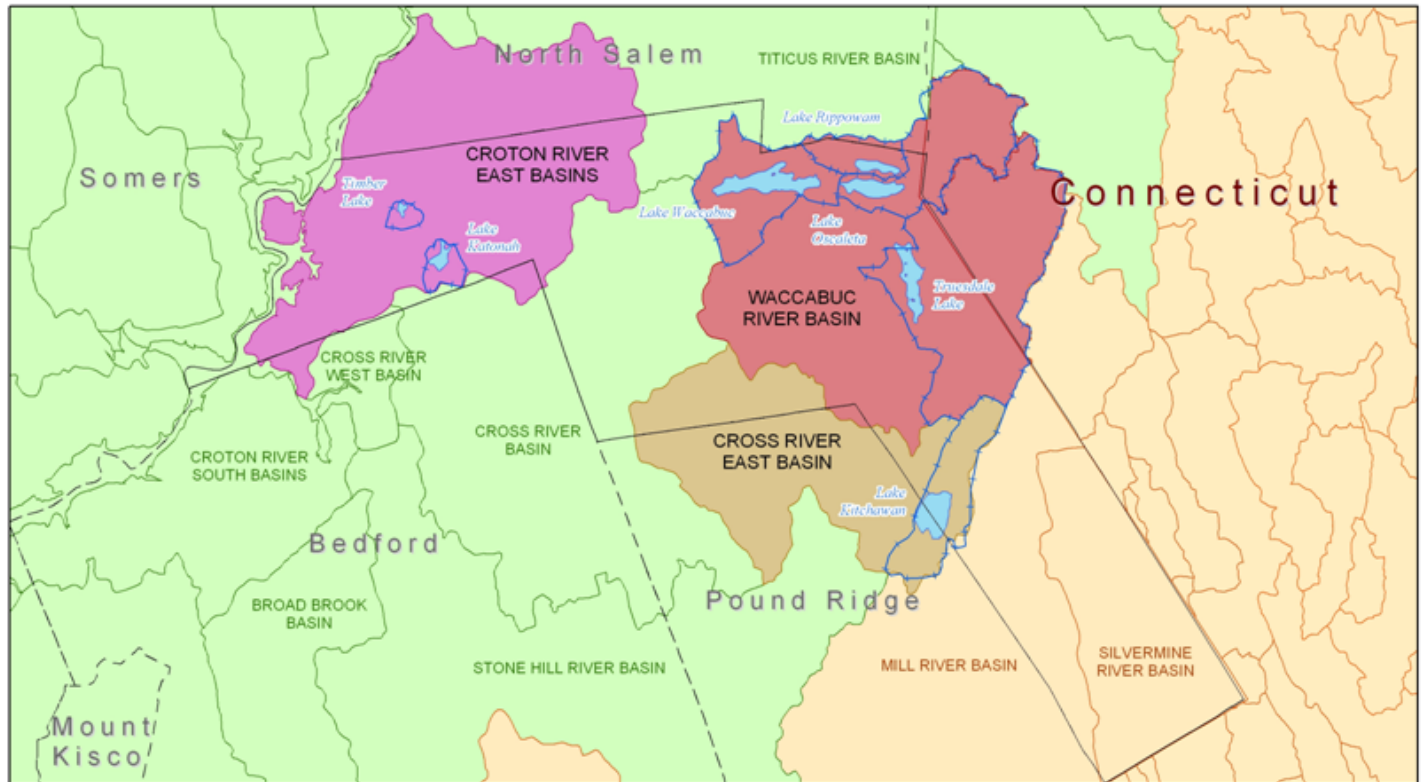


REPORT



Town-wide Comprehensive Lakes Management Plan



Town of Lewisboro, New York
Edward Brancati, Town Supervisor

Final Report
NOVEMBER 2008



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ATTACHMENT 1 – Town Codes Review

Local Laws to Regulate Actions that Affect Water Quality

**ATTACHMENT 2 – 2008 Water Quality and Sediment Sampling Locations and
Laboratory Analysis Reports**

ATTACHMENT 3 – Lewisboro Lakes Water Quality Database
(delivered on CD in electronic format)

1. Introduction

1.1. Objectives

In August 2007, EcoLogic entered into an agreement with the Town of Lewisboro to develop a planning document outlining management of the lakes and watershed areas within the Town. Four specific objectives were cited:

- Create a central repository of natural resource data, statistics, and testing data for each of the lakes in the Town;
- Summarize each lake's water quality and environmental concerns;
- Recommend the most logical, environmentally sound, and cost-effective sequence of projects to improve and maintain water quality throughout the Town;
- Synthesize and collate all the studies on each of the lakes.

Additional data gathering and evaluation tasks were included to meet the overall objectives. This document – *Town-Wide Comprehensive Lakes Management Plan* - summarizes the water quality and aquatic habitat conditions of seven lakes in the Town of Lewisboro, and recommends measures for their protection and restoration.

1.2. Report Organization

The Town-wide Lakes Management Plan is organized in three sections. The first is composed of this introduction, a summary of the environmental settings of the lakes, followed by “Fact Sheets” for each lake. These fact sheets may be used as reference material for the lake associations. The second section discusses the water quality issues on a Town wide basis, identifies the pollutant(s) of concern and their source(s), and identifies reductions needed to meet restoration goals. The third and final section is a synthesis of management options and sets forth recommendations and priority actions for the Town of Lewisboro.

1.3. The importance of phosphorus in the lake ecosystem

1.3.1. Eutrophication

Eutrophication is the term that describes both the process and the effects of enrichment of surface water systems (including lakes, estuaries, and reservoirs), and it is a major water quality issue. Aquatic systems become increasingly enriched with plant nutrients, organic matter, and silt, resulting in increased biomass of algae and plants, reduced water clarity, and ultimately, a reduction in volume. Aesthetic quality and habitat conditions are degraded, and surface waters may lose suitability for recreational uses and water supply as eutrophication proceeds. The composition and abundance of the aquatic biota may be altered.

While eutrophication is a natural process, it can be greatly accelerated by human activities. There are numerous lakes included in state compendia of impaired waters; most are listed due to excessive nutrient inputs from nonpoint sources such as

agricultural runoff and (less frequently) point sources such as outfalls of wastewater treatment facilities.

Water resources managers focus on identifying and controlling the sources of nutrients, organic material, and silt to aquatic ecosystems in an effort to slow down the eutrophication process.

Phosphorus is most often the limiting nutrient for primary productivity and algal biomass in inland lakes of the Northeast. A limiting nutrient is one that is essential for algal growth, but can be present in amounts smaller than required. Once the limiting nutrient (phosphorus) is exhausted, the algal community stops growing. If more phosphorus is added, algal growth will continue until growth is again limited by lack of phosphorus or by other limiting environmental factors (example, decreased sunlight and/or temperature). This finding has focused lake restoration and management techniques on controlling the concentration of phosphorus and has led to significant improvements in many systems. However, [Cooke et al. \(1993\)](#) point out that many lakes are shallow, with extensive wetlands, littoral zones, and macrophyte communities. The complexity of nutrient flux and food web interactions at the sediment-water interface in highly productive shallow regions of lakes cannot be ignored. Nutrient cycling and biological interactions in shallow weedy sections of the Lewisboro Lakes may contribute to maintaining elevated nutrient levels and undesirable plant growth long after external loading is reduced.

1.3.2. Trophic States

Eutrophication, defined as enrichment of lakes with nutrients and the effects of this enrichment, occurs along a continuum. Lakes progress from a nutrient-poor, clear water state (*oligotrophic*) through an intermediate state of higher biological productivity (*mesotrophic*) and eventually to a nutrient rich condition of very high biological productivity (*eutrophic*). *Hypereutrophic* lakes are turbid lakes, closest to the wetland status. However, lakes may exist in a trophic equilibrium for decades or centuries. When human activities accelerate the eutrophication process, it is termed *cultural eutrophication*.

Limnologists and lake managers have developed guidelines to define the transition between trophic states based on phosphorus, water clarity, chlorophyll-a, and deep water dissolved oxygen concentrations ([Table 1-1](#)). Assigning a lake to one category requires professional judgment that considers the cumulative evidence of water quality conditions and the level of productivity.

Table 1-1. Trophic states and indicator parameters

	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic
Average Total Phosphorus, upper waters (µg/l)	<10	10-35	35 -100	>100
Summer chlorophyll-a, upper waters (µg/l)	<2.5	2.5 - 8	8 - 25	>25
Peak chlorophyll-a (µg/l)	<8	8-25	25-75	>75
Average Secchi disk transparency (meters)	>6	6-3	3-1.5	<1.5
Minimum Secchi disk transparency (meters)	>3	3-1.5	1.5-0.7	<0.7
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero

Source: **Janus and Vollenweider 1981**

2. Environmental Setting

Seven lakes are included in this evaluation and report: Truesdale Lake, Lake Kitchawan, Lake Katonah, the Three Lakes – Rippowam, Oscaleta and Waccabuc, and Timber Lake. Collectively referred to as the Lewisboro Lakes, the lakes range in size from 2.9 to 57 ha (7.2– 141 acres) (**Table 2-1**). Location of the lakes within the Town of Lewisboro is displayed in **Figure 2-1**. Water levels in three of the seven lakes – Truesdale, Katonah and Timber – are controlled by dam structures, whereas the remaining four lakes – Rippowam, Oscaleta, Waccabuc and Kitchawan – are not dammed.

Table 2-1. Summary of Physical Characteristics: Lewisboro Lakes.

Lake	Average Depth (m)	Max. Depth (m)	Surface Area (ha)	Number of Structures ^a
Waccabuc	7.1	13.4	57	235
Kitchawan	1.7	4.3	43	127
Truesdale	1.1	3.4	34	303 ^b
Oscaleta	5.9	10.8	27	68 ^c
Rippowam	4.1	6.1	15	46
Katonah	1.6	3.1	10	44
Timber	2.1	3.1	2.9	20

^a Number of structures within 100 m of surface water in watershed; excludes areas of Truesdale and Oscaleta watersheds in Connecticut. Number of structures was obtained from digitized map created by Westchester County from aerial photographs taken in 2000 and 2004.

^b Of total area within 100m of surface water in Truesdale watershed, approximately 27% is within Connecticut and no structures data were available.

^c Of total area within 100m of surface water in Oscaleta watershed, approximately 57% is within Connecticut and no structures data were available.

The Lewisboro Lakes are distributed among three drainage sub-basins, which are part of the New York City water supply watershed (**Figure 2-2**):

Major Basin	Lower Hudson River		
Regional Basin	Croton River		
Sub-Basin	Waccabuc River	Cross River East	Croton River East
Lake Basins	Rippowam Oscaleta Waccabuc Truesdale	Kitchawan	Timber Katonah

2.1. Vegetative cover and land use

Nearly all the Lewisboro Lake watersheds had more than half of their area covered by Forest/Shrub class (**Table 2-2**). The exception was Lake Katonah, where the Developed class was dominant (48%). The Developed class was the second most common land cover class for four of the seven watersheds – Waccabuc, Truesdale, Kitchawan and Timber. The Forest/Shrub class was the second most common in the Lake Katonah watershed; and the Open Water class was the second most common in the Rippowam and Oscaleta watersheds.

Figure 2-1
Town Of Lewisboro Lakes

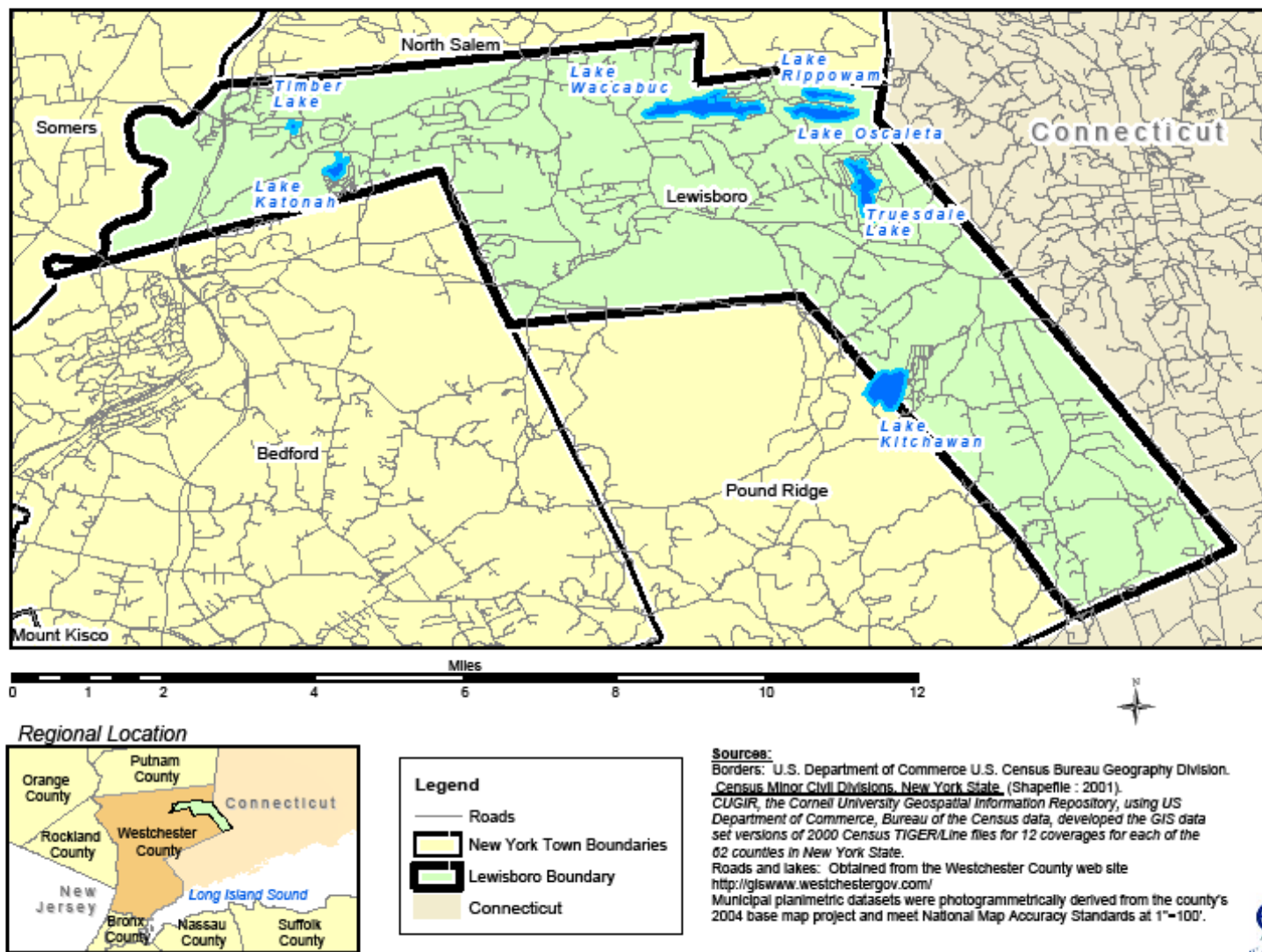
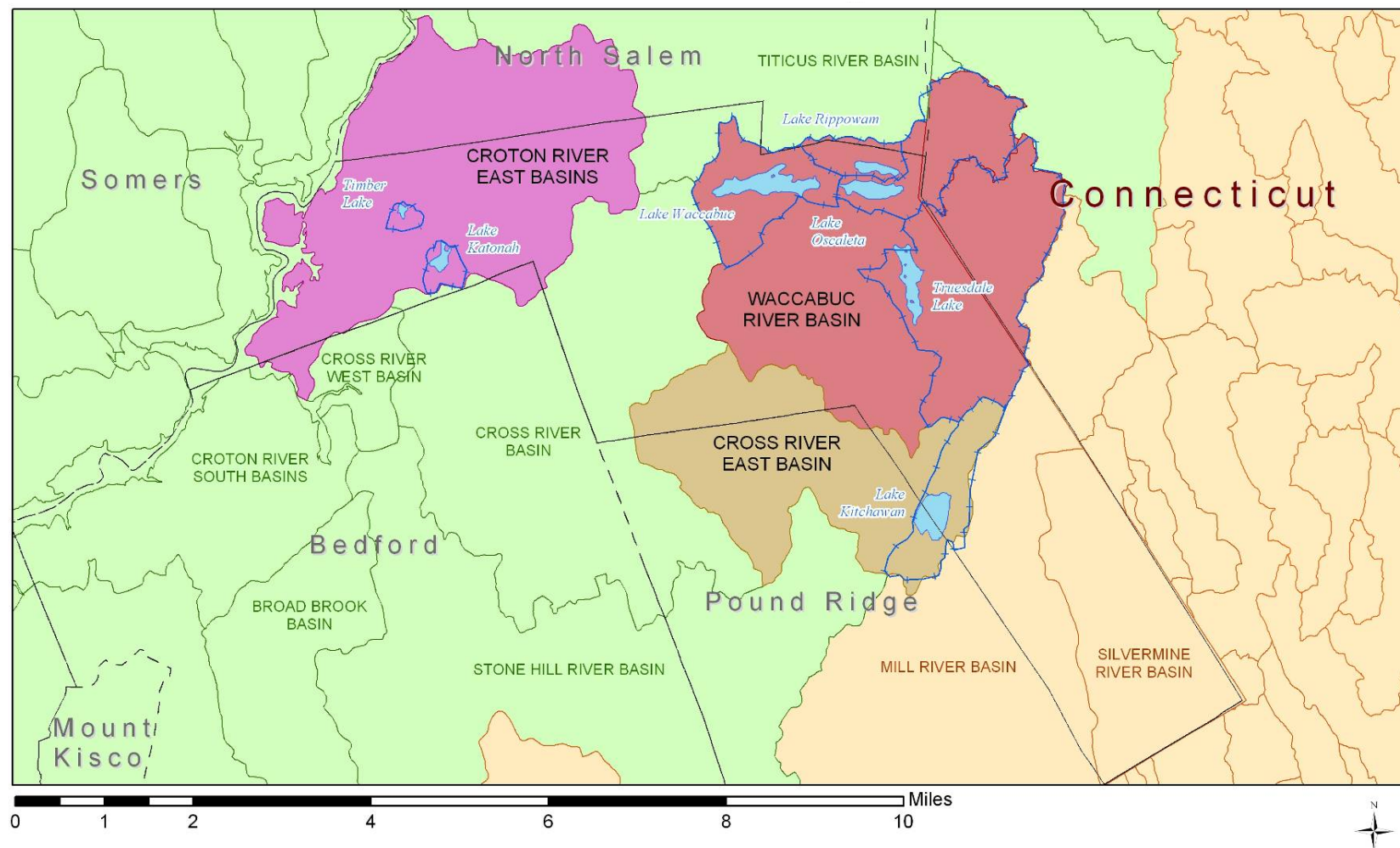


Figure 2-2
Town Of Lewisboro Drainage Basins



Legend

Regional Basin

UPPER LONG ISLAND SOUND BASINS

CROTON RIVER BASIN

Sub-Basins

CROSS RIVER EAST BASIN

CROTON RIVER EAST BASIN

WACCABUC RIVER BASIN

Lake Basins
Timber

Sources for Regional and Sub-Basins:

Westchester County Drainage Basin Boundaries, 1998, scale of 1:24,000 (On-line linkage <<http://giswww.westchestergov.com>>)

Connecticut DEP, Office of Information Management, Local Basins, 1988, scale 1:24000 (On-line linkage: <<http://www.ct.gov/dep/cwp/>>).

Source for Lake Basins:

Delineated by EcoLogic, LLC using existing files and professional judgement.



Table 2-2. Watershed land cover class distribution, Lewisboro Lakes.

Land Cover Classes	Land Cover by Watershed (percent)						
	Rippowam	Oscaleta	Waccabuc	Truesdale	Kitchawan	Katonah	Timber
Open water	11	9.0	15	3.5	12	16	9.0
Developed*	6.8	5.4	26	15	20	48	43
Forest/Shrub**	73	78	53	67	51	36	46
Grassland/Pasture/Crops	0.86	1.9	3.4	4.3	1.2	--	--
Wetlands (woody/emergent)	7.9	5.4	2.7	10	16	--	2.1
Total	100	100	100	100	100	100	100
Source: National Land Cover Dataset 2001 Shaded cells indicate the highest percentage for land cover class in each watershed. *Developed – sum of three Developed classes: open space, low intensity and medium intensity. **Forest/Shrub – sum of four classes: Forest Deciduous, Forest Evergreen, Forest Mixed, and Shrub/scrub.							

2.2. Soils

Lewisboro is underlain by bedrock of the Manhattan Prong, which includes metamorphic gneiss, schist and carbonate rock (Leggette, Brashears & Graham, Inc.). The bedrock is generally covered by shallow surficial soils at higher elevations and thicker surficial soils in the valleys. This material predominantly consists of glacial till, composed of a very poorly-sorted mixture of sand, gravel, silt, clay and stones deposited directly by the glacial ice (Leggette, Brashears & Graham, Inc.).

The combination of shallow till soils and fairly steep slopes exacerbate rainfall runoff, increasing the potential for erosion and transport of sediment, nutrients and contaminants from upland areas into the lakes.

2.3. Fish and wildlife

The Town of Lewisboro has a significant amount of green space interspersed with residential development. This green space supports a diverse wildlife population including a number of State listed rare plant and animal species (see Fact Sheets for listing of species for each lakes watershed).

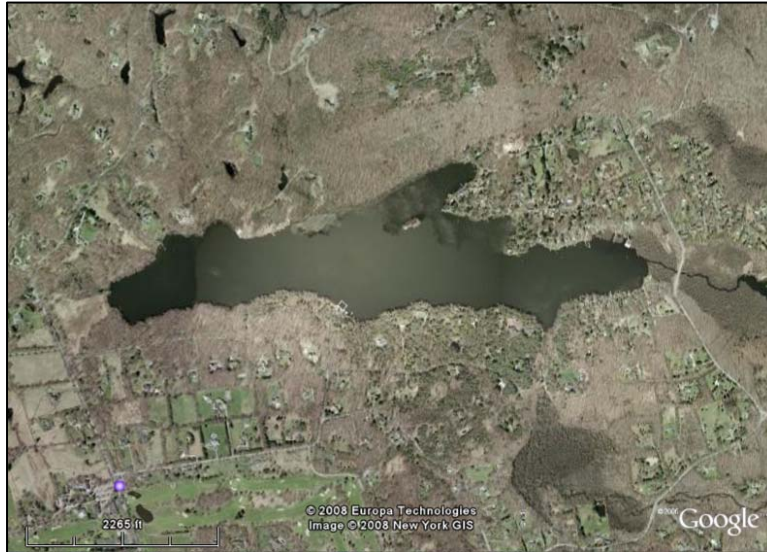
The lakes in Lewisboro support productive fish communities. Warmwater species, such as bass and sunfish, tend to be most abundant because of the shallowness of many of the lakes. The deeper lakes (Waccabuc, Oscaleta, and Rippowam) have historically supported both a warm and cold water (trout) fishery. Although some of the deeper lakes, such as Oscaleta, have been stocked with trout in recent years, the seasonal low dissolved oxygen concentrations in the deeper colder areas of the lakes has apparently led to significant declines in the coldwater fishery. This trend is likely to continue as the lakes continue to become increasingly eutrophic.

3. Lake Fact Sheets

A large amount of information has been collected by individual lake associations. This information has been summarized into fact sheets for each lake. This section presents a summary of lake and watershed characteristics for each lake. The page numbering system in this section is intended to allow each fact sheet to act as a standalone document that can be used by each lakes association. The fact sheets are ordered by surface area (largest to smallest).

3.1. Lake Waccabuc

Lake Waccabuc



Surface water quality classification: Class A

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	56	Cedar Eden 2004
Watershed area	hectares	298	EcoLogic 2008 (excl lake)
Volume	mgal	3,696	Cedar Eden 2004
Elevation	m	144	NYSDEC 2007
Maximum depth	m	14.2	CSLAP Sampling
Average Depth	m	7.1	Cedar Eden 2004

Lake Inlet: at the eastern end via channel from Lake Oscaleta and two streams which drain the extreme northwest and southwest portions of the watershed. There are also more than ninety storm drains that flow into the lake. (Cedar Eden 2002).

Lake Outlet: Waccabuc River along the southeastern shore.

Recreational impacts: The limited recreational use impacts were associated with poor clarity and high algae levels. (NYSDEC 2007).

