1	173	239	0.11	0.156
9	0.5	4.5	9.0	6.0	162	234	0.11	0.151
10	0.5	4.4	8.7	6.0	161	234	0.11	0.151
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Notes: Composite: 0,1,2,3 meters. Chlorophyll: 500ml filtered.

Indian Lake Monitoring

Date: 8-31-18 Location: Station 3 Weather: Cloudy Secchi Depth (m): 3.0

Depth (m)	Dissolved Oxygen (mg/L)	Dissolved Oxygen %Saturation	Temp (ºC)	pH	Conductivity (µs/cm)	Specific Conductance (µs/cm)	Salinity (ppt)	Total Dissolved Solids (g/L)
Surface	8.4	103.6	25.0	7.3	218	219	0.10	0.142
1	8.4	103.6	25.0	7.5	220	221	0.10	0.143
2	7.8	95.4	24.5	7.6	230	234	0.11	0.153
3	7.8	94.5	24.0	7.5	234	241	0.11	0.157
4	5.9	70.2	22.8	7.4	213	225	0.11	0.146
5	3.0	34.6	21.0	7.1	211	229	0.11	0.149
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Notes: Composite: 0,1,2,3 meters. Chlorophyll: 500ml filtered.

Indian Lake Monitoring Summary – 2018 Water Column Data

Table 2 – Station One

Date	Zone	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	pH	Conductivity (µmhos/cm)
7-3-18	Epilimnion	24.8	8.0	98.5	7.5	206
This data was for **Station One**	Hypolimnion	10.4	5.3	49.3	6.6	164
	Lake	13.7	5.9	60.9	6.8	174

Table 3 – Station Two

Date	Zone	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	pH	Conductivity (µmhos/cm)
7-3-18	Epilimnion	25.4	7.7	94.9	7.2	226
This data was for **Station Two**	Hypolimnion	12.0	4.3	42.4	6.5	195
	Lake	16.9	5.5	61.5	6.7	206

Indian Lake Monitoring Summary – 2018 Water Column Data

Table 4 – Station Three

Date	Zone	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	pH	Conductivity (µmhos/cm)
7-3-18	Epilimnion	25.7	8.5	105.5	6.7	190
This data was for **Station Three**	Hypolimnion	19.4	4.3	49.4	6.5	152
	Lake	22.5	6.4	77.5	6.6	171

Table 5 – Station One

Date	Zone	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	pH	Conductivity (µmhos/cm)
8-31-18	Epilimnion	24.3	7.6	92.4	7.1	246
This data was for **Station One**	Hypolimnion	10.8	1.6	16.2	6.2	174
	Lake	14.7	3.4	38.6	6.4	195

Indian Lake Monitoring Summary – 2017 Water Column Data

Table 6 – Station Two

Date	Zone	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	pH	Conductivity (µmhos/cm)
8-31-18	Epilimnion	24.8	8.1	99.5	7.2	258
This data was for **Station Two**	Hypolimnion	14.5	2.4	26.4	6.4	202
	Lake	18.2	4.4	53.0	6.7	222

Table 7 – Station Three

Date	Zone	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	pH	Conductivity (µmhos/cm)
8-31-18	Epilimnion	24.6	8.1	99.3	7.5	223
This data was for **Station Three**	Hypolimnion	21.9	4.5	52.4	7.3	219
	Lake	23.7	6.9	83.7	7.4	221

Table 8 – Indian Lake Monitoring Summary – 2018 Mixed Layer Data

Date	Sampling Location	Total P (mg/L)	Secchi Depth (m)	Chlorophyll *a* (µg/L)	Total Suspended Solids (mg/L)
7-3-18	Station One	0.009	2.2	2.3	4.0
	Station Two	0.004*	1.7	2.2	4.5
	Station Three	0.004*	1.6	4.3	5.0
8-31-18	Station One	0.004*	4.2	1.0	<1.0
	Station Two	0.004*	4.0	1.5	<1.0
	Station Three	0.004*	3.0	3.3	<1.0

***Total phosphorus below detection limit of 0.005 mg/L, value of 0.004 mg/L used for trophic state calculation.**

Table 9 – Trophic State Indices for Indian Lake

Date	Sampling Location	Total P TSI	Secchi Depth TSI	Chlorophyll *a* TSI
7-3-18	Station One	35.8	48.6	38.7
	Station Two	24.2	52.3	38.3
	Station Three	24.2	53.2	44.9
8-31-18	Station One	24.2	39.3	30.6
	Station Two	24.2	40.0	34.5
	Station Three	24.2	44.2	42.3

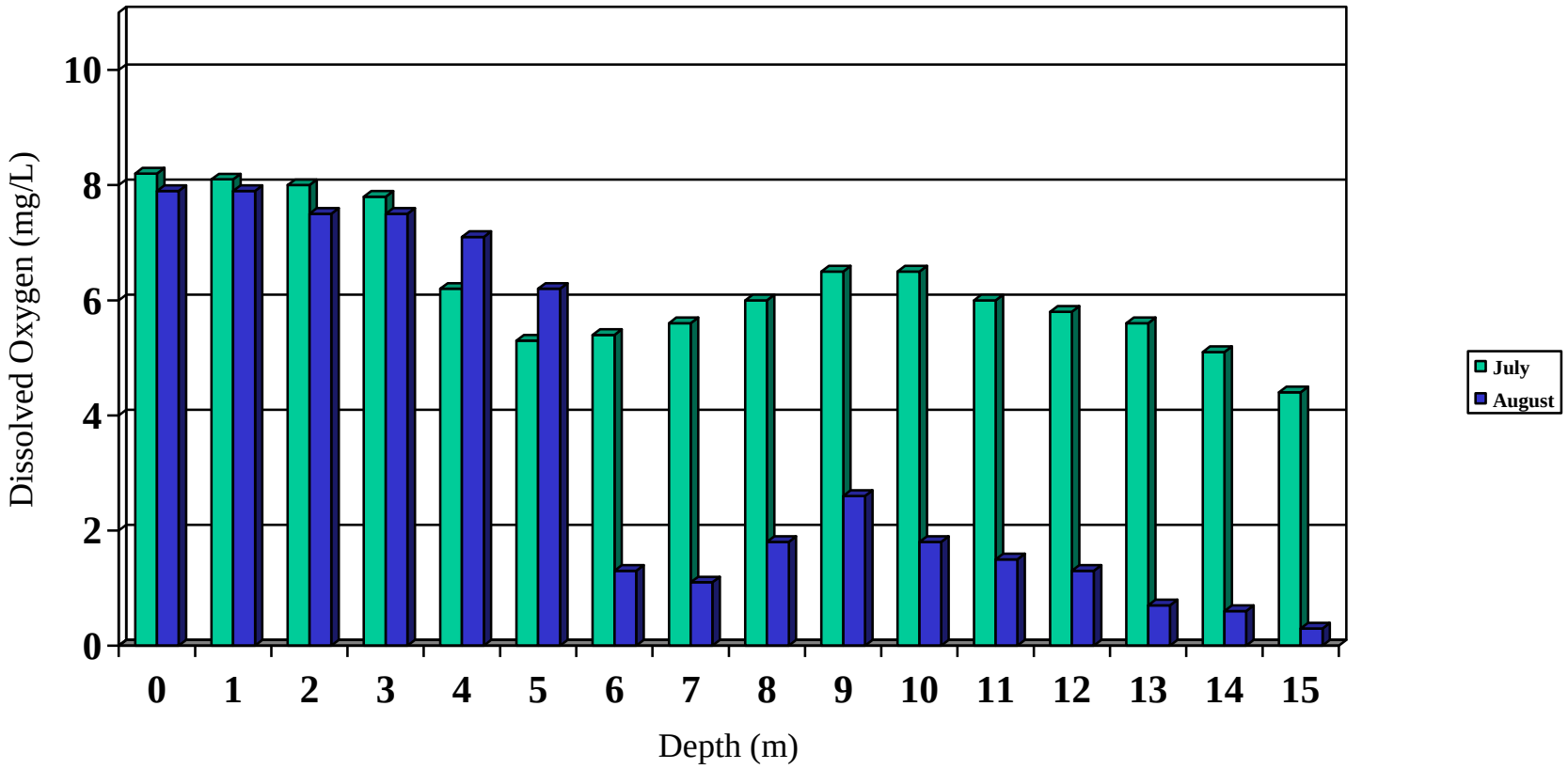
Table 10 – Annual Trophic State Indices for Indian Lake

