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water chem, 8.5
8.3

A REPORT OF TENDER BOG AND BOGPOT LAKE

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A Description of the Lakes

Bogpot lake is one of the prettiest lakes on the property. It is two to three times longer than it is wide, and it is rather small.

The beavers inhabiting Bogpot really show their presence. There are two beaver houses on the lake, one being near shore on the end closest to the road. The other bigger one is in the middle on the far end of the lake. Also, part of the shoreline is strewn with fallen logs. There seems to be evidence of flooding. One can see, in the center of the lake, barren tree trunks that remain standing. The far end of the lake also contains a small floating sphagnum island (where I once saw a beaver).

Grasses surround part of Bogpot's perimeter.. A marshy area surrounds the far end and part of the left side of the far end. Here a little spring trickles into the lake. Hardwoods, balsam fir, and other evergreens encircle the non-marshy areas.

Lilly-pads grow in the lake itself. They seemed to be more numerous in Bogpot then in the other lakes. But then, of course, Bogpot is only two meters deep.

The lake bottom is murky, and the water is brown. There were also many, many tadpoles. Supposedly sticklebacks inhabit the grassy edges of the lake.

A Description of the Lakes... Continued

Tender bog has a small surface area, but it is about nine meters deep. Succession is very apparent, Avery substantial sphagnum moss mat encircles the brown-colored water. One can see bog rosemary, labrador tea, leather leaf, and pitcher plants growing nearthe water's edge. Further away from the edge, the bog is surrounded by small tamaracks and further down by evergreens. There seemed to be no fish, but it is rumored that a bog monster inhabits the adjoining forest.

WATER CHEMISTRY

DATA TABLE _____ TENDER BOG

Test	.5 Meter Sample	7Meter Sample
Phenolpthalein Acidity	125 mg/1	140 Mg/1
Alkalinity	0	0
Nitrate	1.1 mg/1	1.76 mg/1
Phosphate	. 125 mg/1	.160 mg/1
Ca^{++} Hardness	5.0 mg/1	5.0 mg/1
Mg^{++} Hardness	15 mg/1	15 mg/1
Total Hardness	20 mg/1	20 mg/1
Color	55	75
Conductivity	28 micromoles/cm	25 micromoles/cm

Secchii Disk	one meter
H_2S	present in 7 meter sample
pH	3.7
Depth of bog	8.5-9 meters

OXYGEN AND TEMPERATURE READINGS:

Depth	Oxygen	Temperature
Surface	4.1 ppm	18.0°
.5 m	3.0 ppm	15.1°
1m	1.0 ppm	14.0°
1.5m	.40 ppm	11.0°
2m	.45 ppm	7.0°
2.5m	.25 ppm	6.2°
3m	.40 ppm	5.4°
4m	.30 ppm	4.8°
5m		4.6°

Depth	oxygen	Temp.
6m	.25ppm	4.0°
7m		4.6°
8m	.20 ppm	3.8°
9m	.20 ppm	

PLANKTON COUNT _____ TENDER BOG
(cts./ ml)

* A. M. COUNT *

Rotifers

Keratella Taurocephala	1500
Keratella Gracilenia	100
Scaridium	20

Cladocera

Daphnia Longispina	140

Algae

Dinobryon (30 per group)	600
Palycststis	20
Oedegonium	20

Desmids

Micrsterias	20
Spinocosmarium	20

Diatoms

Frustulia	20

Nauplius	20
Chaoboridae	1

* P.M. COUNT *

Rotifers

K. Taurocephala	160
K. Gracilenia	40
Lecane	20

NAuplius	20

Algae

Polucystis	20
Aphanocapsa	20

Copepods

Senecella	20

Desmids

Gonzatozygon	20

Diatoms

Frustella	80
Asterionella	240

Chaoboridae	11

WATER CHEMISTRY

DATA TABLE _____ BOGPOT LAKE

TEST*	1-Meter Sample	2-Meter Sample
Phenolpthalen Acidity	120 mg/1	120mg/1
Alkalinity	0	0
Color	95	100
Nitrate	7.9 mg/1	.88 mg/1
Phosphate	.053 mg/1	.052 mg/1
Ca^{++} Hardness	10 mg/1	10 mg/1
Mg^{++} Hardness	10 mg/1	10 mg/1
Total Hardness	20 mg/1	20 mg/1
Conductivity	23 micromoles/ cm	21 micromoles/cm

Specchii disc	one meter
pH	5.2
Depth of lake	two meters

OXYGEN AND TEMPERATURE READINGS:

Depth	Oxygen	Temperature
Surface	7.1 ppm	21.0°
1 m	5.8 ppm	20.5°
1.5m	1.4 ppm	
2 m	1.0 ppm	15.0°