Lakeshore Development: High density residential development along the northeastern shore, in addition to a small cluster of homes along the southeastern end of the lake. For the most part, the northwest and southwestern shores are undeveloped, and include some conservancy land along the southwest shore. A steeply sloping ridge runs next to the lake along the central north shore (Cedar Eden 2002)

Figure 1
Lake Waccabuc
Bathymetry

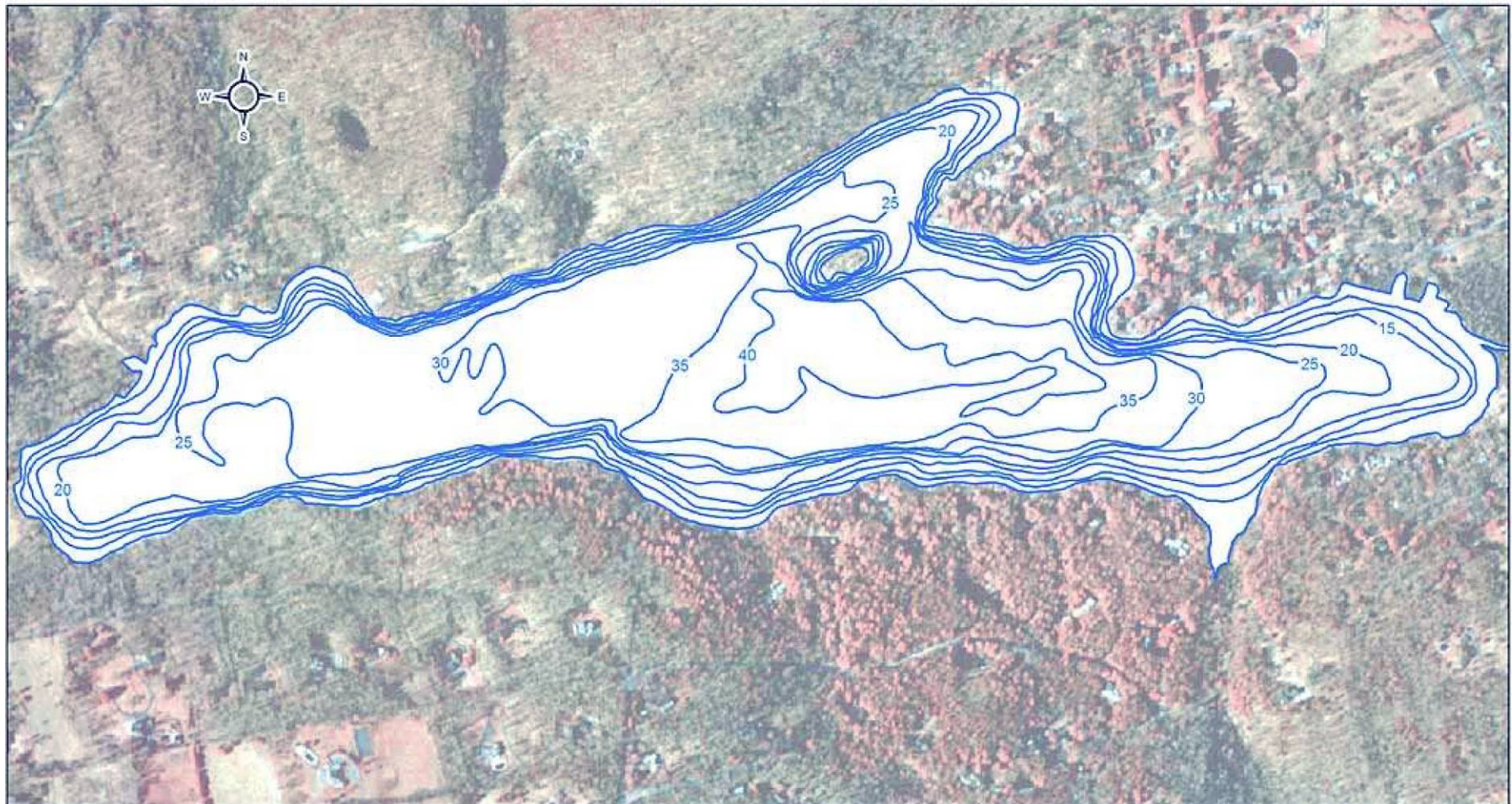
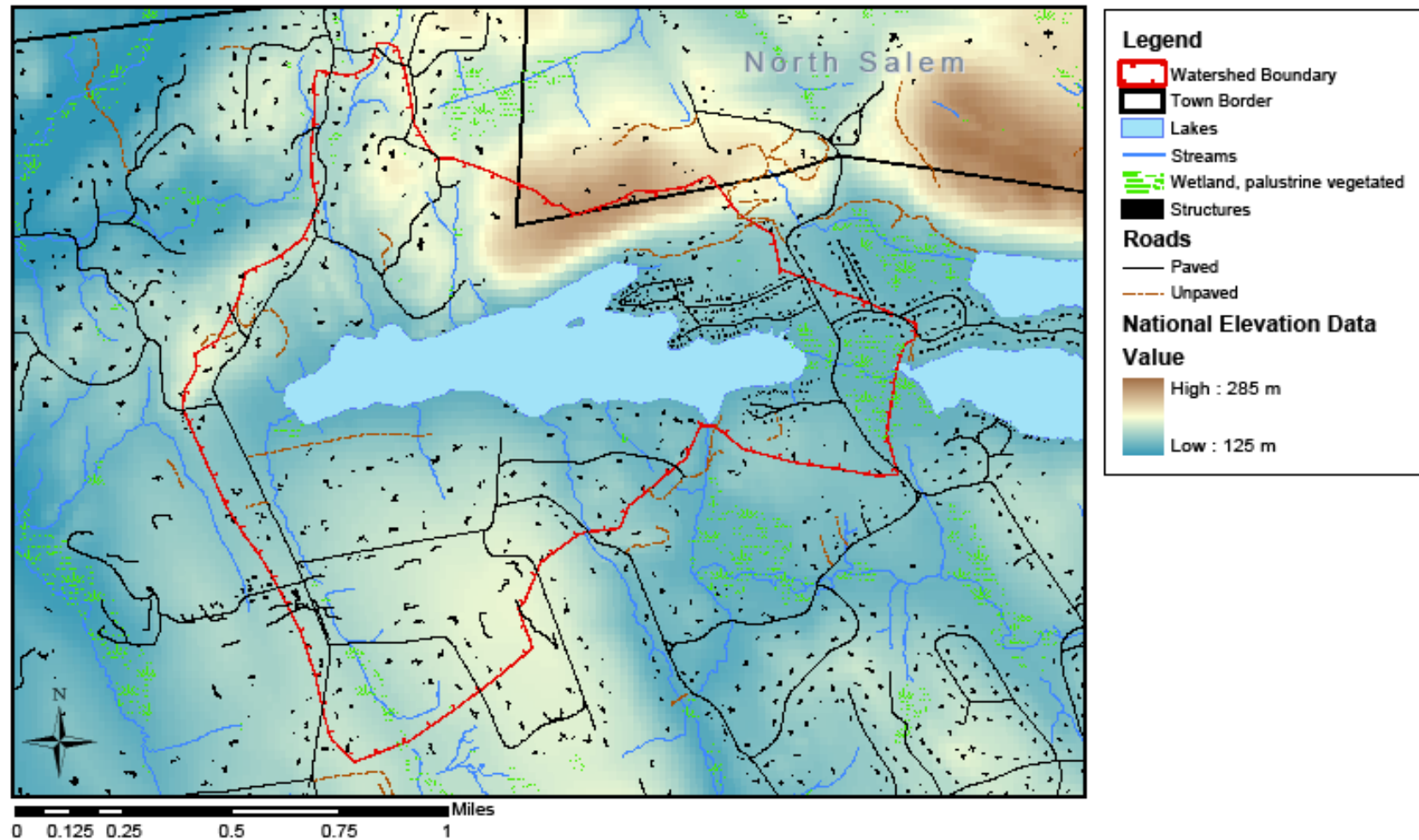


Figure 4.3 Bathymetric Map of Lake Waccabuc
Data Source: J. Gullen, 1967; digitized to fit by CEE LLC

200 100 0 200 Feet

 **Cedar Eden
Environmental, LLC**
Geographic Information Systems

Figure 2
Lake Waccabuc
Topographic and Human Features



Sources:
 Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site <http://giswww.westchesterny.gov/>. 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://niedata.usgs.net/nied/>.
 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), as well as by the Three Lakes Council and other entities over time. Depths ranging from 0 to 15 meters (both upper and lower waters), including some half-meter increment profiles. Table A below summarizes samples collected between January and December of each year; the statistics represent averages of sample results for the time period for all depths, unless otherwise noted. 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
Alkalinity (mg/l)	1936	6	15	34	21
	1972-1976	52	19	55	33
	2002-2007	8	28	46	43
Calcium (mg/l)	2006-2007	4	13.78	14.87	14.45
Chlorophyll- α (mg/m ³)	1976-1979	20	0.81	21.65	7.28
	1980-1989	67	0.17	24.4	6.69
	1990-1996	34	2.01	26.2	9.62
	2002-2007	42	0.90	39.8	10.69
Color (platinum color units)	1986-1989	46	3	23	11
	1990-1996	34	3	20	9
	2006-2007	16	9	29	15
Conductivity	1972-1976	52	86	144	115
	1986-1989	47	123	156	134
	1990-1996	32	136	190	165
	2002-2007	41	142	218	182
Fe ⁺⁺ (mg/l)	1975	10	0.025	0.40	0.14
Mn ⁺⁺ (mg/l)	1975	10	0.02	1.15	0.42
pH (std units)	1936	6	6.4	8.0	7.45
	1972-1976	56	6.2	7.36	6.81
	1986-1989	48	6.11	9.02	7.76
	1990-1996	33	5.85	8.79	7.77
	2002-2007	29	6.0	9.92	8.0
Phaeophytin- α (mg/m ³)	2002-2006	21	0.005	3.1	0.41
Secchi depth (m)	1972-1979	103	0.90	6.0	2.99
	1980-1989	114	1.2	4.68	2.58
	1990-1996	38	2	5	3.34
	2002-2007	86	1.1	4.7	2.32
<i>Temperature:</i>					
Surface (°C) (min depth sampled)	1936	1 (0 m)	27.8	27.8	27.8
	1974-1979	33 (0-1 m)	12	28.2	22.2
	1981-1989	85 (0-1.5 m)	7	29	22
	1990-1996	40 (0-1.5 m)	13	30	23
	2002-2007	80 (0-1 m)	4.2	29.3	19.7
Depth >8 m (°C)	1936	1 (14 m)	7.8	7.8	7.8
	1974-1979	27 (8-15 m)	7	11.8	8.9
	1981-1983	39 (12-14 m)	5.5	11	7.8
	1991-1992	5 (12-15 m)	5.0	9.0	7.8
	2002-2007	78 (12-14 m)	4.2	10.6	6.8

<u>A. Representing samples collected between January and December each year.</u>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
<u>Dissolved Oxygen:</u>					
Surface (mg/l) (min depth sampled)	1936	1 (0 m)	7.9	7.9	7.9
	1972-1979	34 (0-1m)	7.4	14	9.18
	1980-1983	44 (0-1m)	4.6	13.5	8.91
	1991-1992	5 (0-0.3m)	7.0	8.8	8.2
	2002-2007	80 (0-1m)	5.83	14.68	10.3
Depth >8 m (mg/l)	1936	1 (14m)	0	0	0
	1972-1979	29 (8-15m)	0	6.2	3.01
	1980-1983	44 (8-14m)	0.05	9.8	2.36
	1991-1992	5 (12-15m)	0.90	2.2	1.32
	2002-2007	76 (12-14m)	0	10.83	1.60
<u>Nutrients</u>					
<u>Total Phosphorus:</u>					
Surface (mg/l) (min depth sampled)	1986-1989	47 (1.5 m)	0.003	0.037	0.018
	1990-1996	34 (1.5 m)	0.010	0.030	0.016
	2003-2007	10 (1.5 m)	0.024	0.062	0.038
Depth >8 m (mg/l)	1975	14 (12 m)	0.029	0.345	0.164
	1986	1 (13.5 m)	0.12	0.12	0.12
	2003-2007	12 (11-12.5 m)	0.046	0.49	0.242
Soluble Reactive P (mg/l)	1975	14	0.01	0.364	0.132
Nitrate Nitrogen (mg/l)	1973-1975	60	0.0005	0.294	0.078
	1986-1989	35	0.01	0.72	0.049
	1990-1996	8	0.01	0.06	0.01
	2003-2007	21	0.0025	0.13	0.024
Total Kjeldahl Nitrogen (mg/l)	1975	13	0.45	1.93	1.08
	2002-2007	12	0.44	1.1	0.76
Ammonia Nitrogen (mg/l)	1973-1975	60	0.04	1.84	0.88
	2006-2007	16	0.006	0.10	0.03

<u>B. Representing samples collected between June 15 and September 15 each year.</u>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Chlorophyll- α (mg/m ³)	1979	10	0.81	21.65	7.28
	1980-1989	41	0.17	24.4	6.46
	1990-1996	27	2.01	14	8.35
	2002-2007	27	1.58	39.8	11.9
Phaeophytin- α (mg/m ³)	2002-2006	14	0.005	1.4	0.32
Secchi depth (m)	1972-1979	45	0.9	5.6	2.66
	1980-1989	74	1.4	4.68	2.73
	1990-1996	29	2	5	3.34
	2002-2007	32	1.1	3.85	2.39

<u>B. Representing samples collected between June 15 and September 15 each year.</u>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
<u>Dissolved Oxygen:</u>					
Surface (mg/l) (min depth sampled)	1936	1 (0 m)	7.9	7.9	7.9
	1972-1979	22 (0-1 m)	7.4	11.2	9.11
	1980-1983	27 (0-1 m)	4.6	12.6	8.33
	1991-1992	3 (0 m)	8	8.8	8.4
	2002-2007	29 (0 m)	8.22	12.37	9.58
Depth >8 m (mg/l)	1936	1 (14 m)	0	0	0
	1972-1979	19 (8-14 m)	0	6.2	3.17
	1980-1983	27 (8-14 m)	0.05	5.7	2.25
	1991-1992	3 (12-14 m)	0.9	2.2	1.37
	2002-2007	26 (12-14 m)	0	1.9	0.34
<u>Nutrients</u>					
<u>Total Phosphorus:</u>					
Surface (mg/l) (min depth sampled)	1986-1989	38 (1.5 m)	0.003	0.037	0.017
	1990-1996	27 (1.5 m)	0.01	0.03	0.015
	2002-2007	24 (1.5 m)	0.011	0.047	0.027
Depth >8 m (mg/l)	1975	5 (12 m)	0.128	0.345	0.227
	1986	1 (13.5 m)	0.12	0.12	0.12
	2002-2007	26 (11-12.5 m)	0.079	0.45	0.258
Soluble Reactive P (mg/l)	1975	5	0.158	0.364	0.230
Nitrate Nitrogen (mg/l)	1973-1975	23	0.0005	0.136	0.066
	1986-1989	28	0.01	0.72	0.054
	1990-1996	7	0.01	0.01	0.01
	2003-2007	14	0.0025	0.135	0.022
Total Kjeldahl Nitrogen (mg/l)	1975	4	1.22	1.46	1.30
	2002-2007	9	0.607	1.1	0.793
Ammonia Nitrogen (mg/l)	1973-1975	23	0.56	1.54	0.10
	2006-2007	11	0.006	0.1	0.029

Note: A system of hypolimnetic aerators was installed in 1973 and were generally in operation from late spring until early fall. The aerators were updated in 2001 with the installation of new diffusers (Cedar Eden 2002). The aerators were not working properly in 2004, due either to design or sizing (Cedar Eden 2004). Use of the aerators was discontinued in 2005 (Cedar Eden 2006).

Sediment data summary: Composite samples collected May 29, 2008 (EcoLogic, 2008):

Parameter	Analytical Method	Result (mg/kg dry wt)
Pesticides/PCBs	EPA 8081/8082	ND
TCL Volatiles	EPA 8260B	ND
TCL PAHs	EPA 8270	ND
<u>RCRA Total Metals</u>	EPA 6010	
Arsenic		ND
Barium		ND
Cadmium		ND

Parameter	Analytical Method	Result (mg/kg dry wt)
Chromium		ND
Copper		1.5
Lead		4.2
Selenium		ND
Silver		ND
RCRA Mercury	EPA 7471	ND
Total Organic Carbon	EPA 9060	366,000
Total Solids	SM 18-20 2540B	6.9%
ND – non-detect. Analytes reported as less than the method detection 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) to estimate the quality of the sediments with respect to disposal options. 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. Lake Waccabuc 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.

Compound	Required Method Detection Limit	Threshold Values			Waccabuc 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	ND	A
Copper*	2.5	< 33	33 – 207	> 207	1.5	A
Lead	5.0	< 33	33 – 166	> 166	4.2	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	<0.030	A
Total BTEX* ¹	0.002	< 0.96	0.96 - 5.9	> 5.9	<0.030	A
Total PAH	0.33	< 4	4 - 35	> 35	<0.7	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. ND – not detected

⁺ 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.

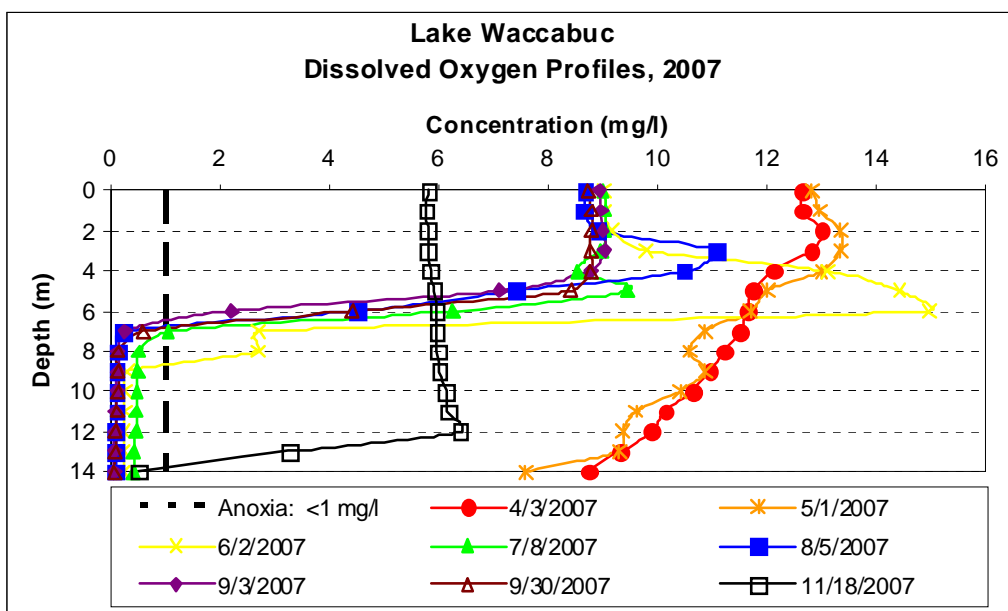
¹ For Sum of PAH, see Appendix E of TOGS 5.1.9. For Lake Kitchawan, each of the 18 PAH compounds were reported as non-detect (<0.7 mg/kg).² For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. For Lake Kitchawan, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.³ TEQ 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.

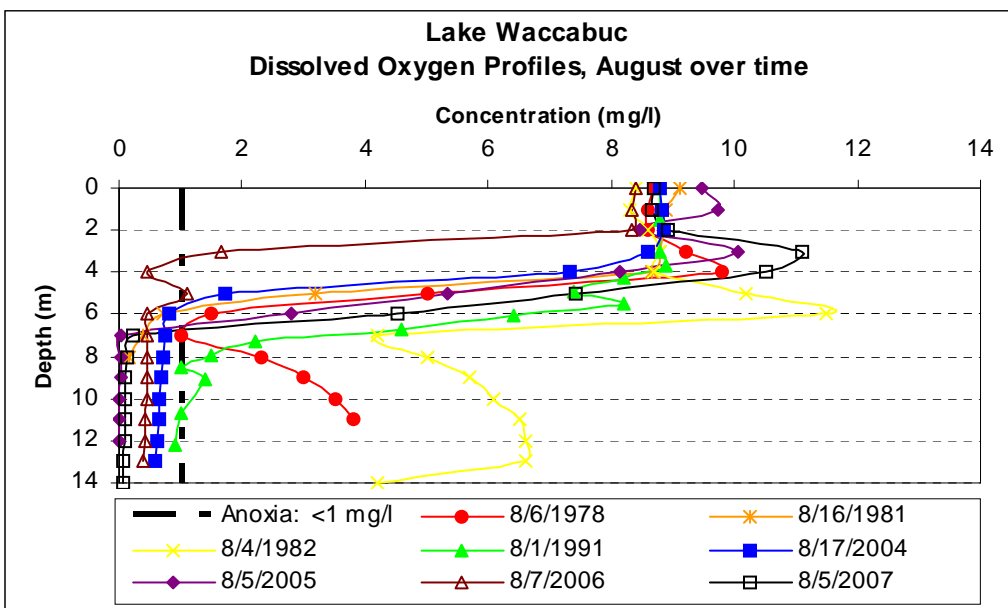
Source:

Table 2, NYSDEC Division of Water, Technical & Operational Guidance Series (TOGS) 5.1.9, In-Water and Riparian Management of Sediment and Dredged Material, November, 2004

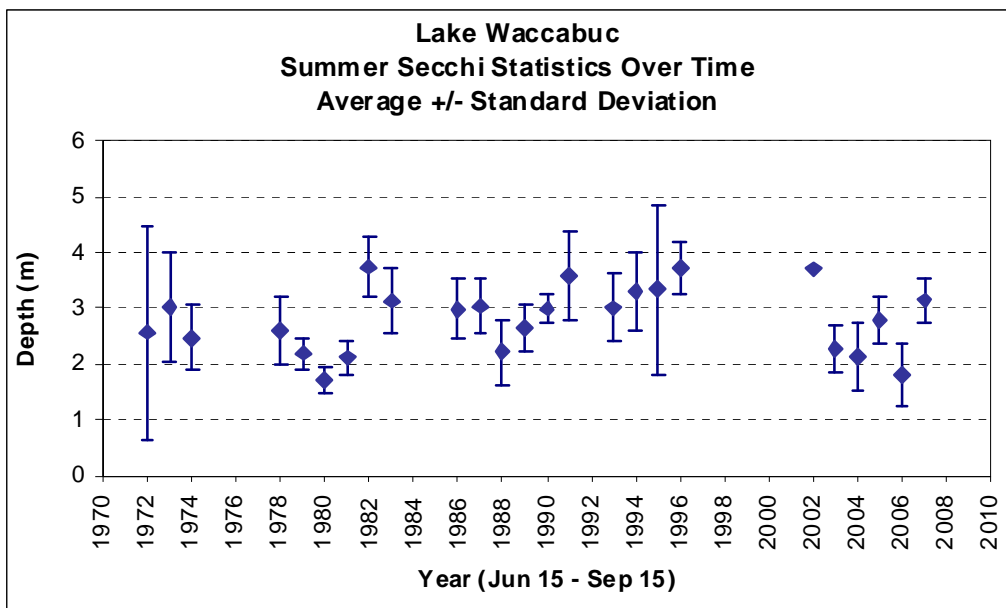
Anoxia: Dissolved oxygen decreases in lower waters, resulting in anoxic conditions from June through September at depths greater than 6 meters. By November, turnover has occurred, resulting in higher DO concentrations at depth and lower DO concentrations at surface.



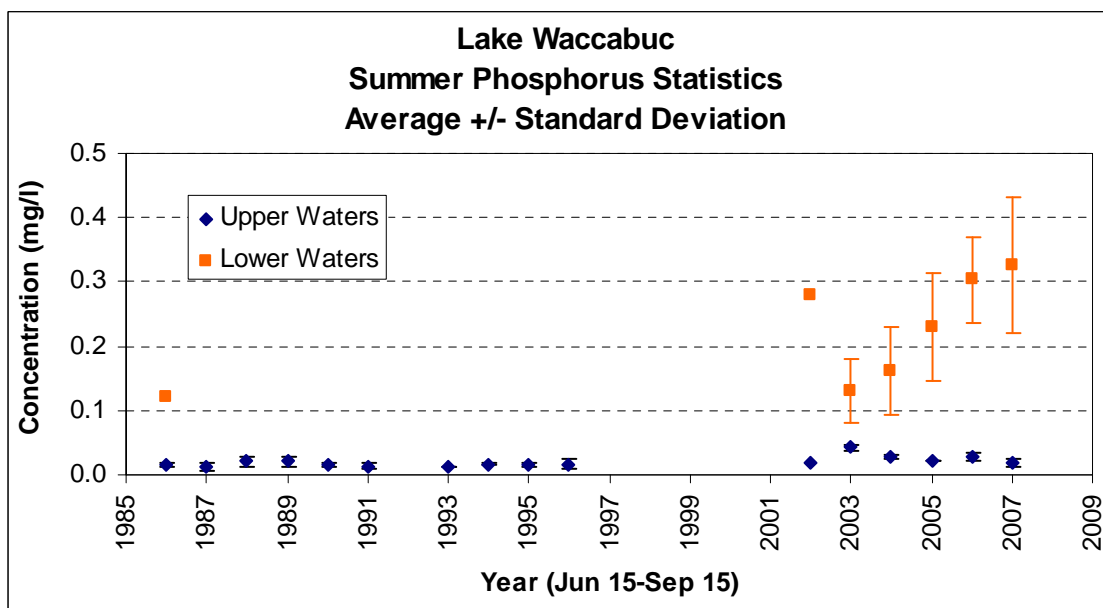
Anoxic conditions are evident in dissolved oxygen profiles collect in the month of August dating back to 1978.



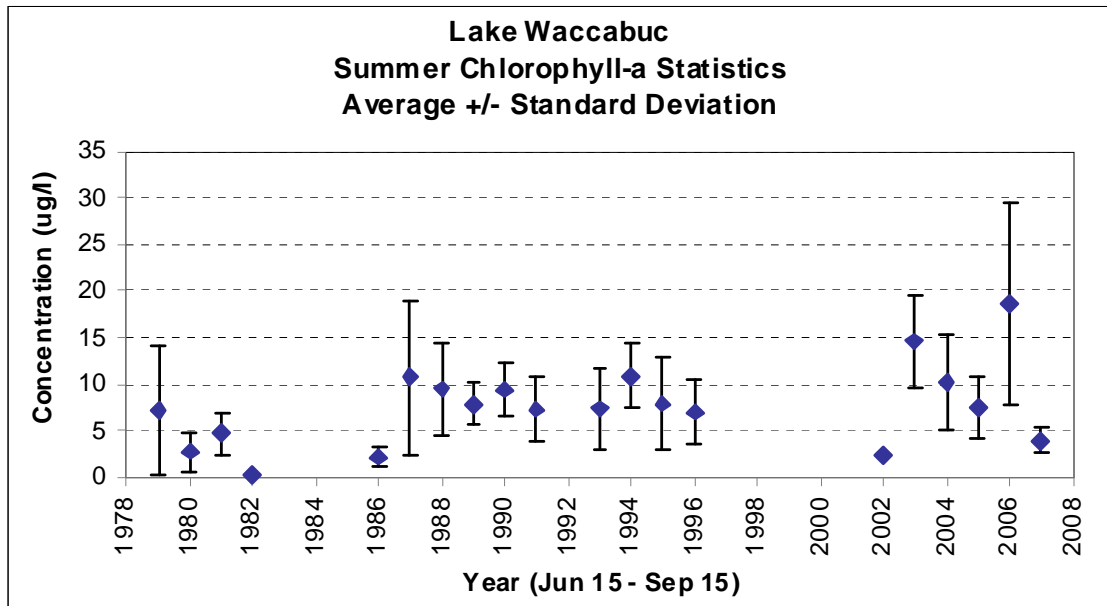
Water Clarity: Averages over time are generally between 2.0 to 4.0 meters. The historical variability around the mean is similar to recent years.