*Calculated Trophic State Indices for:	Annual TSI Values			
	2007	2010/2011**	2017	2018
Total Phosphorus	36.6	42.5	21.6	26.1
Secchi Depth	40.1	43.2	42.9	46.3
Chlorophyll *a*	47.4	32.5	32.9	38.2

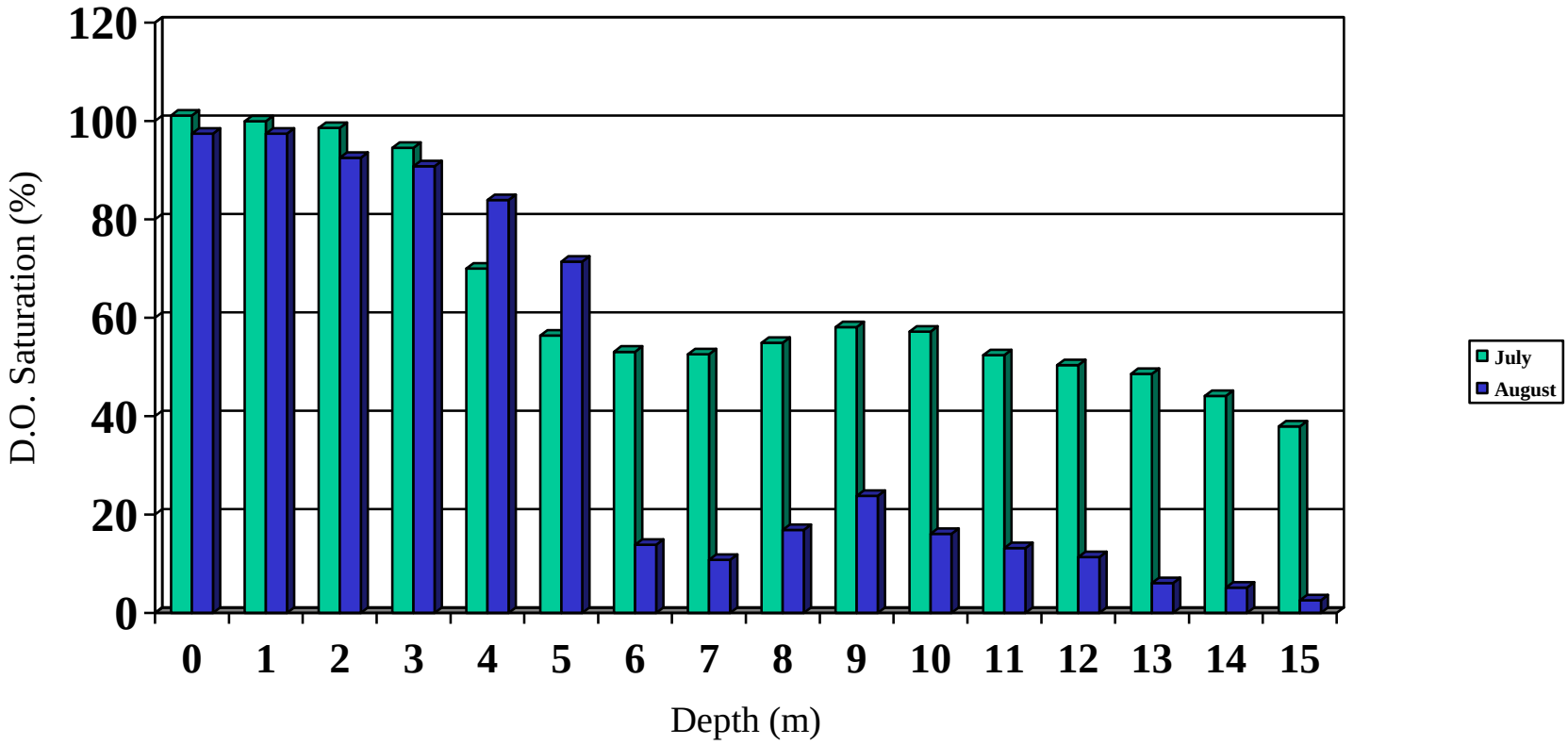
*Values are the average for the season at all three sites.
**Sampling took place summer and fall of 2010 and then winter and spring in 2011.

Table 11 – Indian Lake Historical Data (Seasonal Average)

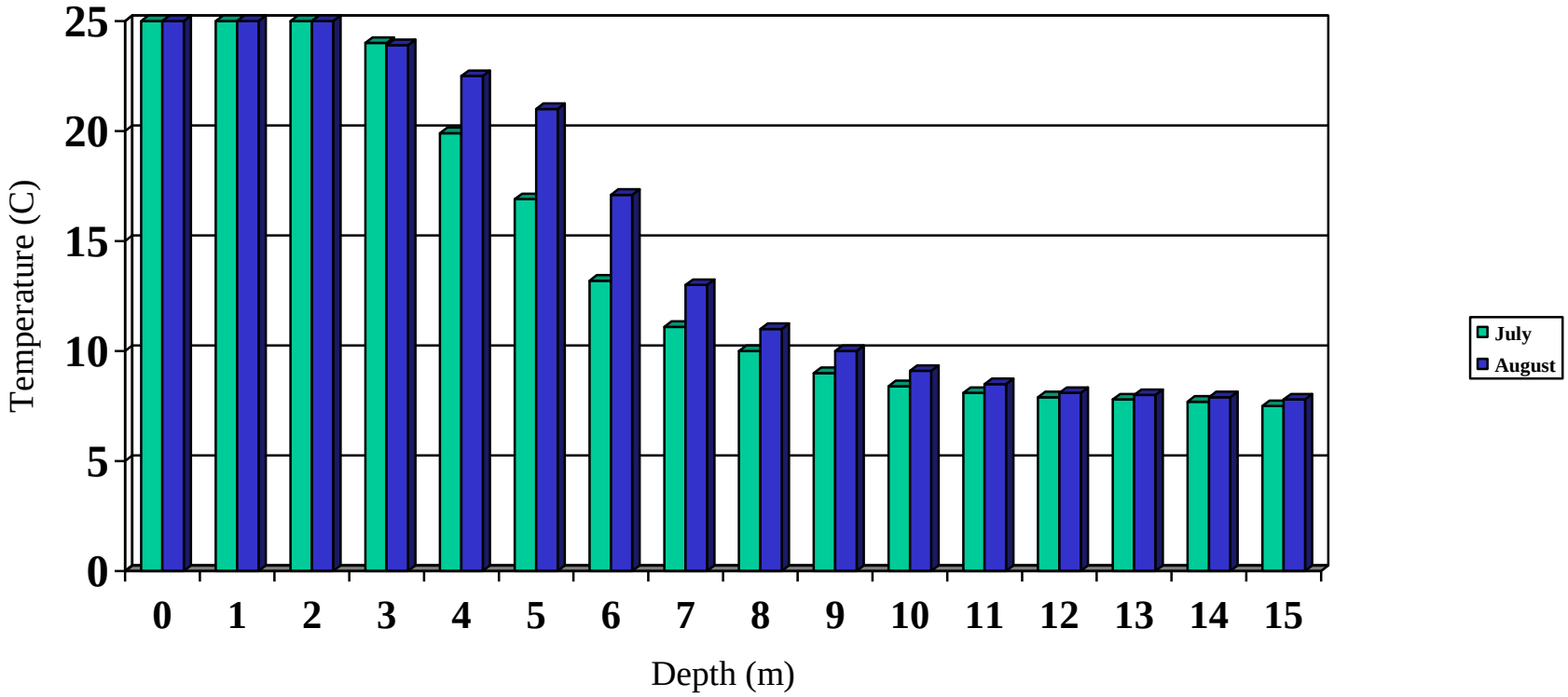
Date	Station	Total Phos. (mg/L)	TSS (mg/L)	Chlor. a (µg/L)	Secchi (m)
2007	1	0.010	2.5	7.7	5.0
	2	0.010	3.1	6.2	2.7
	3	0.009	3.8	2.7	4.2
2010/2011	1	0.018	2.6	1.42	4.3
	2	0.018	3.1	1.28	3.3
	3	0.016	2.5	2.01	3.0
2017	1	0.005	2.3	1.28	4.5
	2	0.003	2.5	0.57	4.0
	3	0.003	6.0	3.76	2.1
2018	1	0.007	2.5	1.65	3.2
	2	0.004	2.7	1.85	2.9
	3	0.004	3.0	3.80	2.3



