

Timber Lake



Surface water quality classification: Class B

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	2.9	NYSDEC 2008
Watershed area	hectares	22	EcoLogic 2008 (excl lake)
Volume	mgal	15.61	EcoLogic 2008
Elevation	m	80	NYSDEC 2008
Maximum depth	m	3.1	EcoLogic 2008
Average Depth	m	2.1	EcoLogic 2008

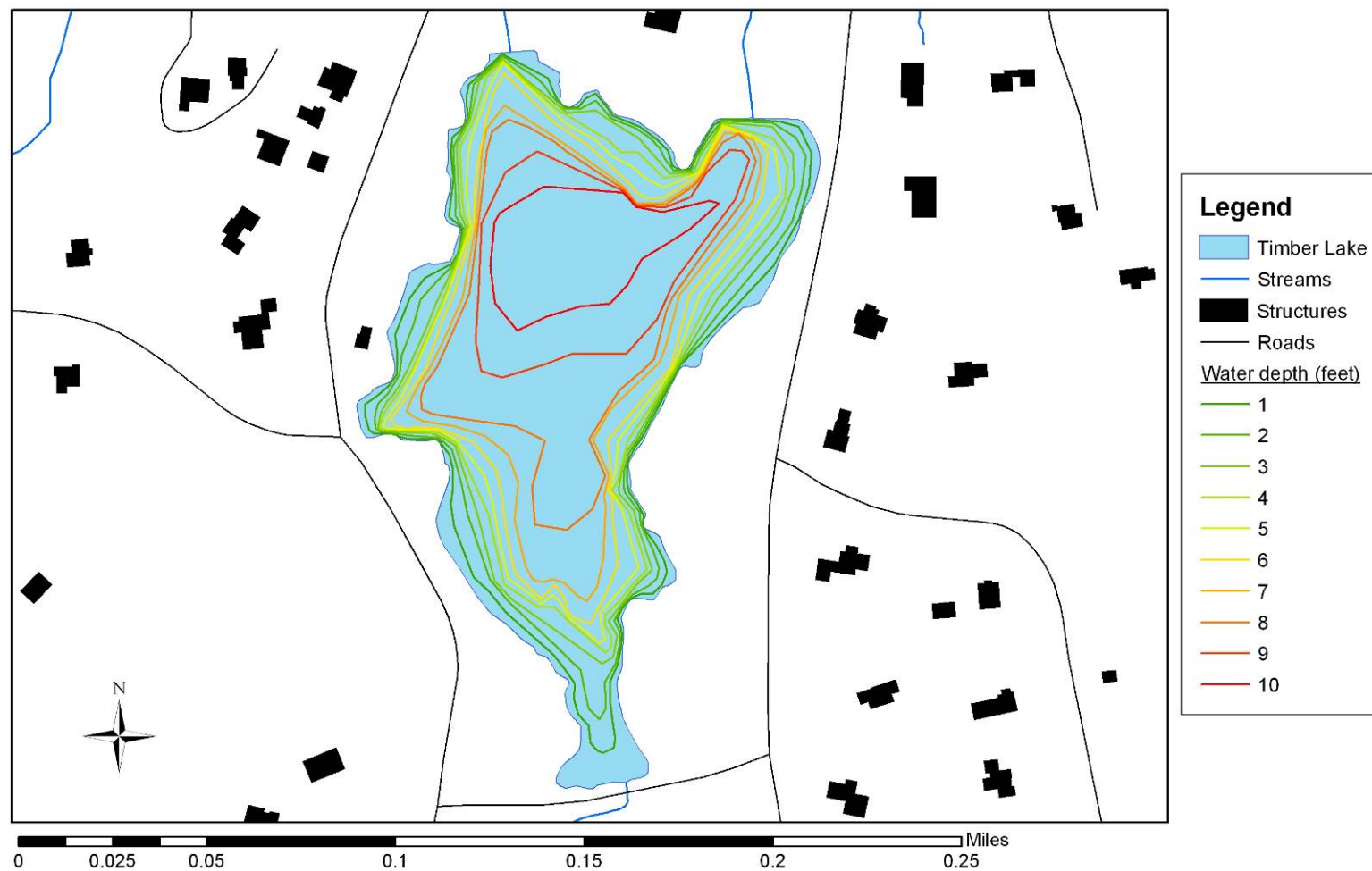
Lake Inlet: There is a small inlet entering on the south shore that drains a wetland area.

Lake Outlet: The lake level is controlled by a dam located on the northwest shore.

Recreational impacts: Recreational suitability was mostly unfavorable in 2005; the lake was described as “slightly” to “substantially” impaired for recreational uses. This was associated with a drop in water clarity and elevated algae levels. (NYSDEC 2006). The lake was described as “excellent” to “slightly” impaired for recreational uses in 2007, slightly better than in recent years, but slightly more favorable than expected given the water quality conditions. (NYSDEC 2008)

Lakeshore Development: Development is predominantly residential, and is most dense to the south and east of the lake.