PLANKTON COUNT ______ BOGPOT LAKE
(cts./ml)

* A.M. COUNT *

Rotifers

Keratella Taurocephala	20
Polyarthra	20

Dinoflagellates

PEridinium	80

Algae

Dinobryon	600
Polycycystis	20

Diatoms

Synedra	40

* P.M. COUNT *

Rotifers

K. Taurocephala	300
Asplancha	260
Conochilus	40
Trichocera	20

Algae 8

Dinobryon	7000
Polycystis	40

Cladocera

Bosmina	20

Dinoflagellates

Peridinium	20

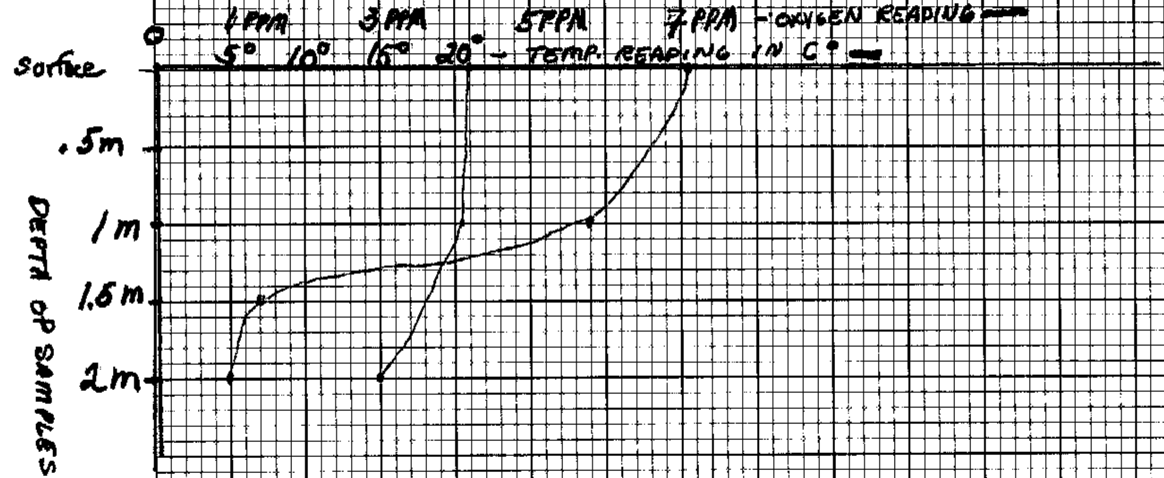
Copepods

Eucyclops	160

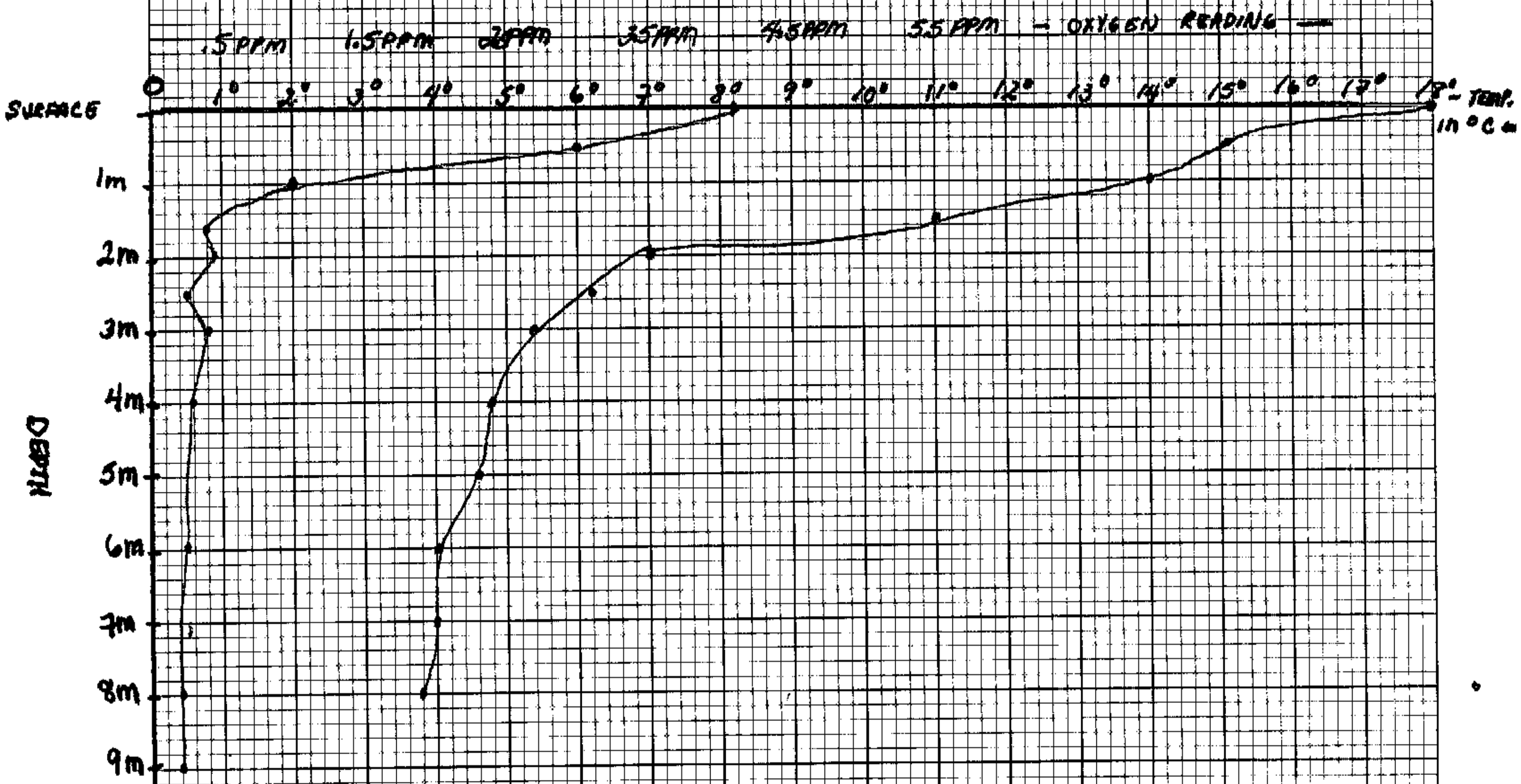
Chaoboridae .25

Samples were obtained with a Wisconsin net.

GRAPH for BOGPOT LAKE



GRAPH for TENDER BOG



DISCUSSION AND ANALYSIS -- TENDER BOG

Each water chemistry test is important in determining the nature of the lake. There is the phenolpthalein acidity test which determines the ability of the sample to donate hydrogen ions, while the alkalinity test indicates the presence of HCO_3^-, $CO_3^{=}$, OH^-. The nitrate and phosphate tests determine the levels of these two important nutrients. The hardness tests indicate the calcium ion, the magnesium ion, and the total magnesium and calcium ion levels in the sample. Soft water is, thus, water that has a low hardness.

The conductivity test determines the conductivity of electricity through the ions in the sample solution. Fewer ions in solution would probably lower the conductivity; therefore one can expect lower conductivity in soft water.

The color test indicates the degree of color in a sample, so this test depends on the amount of light that is transmitted (or absorbed) in a spectrometer.

Turbitity or clarity is tested by the use of a secchi disc. And the hydrogen sulfide test which consists of an Alka Selzer, indicates the presence and the amounts of hydrogen sulfide. The pH test is performed with an electric pH meter. It shows the concentration of H^+ ions in the solution.