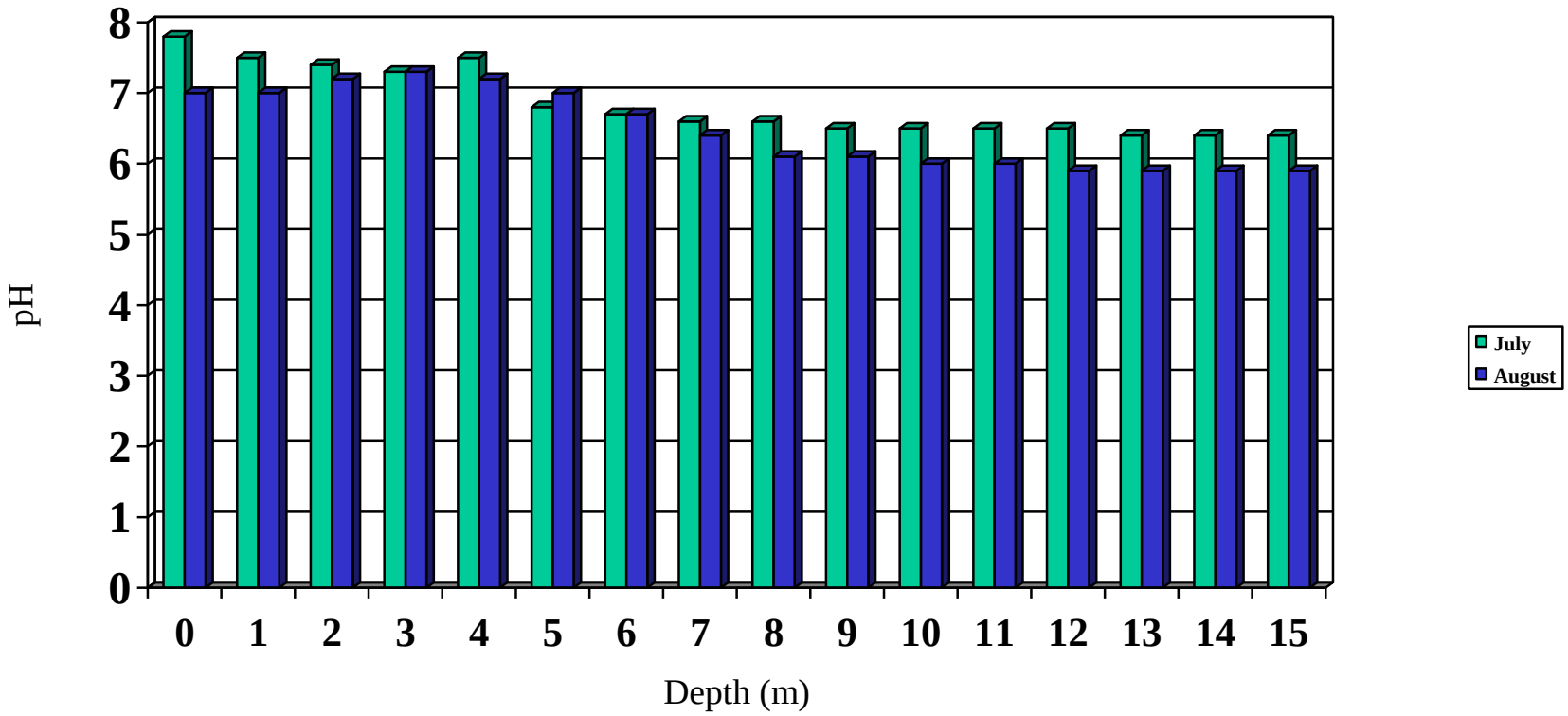
Dissolved Oxygen Data Station One



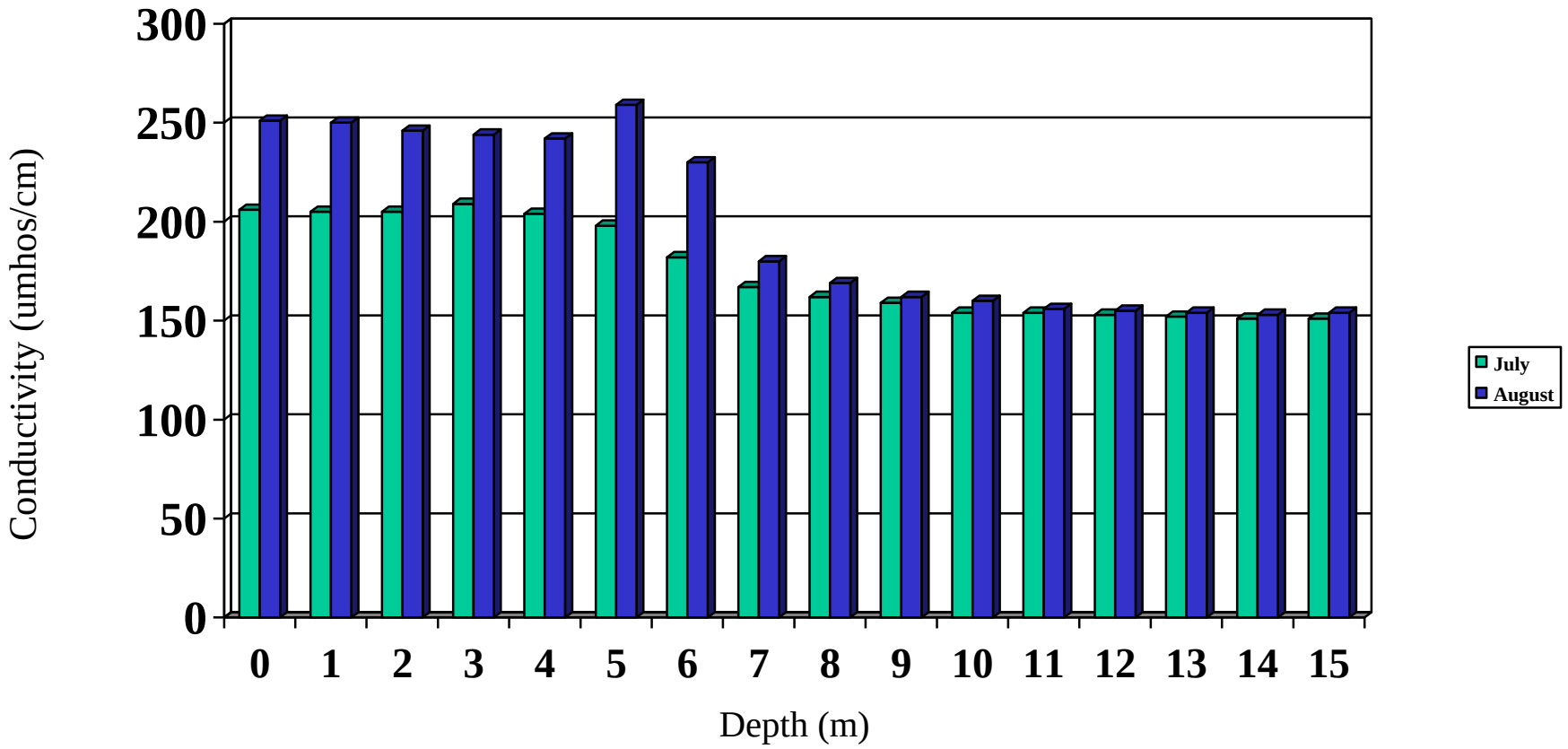
Dissolved Oxygen Percent Saturation Data Station One