Phosphorus Concentrations: Summer phosphorus concentrations in upper waters have been fairly stable since 1985, with low variability. Phosphorus concentrations in lower waters are consistently higher than for samples collected in the upper waters. Averages in lower waters appear to be increasing in recent years.



Chlorophyll- α : Chlorophyll- α concentrations are, on average, slightly higher in recent years as compared with the previous two decades. The standard deviations show considerable variability over time.



Trophic Status:

Parameter	Trophic State (shading indicates match to Lake)				Lake Waccabuc*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters (µg/l)	<10	10-35	35 -100	>100	27
Summer chlorophyll-a, upper waters (µg/l)	<2.5	2.5 - 8	8 - 25	>25	12
Peak chlorophyll-a (µg/l)	<8	8-25	25-75	>75	39.8
Average Secchi disk transparency, m	>6	6-3	3-1.5	<1.5	2.4
Minimum Secchi disk transparency, meters	>3	3-1.5	1.5-0.7	<0.7	1.1
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	2.52
*Summer (June 15 to September 15) averages for the period 2002 to 2007. DO percent saturation in lower waters calculated using data collected June 15 to September 15, at depths \geq 12 m.					

Aquatic Habitat:

- Phytoplankton in 2003 was dominated by Bluegreen group from June through September (#cells/ml ranged from 21,178-51,903). (Cedar Eden 2004)
- Zooplankton in 2003 were dominated by Rotifers in June and July, accounting for 70% and 59% of the zooplankton community, respectively. In September, Cladocerans (*Bosmina*) dominated (68%). (Cedar Eden 2004)
- Aquatic plants in July 2003 were most abundant in the shallow east end and coves, while steep shores limited vegetation establishment elsewhere. Plants at the east end inlet were characterized by Eurasian water milfoil (*Myriophyllum spicatum*), bassweed, coontail, and Robin's pondweed. Eurasian water milfoil was well-established along most of the shoreline, interspersed with white and yellow water lilies. (Cedar Eden 2004).

List of Aquatic Plants identified in 2003:

Scientific Name	Common Name
<i>Brasena schreberi</i>	Watershield
<i>Ceratophyllum spp.</i>	Coontail
<i>Decodon spp.</i>	Three-way sedge
<i>Eleocharis quadrangulata</i>	Four-edge sedge
<i>Eleocharis spp.</i>	Spike-rush
<i>Elodea canadensis</i>	Canadian waterweed
<i>Iris spp.</i>	Iris
<i>Lemna spp.</i>	Duckweed
<i>Lythrum salicaria</i>	Purple loosestrife

Scientific Name	Common Name
<i>Myriophyllum spicatum.</i>	Eurasian watermilfoil
<i>Nuphar spp.</i>	Yellow water lily
<i>Nymphaea spp.</i>	White water lily
<i>Pontederia cordata</i>	Pickrelweed
<i>Potamogeton amplifolius</i>	Bassweed
<i>Potamogeton robustus</i>	Robin's Pondweed
<i>Sagittaria spp.</i>	Arrowhead
<i>Scirpus spp.</i>	Bulrush

Note: A 2008 macrophyte survey conducted by Allied Biological has identified the exotic invasive plant Brazilian elodea (*Egeria densa*) in the north bay of Lake Waccabuc. Management alternatives are being considered.

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>Felix 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)	<u>Water Budget:</u>	
Precipitation (P)	48	562	Inflow to Lake [R+(P-ET)]	1,528 mgal/year
Evaporation (ET)	22	258	Lake Volume	3,696 mgal
Runoff (R)	26	1,597	Flushing Rate	0.4 times/year
			Residence Time	2.4 years

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)	135	15	0.30	16	28
Developed, open space	234	26	0.20	19	32
Developed, low intensity	4.0	0.43	0.30	0.48	0.82
Developed, moderate intensity	1.0	0.11	0.50	0.20	0.34
Deciduous forest	400	44	0.07	11	19
Evergreen forest	70	7.7	0.20	5.7	10
Mixed forest	3.6	0.39	0.09	0.13	0.22
Shrub/scrub	10	1.1	0.28	1.2	2.0
Grassland/herbaceous	15	1.6	0.28	1.7	2.9
Pasture/hay	16	1.8	0.30	2.0	3.4
Woody wetlands	22	2.4	0.09	0.80	1.4
Emergent herbaceous wetlands	2.4	0.27	0.10	0.10	0.17
Total Acres	913	100		58	100

(B) *Septic:* Septic systems serve the communities along the shoreline (Cedar Eden 2002).

Estimated population on septic by soil suitability class with US 2000

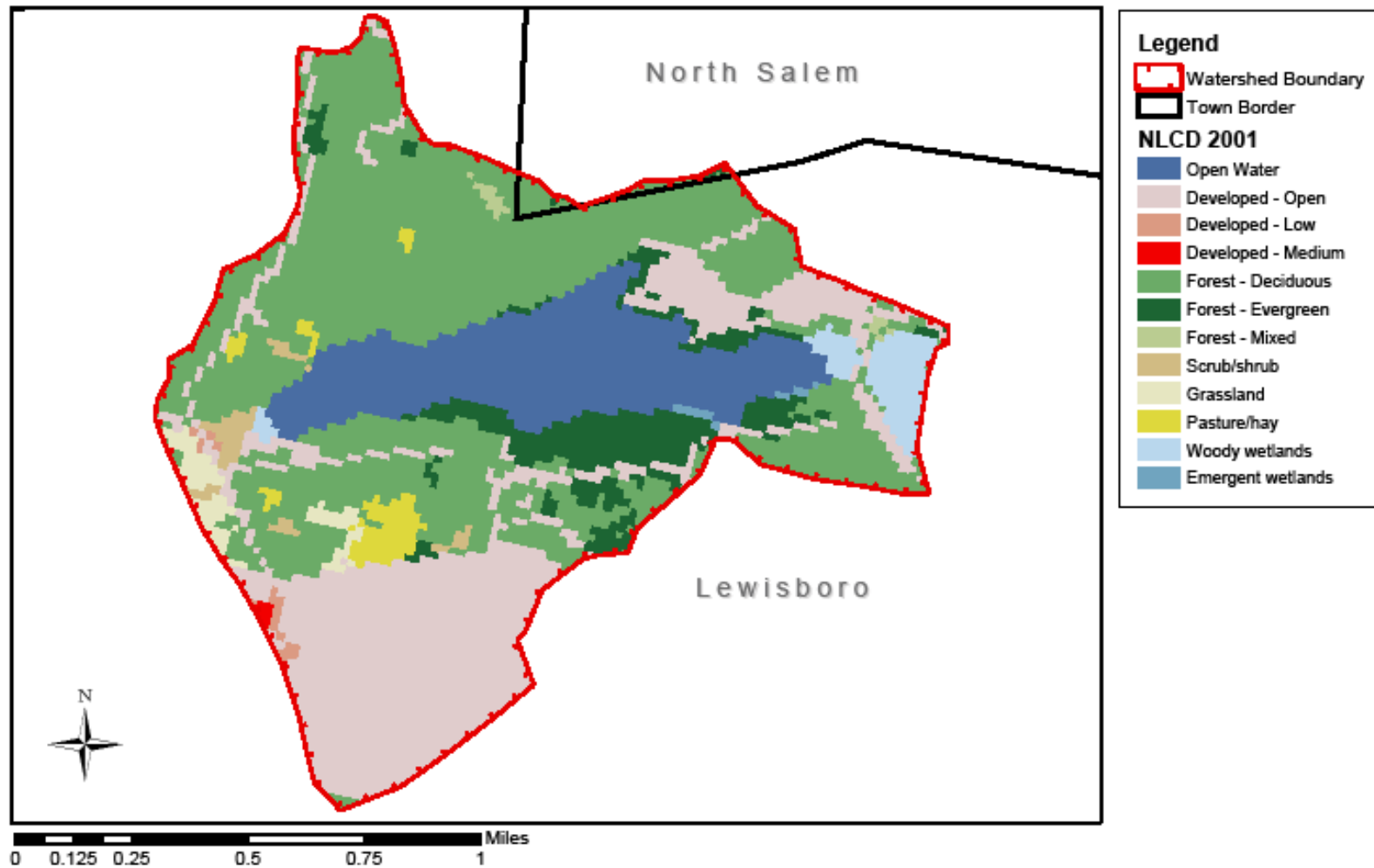
Census household size for 100-meter buffer of surface water.

Class	N Structures	Average Household	Estimated Population
Not limited	21	2.5	53
Somewhat limited	142	2.5	355
Very limited	72	2.5	180
Total	235		588

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	50	0.6	10%	3.0
Somewhat limited	337	0.6	30%	61
Very limited	171	0.6	60%	62
Failed systems (5%)	30	0.6	100%	18
Total	588			144

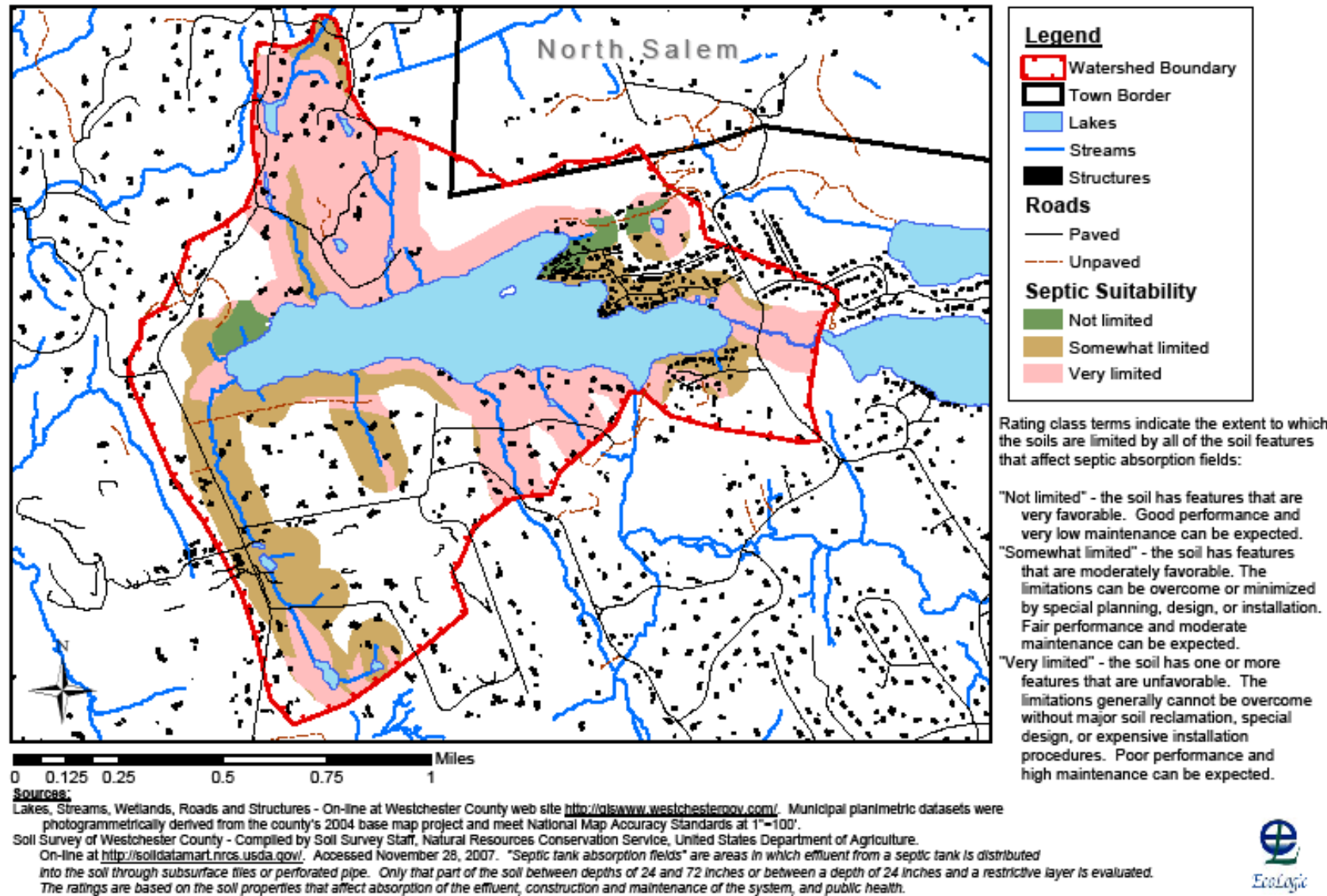
Figure 3
Lake Waccabuc
National Land Cover Dataset 2001



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
Lake Waccabuc
Soil Septic Suitability, 100-Meter Stream Buffer Within the Watershed



(C) *Point Sources*: The outlet of Lake Oscaleta flows to Lake Waccabuc.

Estimated point source load of phosphorus

Source	Estim. Volume input (m ³ /year)	Surface Average P 2002-2007 (ug/l)	Estimated P load (kg/year)
Lake Oscaleta	3,438,272	24	83

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

Source	Input (kg/year)
Watershed Land Cover	59
Point Sources	83
Septic within 100m of surface water	143
Internal loading (sediment)	260
Total	544

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

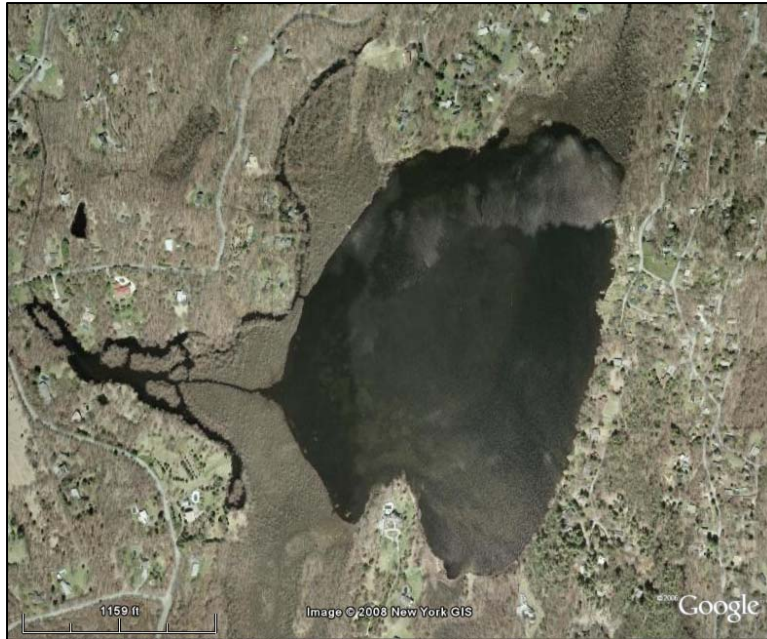
Parameter	Units	Result
W'	g/m ² /year	957
H	m	7.1
ρ	flushes per year	2.4
p	ug/l	35
Summer average TP 2002-2007, upper waters:		27 ug/l

REFERENCES

- Cedar Eden Environmental, LLC. 2006 State of the Lakes: 2004/2005 Water Quality of Lake Rippowam, Lake Oscaleta and Lake Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. April 2006.
- Cedar Eden Environmental, LLC. 2004 Diagnostic-Feasibility Study and Lake & Watershed Management Plan for Lake Rippowam, Lake Oscaleta, and Lake Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. May 2004.
- Cedar Eden Environmental, LLC. 2002 Lake & Watershed Management Recommendations for Lakes Oscaleta, Rippowam and Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. December 2002.
- 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. 2007. 2006 Interpretive Summay, New York Citizens Statewide Lake Assessment Program (CSLAP) 2006 Annual Report - Lake Waccabuc. September 2007. 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/>.

3.2. Lake Kitchawan

Lake Kitchawan



Surface water quality classification: Class B

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	43	ENSR 2008
Watershed area	hectares	225	EcoLogic 2008 (excl lake)
		184.6 (lake)	
		141.9 (lagoon)	ENSR 2008
		326.4 (both)	
Volume	mgal	174 (lake)	ENSR 2008
		3 (lagoon)	
		177 (both)	
Elevation	m	158	
Maximum depth	m	4.3	ENSR 2008
Average Depth	m	1.7	ENSR 2008

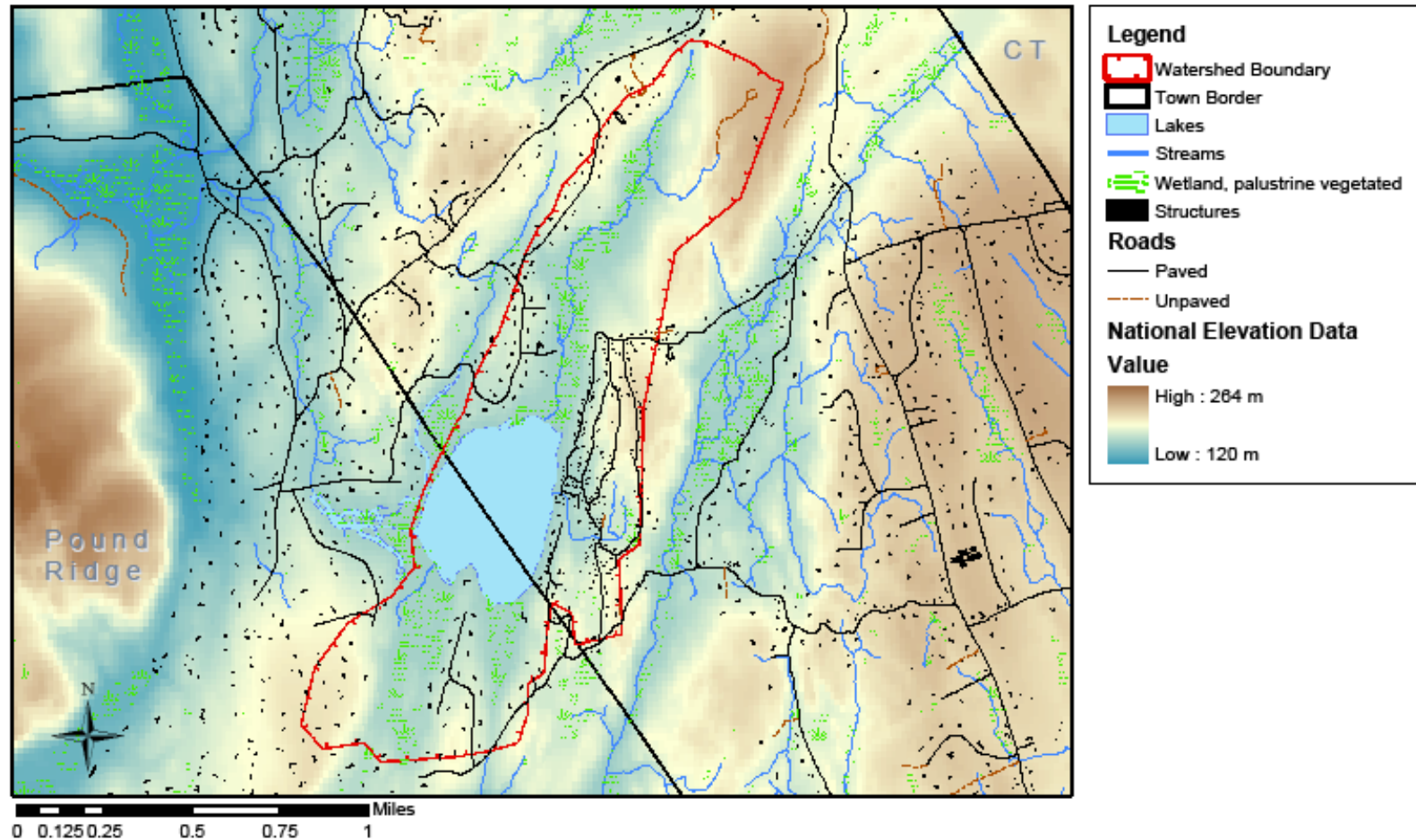
Lake Inlet: Primary inlet drains a large area to the north and enters at north end. Secondary inlets drain areas west and south of the lake. Numerous storm drains enter along east shore.

Lake Outlet: The lake discharges to the west.

Recreational impacts: Occasional poor water quality. High density of macrophytes.

Lakeshore Development: Development is predominantly residential; the highest density is to the east of the lake.

Figure 2
Lake Kitchawan
Topographic and Human Features



Sources:

Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site <http://pliswww.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://niedata.usgs.net/nied/>. Geographic coordinate system. Horizontal datum of NAD83. Vertical datum of NAVD88.



Historical water quality data summary: ENSR(2007) reported two sample events, May and July; Samples were collected from five sites: three in the lake; one at the outlet; and one in the wetland. Only one of the five sites – Site 2 – was sampled both at the surface and at depth.

<u>A. Representing in-lake samples collected in May and July 2007.</u>						
Parameter (units)	Time Period	Location	Number of Samples	Minimum	Maximum	Average
Alkalinity (mg/l)	2007	Upper waters	6	58.9	160	77.5
		Lower waters	2	64.9	85.9	75.4
Chlorophyll- α (ug/l)	2007	Upper waters	2	0.65	5.8	3.2
		Lower waters	0	--	--	--
Conductivity (uS/cm)	2007	Upper waters	9	248	282	263
		Lower waters	5	257	321	275
Dissolved oxygen (mg/l)	2007	Upper waters	9	5.66	11.7	8.95
		Lower waters	5	0.26	16.4	9.94
Dissolved oxygen (%)	2007	Upper waters	9	68	138	106
		Lower waters	5	3.1	183	108
Fecal Coliform (col/100ml)	2007	Upper waters	6	4	46	16.7
		Lower waters	0	--	--	--
pH (std units)	2007	Upper waters	9	7.82	9.06	8.48
		Lower waters	5	6.98	8.84	8.17
Temperature (°C)	2007	Upper waters	9	22.8	25.3	23.8
		Lower waters	5	17.9	21.8	19.9
Total suspended solids (mg/l)	2007	Upper waters	5	<3.9	5.0	4.2
		Lower waters	2	<3.9	6.0	5.0
<u>Nutrients:</u>						
Total Phosphorus (mg/l)	2007	Upper waters	6	0.015	0.085	0.037
		Lower waters	2	0.011	0.023	0.017
Soluble Reactive P (mg/l)	2007	Upper waters	6	<0.005	0.03	0.017
		Lower waters	2	0.009	0.02	0.015
Ammonia Nitrogen (mg/l)	2007	Upper waters	6	<0.032	0.1	0.058
		Lower waters	2	<0.032	0.13	0.081
Nitrate plus Nitrite (mg/l)	2007	Upper waters	6	<0.007	0.062	0.023
		Lower waters	2	<0.007	0.008	0.0075
Total Kjeldahl Nitrogen (mg/l)	2007	Upper waters	6	0.38	0.72	0.58
		Lower waters	2	0.27	0.81	0.54
Note: Site 2 surface duplicate averaged with parent sample prior to calculating upper waters average. Upper waters statistics represent samples collected at depths of less than 2m from three sites in the lake. Lower waters statistics represent samples collected at depths greater than 2m from Site 2 in the lake.						

<u>B. Representing in-lake samples collected in July 2007.</u>						
Parameter (units)	Time Period	Location	Number of Samples	Minimum	Maximum	Average
Chlorophyll- α (ug/l)	2007	Upper waters	1	5.75	5.75	5.75
		Lower waters	0	--	--	--

<u>B. Representing in-lake samples collected in July 2007.</u>						
Parameter (units)	Time Period	Location	Number of Samples	Minimum	Maximum	Average
Dissolved oxygen (mg/l)	2007	Upper waters	4	6.95	8.48	7.44
		Lower waters	3	14.89	16.36	15.46
Dissolved oxygen (%)	2007	Upper waters	4	81	100.4	87.95
		Lower waters	2	3.1	35.2	19.2
<u>Nutrients:</u>						
Total Phosphorus (mg/l)	2007	Upper waters	3	0.015	0.031	0.025
		Lower waters	1	0.023	0.023	0.023
Soluble Reactive P (mg/l)	2007	Upper waters	3	<0.005	0.03	0.015
		Lower waters	1	0.021	0.021	0.021
Ammonia Nitrogen (mg/l)	2007	Upper waters	3	0.066	0.1	0.084
		Lower waters	1	0.13	0.13	0.13
Nitrate plus Nitrite (mg/l)	2007	Upper waters	3	0.026	0.062	0.039
		Lower waters	1	0.008	0.008	0.008
Total Kjeldahl Nitrogen (mg/l)	2007	Upper waters	3	0.66	0.72	0.69
		Lower waters	1	0.81	0.81	0.81
Note: Site 2 surface duplicate averaged with parent sample prior to calculating upper waters average. Upper waters statistics represent samples collected at depths of less than 2m from three sites in the lake. Lower waters statistics represent samples collected at depths greater than 2m from Site 2 in the lake.						

August 2008 water quality data summary:

A. Analytical Results

Parameter (units)	Surface (0 m)	Depth (4.6 m)
Secchi Transparency (m)	1.50	na
Chlorophyll-a (mg/l)	0.014	na
Alkalinity (mg/l)	54	na
<u>Phosphorus:</u>		
Total Phosphorus (mg/l)	0.013	0.035
Soluble Reactive Phosphorus (mg/l)	0.0087 ^a	0.014 ^a
<u>Nitrogen:</u>		
Total Nitrogen	1	1.5
Nitrate + Nitrite N (mg/l)	0.049 ^a	0.17 ^a
Total Kjeldahl Nitrogen (mg/l)	0.98 ^a	1.3 ^a
na – not analyzed		
^a The result of the laboratory control sample was greater than the established limit.		

B. Field Profiles

Depth ft (m)	Temperature (°C)	pH	Conductivity (us)	DO (mg/l)	DO (% sat)
1 (0.305)	23.4	6.8	319	5.0	59.5
2 (0.610)	23.8		321	5.0	59.5
3 (0.915)	23.8		321	5.0	59.5
4 (1.22)	23.8		321	5.0	59.8
5 (1.53)	23.8		319	5.0	59.8
6 (1.83)	23.8		321	5.0	59.8
7 (2.14)	23.8		320	5.0	58.9
8 (2.44)	23.8		319	5.1	60.6
9 (2.75)	23.8		319	5.2	61.4
10 (3.05)	23.7		312	5.5	62.6
11 (3.36)	23.2		312	5.5	62.8
12 (3.66)	22.9		295	4.6	54.3
13 (3.97)	22.8		297	4.7	55.4
14 (4.27)	22.4		287	4.6	53.1
14.5 (4.42)	22.4		287	4.6	53.1

Sediment data summary:

- Composite samples collected August 12, 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
<u>RCRA Total Metals</u>	EPA 6010	
Arsenic		ND
Barium		16
Cadmium		0.24
Chromium		3.1
Copper		8.5
Lead		11
Selenium		0.054
Silver		ND
RCRA Mercury	EPA 7471	ND
Total Organic Carbon	EPA 9060	94000
Total Solids	SM 18-20 2540B	12%
ND – non-detect. Analytes reported as less than the method detection 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) to determine if any threshold screening values that might preclude dredging were exceeded. 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. Lake Kitchawan 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. ND= Not detected.