Figure 1
Timber Lake
Bathymetry August 13, 2008

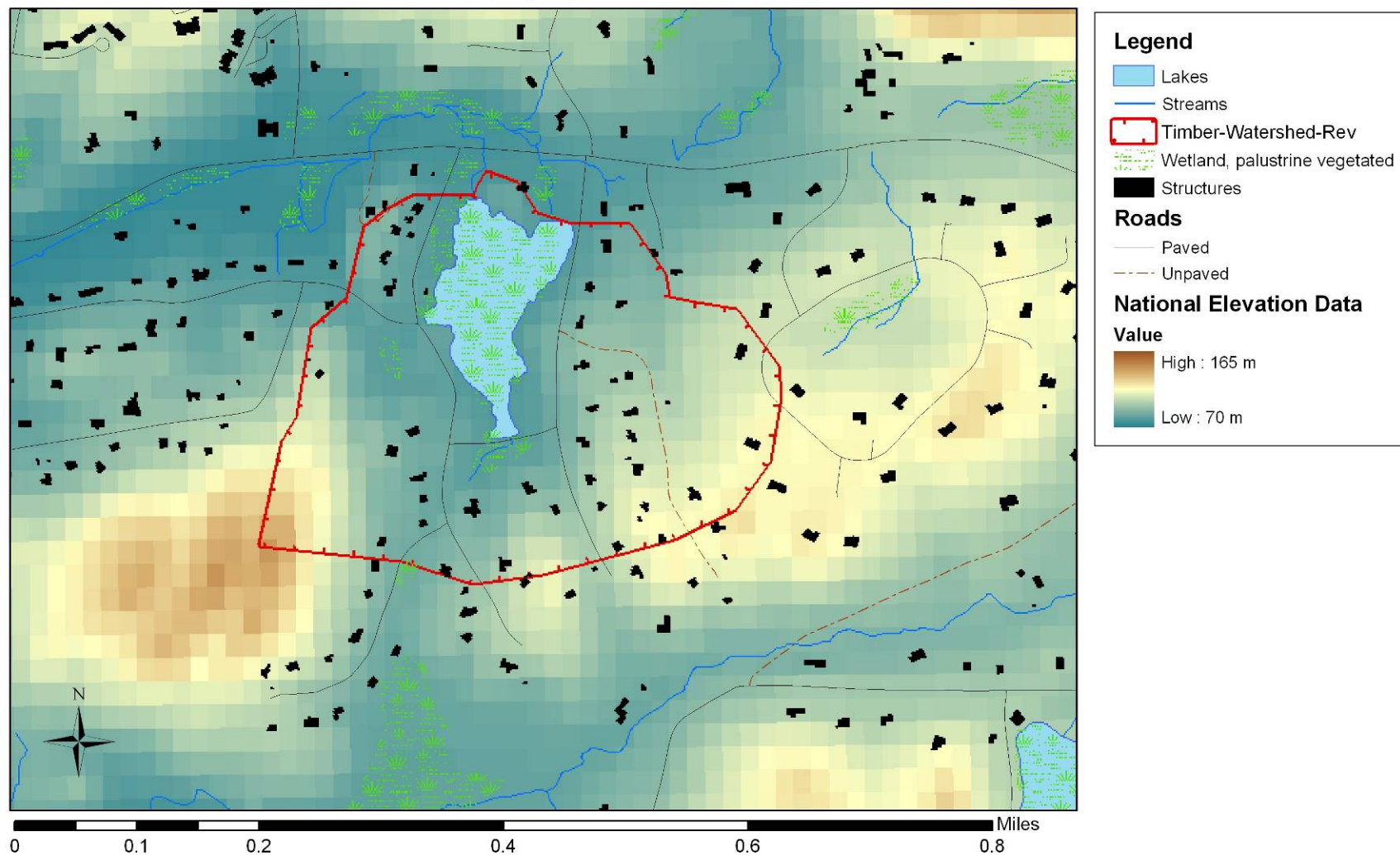


Sources:

Lakes, Streams, Roads and Structures - On-line at Westchester County web site <http://giswww.westchestergov.com/>. Municipal planimetric datasets were photogrammetrically derived from the county's 2004 base map project and meet National Map Accuracy Standards at 1"=100'.



Figure 2
Timber Lake
Topographic and Human Features

**Sources:**

Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site <http://giswww.westchestergov.com/>. Municipal planimetric datasets were photogrammetrically derived from the county's 2004 base map project and meet National Map Accuracy Standards at 1"=100'.

National Elevation Dataset - U.S. Geological Survey (USGS), EROS Data Center, 1999. On-line at <http://gisdata.usgs.net/ned/>.

Geographic coordinate system. Horizontal datum of NAD83. Vertical datum of NAVD88.



Historical water quality data summary:

Data were collected under the Citizen Statewide Lake Assessment Program (CSLAP), at depths ranging from 1.0 to 1.5 meters (upper waters only). Table A below summarizes samples collected between January and December of each year. Table B below summarizes samples collected during the summer, defined as the period between June 15 and September 15 each year.