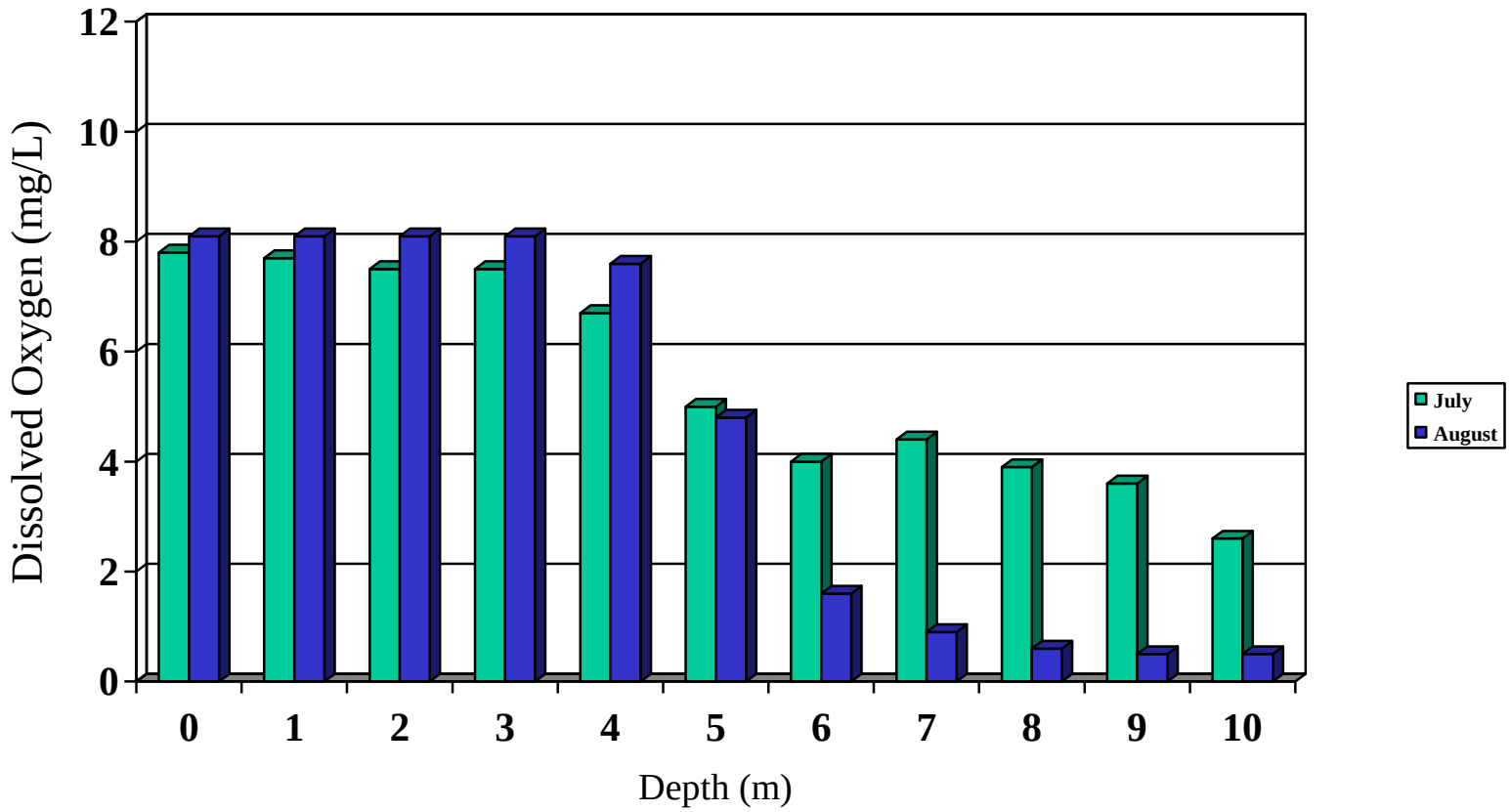
Temperature Data Station One



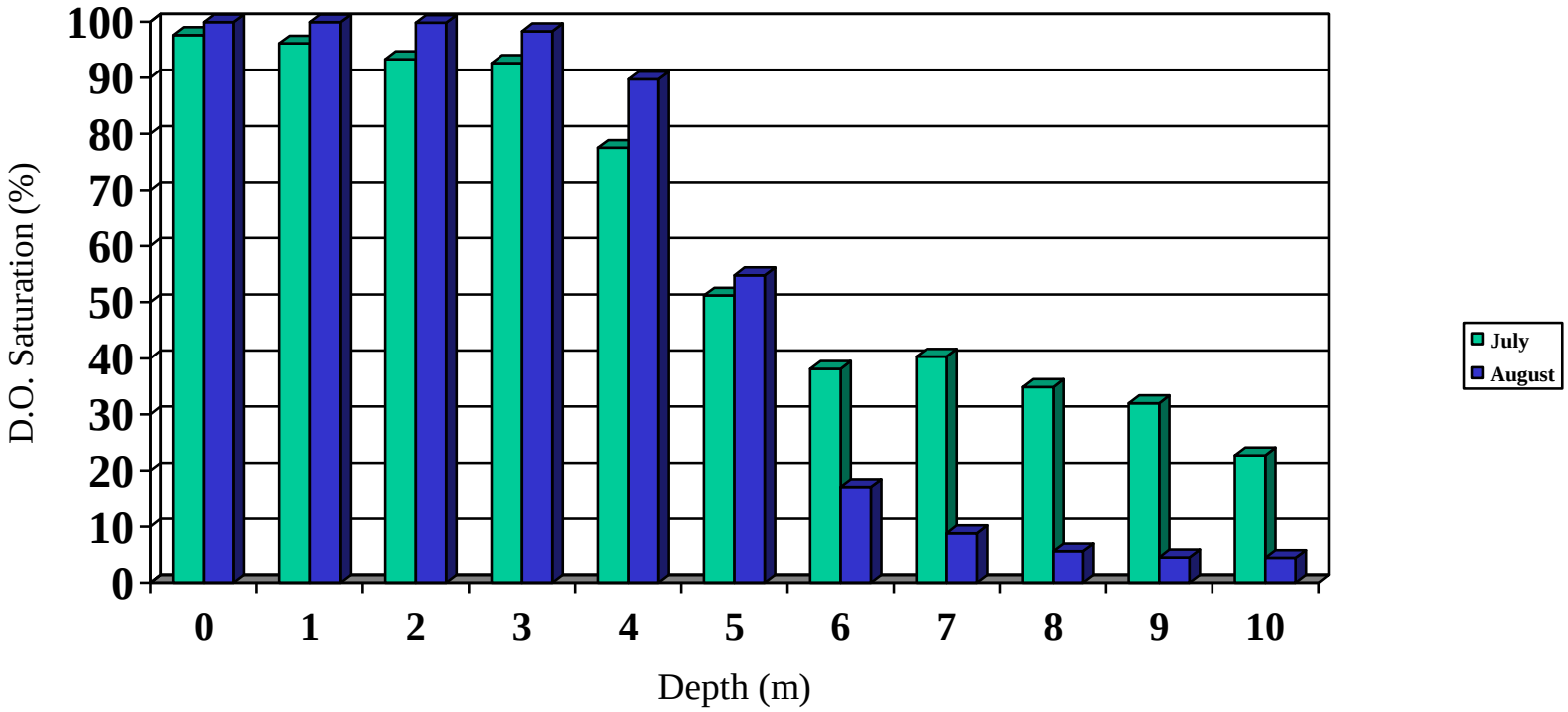
pH Data Station One