Oxygen and temperature readings determine the stratification of the lake -- the epilimnion, the thermocline, and the hypolimnion -- by indicating the amount of oxygen and the temperature at varying depths.

Lakes can either be oligotrophic, eutrophic, or dystrophic. Oligotrophic lakes are characteristically deeper, colder, less conductive, and less productive than eutrophic lakes. They also have a higher oxygen content, fewer littoral plants, softer water, and lower alkalinity. Dystrophic lakes are usually associated with bogs,and have some oligotrophic characteristics.

Tender Bog is a typical bog. It has a low pH (3.7) and high acidity. Humic acid and other acids that come from the hemlock and spruce trees add to the acidity, the brownish color of the water, and consequently a secchi disc reading of one meter.

The sphagnum moss also does its job in creating a highly acidic environment. It acts as an ion exchanger, freeing H^+ ionsinto the water. The accumulating peat belaw the mat also releases acids that contribute to the acidity and to the brow color,

Yet another reason for the low pH is the softness of the water. Since soft water lacks calcium bicarbonate, it has no buffering action.

Soft water and poor conducting lakes like Tender Bog are less productive than hard water lakes. Calcium and magnesium are required by bacteria to effeciently recycle nutrients.

The nutrient levels in Tender are low, with phosphate being the limiting factor. These nutrients are very important to the algae.

It is interesting to note that a greater amount of phos-nitrate, acidity, and color was found in the seven meter sample than in the .5 meter sample. Since the bog doesnt overturn, substances are then collected and concentrated in the lower depths.

