

Physiochemical survey of Thayer farm ponds

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INTRODUCTION

In 2000, the Biological Field Station acquired the Thayer Farm in Springfield, NY. The property comprises a diverse landscape which will be used for research and education. Eleven ponds are on the property (Figure 1), each having unique characteristics (despite the close proximity of many). In order gain some baseline characteristics of each pond, water from each was analyzed for physical and chemical parameters. Observations were also made on the character of the substrate, dominant plants and the water color. Concurrent with this work, a survey of the macrobenthic invertebrate communities was conducted (Conde, 2003).

METHODS

Water samples were collected and physical water parameters measured on 30 July 02 at nine of the eleven ponds on the Thayer property. Two of the ponds were not sampled due to low water levels. A Hydrolab Reporter[®] was used to measure the temperature, conductivity, dissolved oxygen concentration, and pH in each pond. Water samples collected were taken back to the field station laboratory for further analysis, which included total phosphorus, nitrite+nitrate, calcium, chloride and alkalinity. Methodologies for these analyses can be found in Table 1.

Parameter	Sample volume	Method	Reference
Total Phosphorus-P	40 mL	Persulfate digestion followed by single reagent ascorbic acid	EPA, 1983
Nitrite+Nitrate-N	25 mL	Cadmium reduction	APHA, 1989
Calcium	50 mL	EDTA titrimetric	EPA, 1983
Chloride	100 mL	Mercuric nitrate titration	APHA, 1989
Alkalinity	100 mL	Titration to pH = 4.6	APHA, 1989

Table 1. Methods used in water quality analysis.

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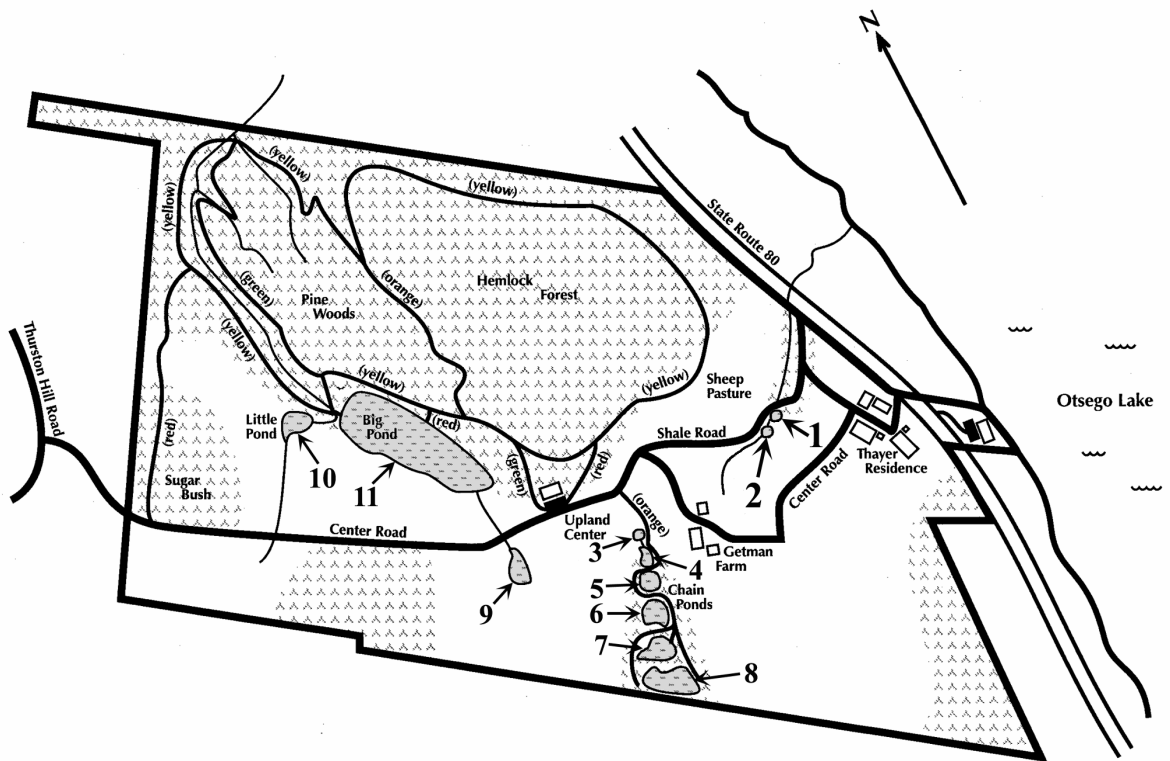


Figure 1. Map of the Thayer Farm indicating the pond system. Ponds 3 and 4 are ephemeral and were not sampled.