<i>A. Representing samples collected between January and December each year.</i>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Calcium (mg/l)	1994-1995	0	--	--	--
	2005-2007	6	18.37	25.31	22.43
Chlorophyll- α (ug/l)	1994-1995	0	--	--	--
	2005-2007	23	1.1	27.98	13.77
Color (platinum color units)	1994-1995	0	--	--	--
	2005-2007	23	3	48	16.78
Conductivity (umhos/cm; 25°C)	1994-1995	0	--	--	--
	2005-2007	24	323.9	565.1	458.7
Dissolved Nitrogen (mg/l)	1994-1995	0	--	--	--
	2005-2007	24	0.125	0.929	0.486
NO ₃ Nitrates (mg/l)	1994-1995	0	--	--	--
	2005-2007	23	0.0025	0.153	0.034
NH ₃ Nitrogen (mg/l)	1994-1995	0	--	--	--
	2005-2007	23	0.005	0.208	0.048
Phosphorus (mg/l)	1994-1995	0	--	--	--
	2005-2007	23	0.0155	0.0588	0.0348
Nitrogen:Phosphorus Ratio	1994-1995	0	--	--	--
	2005-2007	23	2.99	37.90	16.15
pH (std units)	1994-1995	0	--	--	--
	2005-2007	24	7.29	8.38	7.78
Secchi depth (m)	1994-1995	18	0.49	2.75	1.39
	2005-2007	24	0.70	3.0	1.53
Temperature (°C)	1994-1995	0	--	--	--
	2005-2007	24	21.5	29	25.73

<i>B. Representing samples collected between June 15 and September 15 each year.</i>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Chlorophyll- α (ug/l)	1994-1995	0	--	--	--
	2005-2007	20	1.1	27.98	14.17
Dissolved Nitrogen (mg/l)	1994-1995	0	--	--	--
	2005-2007	21	0.125	0.929	0.467
NO ₃ Nitrates (mg/l)	1994-1995	0	--	--	--
	2005-2007	20	0.0025	0.15	0.036
NH ₃ Nitrogen (mg/l)	1994-1995	0	--	--	--
	2005-2007	20	0.005	0.171	0.040

<i>B. Representing samples collected between June 15 and September 15 each year.</i>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Phosphorus (mg/l)	1994-1995	0	--	--	--
	2005-2007	20	0.016	0.059	0.034
Nitrogen:Phosphorus Ratio	1994-1995	0	--	--	--
	2005-2007	20	2.99	37.90	16.38
Secchi depth (m)	1994-1995	10	0.51	2.52	1.39
	2005-2007	21	0.70	3.0	1.49

EcoLogic August 2008 water quality data summary:

A. Analytical Results

Parameter (units)	Surface (0 m)	Depth (3.1 m)
Secchi Transparency (m)	1.0	--
Chlorophyll-a (mg/l)	0.026	na
Alkalinity (mg/l)	68	na
<u>Phosphorus:</u>		
Total Phosphorus (mg/l)	0.012	0.017
Soluble Orthophosphate as P (mg/l)	<0.003	0.0056 ^a
<u>Nitrogen:</u>		
Total Kjeldahl Nitrogen (mg/l)	0.60	0.68
Nitrate/Nitrite as N (mg/l)	0.055	0.054
Total Nitrogen (mg/l)	0.66	0.73
na – not analyzed		
^a A trace amount of this analyte was found in the laboratory preparation blank.		

B. Field Profiles

Depth ft (m)	Temperature (°C)	pH	Conductivity (us)	DO (mg/l)	DO (% sat)
1 (0.305)	24.5	7.2	636	5.2	61
2 (0.61)	24.2	--	635	5.1	61
3 (0.915)	24.2	--	634	4.9	58
4 (1.22)	24.1	--	625	4.8	57
5 (1.525)	24.1	--	635	4.8	58
6 (1.83)	24.1	--	634	4.8	57
7 (2.135)	24.1	--	634	4.7	56
8 (2.44)	24.1	--	634	4.7	56
9 (2.745)	24.1	--	634	4.7	56
10 (3.05)	24.0	--	634	4.6	54

Sediment data summary:

- Composite samples collected August 13, 2008 (EcoLogic, 2008):

Parameter	Analytical Method	Result (mg/kg dry wt)
Pesticides/PCBs	EPA 8081/8082	ND
TCL Volatiles	EPA 8260B	ND
TCL Semi-Volatiles	EPA 8270	ND

Parameter	Analytical Method	Result (mg/kg dry wt)
<u>RCRA Total Metals</u>	EPA 6010	
Arsenic		ND
Barium		19
Cadmium		0.26
Chromium		3.8*
Copper		18
Lead		13
Selenium		ND
Silver		ND
RCRA Mercury	EPA 7471	ND
Total Organic Carbon	EPA 9060	103,000
Total Solids	SM 18-20 2540B	18%
ND – non-detect. Analytes reported as less than the method detection limit.		
*The result of the laboratory control sample for this analyte was less than the established limit.		