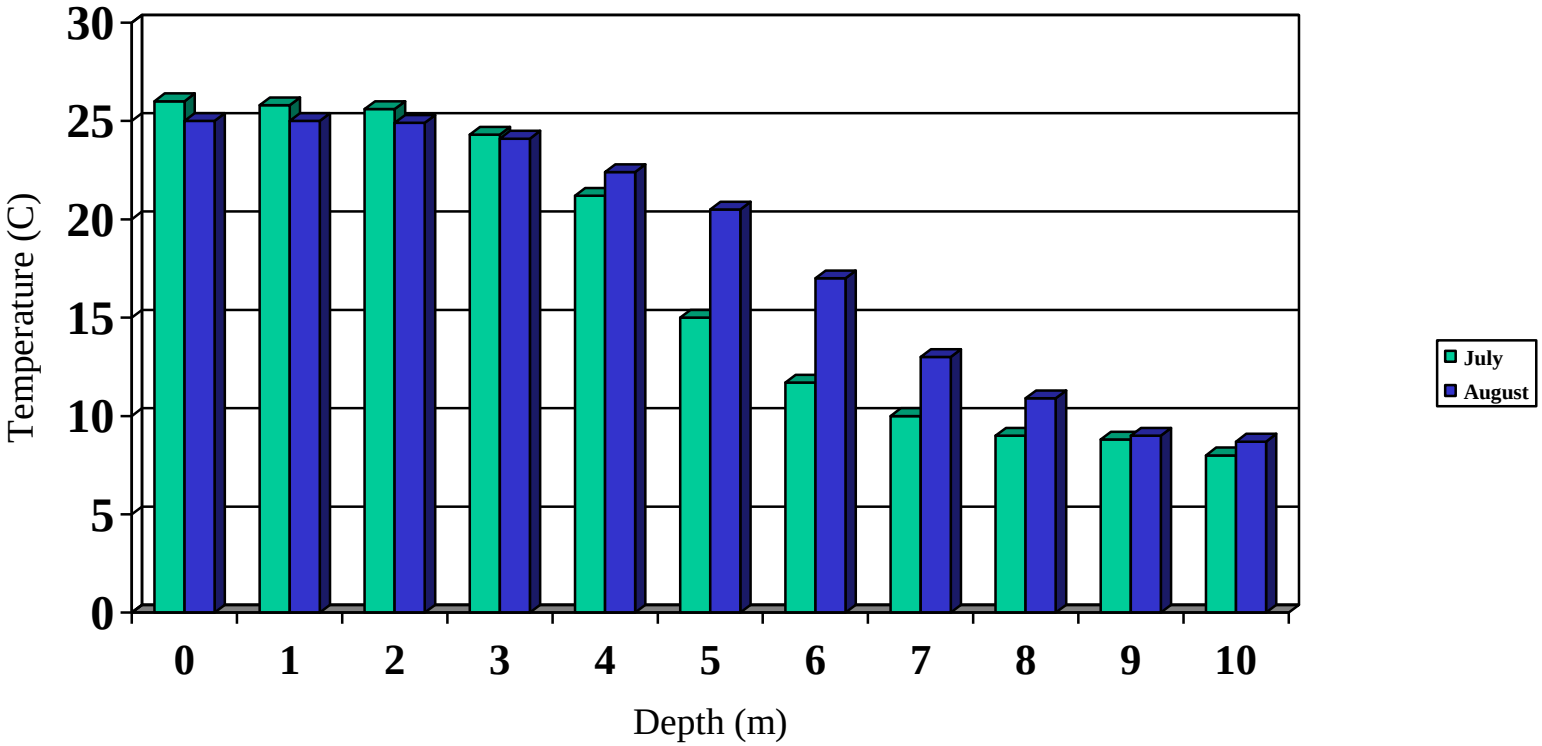
Conductivity Data Station One



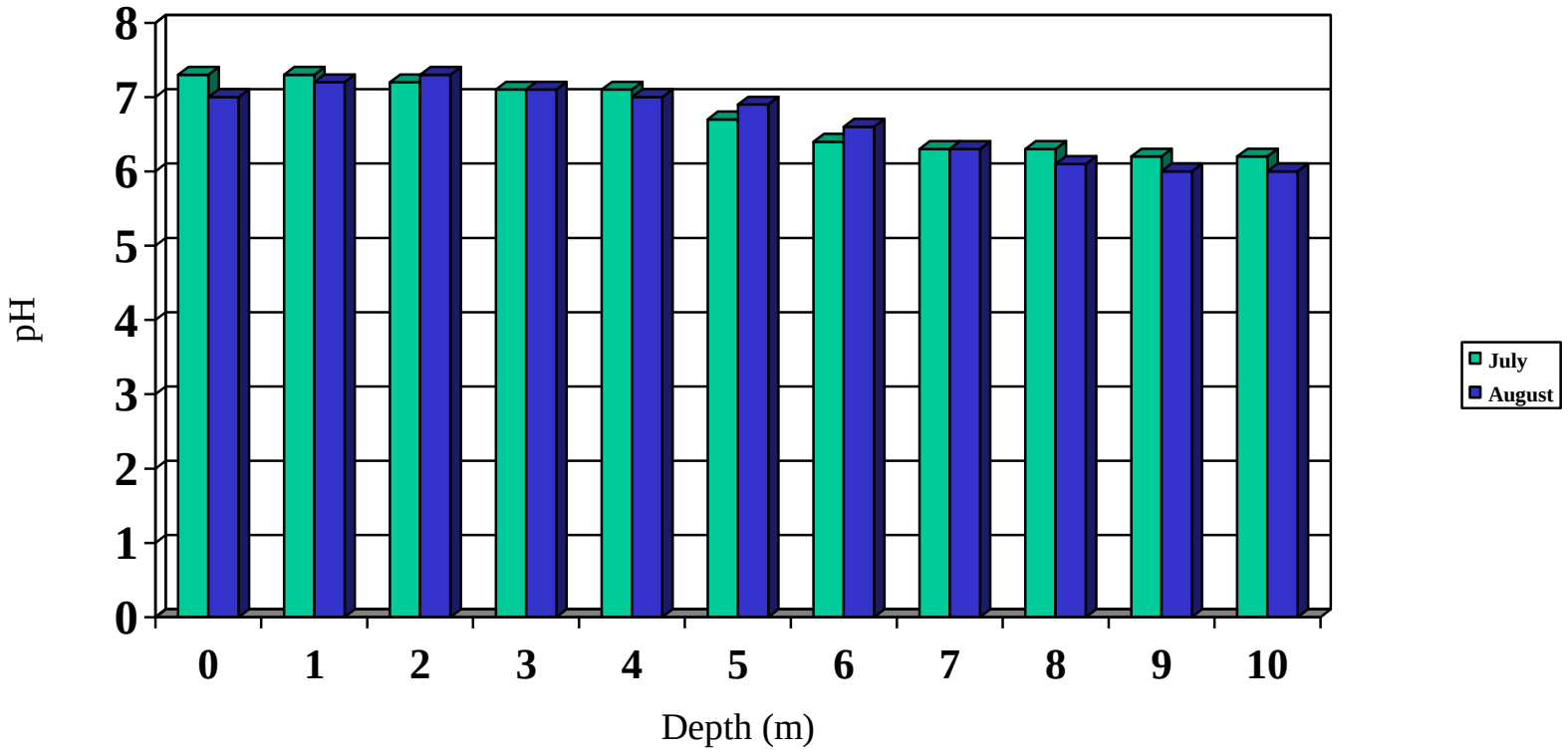