Compound	Required Method Detection Limit	Threshold Values			Kitchawan 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	0.24	A
Copper*	2.5	< 33	33 – 207	> 207	8.5	A
Lead	5.0	< 33	33 – 166	> 166	11	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. ND – not detected

⁺ 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.

¹ For Sum of PAH, see Appendix E of TOGS 5.1.9. For Lake Kitchawan, each of the 18 PAH compounds were reported as non-detect (<0.7 mg/kg).

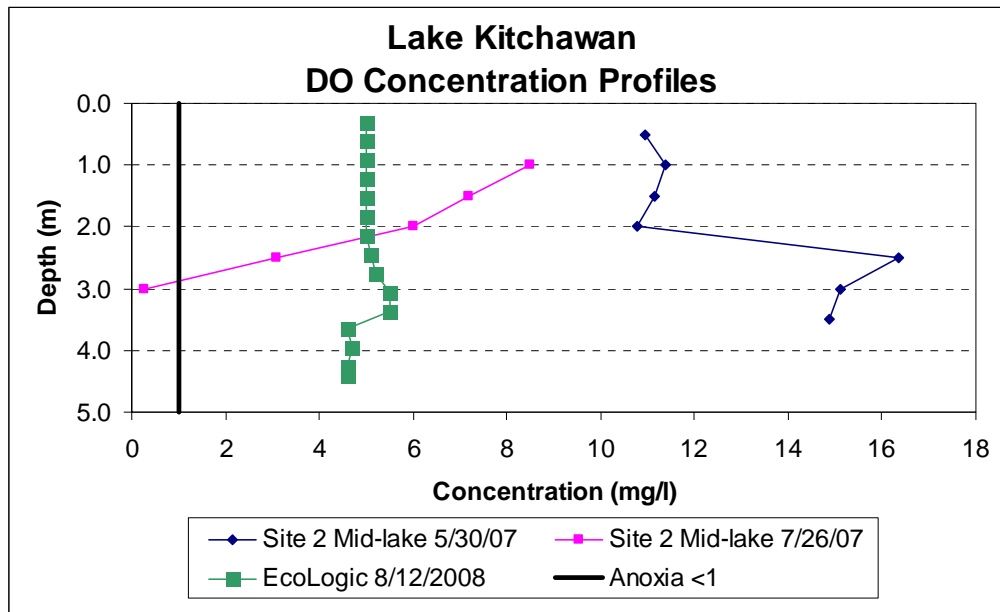
² For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. For Lake Kitchawan, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.

³ TEQ 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.

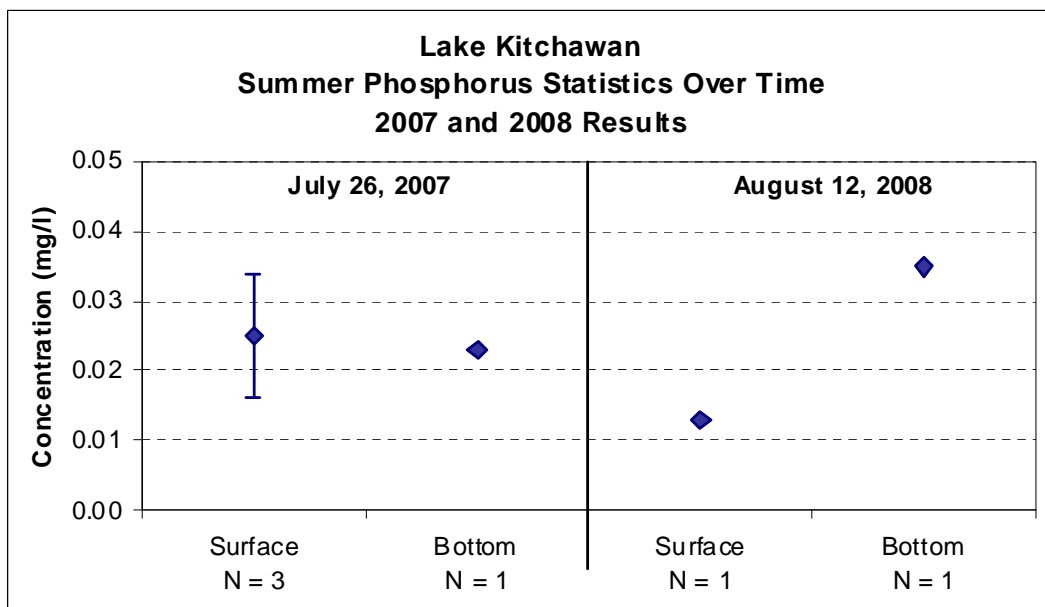
Source: Table 2, NYSDEC Division of Water, Technical & Operational Guidance Series (TOGS) 5.1.9, "In-Water and Riparian Management of Sediment and Dredged Material", Nov. 2004

Anoxia: Evidence of anoxic conditions at depth in July 2007; no stratification in May 2007 or in August 2008.

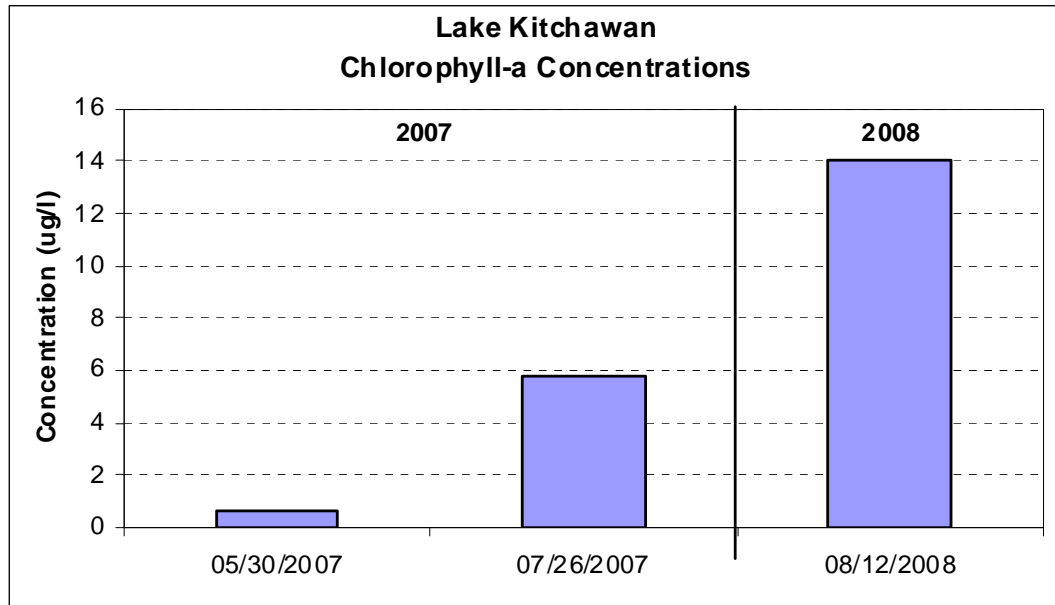


Water Clarity: Secchi depth was measured at 1.5 meters by EcoLogic on August 12, 2008. This is the only known Secchi measurement.

Phosphorus Concentrations: Samples were collected in-lake in May and July 2007, and August 2008.



Chlorophyll- α : Two samples collected in 2007 from the mid-lake sample location, and one sample in 2008.



Trophic Status:

Parameter	Trophic State (shading indicates match to Lake)				Lake Kitchawan*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters ($\mu\text{g/l}$)	<10	10-35	35 -100	>100	23
Summer chlorophyll-a, upper waters ($\mu\text{g/l}$)	<2.5	2.5 - 8	8 - 25	>25	5.6
Peak chlorophyll-a ($\mu\text{g/l}$)	<8	8-25	25-75	>75	5.8
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	1.5
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	19%
ENSR data collected May and July 2007; summer represented by July samples except Secchi depth which represents one reading collected by EcoLogic on 8/12/2008. Sample results from 2007 include three lake stations, and do not include outlet and wetland samples collected during the same field event.					

Aquatic Habitat:

- Supports a warm-water fish community (largemouth bass, sunfish, other recreational species)
- Invasives observed: Eurasian watermilfoil

- Aquatic plants identified in July 2007

Scientific Name	Common Name
<i>Ceratophyllum demersum</i>	Coontail
<i>Elodea canadensis</i>	Common Water Weed
<i>Lemna sp.</i>	Duckweed
<i>Lythrum salicaria</i>	Purple Loosestrife
<i>Myriophyllum spicatum</i>	Eurasian Milfoil
<i>Nuphar polysepala</i>	Spatterdock
<i>Nuphar sp.</i>	Yellow Water Lily

Scientific Name	Common Name
<i>Nymphaea sp.</i>	White Water Lily
<i>Pontederia cordata</i>	Pickeral Weed
<i>Potamogeton crispus</i>	Curly Pondweed
<i>Potamogeton illinoensis</i>	Illinois Pondweed
<i>Potamogeton robustus</i>	Fern Pondweed
<i>Ranunculus longirostris</i>	White Water Crowfoot
<i>Vallisneria spiralis</i>	Wild Celery

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. purpurea)</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
Reptiles		
<i>Clemmys muhlenbergii</i>	Bog Turtle	Threatened, Westchester Co.
Birds		
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Threatened, entire state
Mammals		
<i>Myotis sodalis</i>	Indiana Bat	Endangered, entire state
<i>Felis concolor cougar</i>	Eastern Cougar	Endangered, entire state (probably extinct)
Plants		
<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 – Town of Lewisboro

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

* indicates species of particular concern for this lake and watershed.

Water Balance:

USGS Mean Annual (inches/year)		Volume (acre-ft/year)	<u>Water Budget:</u>	
Precipitation (P)	48	427	Inflow to Lake [R+(P-ET)]	468 mgal/yr
Evaporation (ET)	22	196	Lake Volume	174 mgal
Runoff (R)	26	1,204	Flushing Rate	2.7 times/year
			Residence Time	0.37 years

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)	78	12	0.30	9.5	26
Developed, open space	130	19	0.20	10.5	28
Developed, low intensity	3.6	0.53	0.30	0.432	1.2
Deciduous forest	305	45	0.07	8.63	23
Evergreen forest	35	5.2	0.20	2.82	7.6
Mixed forest	7.1	1.0	0.09	0.257	0.69
Shrub/scrub	0.16	0.02	0.28	0.018	0.05
Pasture/hay	8.3	1.2	0.30	1.01	2.7
Woody wetlands	97	14	2.10	3.55	10
Emergent herbaceous wetlands	12	1.7	0.09	0.467	1.3
Total Acres*	676	100		37.2	100

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

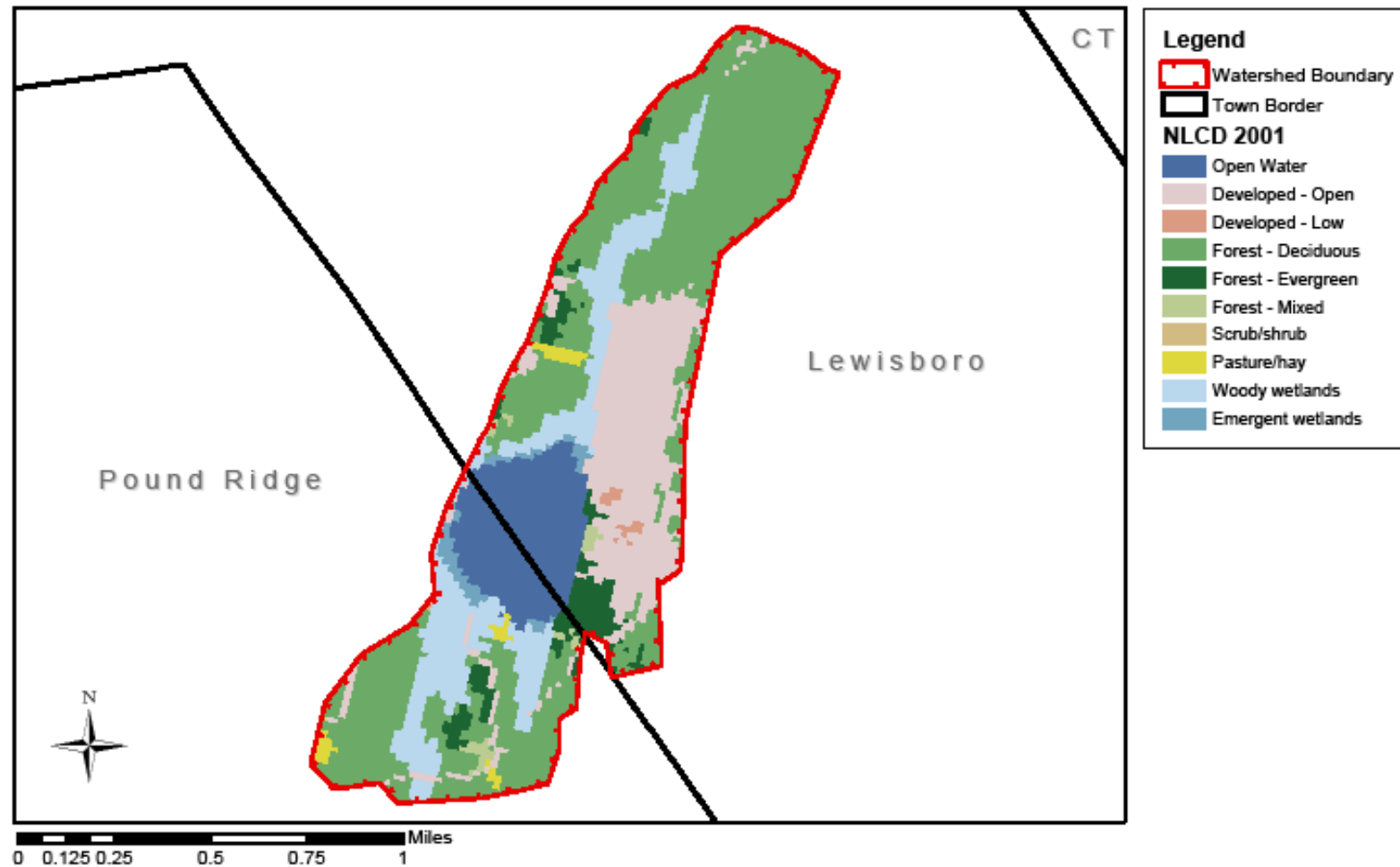
Estimated population on septic by soil suitability class with US 2000 Census household size for 100-meter buffer of surface water.

Class	N Structures	Average Household	Estimated Population*
Not limited	0	2.5	0
Somewhat limited	57	2.5	143
Very limited	71	2.5	175
Total	127		318

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	135	0.6	30%	24
Very limited	166	0.6	60%	60
Failed systems (5%)	17	0.6	100%	10
Total	318			94

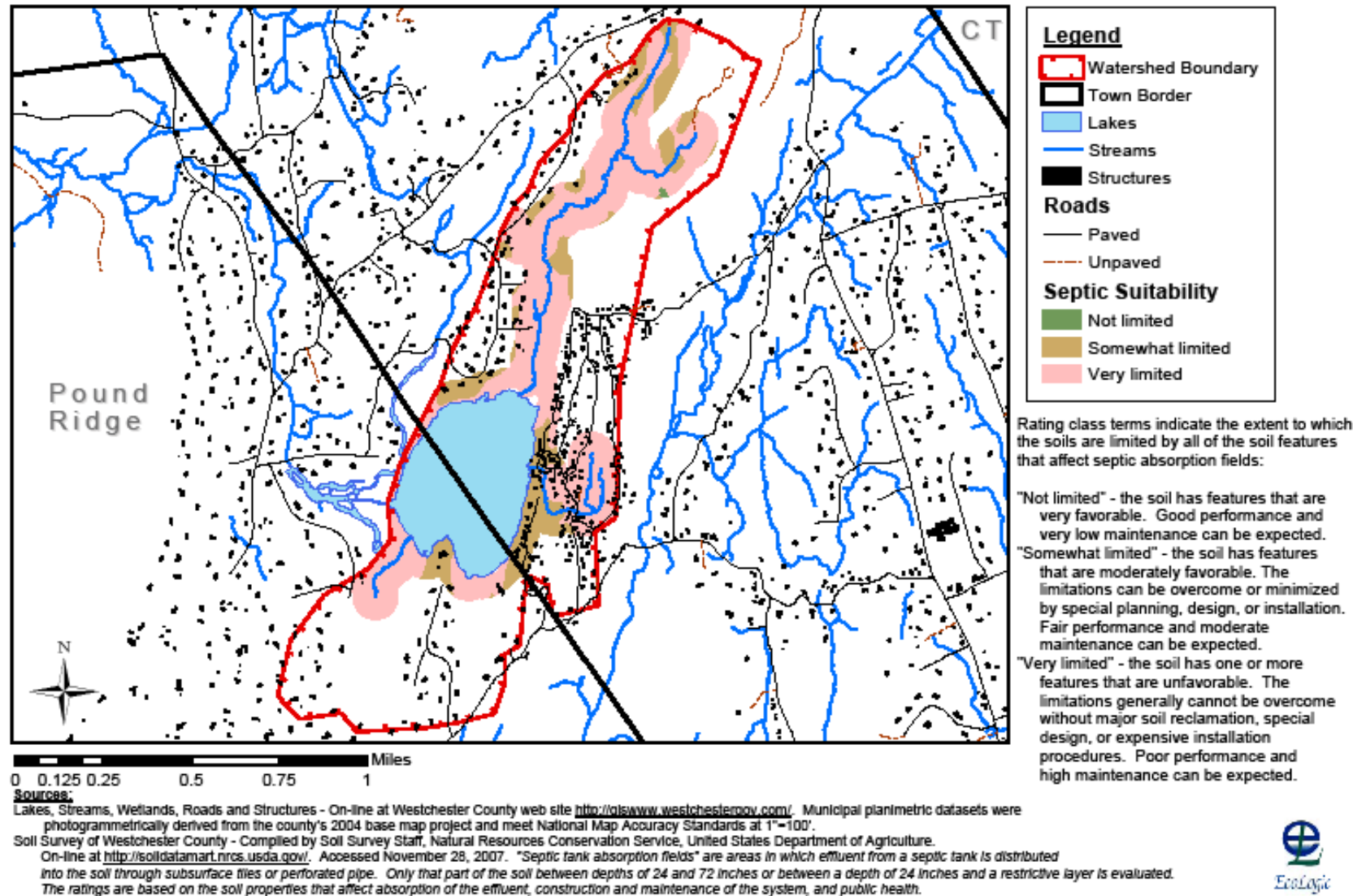
Figure 3
Lake Kitchawan
National Land Cover Dataset 2001



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
Lake Kitchawan
Soil Septic Suitability, 100-Meter Stream Buffer Within the Watershed



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

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

Source	Input (kg/year)
Watershed Land Cover	37
Point Sources	0
Septic within 100m of surface water	94
Internal loading (sediment)	0
Total	131

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 = residence time (year)

Parameter	Units	Result
W'	g/m ² /year	303
H	m	1.7
ρ	flushes per year	0.37
p	ug/l	28
Summer average TP 2007 and 2008, upper waters:		22 ug/l

REFERENCES

- ENSR Corporation. 2008. Final Report - Lake/Lagoon and Watershed Management Plan for Lake Kitchawan –Pound Ridge, NY. Prepared for Lake Kitchawan Conservation Committee, Pound Ridge, New York. March 2008. Document number 12567-002-100.
- 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.
- 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/>.

3.3. Truesdale Lake

Truesdale Lake



Surface water quality classification: Class B

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	34	Land-Tech 2001
Watershed area	hectares	972*	EcoLogic 2008 (excl lake)
Volume	mgal	99.2	Land-Tech 2001
Elevation	m	153	NYSDEC 2007
Maximum depth	m	3.4	Land-Tech 2001
Average Depth	m	1.1**	EcoLogic 2008
* Approximately 49% of the lake's watershed area lies within the State of Connecticut.			
**EcoLogic calculated from Land-Tech data: mean depth = volume divided by area.			

Lake Inlet: A perennial watercourse discharges into the northeastern portion of the lake from Pumping Station Swamp, a drinking water wellfield located on the border of New York and Connecticut (Land-Tech 2001). A smaller intermittent water course discharges to a cove in the northeast portion of the lake. The lake level is lowered seasonally to minimize damage from ice and to minimize encroachment of aquatic plants.

Recreational impacts: Recreational assessments degrade through mid summer (coincident with increasing lake productivity and despite decreasing weed densities) and improve slightly during late summer as weed densities drop. (NYSDEC 2007).

Lakeshore Development: Mix of forest and maintained lawns (Land-Tech 2001)

Lake Outlet: The lake discharges at the northern end of the lake through a concrete dam. The dam contains an 18-foot spillway with removable springboards allowing the lake levels to be seasonally managed. A spillway height of 14 inches is maintained during the summer months.

Additional Notes:

- Truesdale Lake is a man-made lake created in 1927 by damming a stream and flooding a small pond and surrounding swamp (Truesdale Lake web site¹)
- Sediments accumulate in the lake at a rate of approximately 0.1-0.3 inches per year (Land-Tech 2001).
- Volunteer monitoring Truesdale Inlet from May to August 31 2007 measured Orthophosphate at average concentration of 63.2 ug/l.

¹ Truesdale Lake web site <<http://www.truesdalelake.com/>>

Figure 1
Truesdale Lake Aquatic Vegetation Survey
Bathymetry Map
July 7, 2005



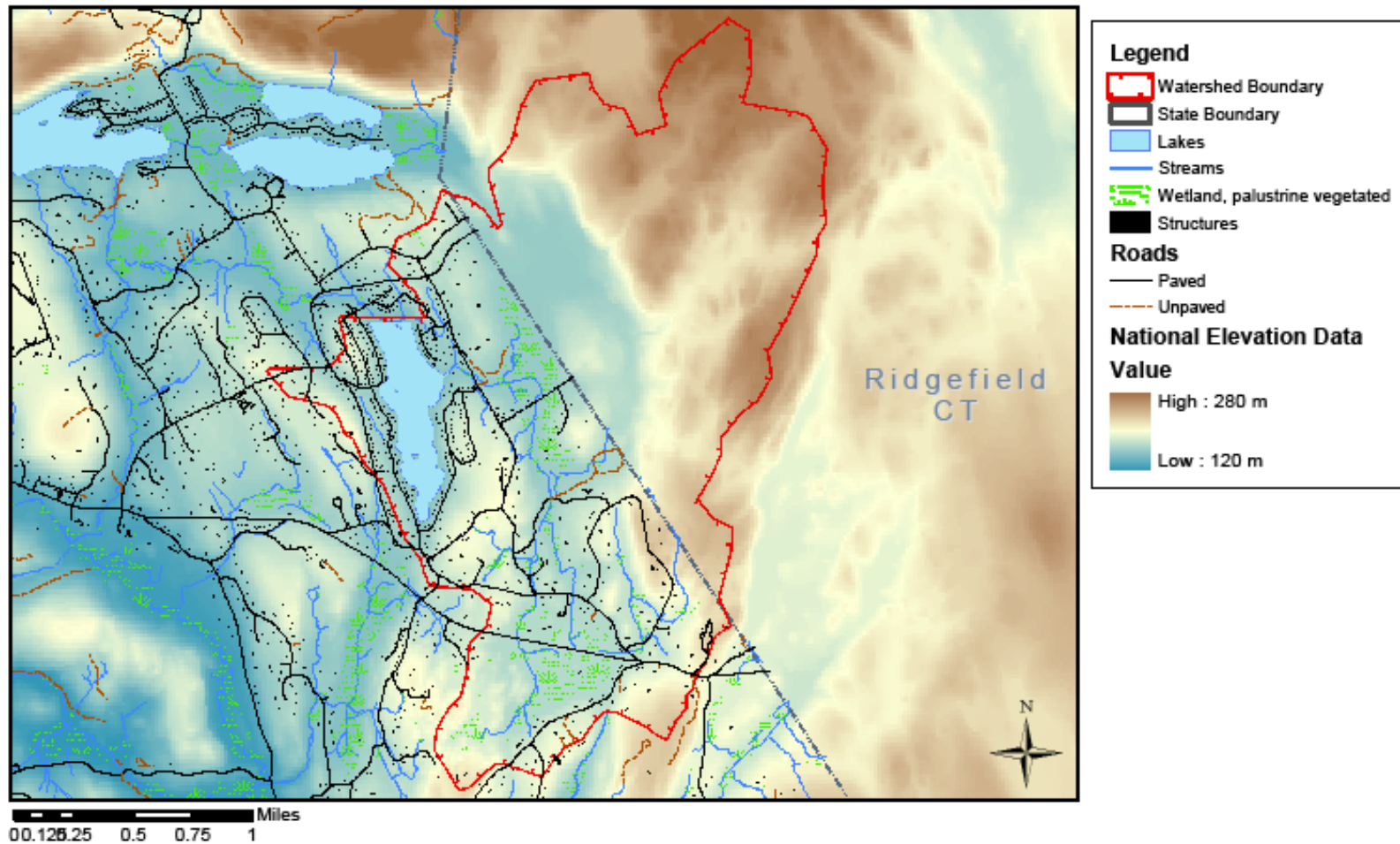
0 260 520 1,040 1,560 2,080 Feet

Legend

- Water Depth in feet



Figure 2
Truesdale Lake
Topographic and Human Features



Sources:
 Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site <http://nlswww.westchesterco.ny.gov/>. 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://nlsdata.usgs.net/nlsdata/>.
 Geographic coordinate system. Horizontal datum of NAD83. Vertical datum of NAVD88.