Sediment Contaminant Analysis: Interest has been expressed in exploring the feasibility of dredging. A composite sediment sample was collected on August 13, 2008 (EcoLogic, 2008). Results are summarized in Table C, in the context of NYSDEC Screening levels. A complete set of results is attached to the end of this report. (Attachment 2 - 2008 Water Quality and Sediment Sampling Locations and Laboratory Analysis Reports). The NYSDEC screening levels are separated into three Classes: A, B, and C:

- **Class A - No Appreciable Contamination (No Toxicity to aquatic life).**
If sediment chemistry is found to be at or below the chemical concentrations which define this class, dredging and in-water or riparian placement, at approved locations, can generally proceed.
- **Class B - Moderate Contamination (Chronic Toxicity to aquatic life).**
Dredging and riparian placement may be conducted with several restrictions. These restrictions may be applied based upon site-specific concerns and knowledge coupled with sediment evaluation.
- **Class C - High Contamination (Acute Toxicity to aquatic life).**
Class C dredged material is expected to be acutely toxic to aquatic biota and therefore, dredging and disposal requirements may be stringent. When the contaminant levels exceed Class C, it is the responsibility of the applicant to ensure that the dredged material is not a regulated hazardous material as defined in 6NYCRR Part 371. This TOGS does not apply to dredged materials determined to be hazardous.

Table C. Timber Lake sediment analytical results with NYSDEC Sediment Quality Threshold Values for Dredging, Riparian or In-water Placement. Threshold values are based on known and presumed impacts on aquatic organisms/ecosystem. Results that fall into Class C (high contamination) are highlighted.

Compound	Required Method Detection Limit	Threshold Values			Timber Results	Threshold Class
		Class A	Class B	Class C		
<u>Metals (mg/kg dry wt) – EPA Method 6010B</u>						
Arsenic	1.0	< 14	14 – 53	> 53	ND	A
Cadmium	0.5	< 1.2	1.2 - 9.5	> 9.5	0.26	A
Copper*	2.5	< 33	33 – 207	> 207	18	A
Lead	5.0	< 33	33 – 166	> 166	13	A
Mercury ⁺	0.2	< 0.17	0.17 - 1.6	> 1.6	ND	A
<u>PAHs and Petroleum-Related Compounds (mg/kg dry wt) – EPA Methods 8020, 8021, 8260 and 8270</u>						
Benzene	0.002	< 0.59	0.59 - 2.16	> 2.16	ND	A
Total BTEX*	0.002	< 0.96	0.96 - 5.9	> 5.9	ND	A
Total PAH ¹	0.33	< 4	4 - 35	> 35	ND	A
<u>Pesticides (mg/kg dry wt) – EPA Methods 8081</u>						
Sum of DDT+DDD+DDE ⁺	0.029	< 0.003	0.003 - 0.03	> 0.03	ND	A
Mirex* ⁺	0.189	< 0.0014	0.0014 - 0.014	> 0.014	na	--
Chlordane* ⁺	0.031	< 0.003	0.003 - 0.036	> 0.036	ND	A
Dieldrin	0.019	< 0.11	0.11 - 0.48	> 0.48	ND	A
<u>Chlorinated Hydrocarbons (mg/kg dry wt) – EPA Methods 8082 and 1613B</u>						
PCBs (sum of aroclors) ²	0.025	< 0.1	0.1 - 1	> 1	ND	A
2,3,7,8-TCDD* ³ (sum of toxic equivalency)	0.000002	< 0.0000045	0.0000045 - 0.00005	> 0.00005	na	--

na – not analyzed; “<” – indicates result was not detected above the level reported.

⁺Threshold values lower than the Method Detection Limit are superseded by the Method Detection Limit.

* Indicates case-specific parameter. The analysis and evaluation of these case specific analytes is recommended for those waters known or suspected to have sediment contamination caused by those chemicals. These determinations are made at the discretion of Division staff.

¹For Sum of PAH, see Appendix E of TOGS 5.1.9. For Timber Lake, each of the 18 PAH compounds were reported as non-detect (<0.9 mg/kg).

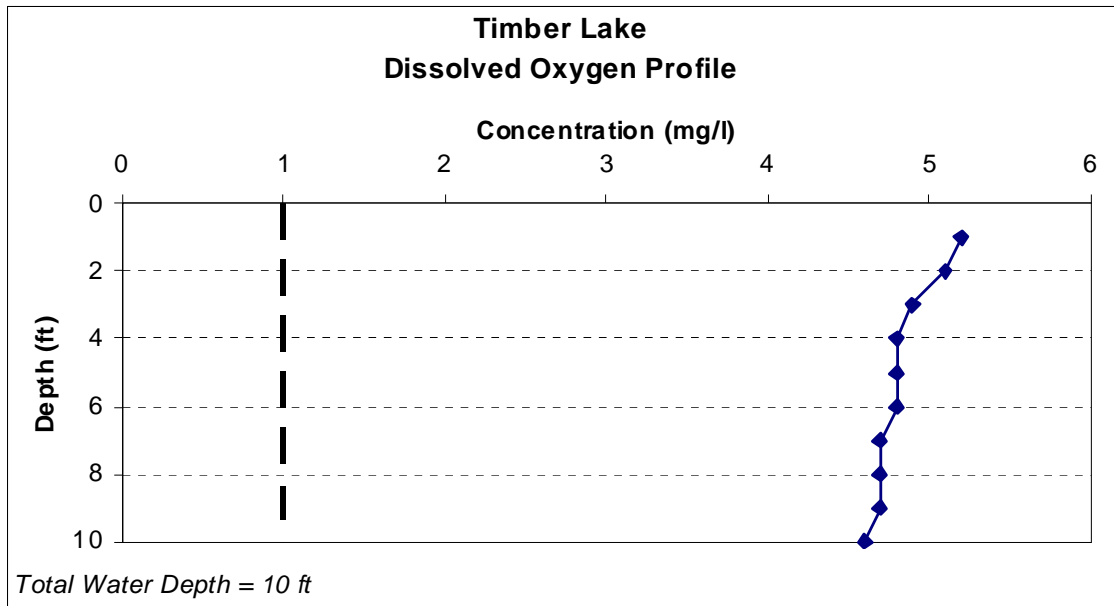
²For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. On Timber Lake, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.