Dissolved Oxygen Data Station Two



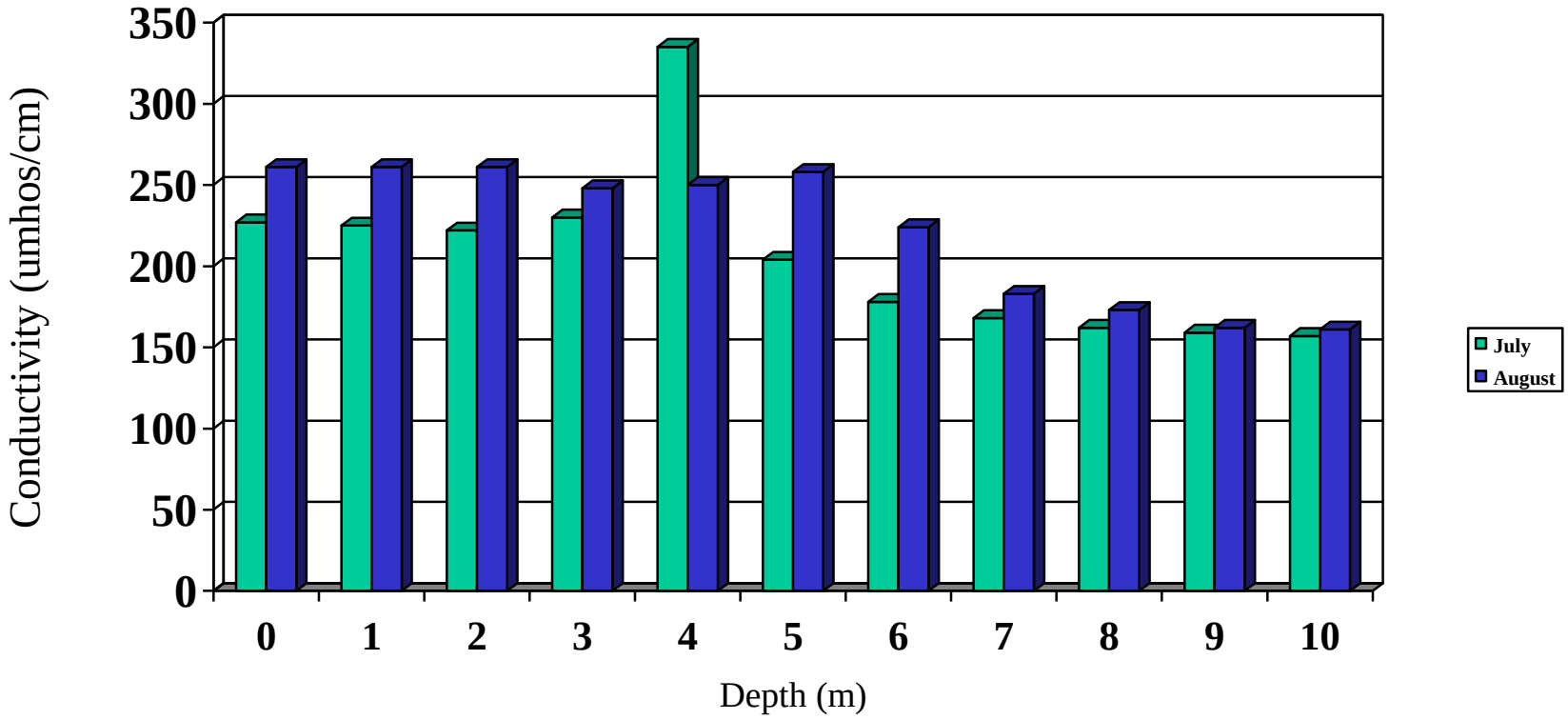
Dissolved Oxygen Percent Saturation Data Station Two