Historical water quality data summary: Data were collected under the Citizens 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)	2003-2007	7	21.4	30	25.4
Chlorophyll- α (ug/l)	1999-2007	69	0.24	116	27.3
Color (platinum color units)	1999-2007	69	11	88	31.5
Conductivity (umhos/cm; 25°C)	1999-2007	70	110	322	263
Dissolved Nitrogen (mg/l)	2002-2007	45	0.005	1.52	0.66
Nitrate Nitrogen (mg/l)	1999-2007	71	0.0015	0.14	0.023
Ammonia Nitrogen (mg/l)	2002-2007	47	0.005	0.20	0.038
Phosphorus (mg/l)	1999-2007	78	0.018	0.125	0.057
Nitrogen:Phosphorus Ratio	2002-2007	44	0.20	61	13.6
pH (std units)	1999-2007	68	7.02	9.17	8.02
Secchi depth (m)	1999-2007	72	0.53	2.7	1.23
Temperature (°C)	1999-2007	72	17	31	24

<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)	1999-2007	69	1.9	116	30.21
Dissolved Nitrogen (mg/l)	2002-2007	35	0.147	1.52	0.70
Nitrate N (mg/l)	1999-2007	55	0.0015	0.14	0.023
Ammonia N (mg/l)	2002-2007	36	0.005	0.155	0.035
Phosphorus (mg/l)	1999-2007	62	0.018	0.125	0.059
Nitrogen:Phosphorus Ratio	2002-2007	35	1.86	61	13.26
Secchi depth (m)	1999-2007	56	0.53	2.48	1.09

EcoLogic August 2008 water quality data summary:**A. Analytical Results 08/12/2008**

Parameter (units)	Surface (0 m)	Depth (3.3 m)
Secchi Transparency (m)	0.75	na
Chlorophyll-a (mg/l)	0.12	na
Alkalinity (mg/l)	80	na
<u>Phosphorus:</u>		
Total Phosphorus (mg/l)	0.092	0.096
Soluble Reactive Phosphorus (mg/l)	0.0070 ^a	0.021 ^a
<u>Nitrogen:</u>		
Nitrate + Nitrite as N (mg/l)	0.065 ^a	0.092 ^a
Total Kjeldahl Nitrogen (mg/l)	1.3 ^a	1.6 ^a
Total Nitrogen (mg/l)	1.4	1.7
na – not analyzed		
^a The result of the laboratory control sample was greater than the established limit.		

B. Field Profiles

Depth ft (m)	Temperature (°C)	pH	Conductivity (us)	DO (mg/l)	DO (% sat)
1 (0.305)	23.8	7.7	308	7.1	83.9
2 (0.61)	23.9		308	7.0	81.9
3 (0.915)	23.8		308	6.9	81.6
4 (1.22)	23.8		308	6.8	81.1
5 (1.525)	23.7		309	6.6	78.5
6 (1.83)	23.7		309	6.7	79.1
7 (2.135)	23.6		309	6.4	74.0
8 (2.44)	23.3		308	6.3	74.4
9 (2.745)	23.1		305	5.6	67.0
10 (3.05)	21.8		275	4.2	48.3

Sediment data summary:

- Composite samples collected May 2001 (Land-Tech, 2001):

Parameter (units)	Result
Phosphorus (mg/kg)	410
Copper (mg/kg)	34

- Composite samples collected August 12, 2008 (EcoLogic, 2008):

Parameter	Analytical Method	Result-1 (mg/kg dry wt)	Result-2 (mg/kg dry wt)
Pesticides/PCBs	EPA 8081/8082	ND	ND
TCL Volatiles	EPA 8260B	ND	ND
TCL Semi-Volatiles	EPA 8270	ND	ND
RCRA Total Metals	EPA 6010		
Arsenic		ND	ND
Barium		19	26
Cadmium		0.23	0.32
Chromium		3.3	4.7

Parameter	Analytical Method	Result-1 (mg/kg dry wt)	Result-2 (mg/kg dry wt)
Copper		240	210
Lead		7.8	8.2
Selenium		ND	ND
Silver		ND	ND
RCRA Mercury	EPA 7471	ND	ND
Total Organic Carbon	EPA 9060	132000	39300
Total Solids	SM 18-20 2540B	9.2%	26%
ND – non-detect. Analytes reported as less than the method detection 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) to determine if any threshold screening values that might preclude dredging were exceeded. 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:

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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. Truesdale Lake sediment analytical results for two samples, 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			Truesdale 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; ND	A
Cadmium	0.5	< 1.2	1.2 - 9.5	> 9.5	0.23; 0.32	A
Copper*	2.5	< 33	33 – 207	> 207	240; 210	C
Lead	5.0	< 33	33 – 166	> 166	7.8; 8.2	A
Mercury ⁺	0.2	< 0.17	0.17 - 1.6	> 1.6	ND; 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; ND	A
Total BTEX*	0.002	< 0.96	0.96 - 5.9	> 5.9	ND; ND	A
Total PAH ¹	0.33	< 4	4 - 35	> 35	ND; 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; 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; ND	A
Dieldrin	0.019	< 0.11	0.11 -0. 48	> 0.48	ND; 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; 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.

¹ For Sum of PAH, see Appendix E of TOGS 5.1.9. For Truesdale Lake, each of the 18 PAH compounds in two samples were reported as non-detect (<0.8 and <1 mg/kg).

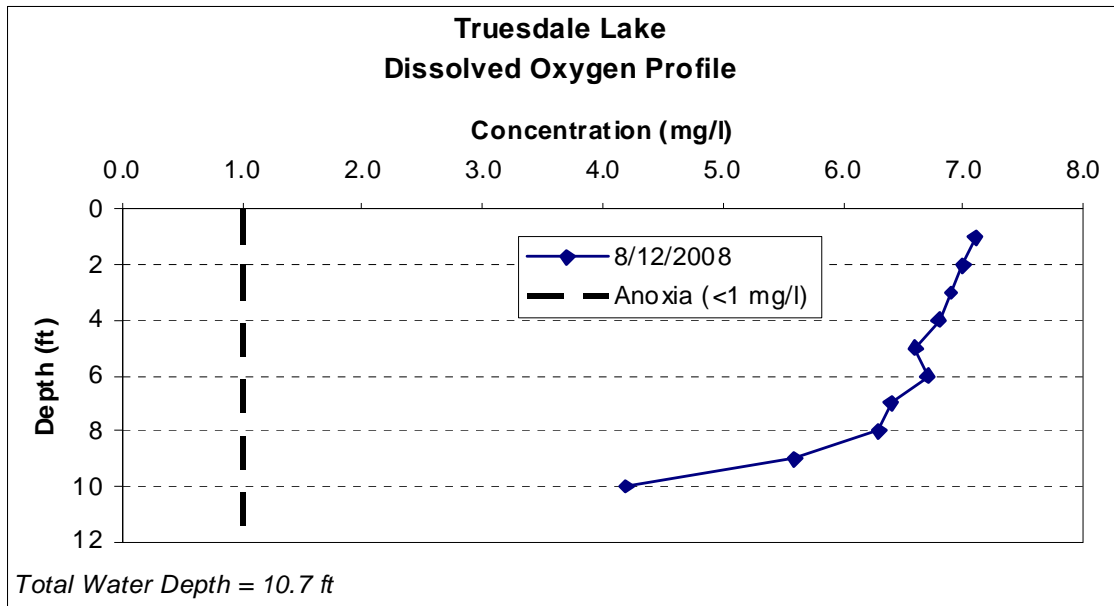
² For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. For Truesdale Lake, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.

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

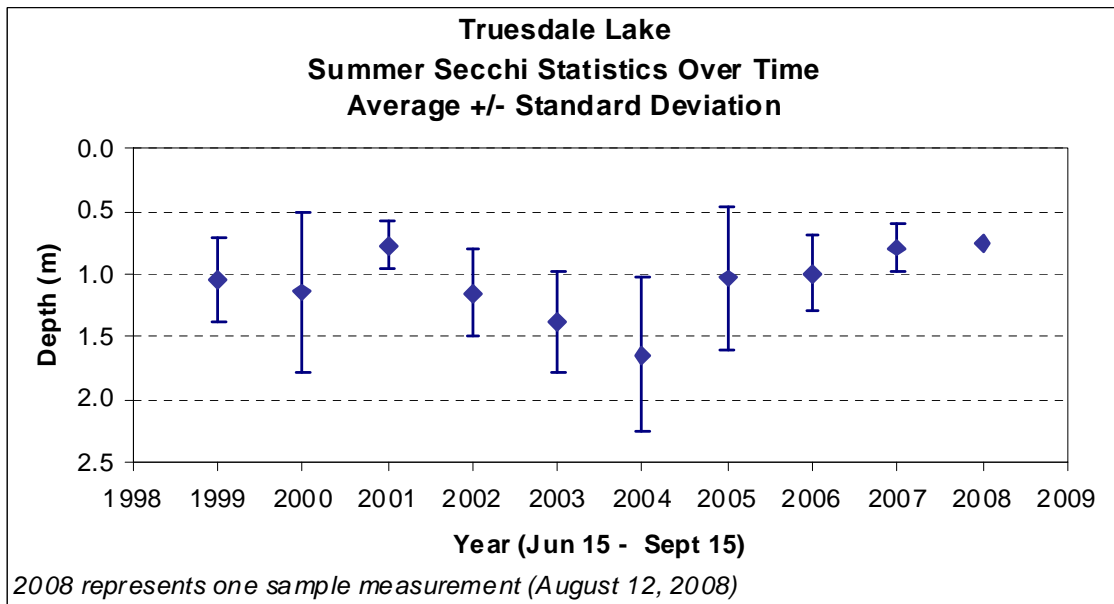
Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

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

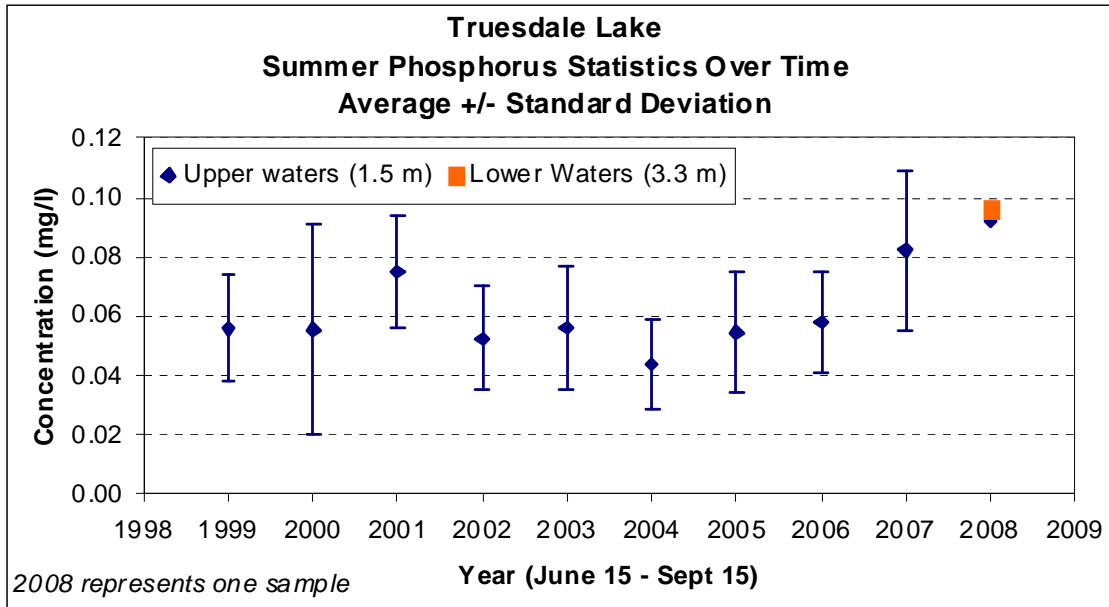
Anoxia: Based on the dissolved oxygen profile collected on August 12, 2008, oxygen levels were depleted in the lower waters, but anoxic conditions (concentrations less than 1 mg/l) were not observed in the lake.



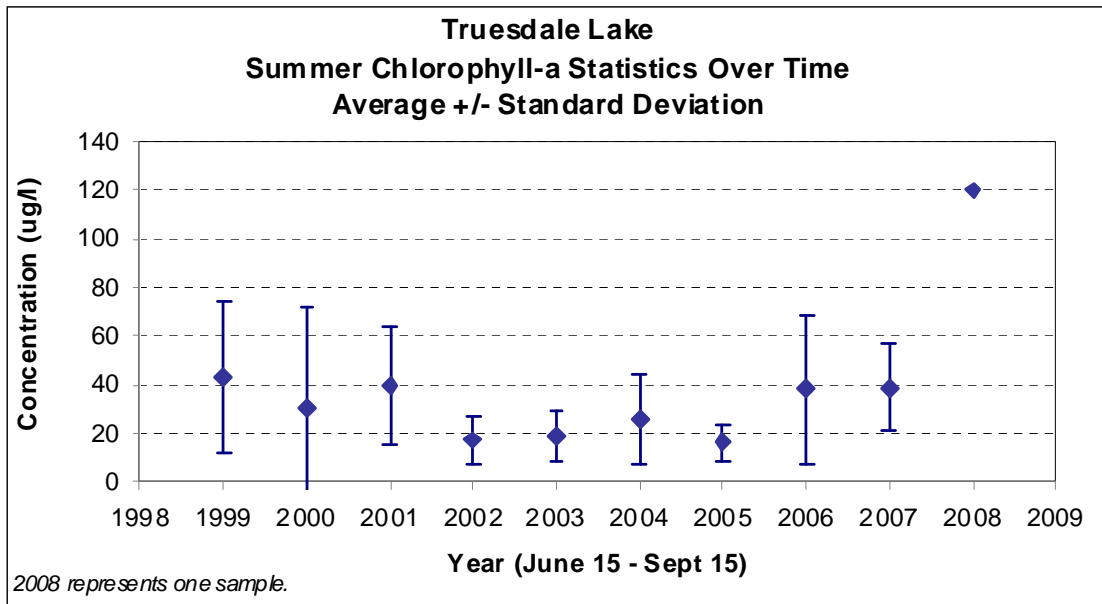
Water Clarity: Averages over time are generally less than 2 meters. The historical variability around the mean is about half a meter.



Phosphorus Concentrations: Phosphorus concentrations in upper waters have been fairly stable since 1999. There are no phosphorus data for lower waters prior to 2008. In 2008, lower and upper waters phosphorus concentrations are similar.



Chlorophyll- α : Chlorophyll- α concentrations are generally lower for the 2002 through 2005 time period than for the 1999 through 2001 period. The concentrations in 2006 and 2007 are comparable to the 1999 through 2001 period. The standard deviations show considerable variability over time.



Trophic Status:

Parameter	Trophic State (shading indicates match to Lake)				Truesdale Lake*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters (µg/l)	<10	10-35	35 -100	>100	59
Summer chlorophyll-a, upper waters (µg/l)	<2.5	2.5 - 8	8 - 25	>25	30
Peak chlorophyll-a (µg/l)	<8	8-25	25-75	>75	116
Average Secchi disk transparency, m	>6	6-3	3-1.5	<1.5	1.09
Minimum Secchi disk transparency, meters	>3	3-1.5	1.5-0.7	<0.7	0.53
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	48.3
*Data shown represent the period 1999-2007, except for dissolved oxygen, which was collected at a depth of 10 feet by EcoLogic on 08/12/2008.					

Aquatic Habitat:

- The lake lacks habitat diversity; it is shallow with gentle slopes offering little variation in depth for fish habitat. (Land-Tech 2001)
- Aquatic vascular plants and algae are a major problem in Lake Truesdale. The physical removal of weeds goes back to 1950 using weed cutters and harvesting. Chemical treatment was initiated in 1957 under the direction of Cornell University's State School of Agriculture, Conservation Department. (Land-Tech 2001).
- Vegetation survey was conducted on July 7, 2005 (Allied Biological):
 - Truesdale Lake was treated with an aquatic herbicide ten days before the vegetation survey (June 27, 2005). The target macrophytes were Curly-leaf pondweed (*P. crispus*) and Leafy pondweed (*P. foliosus*). Since neither of these pondweeds were observed during the July 7th survey, that treatment can be considered a success.
 - Benthic filamentous algae was scattered throughout the lake, as was stonewort. Southern Naiad was observed mostly in the northern half of the lake but almost exclusively in trace amounts. As Southern Naiad is a late season annual, the July 7th survey is probably not an accurate representation of its true distribution later in the season. Common Waterweed was only observed at three sample locations in Lake Truesdale.
 - List of Aquatic Plants identified in 2005:

Scientific Name	Common Name
Miscellaneous	Benthic filamentous algae
<i>Nitella spp.</i>	Stonewort, Nitella
<i>Najas guadalupensis</i>	Southern naiad, southern water nymph, bushy pondweed
<i>Elodea canadensis</i> .	Elodea, common water weed

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</i> (<i>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</i> (<i>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>Felix 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 – Town of Lewisboro

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)	<u>Water Budget:</u>	
Precipitation (P)	48	336	Inflow to Lake [R+(P-ET)]	1,756 mgal/year
Evaporation (ET)	22	154	Lake Volume	180 mgal
Runoff (R)	26	5,206	Flushing Rate	10 times/year
			Residence Time	0.10 years

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)	90	3.5	0.30	11	9.0
Developed, open space	380	15	0.20	31	25
Developed, low intensity	6.3	0.25	0.30	0.77	0.63
Developed, moderate intensity	2.5	0.10	0.50	0.52	0.42
Deciduous forest	1,569	61	0.07	44	36
Evergreen forest	105	4.1	0.20	8.5	6.9
Mixed forest	36	1.4	0.09	1.3	1.1
Shrub/scrub	3.8	0.15	0.28	0.43	0.35
Grassland/herbaceous	2.2	0.09	0.28	0.25	0.21
Pasture/hay	106	4.1	0.30	13	11
Cultivated crops	2.0	0.08	2.10	1.7	1.4
Woody wetlands	264	10	0.09	9.6	7.9
Total Acres*	2,567	100		122	100
*Watershed area includes the area located in the State of Connecticut.					

(B) *Septic:* Assumes 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	9	3	27
Somewhat limited	198	3	594
Very limited	96	3	288
Total	303		909
*Population estimate does not include the area of the watershed located in the State of Connecticut; a Structures file was not available to conduct the analysis.			

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	26	0.6	10%	1.5
Somewhat limited	564	0.6	30%	102
Very limited	274	0.6	60%	98
Failed systems (5%)	45	0.6	100%	27
Total	909			229
*Population estimate does not include the area located in the State of Connecticut; a Structures file was not available for this area.				

Figure 3
Truesdale Lake
National Land Cover Dataset 2001

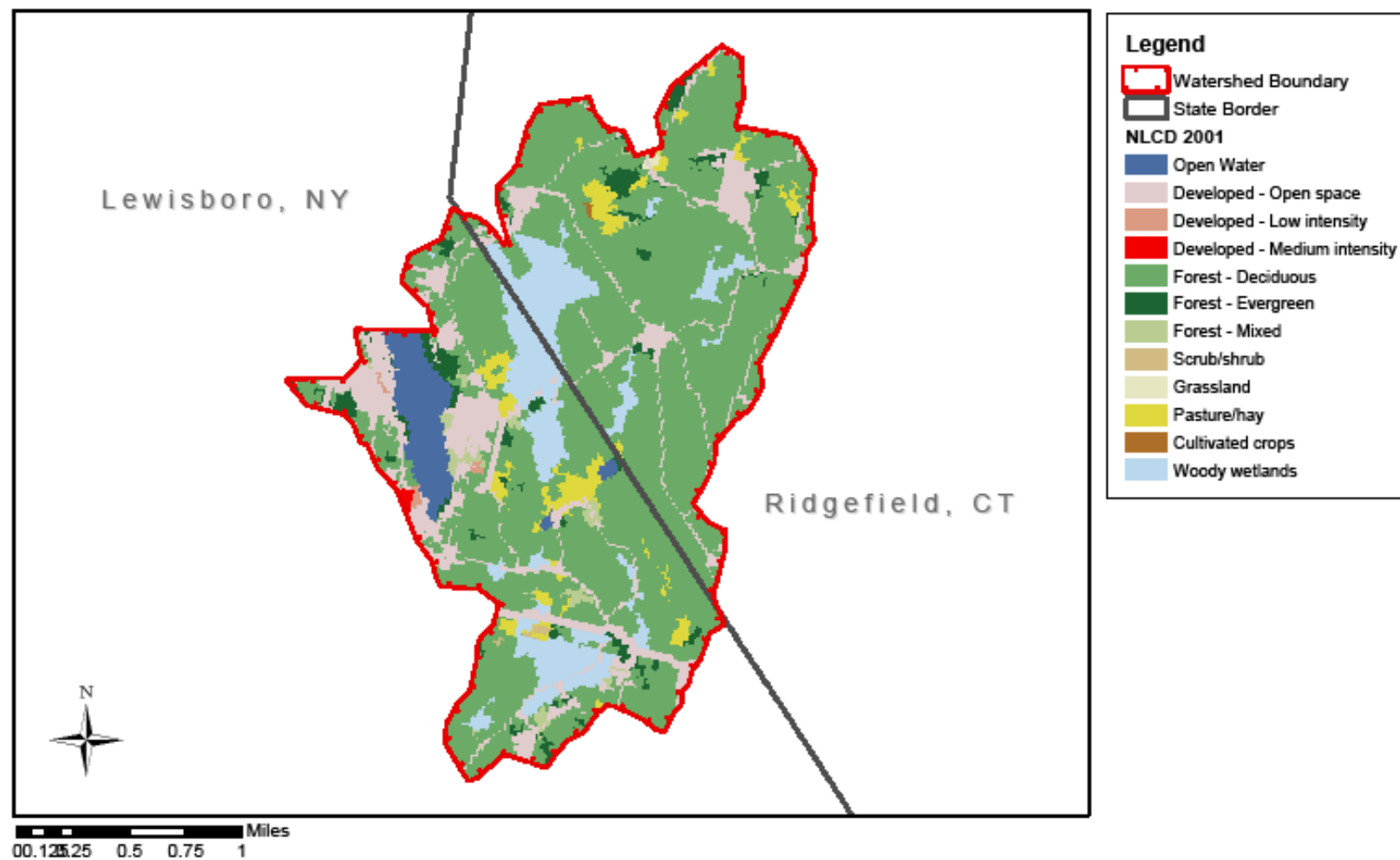
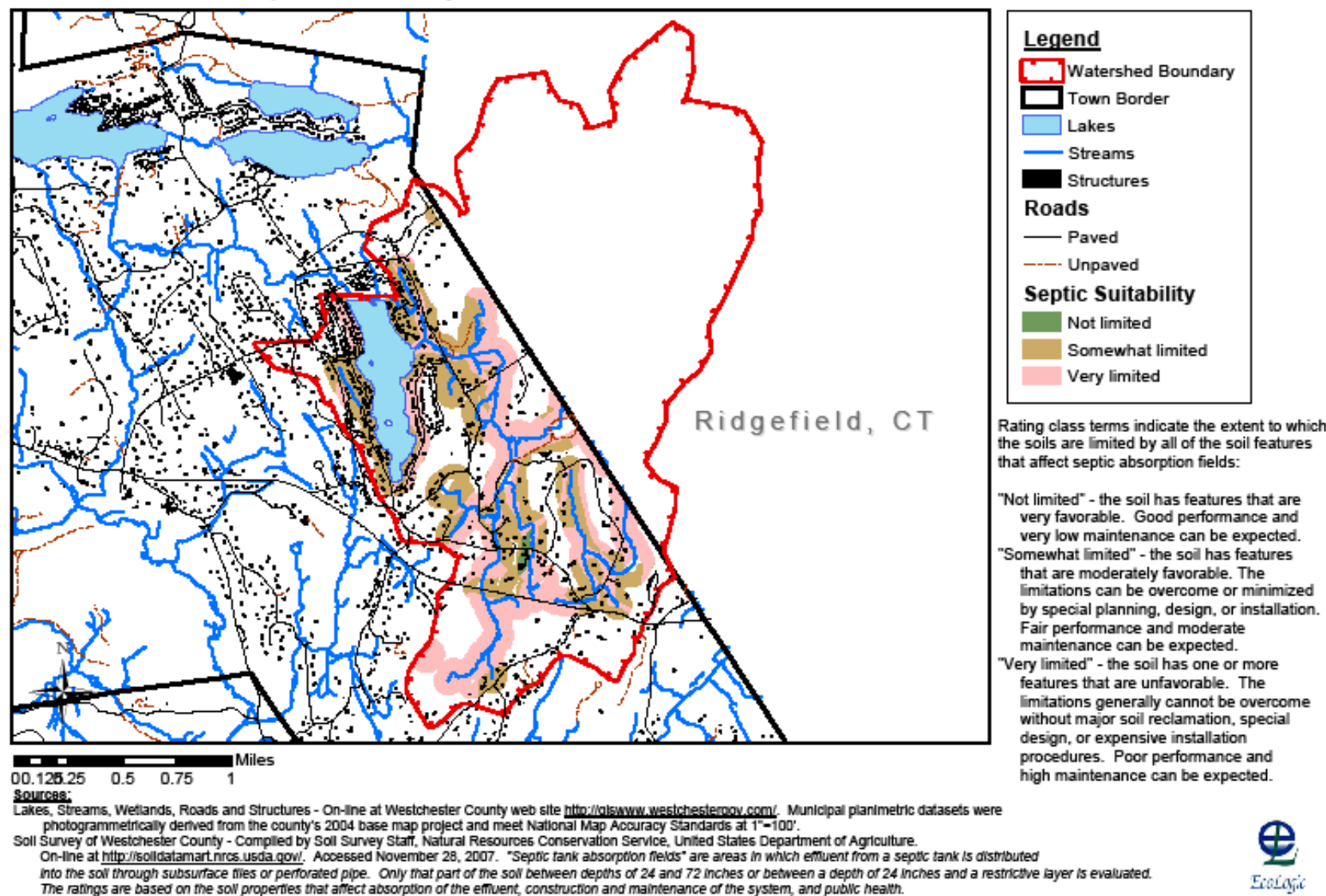


Figure 4
Truesdale Lake
Soil Septic Suitability, 100-Meter Stream Buffer Within the Watershed



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

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

Source	Input (kg/year)
Watershed Land Cover	122
Point Sources	0
Septic within 100m of surface water	229
Internal loading (sediments)	0
Total	351

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	1,032
H	m	2.0
ρ	flushes per year	0.10
p	ug/l	101
<i>Summer (Jun 15 – Sept 15) average TP</i>		
<i>1999-2007, upper waters:</i>		54 ug/l

REFERENCES

- Allied Biological, Inc. 2005. Aquatic Macrophyte Survey, July 7 2005, Truesdale Lake, South Salem NY. Prepared for the Truesdale Lake Property Owners Association, South Salem, NY.
- 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.
- Land-Tech Consultants, Inc. 2001. Lake Evaluation and Enhancement Plan, Lake Truesdale, Lewisboro New York. Prepared for Truesdale Lake Association, September 5, 2001.
- 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. 2007. 2006 Interpretive Summary, New York Citizens Statewide Lake Assessment Program (CSLAP) 2006 Annual Report - Lake Truesdale. October 2007. With New York Federation of Lake Associations. Scott A. Kishbaugh, PE.
- Truesdale Lake web site <http://www.truesdalelake.com/>
- 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/>.

