

Interagency Memorandum
Department of Environmental Protection
Bureau of Water Protection and Land Reuse

To: Ms. Ellen Weitzler
Mr. Toby Stover
USEPA Region 1

From: Traci Iott
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Bureau of Water Protection and Land Reuse
CTDEP

Date: February 10, 2011

Re: Supporting documentation for use of macrophyte data in determining lake trophic status

Lake trophic status in Connecticut is determined through a careful evaluation of both chemical and macrophyte data for individual lakes. The Connecticut Water Quality Standards contains ranges of Total Phosphorus, Total Nitrogen, Chlorophyll A and transparency as associated with lake trophic status. These chemical ranges are based on a previous study by Norvell and Frink⁽¹⁾ of Connecticut Lakes and are well supported for guiding the assessment of lake trophic status. However, reliance solely on chemistry data can under-predict the trophic status of a lake in certain conditions⁽²⁾⁽³⁾. Macrophyte growth in lakes is dependent on lake morphology and chemistry. However, the presence of macrophytes may affect observed water chemistry, as the plants are capable of removing nutrients from the water column to support plant growth and development. For this reason, Connecticut Department of Environmental Protection (CTDEP) uses both water chemistry data and information concerning macrophyte coverage when assessing the trophic status of a lake. Examples are provided below to illustrate this point.

Green Falls Reservoir

Green Falls Reservoir in Voluntown CT was assessed within the 1991 publication of Trophic Classifications of Forty-nine Connecticut Lakes⁽⁴⁾ published by CTDEP. Within this report, the trophic classification of this lake is identified as Mesotrophic. However, if only the chemistry data provided within this report was evaluated, the trophic status might have been identified as Oligotrophic.

Excerpt from page 28 of Trophic Classifications of Forty-nine Connecticut Lakes

GREEN FALLS RESERVOIR
(Voluntown, CT)

Date	Alkalinity/CaCO ₃	Transparency	Sample Depth	pH	Chlorophyll-a	Total P	Organic N	NH ₄ - N	NO ₂ N + NO ₃ N	Total N
	mg/l	m		units			ppb			
05/11/89	1	5.2	comp	4.9	-	3	186	14	14	214
09/06/89	1	7.5	0.3	5.0	0.3	2	183	17	10	210
			5.8	4.8	-	1	182	18	10	210
			7.0	4.7	-	5	175	25	10	210
			8.2	5.4	-	6	286	14	10	310

Evaluation of Chemistry Data for Green Falls Reservoir

Parameter	Green Falls Reservoir	Oligotrophic Range	Mesotrophic Range	Potential Trophic Assessment
Total Phosphorus (ug/L)	1-6	0-10	10-30	Oligotrophic
Total Nitrogen (ug/L)	210-310	0-200	200-600	Oligotrophic
Chlorophyll-a (ug/L)	0.3	0-2	2-15	Oligotrophic
Transparency (meters)	5.2-7.5	6	2-6	Oligotrophic

However, as documented on the same page within the report, there was extensive macrophyte coverage within the lake.

Aquatic Macrophyte Notes

Areal coverage of aquatic vegetation was extensive and found predominantly along the shoreline. The dominant vegetation was Pontederia cordata (Pickerelweed) which was moderately dense. Other moderately dense aquatic vegetation included Dulichium arundinaceum (Three-Way Sedge), Eriocaulon spp. (Wild Millet), Lythrum salicaria (Spiked Loosestrife), Utricularia purpurea and U. inflata (Bladderwort), Nymphaea spp. (White Water Lily) and Nuphar spp. (Yellow Water Lily).

For this reason, the trophic status of Green Falls Reservoir was assessed as Mesotrophic, not Oligotrophic.

Morey Pond

Morey Pond in Ashford and Union CT was assessed within the 1991 publication of Trophic Classifications of Forty-nine Connecticut Lakes published by CTDEP. Within this report, the trophic classification of this lake is identified as Mesotrophic. However, if only the chemistry data provided within this report was evaluated, the trophic status might have been identified as Oligotrophic.

Excerpt from page 62 of Trophic Classifications of Forty-nine Connecticut Lakes

MOREY POND
(Ashford, Union, CT)

Date	Alkalinity/CaCO ₃	Transparency	Sample Depth	pH	Chlorophyll-a	Total P	Organic N	NH ₄ - N	NO ₂ -N + NO ₃ -N	Total N
	mg/l	m		units			ppb			
04/20/89	9	3.8	comp	6.8	-	2	288	12	10	310
07/27/89	9	3.5	0.3	6.9	0.4	3	-	25	10	-
			1.8	6.7	-	2	170	34	10	214
			2.7	6.5	-	3	270	28	10	308
			3.7	6.4	-	4	270	33	10	313

Evaluation of Chemistry Data for Morey Pond

Parameter	Morey Pond	Oligotrophic Range	Mesotrophic Range	Potential Trophic Assessment
Total Phosphorus (ug/L)	2-4	0-10	10-30	Oligotrophic
Total Nitrogen (ug/L)	214-310	0-200	200-600	Oligotrophic
Chlorophyll-a (ug/L)	0.3	0-2	2-15	Oligotrophic
Transparency (meters)	3.5-3.8	6	2-6	Mesotrophic

However, as documented on the same page within the report, there was extensive macrophyte coverage within the lake.

Aquatic Macrophyte Notes

Areal coverage of aquatic vegetation was extensive throughout the entire pond. The dominant types of vegetation included Nitella spp. (Stonewort), and Potamogeton epihydrus (Leafy Pondweed). Other vegetation included Brasenia schreberi (Water Shield), Potamogeton natans (Floating-Leaf Pondweed), and Myriophyllum farwellii (Water Milfoil).

For this reason, the trophic status of Morey Pond was assessed as Mesotrophic, not Oligotrophic.

Bibliography

- (1) Norvell, W.A. and C.R. Frink. 1975. Water chemistry and fertility of twenty-three Connecticut lakes. The Connecticut Agricultural Experiment Station Bulletin 759.
- (2) Canfield, D.E., K.A. Langeland, M.J. Maceina, W.T. Haller, J.V. Shireman, and J.R. Jones. 1983. Trophic state classification of lakes with aquatic macrophytes. Can. J. Fish Aquat. Sci. 40: 1713-1718.
- (3) Bachmann, R.W., C.A. Horsburgh, M.V. Hoyer, L.K. Mataraza and D.E. Canfield, Jr. 2002. Relations between trophic state indicators and plant biomass in Florida lakes. Hydrobiologia 470: 219-234.

(4) Connecticut Department of Environmental Protection. 1991. Trophic Classification of Forty-Nine Connecticut Lakes.