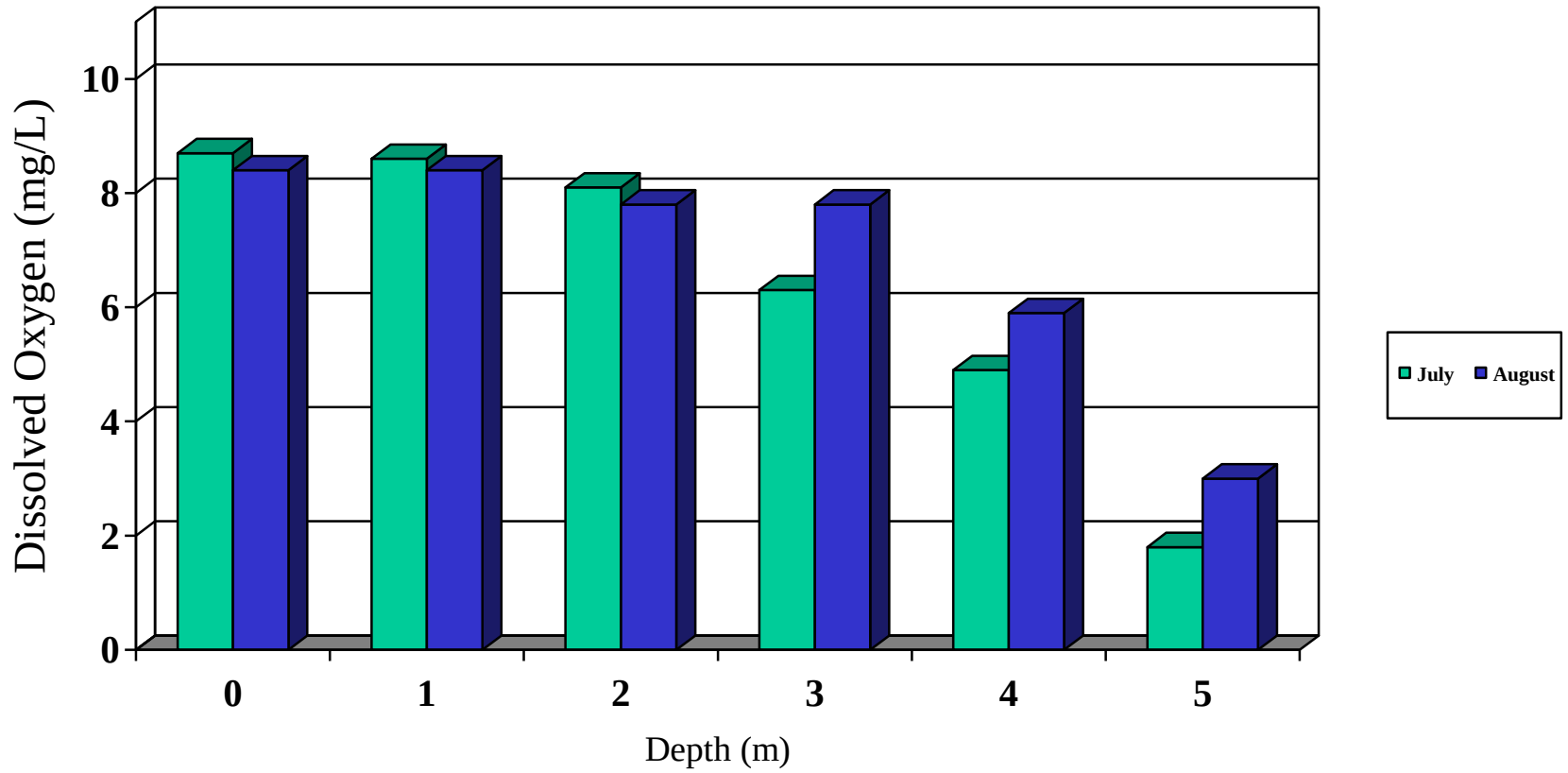
Temperature Data Station Two



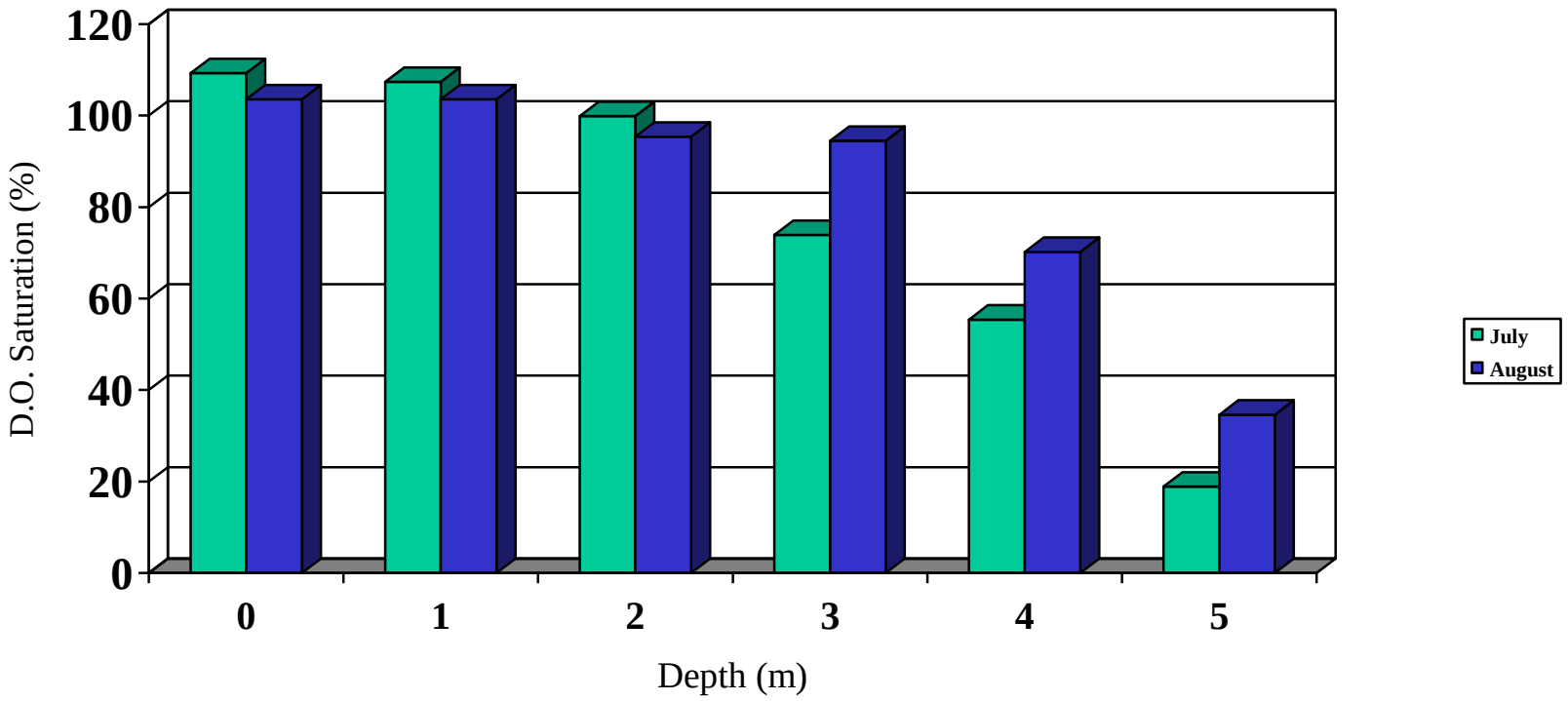
pH Data Station Two



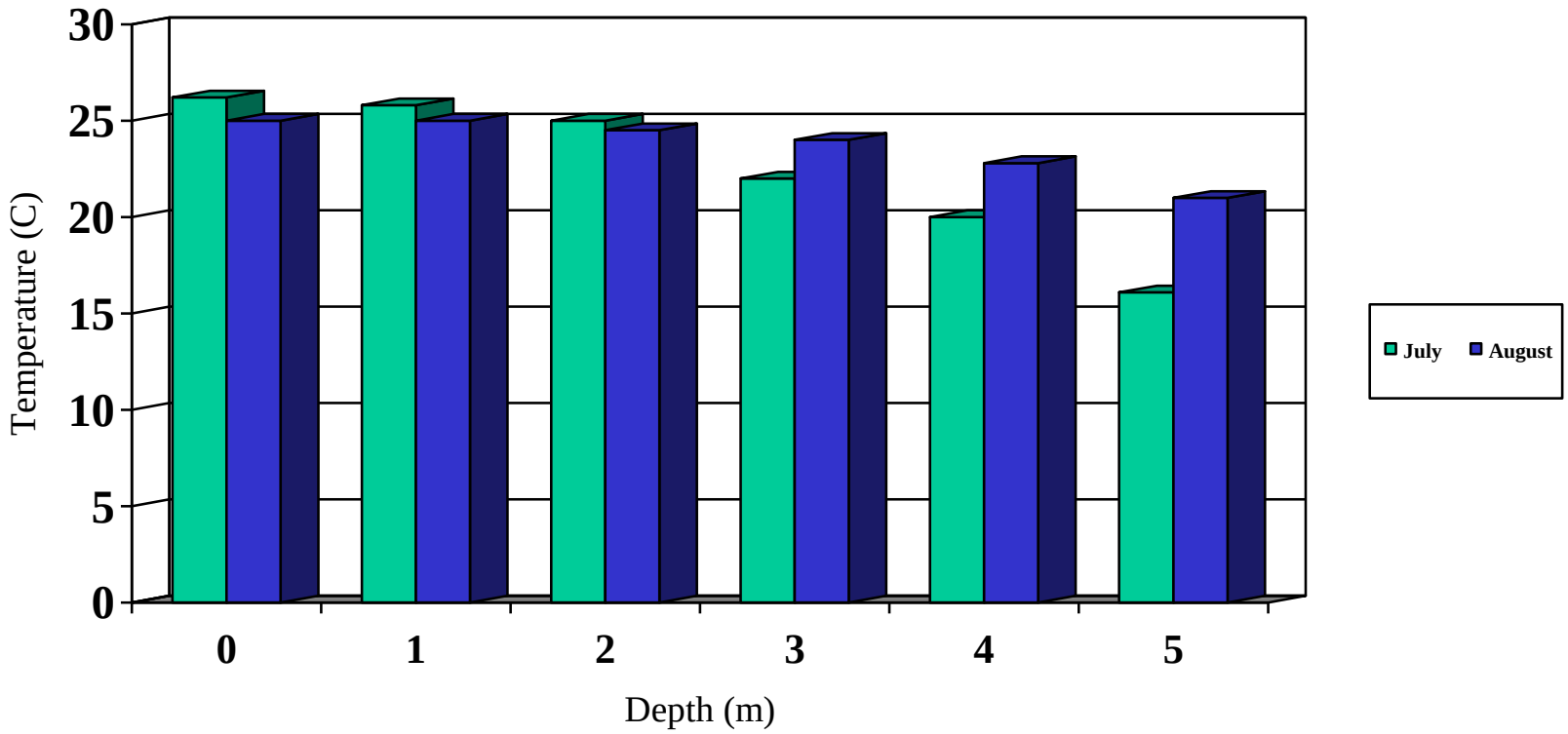
Conductivity Data Station Two



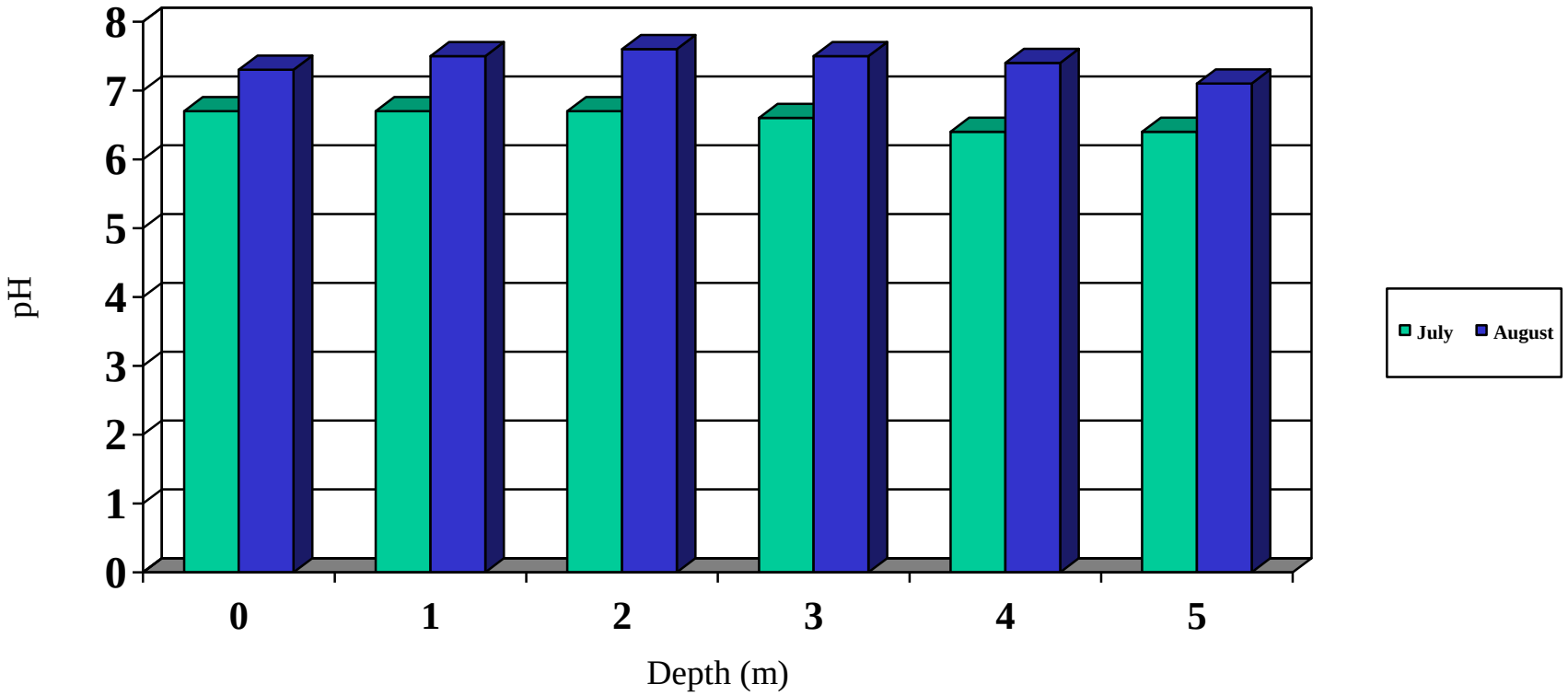