3.4. Lake Oscaleta

Lake Oscaleta



Surface water quality classification: Class B

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	26	Cedar Eden 2004
Watershed area*	hectares	384	EcoLogic 2008 (excl lake)
Volume	mgal	412	Cedar Eden 2004
Elevation	m	144	CSLAP 2006
Maximum depth	m	10.8	Cedar Eden 2004
Average Depth	m	5.9	Cedar Eden 2004
*Approximately 73% of the watershed area is within the State of Connecticut; approximately 6% is located in the Town of North Salem.			

Lake Inlet: at the northeast end via channel from Lake Rippowam (Cedar Eden 2002), and via Rippowam Creek on the east shore.

Lake Outlet: at the western end of the lake, discharging via channel to Lake Waccabuc.

Recreational impacts: Water quality and aquatic plants were both cited as impacting recreational assessments, although the most significant impacts were associated with poor clarity and high algae levels. (CSLAP 2006)

Lakeshore Development: Northern shore (Twin Lakes Community built in the 1950's). Southern shore there is a cluster of camps (built in early 1900's) that are now mostly year-round homes. Community beach at the northwest end. Otherwise, the shoreline is forested. Forested wetlands at eastern and western ends of the lake (Cedar Eden 2002).

Figure 1
Lake Oscaleta
Bathymetry

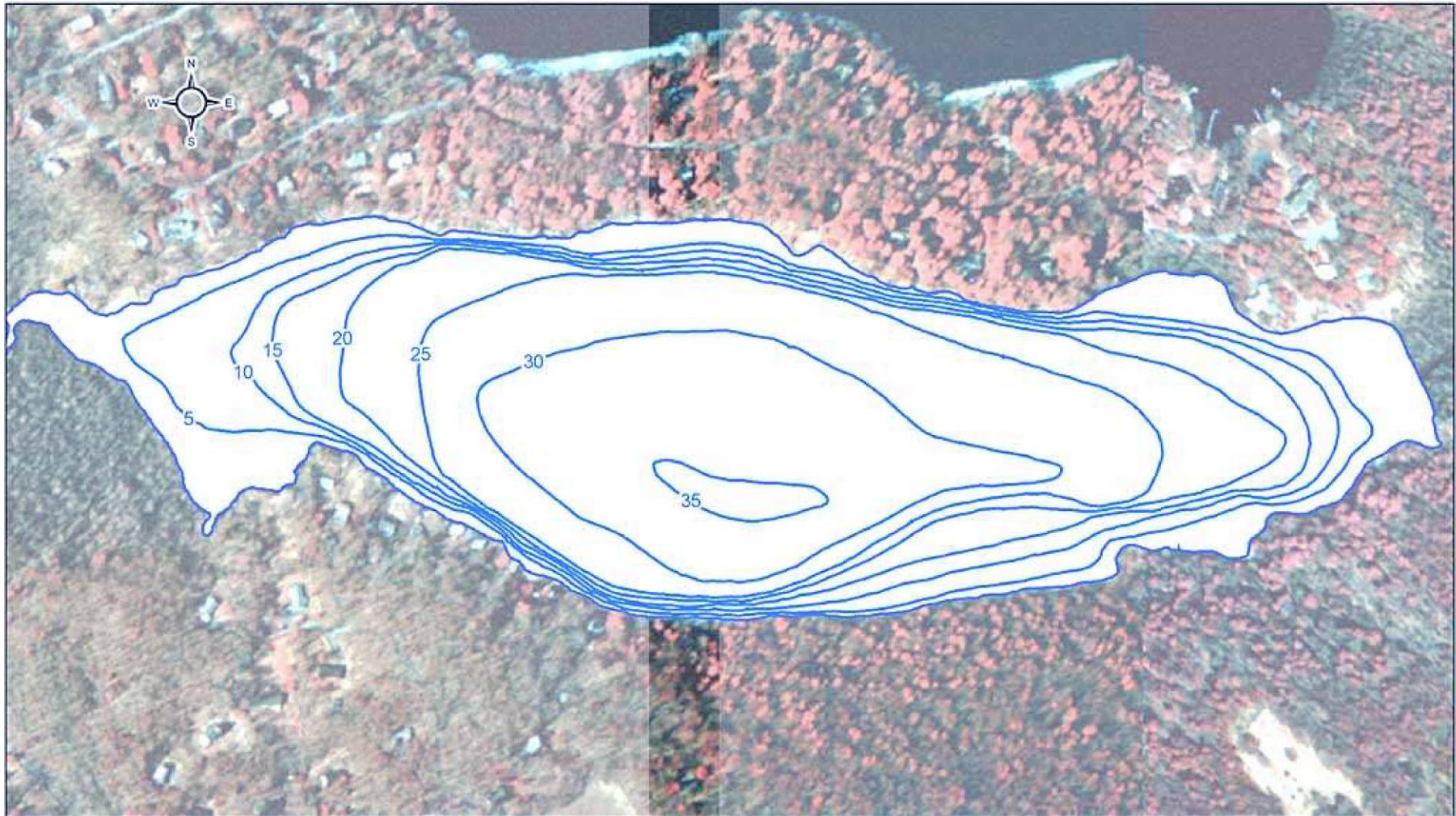


Figure 4.2 Bathymetric map of Lake Oscaleta

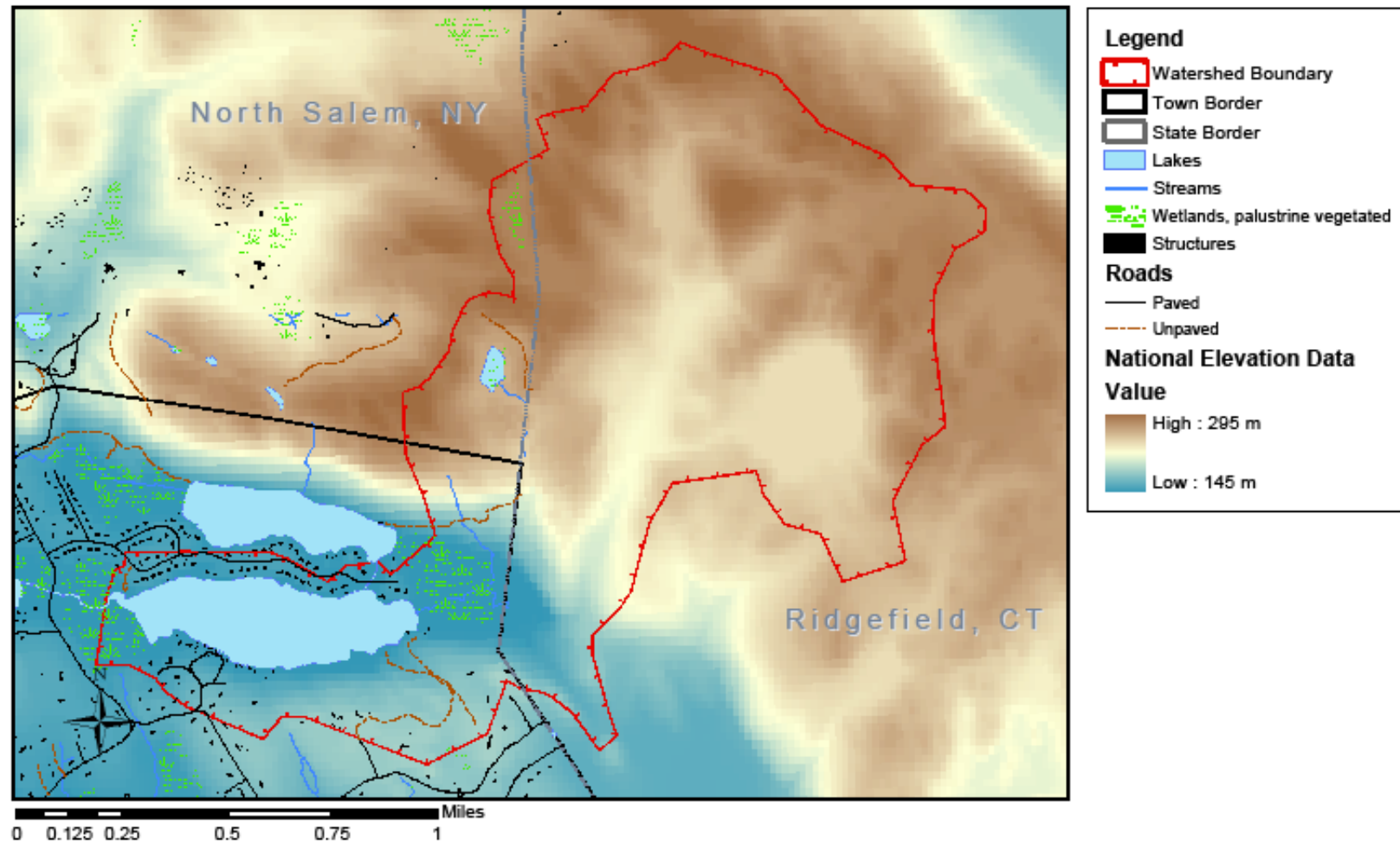
Data Source: Field Points by P.Lewis, 5 foot contours by CEE LLC

200 100 0 200 Feet



Cedar Eden
Environmental, LLC
Geographic Information Systems

Figure 2
Lake Oscaleta
Topographic and Human Features



Sources:

Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site <http://giswww.westchesterny.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://niedata.usgs.net/nied/>. Geographic coordinate system. Horizontal datum of NAD83. Vertical datum of NAVD88.



Historical water quality data summary: Data have been collected as part of the New York Citizens Statewide Lake Assessment Program (CSLAP), as well as by the Three Lakes Council and other entities over time. Depths ranging from 0 to 11 meters (both upper and lower waters), including some half-meter increment profiles. Table A below summarizes samples collected between January and December of each year; the statistics represent averages of sample results for the time period for all depths, unless otherwise noted. 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
Alkalinity (mg/l)	1972-1974	52	15	45	29
	2002-2007	8	16	38	31
Calcium (mg/l)	2006-2007	4	11.7	15.6	12.77
Chlorophyll- α (mg/m ³) – Jun-Sept	1979	19	0.81	19.8	6.13
	1980-1982	23	0.75	56	7.13
	2002-2007	41	0.16	53.6	8.90
Color (platinum color units)	2006-2007	16	8	35	16.75
Conductivity	1972-1974	49	94	132	109
	2002-2007	39	108	177	146
Fe ⁺⁺ (mg/l)	1975	10	0.025	0.45	0.15
Mn ⁺⁺ (mg/l)	1975	10	0.01	1.01	0.40
pH (std units)	1972-1974	52	6.3	7.36	6.80
	2002-2007	28	6.85	10.03	7.87
Phaeophytin- α (mg/m ³)	2003-2006	19	0.005	2.1	0.38
Secchi depth (m)	1972-1979	97	1.0	5.3	3.34
	1980-1983	69	1.5	4.25	2.92
	2002-2007	88	0.5	4.42	2.73
<i>Temperature:</i>					
Surface (°C) (depth <2m)	1974-1979	32 (0-1 m)	17	27.5	22.98
	1981-1983	78 (0-1 m)	6.8	28.3	20.4
	1991	2 (0-1.5m)	25	26	25.5
	2002-2007	170 (0-1.5 m)	3.3	31	19.57
Depth >8m (°C)	1978-1979	22 (9-10 m)	8.5	11	9.5
	1981-1982	29 (9 m)	6.5	10.5	8.13
	1991	1 (9.1 m)	8.5	8.5	8.5
	2002-2007	204 (9-11 m)	3.8	10.2	7.06
<i>Dissolved Oxygen:</i>					
Surface (mg/l) (<2 m)	1972-1979	30 (0-1 m)	7.8	10	8.79
	1981-1983	78 (0-1 m)	4.4	12.3	8.22
	1991	2 (0-1.5 m)	7.9	8.0	7.95
	2002-2007	152 (0-1 m)	7.13	16	10.0
Depth >8m (mg/l)	1978-1979	19 (9-10 m)	0	0.5	0.12
	1981-1982	29 (9 m)	0	7.8	1.04
	1991	1 (9.1 m)	1.1	1.1	1.1
	2002-2007	198 (9-11 m)	-0.77	12.28	2.43

<u>A. Representing samples collected between January and December each year.</u>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
<u>Nutrients</u>					
Phosphorus:					
Surface (mg/l) (<2 m)	2002-2007	43 (1.5 m)	0.012	0.055	0.024
Depth >8m (mg/l)	1975	13 (9 m)	0.015	0.225	0.072
	2004-2007	35 (9-10 m)	0.013	0.240	0.069
Soluble Reactive P (mg/l)	1975	14	0.001	0.131	0.043
Nitrate-N (mg/l)	1973-1975	34	0	0.19	0.052
	2003-2007	21	0.003	0.045	0.011
Total Kjeldahl Nitrogen (mg/l)	1975	14	0.24	1.7	0.99
	2002-2007	13	0.37	1.0	0.62
Ammonia Nitrogen (mg/l)	1973-1975	37	0.04	1.7	0.67
	2006-2007	16	0.006	0.12	0.028

<u>B. Representing samples collected between June 15 and September 15 each year.</u>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Chlorophyll- α (mg/m ³)	1979	10	0.81	9.8	3.21
	1980-1982	5	0.75	4.4	2.59
	2002-2007	26	0.16	53.6	8.84
Phaeophytin- α (mg/m ³)	2003-2006	12	0.005	1.2	0.23
Secchi depth (m)	1972-1979	43	1	5	3.37
	1980-1983	37	1.8	4.2	3.17
	2002-2007	33	0.5	4.42	3.15
<u>Dissolved Oxygen:</u>					
Surface (mg/l) (< 2m)	1972-1979	24 (0-1 m)	7.8	10	8.69
	1981-1983	46 (0-1 m)	4.4	10.2	7.6
	1991	2 (0-1.5 m)	7.9	8	7.95
	2002-2007	50 (0-1 m)	7.59	14.3	9.04
Depth >8 m (mg/l)	1978-1979	16 (9-10 m)	0	0.3	0.088
	1981-1982	15 (9 m)	0	1.4	0.49
	1991	1 (9.1 m)	1.1	1.1	1.1
	2002-2007	64 (9-10.5 m)	-0.01	1.03	0.33
<u>Nutrients</u>					
Phosphorus:					
Surface (mg/l) (<2 m)	2002-2007	26 (1.5 m)	0.012	0.055	0.024
Depth >8 m (mg/l)	1975	4 (9 m)	0.053	0.225	0.129
	2004-2007	21 (9-10 m)	0.013	0.133	0.065
Soluble Reactive P (mg/l)	1975	5	0.001	0.131	0.073
Nitrate-N (mg/l)	1973-1975	14	0.0005	0.108	0.06
	2003-2007	14	0.0025	0.02	0.009

<u>B. Representing samples collected between June 15 and September 15 each year.</u>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Total Kjeldahl Nitrogen (mg/l)	1975	5	0.656	1.7	1.30
	2002-2007	9	0.374	1	0.640
Ammonia Nitrogen (mg/l)	1973-1975	14	0.53	1.55	0.96
	2006-2007	11	0.006	0.12	0.028

Sediment data summary: Composite samples collected May 29, 2008 (EcoLogic, 2008):

Parameter	Analytical Method	Result (mg/kg dry wt)
Pesticides/PCBs	EPA 8081/8082	ND
TCL Volatiles	EPA 8260B	ND
TCL PAHs	EPA 8270	ND
<u>RCRA Total Metals</u>	EPA 6010	
Arsenic		ND
Barium		ND
Cadmium		ND
Chromium		ND
Copper		1.1
Lead		2.0
Selenium		ND
Silver		ND
RCRA Mercury	EPA 7471	ND
Total Organic Carbon	EPA 9060	110,000
Total Solids	SM 18-20 2540B	6.1%
ND – non-detect. Analytes reported as less than the method detection limit.		

Sediment Contaminant Analysis: Interest has been expressed in exploring the feasibility of dredging. A composite sediment sample was collected on May 29, 2008 (EcoLogic, 2008). Results are summarized in Table C, in the context of NYSDEC Screening levels. A complete set of results is appended. 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. Lake Oscaleta 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			Oscaleta 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	ND	A
Copper*	2.5	< 33	33 – 207	> 207	1.1	A
Lead	5.0	< 33	33 – 166	> 166	2.0	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; ND – not detected

⁺ 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.

¹ For Sum of PAH, see Appendix E of TOGS 5.1.9. For Lake Oscaleta, each of the 16 PAH compounds were reported as non-detect (<0.5 mg/kg).

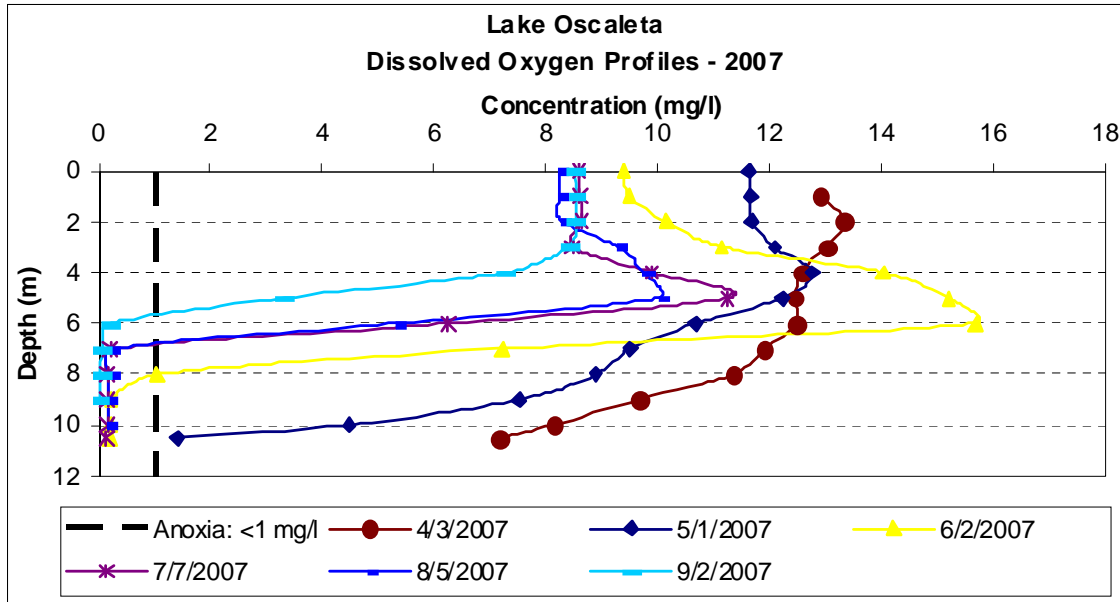
² For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. On Lake Oscaleta, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.

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

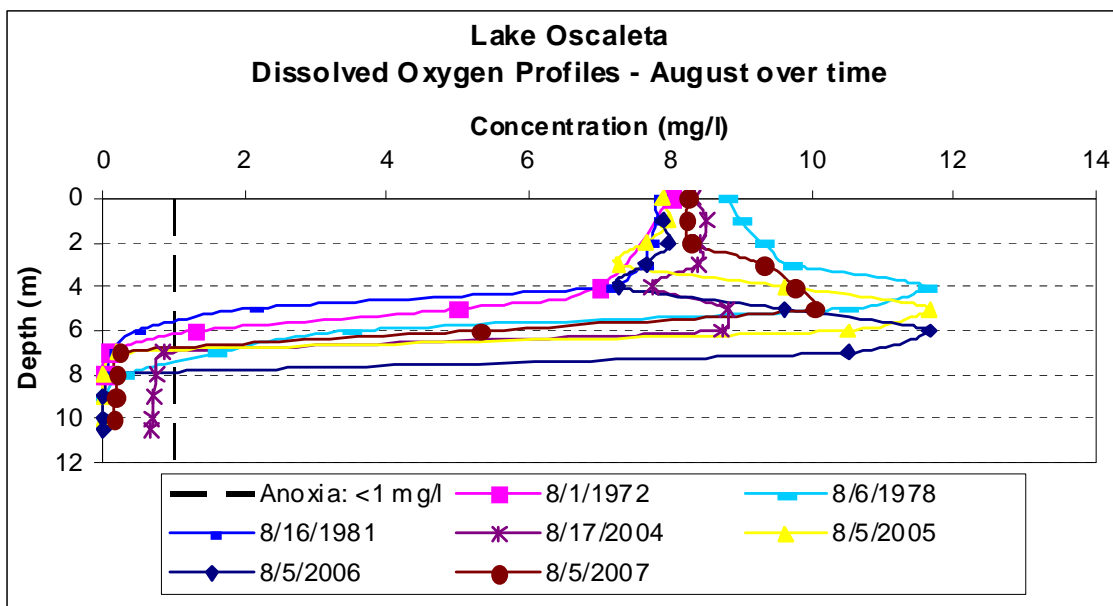
Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

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.

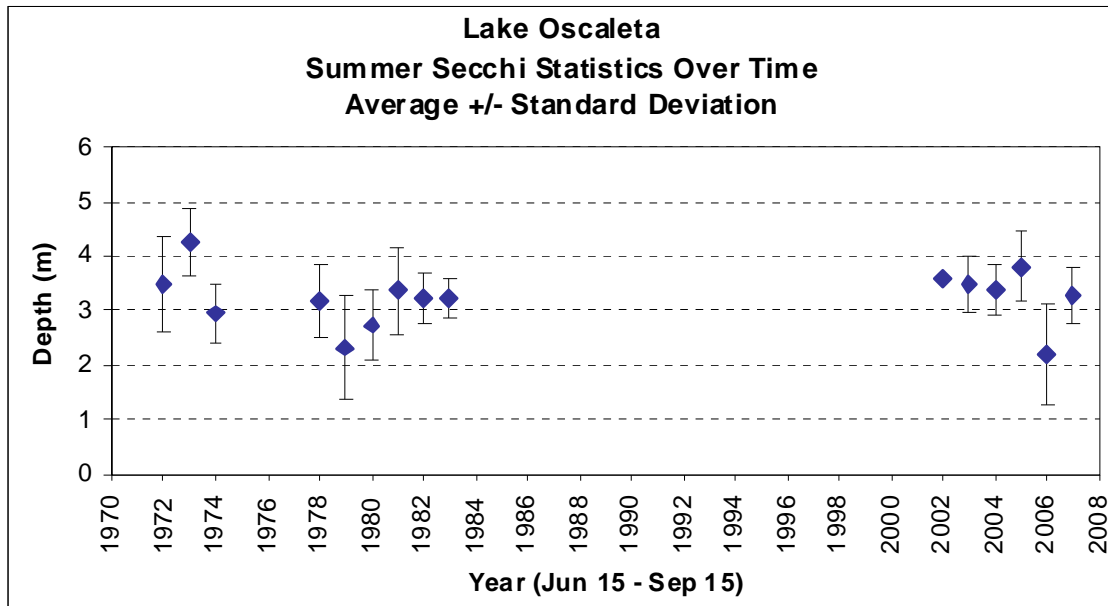
Anoxia: During 2007, the lake shows evidence of stratification as dissolved oxygen concentrations in lower waters become anoxic by June, and remain anoxic into September.



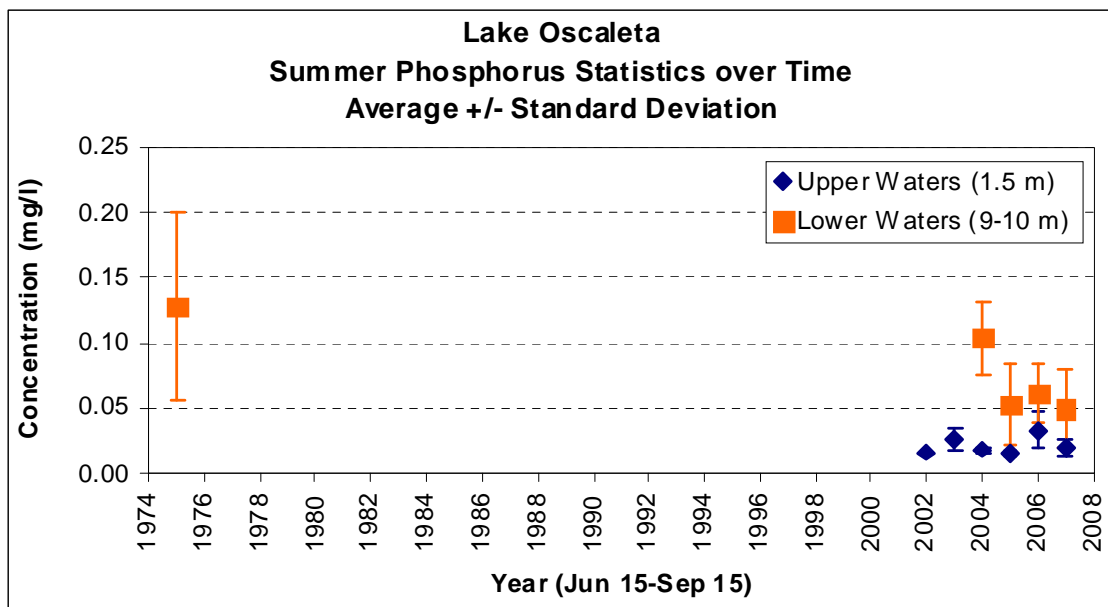
Dissolved oxygen decreases in lower waters, resulting in anoxic conditions in August at depths greater than 6 meters. These conditions were evident from the 1970's to the present.