RESULTS AND DISCUSSION

The physical characteristics of the ponds are given in Table 2 and some chemical parameters are given in Table 3. Given the close proximity of the ponds, particularly 5-8, which are connected during periods of high water, it is surprising how variable they are. Dissolved oxygen is undoubtedly extremely variable and differences between the ponds are probably due to plant photosynthesis vs. respiration at the points sampled. pH was positively related to dissolved oxygen. In ponds near or above oxygen saturation, carbonic acid would be actively removed from the water by plants, which would increase pH; the inverse would be true during periods experiencing respiration and/or decomposition.

Because only the nitrite+nitrate fraction of nitrogen was measured, it is not possible to calculate the total nitrogen:total phosphorus ratio, which would provide insight into which nutrient limits the pond's productivity. Based upon the total nitrogen:total phosphorus ratio in algal biomass of 7 - 10, values lower than that would

indicate nitrogen limitation (Valentyne, 1974). The low nitrite+nitrate:total phosphorus ratios encountered in the ponds (range = 0.22 to 1.33, mean = 0.7) would imply that nitrogen is limiting.

Pond	Temperature (°C)	pH units	Dissolved Oxygen (mg/l)	Conductivity (umho/cm)
1	22.6	7.19	1.82	276
2	24.75	7.69	6.86	230
5	28.81	7.83	8.83	131
6	23.96	7.30	2.85	111
7	28.6	9.36	11.12	74
8	28.13	8.8	7.92	172
9	28.59	8.09	9.35	245
10	26.8	7.90	8.10	159
11	27.07	7.72	6.56	334

Table 2. Temperature, pH, dissolved oxygen and conductivity of ponds on the Thayer Farm.

Pond	Alkalinity (mg/l as CaCO₃)	Calcium (mg/l)	T-Phosphorus (ug/l)	NO₂+NO₃ (mg/l)	Chlorides (mg/l)
1	137	55.31	76	0.04	1.0
2	111	45.69	136	0.03	0.5
5	59	26.45	88	0.04	1.5
6	53	20.84	180	0.04	1.5
7	81	15.23	30	0.03	1.0
8	81	36.07	66	0.02	1.0
9	121	49.70	63	0.08	1.25
10	77	36.07	15	0.02	0.75
11	174	75.35	19	0.02	2.25

Table 3. Alkalinity, calcium, total phosphorus, nitrite+nitrate and chloride concentrations of ponds on the Thayer Farm.

While anecdotal in nature, Table 4 provides some notes on the general nature of the plant communities, the substrates and water color of the ponds. As is the case with the other characteristics evaluated, the variability among the ponds is noteworthy.

Pond	Plant Growth	Substrate	Water Clarity
1	<i>Ceratophyllum demersum</i> , scum algae	Organic matter	Brown
2	<i>C. demersum</i> , <i>Typha</i> sp.	Organic matter	Light brown
3	Solid <i>Typha</i> sp.		Clear
4	No emergents		Shallow, brown
5	No plants	Organic layer on hard clay	Very brown, almost opaque
6	<i>Potamogeton</i> sp.	Clay	Brown
7	<i>Potamogeton</i> sp., <i>Typha</i> sp.	Hard clay	Clear
8	<i>C. demersum</i> , <i>Potamogeton</i> sp.	Hard clay	Light brown
9	No plants	Hard clay	Brown
10	Few emergents, no submergents	Rocky	Brown
11	Great diversity of both emergents and submergents	Clay	Clear

Table 4. Notes on the plant communities, the substrates and water color of the ponds.

REFERENCES

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