From .5 meter to 1.5 meters the oxygen content drops greatly. Below that, oxygen is almost non-existant. Although, at nine meters there was still a minimal reading. But this reading could have instead been indicating hydrogen sulfide, which was definitely present in the seven meter sample. The hydrogen sulfide is produced by anaerobic bacteria.

The absence of oxygen from most of the depths can again be explained by the bog's failure to overturn. The waters in the epilimnion,the thermocline, and the hypolimnion are all seperated from each other by their varying temperatures and densities. The oxygen that was once there, was consumed by decaying organic material. Thus, the three layers can not mix with each other, and the oxygen can not be replenished.

The graph shows a few tiny blips on the oxygen curve. These blips might be the sights of small plankton blooms, or they may be the result of a drifing Oxygen probe.

The temperature and oxygen plots for Tender Bog show that the epilimnion extends to about .5 meter, the thermocline toabout 2 meters, and the hypolimnion from 2 meters to the bottom. It is a-mazing how the temperature and oxygen readings can drop so drastically in only a few meters.

As one can expect, extreme conditions make life in Tender Bog limited. Few ,if any, species of fish, reptiles, and amphibians could inhabit these waters. Even the plants-such as leatherleaf, sundews, and pitcher plants- are specialized for living on the harsh environment of the bog mat.

But Tender Bog is not at all barren with respect to its plakton population (even though the count was low). The most a-bundant species in the A.M. sample was <u>Keratella</u> <u>taurocephala</u>. This rotifer is an acid water species. At night the daytime plankton population migrates down,and an almost entirely different night-time population replaces it. TheP.M. sample has <u>Asterionella</u> as the most abundant genus. <u>K</u>. <u>taurocephala</u> ,again present, comes in second. <u>Chaoboridae</u> and <u>K</u>. <u>gracilenia</u> are also present twice. Since there are no fish in the bog, <u>Chaoboridae</u> is ,is most likely, an important predator.

Each year the sphagnum mat covers more and more the surface of the water. Eventually, open water will disappear, the spruce and other evergreens will shade out the tamarack, anda climax forest will exist on what was Tender Bog.

BOGPOT LAKE

Bogpot is interesting because it is so shallow. From surface to bottom the temperature drops only 5°C. The lake is shallow enough to be evenly warmed by the air.

The oxygen plot does show stratification, At one meter the oxygen reading drops from 5.8ppm to 1.4 ppm at 1.5 meters. At 2 meters it is only 1.0 ppm. There must be decay going on in the lower depths. Either the lake is productive, or there are many decaying logs on the bottom (there are). Both reasons may apply, but the productivity of the lake is doubtful.

The plankton samples were rather clear. Dinobryon was the most numerous plankton, both at night and during the day. At night, especially, it occurs in great numbers. It is interesting to note that there were a lot more species and numbers at night than there were during the day at Bogpot. In Tender Bog, the opposite occured. There are fish in Bogpot, so the plankton come up at night in an effort to escape predation. Also, Chaoboridae occurs in lesser mumbers than it did in Tender Bog. It only comes up at night.

The nutrient levels are also low. The phosphate level is low, while the nitrate levels are puzzling. There is a big difference between the one meter sample and the two meter sample. The one meter sample is markedly higher. One explanation is that the two meter sample could have been contaminated. Otherwise, the differences between the one and two meter samples for the other categories are minimal. This would be expected in a shallow lake, where the water is more easily mixed.

The lake is on the acid side with a pH of 5.2and a high phenolpthalein acidity. This may be partly a result of the humeric acidswhich also stain the water brown. The alkalinity test was zero. There was probably a minute quantity present, but the test is not able to detect it. Low alkalinity (poor buffering capacity) would also explain the high acidity fo the lake.

The water in Bogpot is also soft and pooorly conductive. This might be caused by the absence of limestone. Limestone reacts with carbonic acid to produce calcium bicarbonate. This soluable product increases both the hardness and the alkalinity of the water. As was mentioned before, hard water is important in increasing the productivity of a lake. Bogpot's soft water might then be a cause of the rather clear plankton samples.

Bogpot lake has a mixture of both oligotrophic and eutrophic characteristics. Like a eutrophic lake it is shallow, warm, has littoral vegetation, and a declining oxygen curve. On the other hand, it has low alkalinity, low hardness, a low nutrient level, and a rather poor plankton sample. All in all, these characteristics best describe a dystrophic lake.. But Bogpot is fairly new, and doesn't seem to be filling in(at least not rapidly). This lake just doesn't fit into any clear cut aategory.

The lake will, after many years, when the beaver are gone, turn into a marsh like some of the marshy areas that now adjoin it.