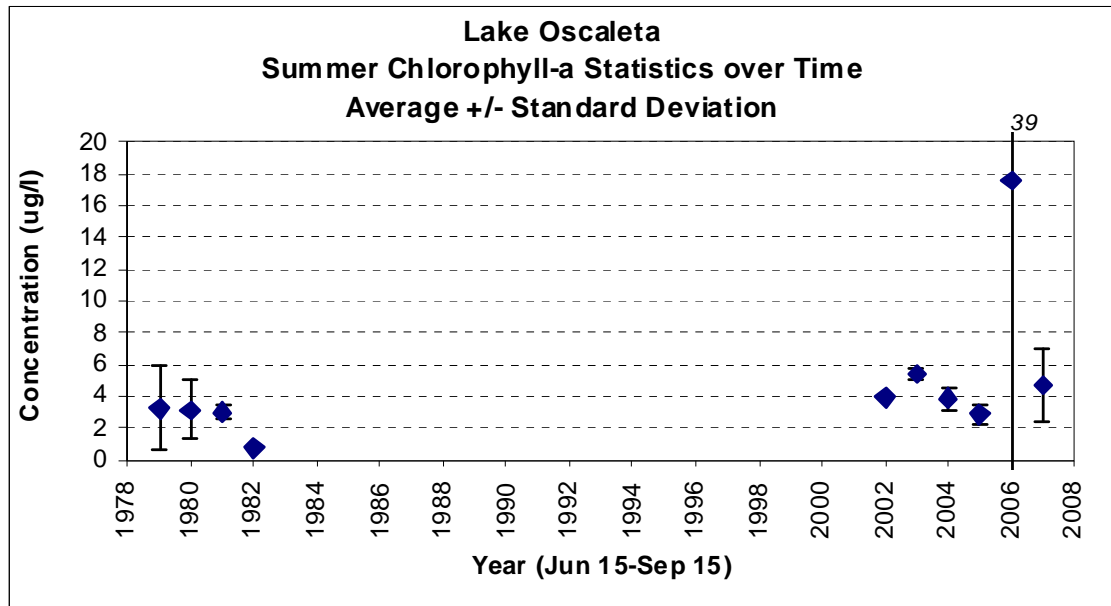
Water Clarity: Summer (June 15 to September 15) Secchi transparency averages over time are generally more than 3 meters, and historical variability around the mean is similar to recent years.



Phosphorus Concentrations: Phosphorus concentrations in upper waters have been fairly stable since 2002. During the summer months when anoxia occurs in the lower waters, phosphorus concentrations are higher in lower water samples than in upper water samples.



Chlorophyll- α : Chlorophyll- α concentrations are, on average, slightly higher in recent years compared with the late 1970's and early 1980's. The standard deviations show low variability of the data except for 2006.



Trophic Status:

Parameter	Trophic State (shading indicates match to Lake)				Lake Oscaleta*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters ($\mu\text{g/l}$)	<10	10-35	35 -100	>100	24
Summer chlorophyll-a, upper waters ($\mu\text{g/l}$)	<2.5	2.5 - 8	8 - 25	>25	8.8
Peak chlorophyll-a ($\mu\text{g/l}$)	<8	8-25	25-75	>75	54
Average Secchi disk transparency, m	>6	6-3	3-1.5	<1.5	3.15
Minimum Secchi disk transparency, meters	>3	3-1.5	1.5-0.7	<0.7	0.5
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	2.79

*Phosphorus, chlorophyll and Secchi data for the period 2002-2007. Summer June 15 to September 15. Dissolved oxygen percent saturation calculated using data from June 15 to September 15 at depths greater than 10 m.

Aquatic Habitat:

- Phytoplankton in 2003 included Golden, Green and Bluegreen groups. June through July the Bluegreen groups dominated (#cells/ml ranged from 15,270-21,452); in August and September the Green and Golden groups were dominant (#cells/ml ranged from 10,225 to 3,298). (Cedar Eden 2004)

- Zooplankton in 2003 were dominated by Rotifers in June, accounting for 90% of the zooplankton community. In July, Cladocerans (*Bosmina/Ceriodaphnia*) dominated (50%). The Rotifers returned in September (52%) with Cladocerans and Copepods making up the rest of the population (24% and 25%, respectively). (Cedar Eden 2004)
- Aquatic Plants in July 2003 were present in large beds at the east and west ends, in a narrow band along the northern shore, and in some parts of the southern shore. Residents of the area have noted that bassweed may actually be out-competing the Eurasian water milfoil at the west end of the lake. (Cedar Eden 2004).

List of Aquatic Plants identified in 2003:

Scientific Name	Common Name
<i>Brasena schreberi</i>	Watershield
<i>Ceratophyllum spp.</i>	Coontail
<i>Decodon spp.</i>	Three-way sedge
<i>Eleocharis quadrangulata</i>	Four-edge sedge
<i>Eleocharis spp.</i>	Spike-rush
<i>Elodea canadensis</i>	Canadian waterweed
<i>Iris spp.</i>	Iris
<i>Lythrum salicaria</i>	Purple loosestrife

Scientific Name	Common Name
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil
<i>Nuphar spp.</i>	Yellow water lily
<i>Nymphaea spp.</i>	White water lily
<i>Pontederia cordata</i>	Pickerelweed
<i>Potamogeton amplifolius</i>	Bassweed
<i>Potamogeton robustus</i>	Robin's Pondweed
<i>Sagittaria spp.</i>	Arrowhead
<i>Scirpus spp.</i>	Bulrush

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. purpurea)</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>Felix 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 – Town of Lewisboro.

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>Satyrrium 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*

* indicates particular concern for this lake and watershed.

Water Balance:

USGS Mean Annual (inches/year)		Volume (acre-ft/year)
Precipitation (P)	48	265
Evaporation (ET)	22	122
Runoff (R)	26	2,058

<u>Water Budget:</u>	
Inflow to Lake [R+(P-ET)]	908 mgal/year
Lake Volume	412 mgal
Flushing Rate	2.2 times/year
Residence Time	0.45 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)	97	9.0	0.30	12	22
Developed, open space	56	5.2	0.20	4.5	8.5
Developed, low intensity	1.8	0.17	0.30	0.22	0.41
Deciduous forest	683	63	0.07	19	37
Evergreen forest	147	14	0.20	12	22
Mixed forest	13	1.2	0.09	0.48	0.91
Shrub/scrub	1.3	0.12	0.28	0.15	0.29
Pasture/hay	21	1.9	0.30	2.5	4.7
Woody wetlands	54	5.1	0.09	2.0	3.7
Emergent herbaceous wetlands	2.9	0.27	0.10	0.12	0.22
Total Acres	1078	100		53	100
*Includes land area in Connecticut and North Salem.					

(B) *Septic:* Septic systems serve the communities along the shoreline (Cedar Eden 2002).

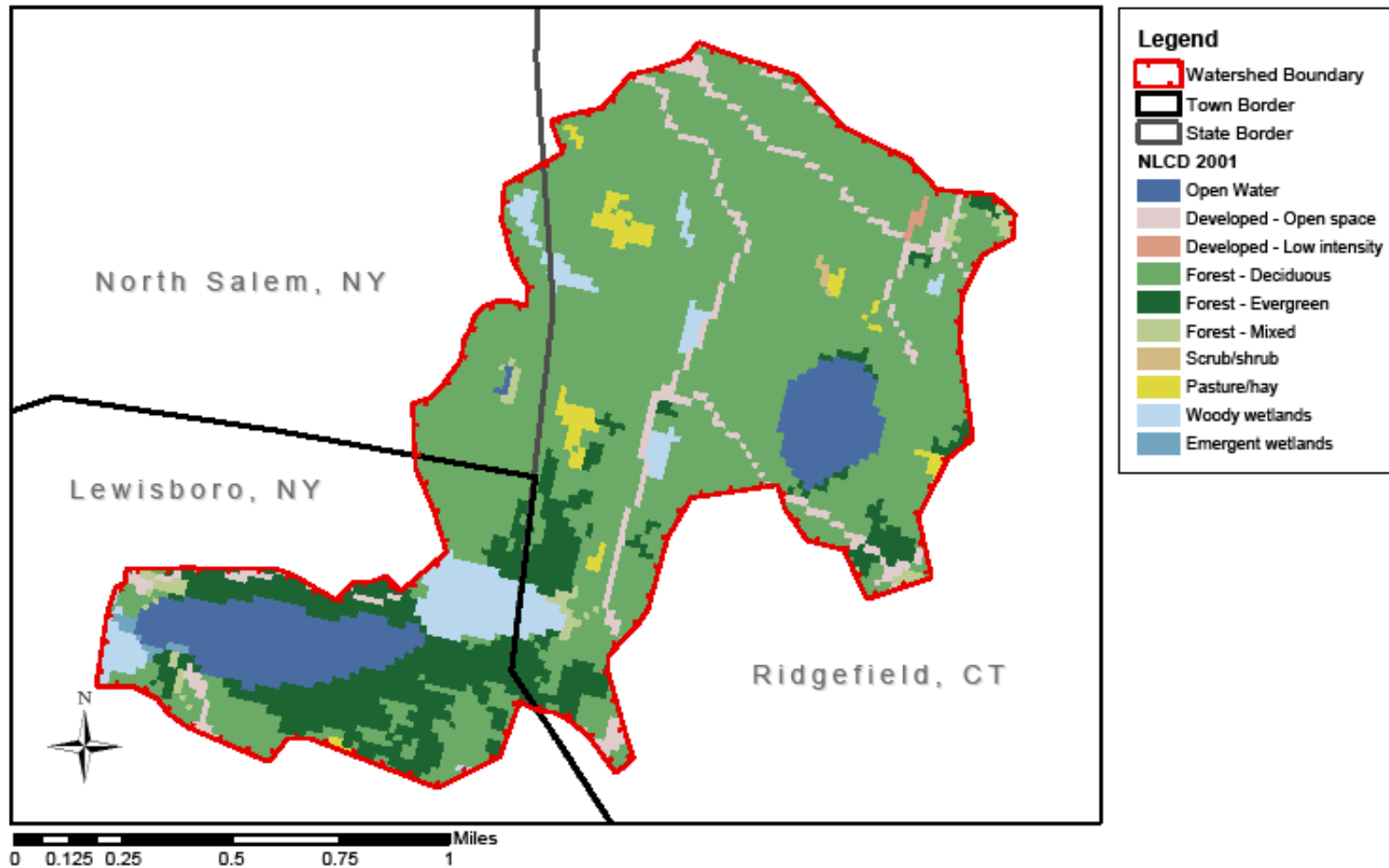
Estimated population on septic by soil suitability class with US 2000
Census household size for 100-meter buffer of surface water.

Class	N Structures*	Average Household	Estimated Population
Not limited	12	2.5	30
Somewhat limited	47	2.5	118
Very limited	9	2.5	23
Total	68		171
*Structures data not available for Connecticut portion of watershed.			

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

Class	Population	P per cap	Transport	kg/year
Not limited	29	0.6	10%	1.7
Somewhat limited	112	0.6	30%	20
Very limited	21	0.6	60%	7.7
Failed systems (5%)	9	0.6	100%	5.1
Total	171			35

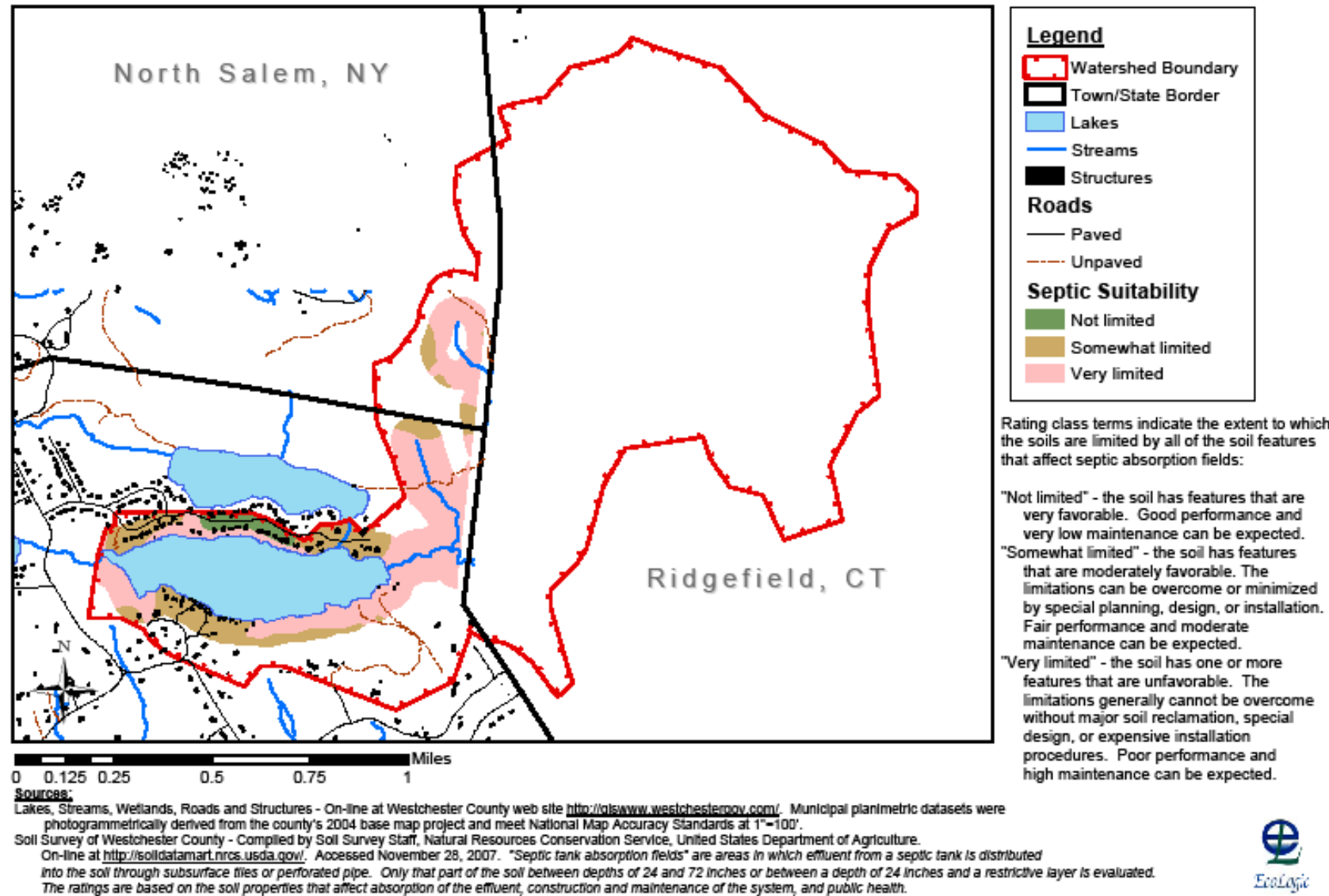
Figure 3
Lake Oscaleta
National Land Cover Dataset 2001



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
Lake Oscaleta
Soil Septic Suitability, 100-Meter Stream Buffer Within the Watershed



(C) *Point Sources*: The outlet of Lake Rippowam flows to Lake Oscaleta.

Estimated point source load of Phosphorus

Source	Estim. Volume input (m ³ /year)	Surface Average P 2002-2007 (ug/l)	Estimated P load (kg/year)
Lake Rippowam	721,943	24	17

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

Source	Input (kg/year)
Watershed Land Cover	53
Point Sources	17
Septic within 100m of surface water	35
Internal load (sediment)	12
Total	117

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	437
H	m	5.9
ρ	flushes per year	0.45
p	ug/l	34
<i>Summer (Jun 15-Sep 15) average TP 2002-2007, upper waters:</i>		24

REFERENCES

- Cedar Eden Environmental, LLC. 2006 State of the Lakes: 2004/2005 Water Quality of Lake Rippowam, Lake Oscaleta and Lake Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. April 2006.
- Cedar Eden Environmental, LLC. 2004 Diagnostic-Feasibility Study and Lake & Watershed Management Plan for Lake Rippowam, Lake Oscaleta, and Lake Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. May 2004.
- Cedar Eden Environmental, LLC. 2002 Lake & Watershed Management Recommendations for Lakes Oscaleta, Rippowam and Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. December 2002.
- 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. 2007. 2006 Interpretive Summay, New York Citizens Statewide Lake Assessment Program (CSLAP) 2006 Annual Report - Lake Oscaleta. September 2007. 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/>.

3.5. Lake Rippowam

Lake Rippowam



Surface water quality classification: Class B

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	14	Cedar Eden 2004
Watershed area	hectares	95	EcoLogic 2008 (excl lake)
Volume	mgal	150	Cedar Eden 2004
Elevation	m	144	NYSDEC 2007
Maximum depth	m	6.1	Cedar Eden 2004
Average Depth	m	4.1	Cedar Eden 2004

Lake Inlet: Primary inlet drains wetlands to the west and enters on west shore. Smaller rivulets drain area to the north of the lake.

Lake Outlet: Located at the southeastern end of the lake; outlet flows to Lake Oscaleta.

Recreational impacts: Water quality and aquatic plants were both cited as impacting recreational assessments, although the most significant impacts were associated with poor water clarity and excessive algae growth (NYSDEC 2007). The duration, intensity and composition of periodic algal blooms have not been characterized (Cedar Eden 2002)

Lakeshore Development: Limited to southern shore (Twin Lakes Community built in the 1950's). Northern shore is steeply sloped, forested and undeveloped. Forested wetlands located at eastern and western ends of the lake. (Cedar Eden 2002)

Figure 1
Lake Rippowam
Bathymetry

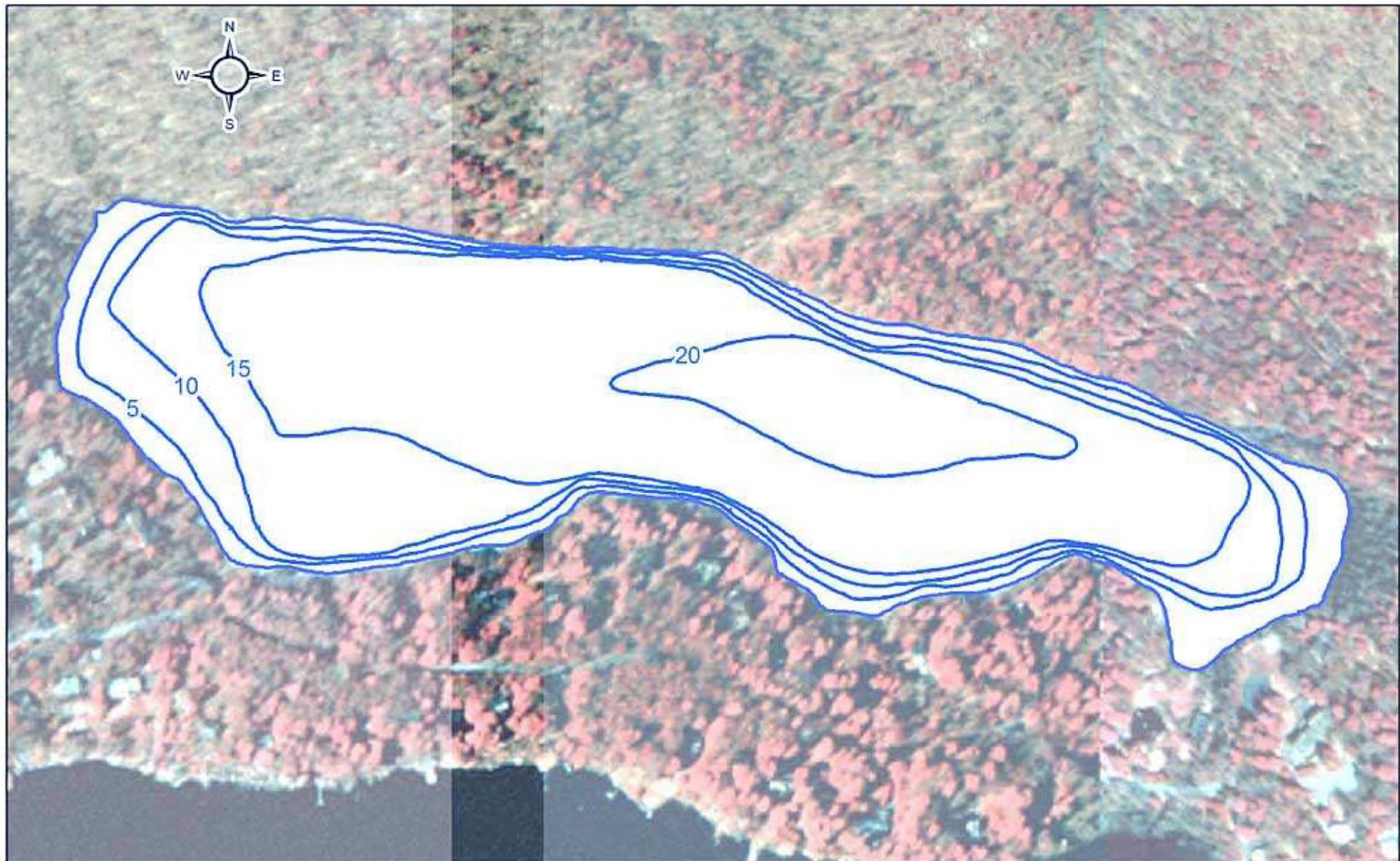
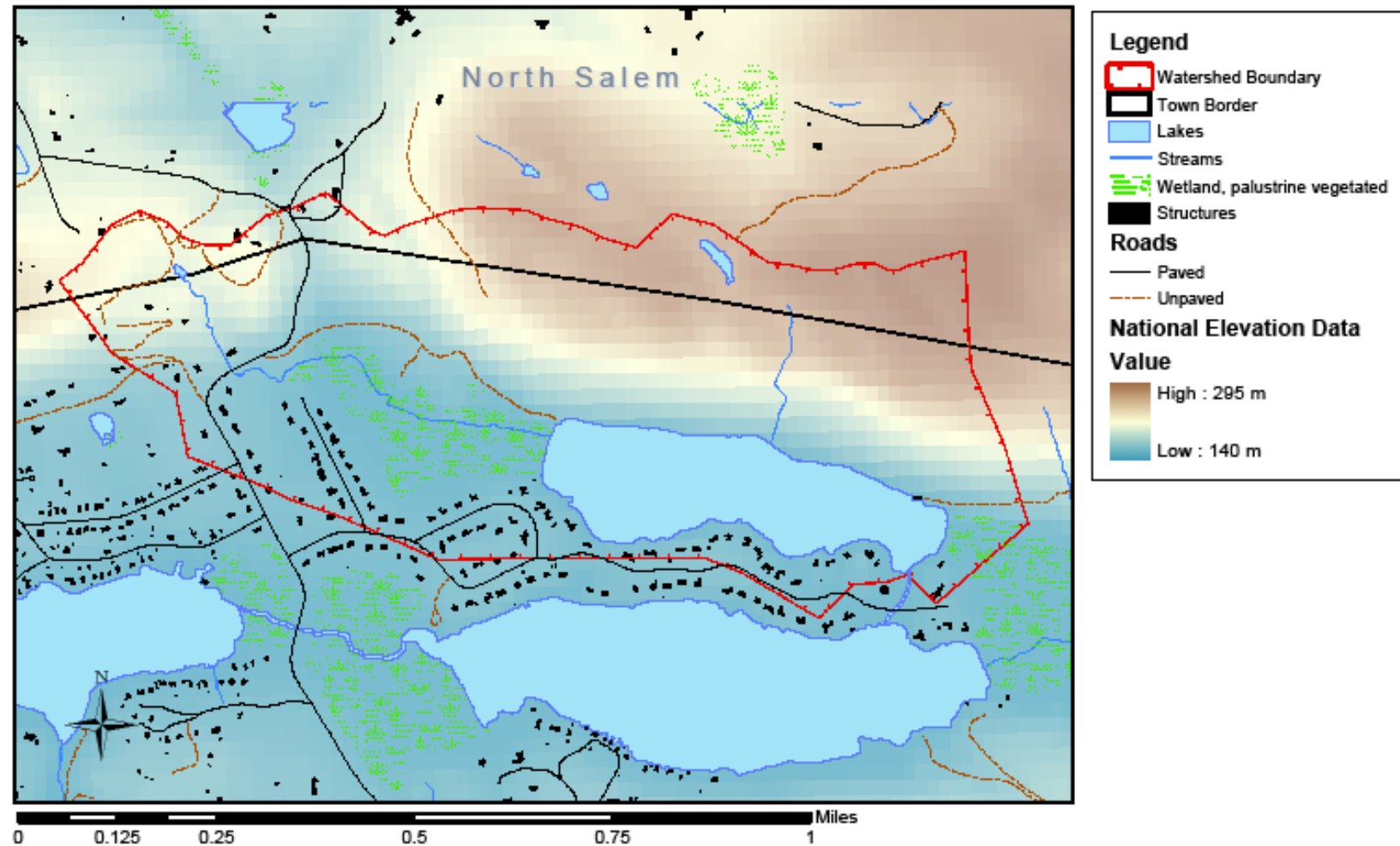


Figure 4.1 Bathymetric map of Lake Rippowam
Data Source: Field Points by P.Lewis, 5 foot contours by CEE LLC
EcoLogic, LLC

200 100 0 200 Feet

Figure 2
Lake Rippowam
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://nied.usgs.net/nied/>.
 Geographic coordinate system. Horizontal datum of NAD83. Vertical datum of NAVD88.