³TEQ calculation as per the NATO - 1988 method (see Appendix D of TOGS 5.1.9).

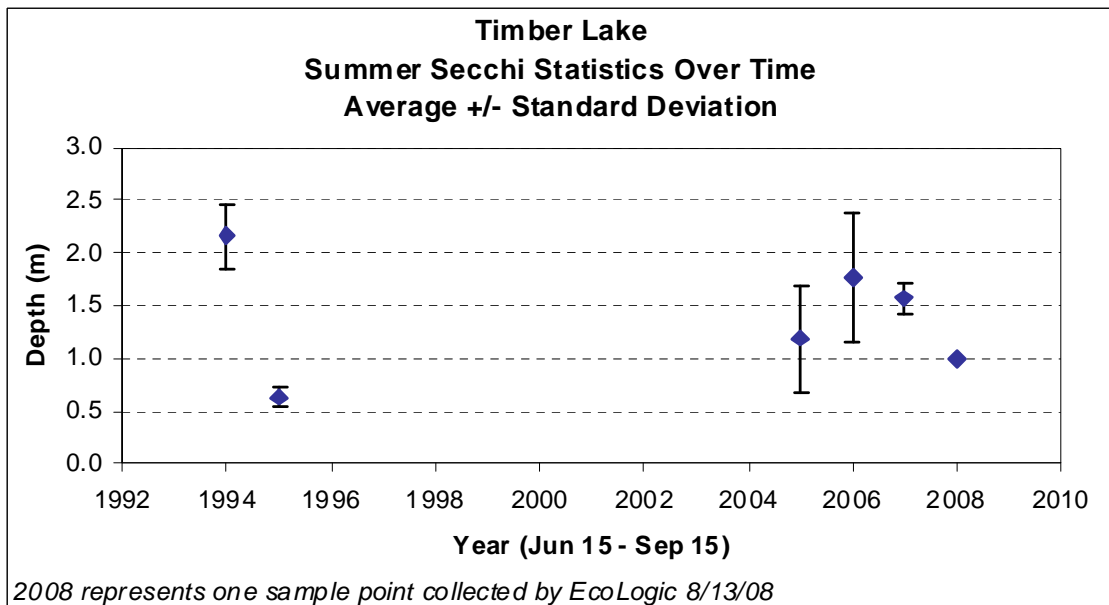
Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

Source: Table 2, NYSDEC Division of Water, Technical & Operational Guidance Series (TOGS) 5.1.9, “In-Water and Riparian Management of Sediment and Dredged Material”, Nov. 2004.

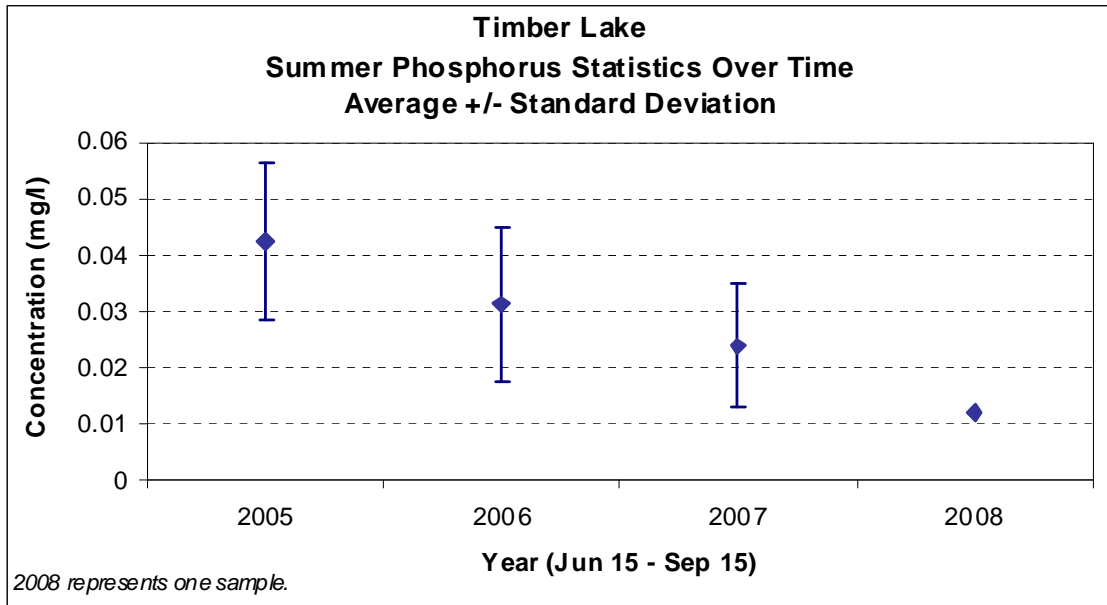
Anoxia: Based on the dissolved oxygen profile collected on August 13, 2008, oxygen levels were depleted in the lower waters, but anoxic conditions (concentrations less than 1 mg/l) were not observed in the lake.