Dissolved Oxygen Data Station Three



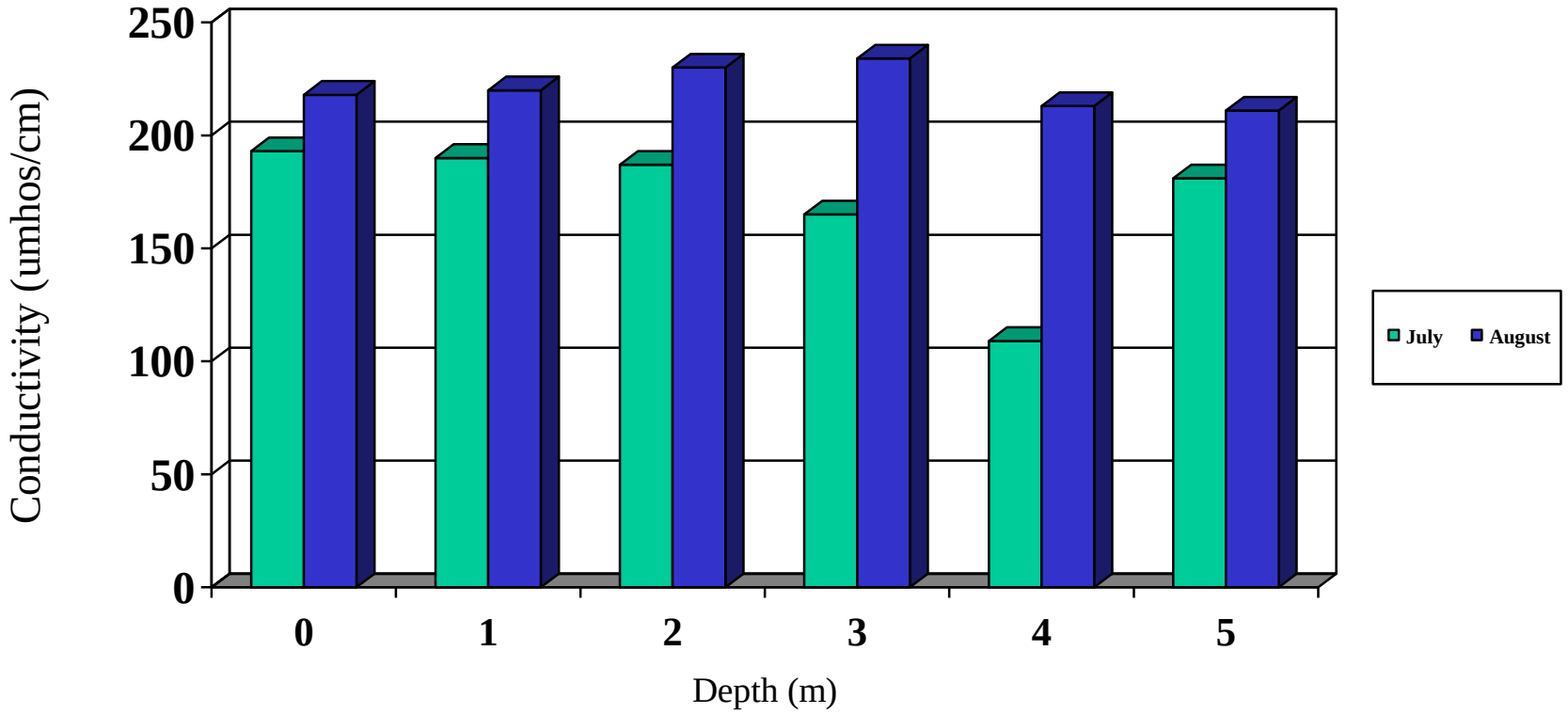
Dissolved Oxygen Percent Saturation Data Station Three



Temperature Data Station Three



pH Data Station Three



Conductivity Data Station Three