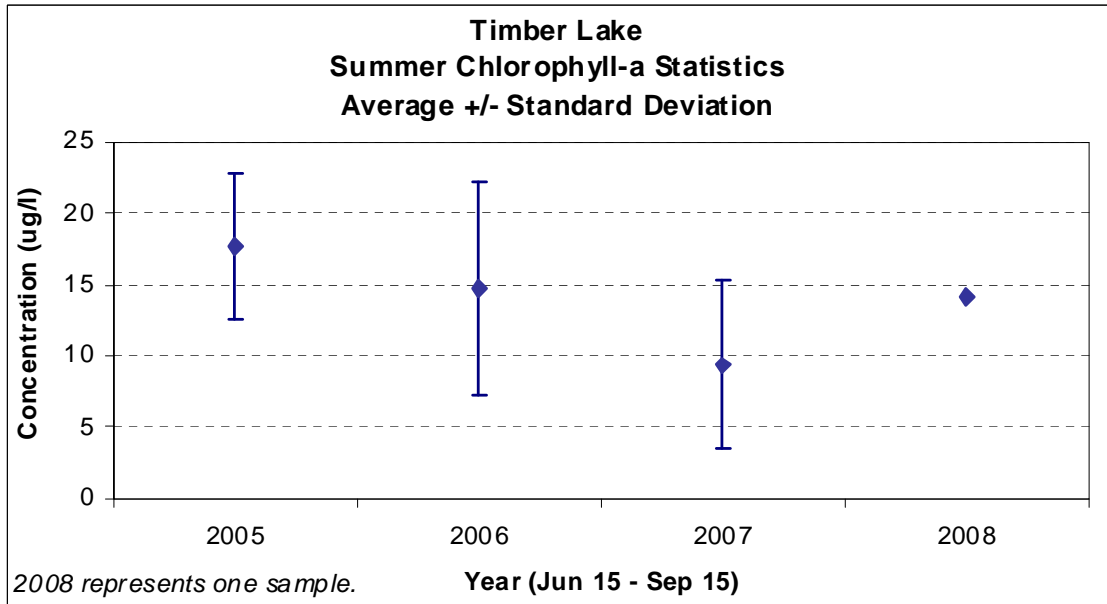
Water Clarity: While clarity in 1994 was about 2 meters, clarity was significantly reduced in 1995 at just over half a meter. The summer averages for 2005 through 2007 were generally around 1.5 meters; one measurement in 2008 was 1.0 meter.



Phosphorus Concentrations: Summer average phosphorus concentrations are decreasing over time.



Chlorophyll- α : Chlorophyll- α concentrations generally decreased from 2005 to 2007.



Trophic Status:

Parameter	Trophic State (shading indicates match to Lake)				Timber Lake*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters (µg/l)	<10	10-35	35 -100	>100	34
Summer chlorophyll-a, upper waters (µg/l)	<2.5	2.5 - 8	8 - 25	>25	14
Peak chlorophyll-a (µg/l)	<8	8-25	25-75	>75	28
Summer average Secchi disk transparency, m	>6	6-3	3-1.5	<1.5	1.5
Minimum Secchi disk transparency, meters	>3	3-1.5	1.5-0.7	<0.7	0.70
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	54
*Data for the period 2005-2007, except for dissolved oxygen collected at 10-ft depth by EcoLogic on 08/13/2008. Summer defined as the period June 15 – Sept 15.					

Aquatic Habitat:

- Aquatic plants have not been visible from the lake surface in recent years, probably due to the stocking of grass carp. Highest vegetation coverage reported in 1994 and 1995; lowest vegetation coverage reported in 2006 and 2007. Aquatic plant surveys have not been conducted through CSLAP at Timber Lake. (NYSDEC 2008)

List of Aquatic Plants identified in 2008:

- No aquatic plants were found during the August 2008 survey.

Invasive Species: Early Detection List for eight regions in New York State, published by the Invasive Species Plant Council of New York State. Obtained on-line (11/29/07). Lower Hudson region list:

Scientific Name	Common Name
<i>Heracleum mantegazzianum</i>	Giant Hogweed
<i>Wisteria floribunda</i>	Japanese Wisteria, Wisteria
<i>Digitalis grandiflora (D. pupurea)</i>	Yellow Foxglove, Foxglove
<i>Geranium thunbergii</i>	Thunberg's Geranium
<i>Miscanthus sinensis</i>	Chinese Silver Grass, Eulalia
<i>Myriophyllum aquaticum</i>	Parrot-feather, Waterfeather, Brazilian Watermilfoil.
<i>Pinus thunbergiana (P. thunbergii)</i>	Japanese Black Pine
<i>Prunus padus</i>	European Bird Cherry
<i>Veronica beccabunga</i>	European Speedwell

Endangered Species:

- US Fish and Wildlife Service

Scientific Name	Common Name	Federal Status
<u>Reptiles</u>		
<i>Clemmys muhlenbergii</i>	Bog Turtle	Threatened, Westchester Co.
<u>Birds</u>		
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Threatened, entire state
<u>Mammals</u>		
<i>Myotis sodalist</i>	Indiana Bat	Endangered, entire state
<i>Felis concolor cougar</i>	Eastern Cougar	Endangered, entire state (probably extinct)
<u>Plants</u>		
<i>Isotria medeoloides</i>	Small Whorled Pogonia	Threatened, entire state
<i>Platanthera leucophea</i>	Eastern Prairie Orchid	Threatened, not relocated in NY
<i>Scirpus ancistrochaetus</i>	Northeastern Bulrush	Endangered, not relocated in NY

- New York Natural Heritage Program

Scientific Name	Common Name	NY Legal Status
<u>Reptiles</u>		
<i>Glyptemys muhlenbergii</i> (formerly <i>Clemmys muhlenbergii</i>)	Bog Turtle	Endangered
<u>Birds</u>		
<i>Oporornis formosus</i>	Kentucky Warbler	Protected
<u>Butterflies and Skippers</u>		
<i>Satyrus favonius ontario</i>	Northern Oak Hairstreak	Unlisted
<u>Dragonflies and Damselflies</u>		
<i>Enallagma laterale</i>	New England Bluet	Unlisted
<u>Plants</u>		
<i>Asclepias purpurascens</i>	Purple Milkweed	Unlisted
<i>Eleocharis quadrangulata</i>	Angled Spikerush	Endangered

Water Balance:

USGS Mean Annual (inches/year)		Volume (acre-ft/year)	Water Budget:	
Precipitation (P)	48	29	Inflow to Lake [R+(P-ET)]	44 mgal/year
Evaporation (ET)	22	13	Lake Volume	16 mgal
Runoff (R)	26	119	Flushing Rate	2.8 times/year
			Residence Time	0.36 year

Phosphorus Budget:

(A) *Watershed Land Cover:* 2001 National Land Cover Data Set (MRLC). Includes phosphorus export coefficient (kg/ha/year) and estimated phosphorus export.

Description	Watershed (acres)	Cover (%)	Phosphorus Export Coeff	Estim P Export kg/year	Percent
Open water (all)	5.8	9.0	0.30	0.70	17.9
Developed, open space	28	43	0.20	2.2	57
Deciduous forest	28	44	0.07	0.8	20
Shrub/scrub	0.9	1.5	0.28	0.11	2.7
Emergent herbaceous wetlands	1.3	2.1	0.09	0.05	1.38
Total Acres*	64	100		3.9	100

(B) *Septic:* Assumed that communities around the lake are on septic systems.

Estimated population on septic by soil suitability class with US 2000 Census household size for 100-meter buffer of surface water.

Class	N Structures	Average Household	Estimated Population*
Not limited	0	3.0	0
Somewhat limited	11	3.0	33
Very limited	9	3.0	27
Total	20		60

Estimated Phosphorus export by Soil Suitability class for 100-meter buffer of surface water, with failure rate of 5%.

Class	Population*	P per cap	Transport	kg/year
Not limited	0	0.6	10%	0
Somewhat limited	31	0.6	30%	6
Very limited	26	0.6	60%	9.2
Failed systems (5%)	3	0.6	100%	1.8
Total	60			17

Figure 3
Timber Lake
National Land Cover Dataset 2001

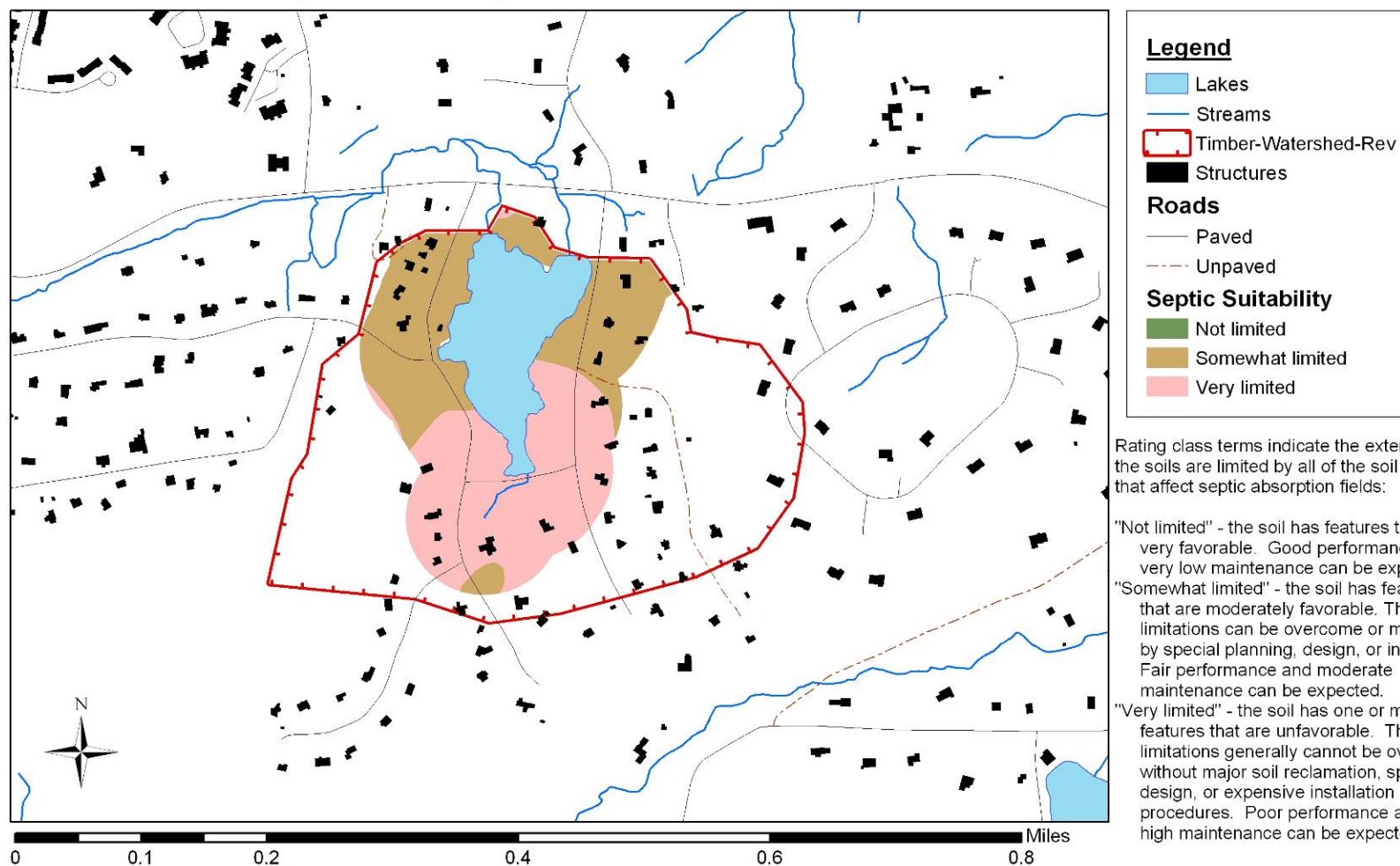


Source:

National Land Cover Database zone 65 Land Cover Layer. On-line at <http://www.mrlc.gov>
The National Land Cover Database 2001 land cover layer for mapping zone 65 was produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium. Minimum mapping unit = 1 acre. Geo-referenced to Albers Conical Equal Area, with a spheroid of GRS 1980, and Datum of NAD83.



Figure 4
Timber Lake
Soil Septic Suitability, 100-Meter Stream Buffer Within the Watershed

**Sources:**

Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site <http://giswww.westchestergov.com/>. Municipal planimetric datasets were photogrammetrically derived from the county's 2004 base map project and meet National Map Accuracy Standards at 1"=100'.

Soil Survey of Westchester County - Compiled by Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture.

On-line at <http://soildatamart.nrcs.usda.gov/>. Accessed November 28, 2007. "Septic tank absorption fields" are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches or between a depth of 24 inches and a restrictive layer is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health.



(C) *Point Sources*: There are no known point sources of phosphorus to Timber Lake.

(D) *Summary of Phosphorus Input to the Lake*:

Source	Input (kg/year)
Watershed Land Cover	3.9
Point Sources	0
Septic within 100m of surface water	17
Internal loading (sediment)	0
Total	21

Phosphorus Mass Balance: Empirical estimates of net loss from system based on mean depth and water residence time.

$$p = W'/10 + H\rho$$

where:

p = summer average in-lake TP concentration, ug/l

W' = areal loading rate, g/m²/year

H = mean depth, m

ρ = flushes per year

Parameter	Units	Result
W'	g/m ² /year	714
H	m	2.1
ρ	flushes per year	0.36
p	ug/l	66
<i>Summer (Jun 15 – Sep 15) average TP</i>		
<i>2005-2007, upper waters:</i>		34 ug/l

REFERENCES

- Invasive Species Council of New York State. Early Detection Invasive Plants by Region. Web site: <http://www.ipcnys.org/>. Obtained on-line 11/29/07.
- New York Natural Heritage Program. Letter dated December 21, 2007 received by EcoLogic, LLC. New York State Department of Environmental Conservation, Division of Fish, Wildlife & Marine Resources.
- New York State Department of Environmental Conservation. 2006. 2005 Interpretive Summary, New York Citizens Statewide Lake Assessment Program (CSLAP) 2005 Annual Report – Timber Lake. March 2006. With New York Federation of Lake Associations. Scott A. Kishbaugh, PE.
- New York State Department of Environmental Conservation. 2008. 2007 Interpretive Summary, New York Citizens Statewide Lake Assessment Program (CSLAP) 2007 Annual Report – Timber Lake. March 2008. With New York Federation of Lake Associations. Scott A. Kishbaugh, PE.
- US Fish and Wildlife Service. 2007. US Fish and Wildlife Service State Listing. List filtered to species with possible presence in the Town of Lewisboro. Obtained from web site on 11/28/07. Web site: <http://www.fws.gov/northeast/Endangered/>.