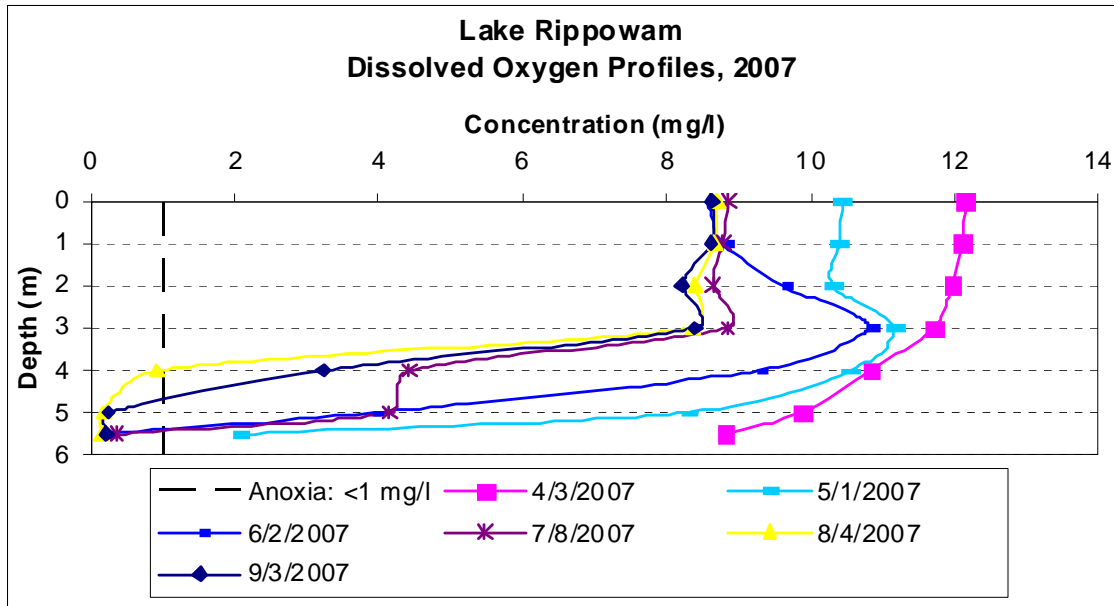
Historical water quality data summary:

Data were collected under the Citizen Statewide Lake Assessment Program (CSLAP), as well as by the Three Lakes Council and other entities over time. Depths ranging from 0 to 5 meters (both upper and lower waters), including some half-meter increment profiles. Table A below summarizes samples collected between January and December of each year; the statistics represent averages of sample results for the time period for all depths, unless otherwise noted. Table B below summarizes samples collected during the summer, defined as the period between June 15 and September 15 each year.

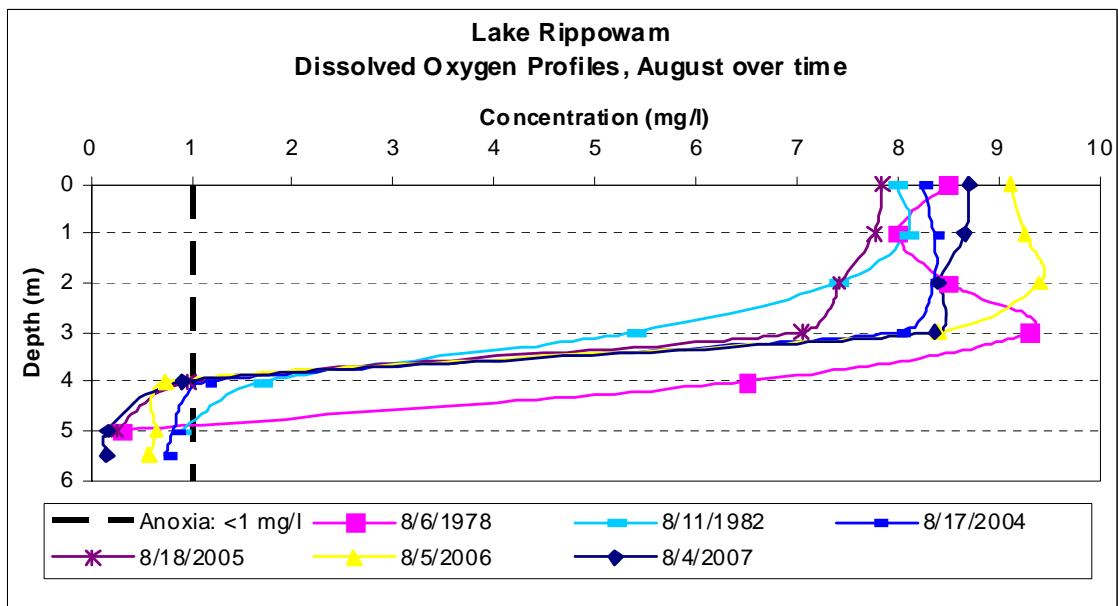
<u>A. Representing samples collected between January and December each year.</u>					
Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Alkalinity (mg/l)	2002-2007	7	42	54	45
Color (platinum color units)	2006-2007	16	13	41	22.4
Conductivity	2002-2007	37	134.6	287.5	196
pH (std units)	2002-2007	24	7.14	9.4	7.83
Chlorophyll- α (mg/m ³)	1982	3	0.952	4.571	2.752
	2002-2007	40	2.4	38.6	10.15
Phaeophytin- α (mg/m ³)	2003-2006	19	0.005	1.4	0.324
Secchi depth (m)	1978	12	1.83	3.35	2.58
	1980-1983	40	1.80	3.28	2.348
	2002-2007	59	0.50	3.40	2.18
<u>Temperature</u>					
Surface (°C)	1978	26 (0-1 m)	8.6	27	22
	1981-1983	53 (0-1m)	11.2	28.4	22
	2002-2007	112 (0-1.5 m)	6.2	30	21
Depth >5m (°C)	1978	11 (6-7 m)	13.5	17	14.4
	1981-1982	5 (6 m)	10.9	20	14.6
	2002-2007	35 (5.5-6 m)	5.2	19.7	12.3
<u>Dissolved Oxygen</u>					
Surface (mg/l)	1978	26 (0-1 m)	7.2	17	8.9
	1981-1983	53 (0-1 m)	4.5	10.8	7.5
	2002-2007	96 (0-1 m)	6.76	14.39	9.6
Depth >5m (mg/l)	1978	11 (6-7 m)	0	0.6	0.32
	1981-1983	5 (6 m)	0.6	10.2	2.93
	2002-2007	35 (5.5-6 m)	0.01	10.1	2.41
<u>Nutrients:</u>					
<u>Phosphorus</u>					
Upper waters (mg/l)	2002-2007	42 (1.5 m)	0.010	0.058	0.024
Lower waters (mg/l)	2002-2007	26 (4-5 m)	0.020	0.166	0.050
Nitrate N (mg/l)	2003-2007	21	0.0025	0.040	0.0125
Total Kjeldahl Nitrogen (mg/l)	2002-2007	13	0.41	0.98	0.70
Ammonia Nitrogen (mg/l)	2006-2007	16	0.006	0.23	0.047

<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 (mg/m ³)	1982	1	0.952	0.952	0.952
	2002-2007	26	2.4	38.6	8.37
Phaeophytin- α (mg/m ³)	2003-2006	12	0.005	1.2	0.16
Secchi depth (m)	1978	9	2.13	3.35	2.80
	1980-1983	26	1.9	3.28	2.41
	2002-2007	27	0.5	3.35	2.24
<u>Dissolved Oxygen:</u>					
Surface (mg/l) (min depth sampled)	1978	20 (0-1 m)	7.8	9	8.34
	1981-1983	36 (0-1 m)	4.5	9.4	7.05
	2002-2007	40 (0-1 m)	7.21	13.96	8.86
Depth ≥ 4 m (mg/l)	1978	11 (6-7 m)	0	0.6	0.318
	1981	1 (6 m)	2.4	2.4	2.4
	2002-2007	15 (5.5 m)	0.06	2.6	0.642
<u>Nutrients</u>					
<u>Phosphorus:</u>					
Surface (mg/l) (min depth sampled)	2002-2007	27 (1.5 m)	0.01	0.058	0.021
Depth ≥ 4 m (mg/l)	2002-2007	15 (4-5 m)	0.02	0.166	0.052
Nitrate N (mg/l)	2003-2007	15	0.0025	0.03	0.011
Total Kjeldahl Nitrogen (mg/l)	2002-2007	10	0.5159	0.98	0.708
Ammonia Nitrogen (mg/l)	2006-2007	12	0.006	0.15	0.032

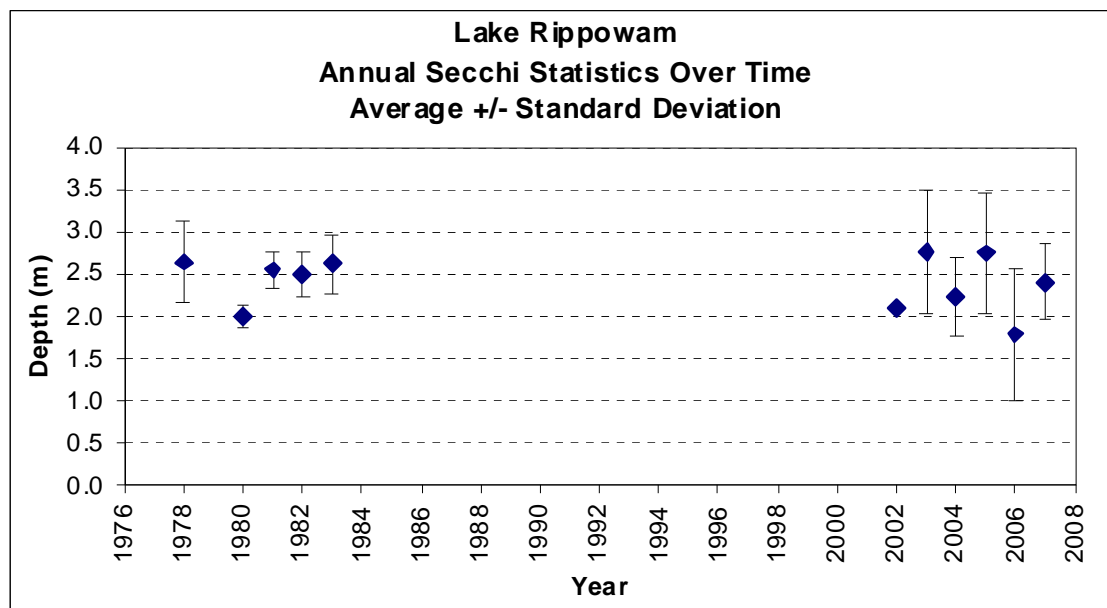
Anoxia: Dissolved oxygen decreases in lower waters, resulting in anoxic conditions from June through September.



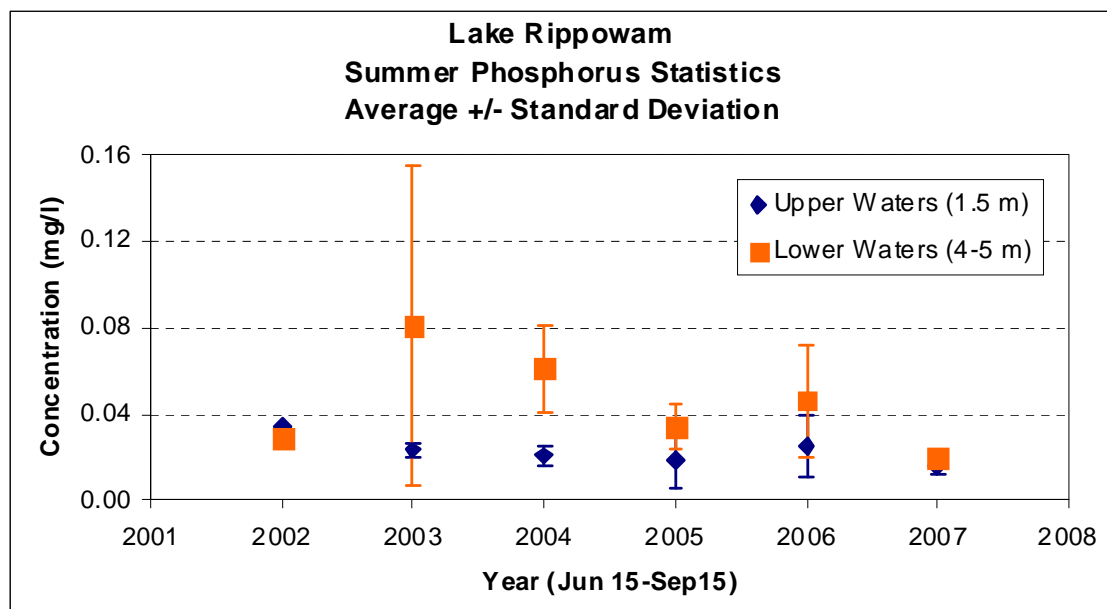
Anoxic conditions in lower waters have been observed in the lake in August from the 1970's to the present.



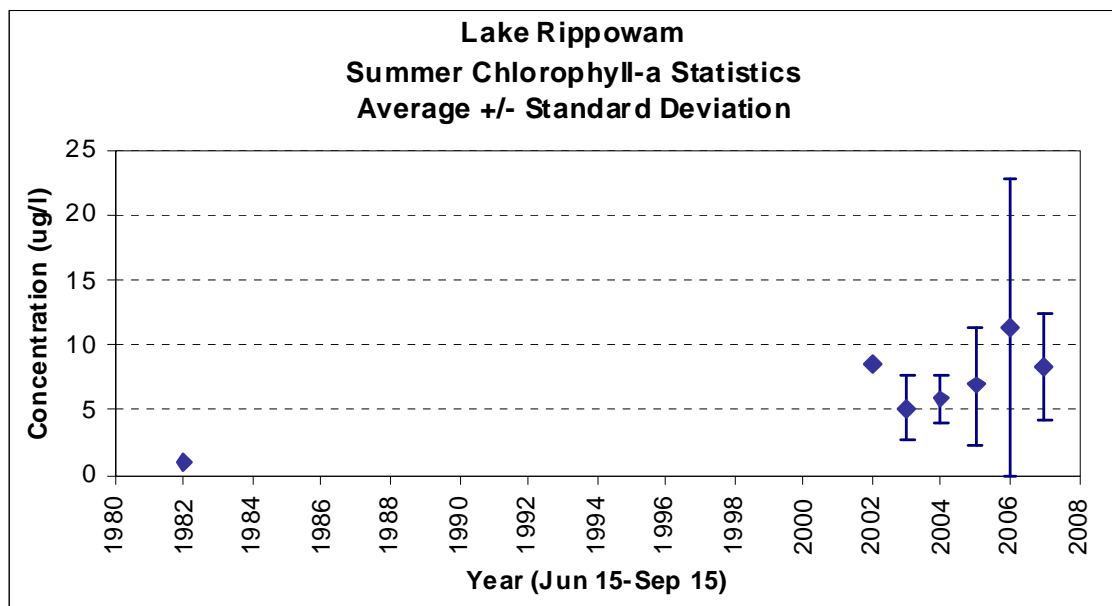
Water Clarity: Averages over time are relatively constant; there is more variability between the annual maximum and minimum in the 2000-2007 period than in the 1980s.



Phosphorus Concentrations: Phosphorus concentrations in the upper waters have been fairly stable since 2003. During the summer months when anoxia occurs in the lower waters (5 meters depth), phosphorus concentrations are elevated, reflecting sediment phosphorus release.



Chlorophyll- α : Chlorophyll- α concentrations are, on average, higher from 2002-2007 than in 1983. The standard deviations show greater variability of the 2006 data from other years.



Trophic Status:

Parameter	Trophic State Indicators (shading indicates match to Lake)				Lake Rippowam*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters ($\mu\text{g/l}$)	<10	10-35	35 -100	>100	21
Summer chlorophyll-a, upper waters ($\mu\text{g/l}$)	<2.5	2.5 - 8	8 - 25	>25	8.37
Peak chlorophyll-a ($\mu\text{g/l}$)	<8	8-25	25-75	>75	38.6
Average Secchi disk transparency, m	>6	6-3	3-1.5	<1.5	2.24
Minimum Secchi disk transparency, meters	>3	3-1.5	1.5-0.7	<0.7	0.50
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	8.45
*Data shown are for the period 2002-2007. Summer represents June 15 to September 15. Dissolved oxygen percent saturation calculated using summer data at depths \geq 5 m.					

Aquatic Habitat:

- Phytoplankton in 2003 included Golden, Green and Bluegreen groups. June through August the Golden and Green groups dominated (#cells/ml ranged from 7,730-16,296); in September the Bluegreen group was dominant (#cells/ml = 59,870). (Cedar Eden 2004)

- Zooplankton in 2003 were dominated by Cladocerans (*Ceriodaphnia*), accounting for 60% and 76% of the zooplankton communities in June and July, respectively. In September, Cladocerans and Rotifers dominated (45% and 48% of the zooplankton population, respectively). Copepods generally accounted for 12% or less of the population in each sampling event. (Cedar Eden 2004)
- Aquatic Plants in July 2003 were most abundant in the shallow east and west ends, while steep shores prevented vegetation establishment along the north shore. White water lilies (*Nymphaeae* spp) were common in the lake. Eurasian water milfoil (*Myriophyllum spicatum*) was also present in the lake. (Cedar Eden 2004)

List of Aquatic Plants identified in 2003:

Scientific Name	Common Name
<i>Decodon sp.</i>	Three-way sedge
<i>Eleocharis sp.</i>	Spike-rush
<i>Iris spp</i>	Iris
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil
<i>Nuphar sp.</i>	Yellow water lily

Scientific Name	Common Name
<i>Nymphaeae sp.</i>	White water lily
<i>Pontederia cordata</i>	Pickrelweed
<i>Sagittaria sp.</i>	Arrowhead
<i>Scirpus sp.</i>	Bulrush

Invasive Species: Early Detection List for eight regions in New York State, published by the Invasive Species Plant Council of New York State. Data 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>Felix 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 – Town of Lewisboro

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)
Precipitation (P)	48	143
Evaporation (ET)	22	66
Runoff (R)	26	507

<u>Water Budget:</u>	
Inflow to Lake [R+(P-ET)]	191 mgal/year
Lake Volume	150 mgal
Flushing Rate	1.3 times/year
Residence Time	0.79 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)	32	11	0.30	3.8	29
Developed, open space	19	6.8	0.20	1.5	12
Deciduous forest	182	65	0.07	5.1	38
Evergreen forest	22	7.9	0.20	1.8	13
Mixed forest	0.04	0.01	0.09	0.001	0.01
Pasture/hay	2.4	0.86	0.30	0.29	2.1
Woody wetlands	22	7.9	0.09	0.81	6.1
Total Acres	279	100		13	100

(B) *Septic:* Septic systems serve the communities along the shoreline (Cedar Eden 2002).

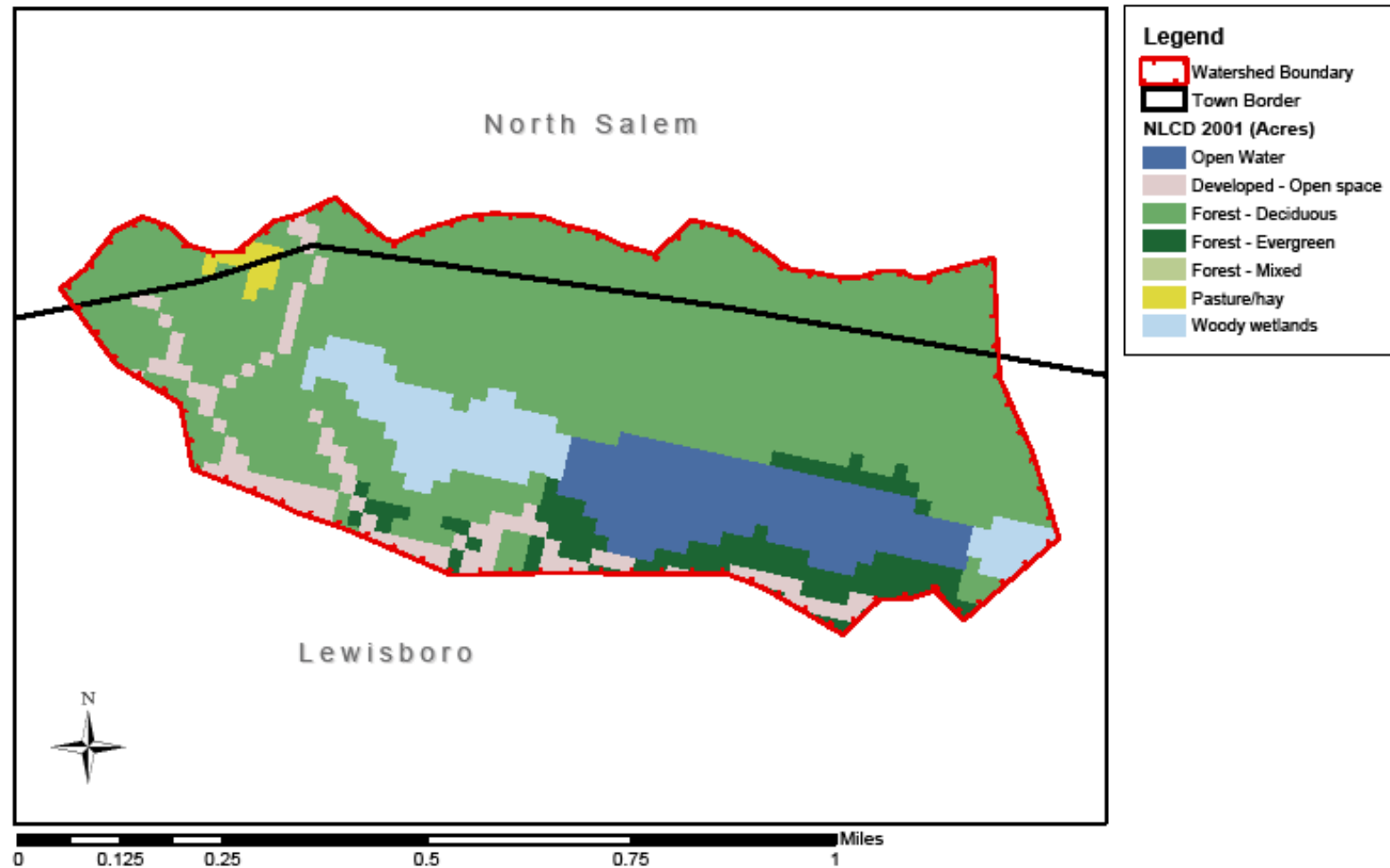
Estimated population on septic by soil suitability class with US 2000
Census household size for 100-meter buffer of surface water.

Class	N Structures	Average Household	Estim Population
Not limited	7	2.5	17
Somewhat limited	21	2.5	53
Very limited	18	2.5	45
Total	46		115

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	16	0.6	10%	1.0
Somewhat limited	50	0.6	30%	9.1
Very limited	43	0.6	60%	15
Failed systems (5%)	5.8	0.6	100%	3.5
Total	115			29

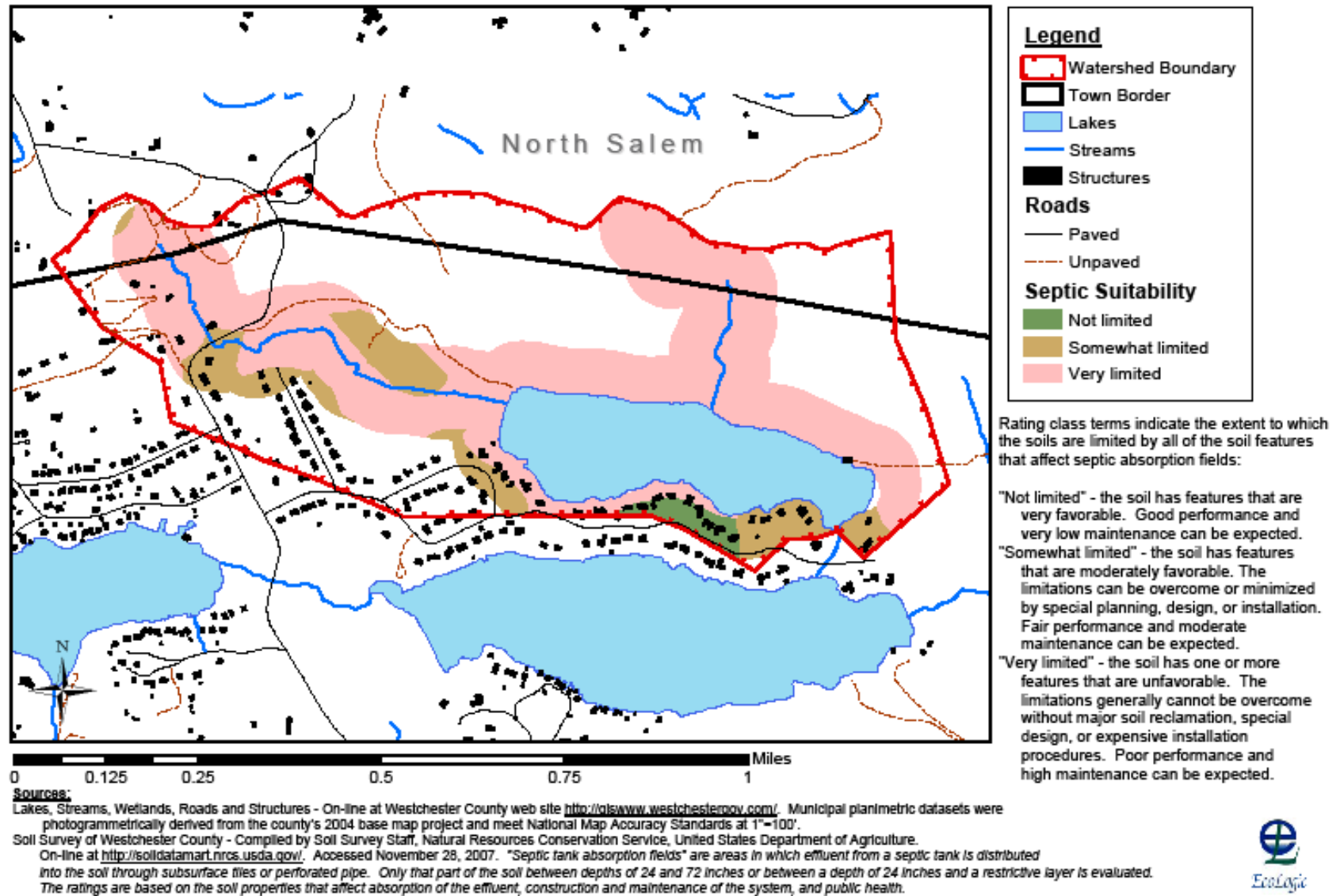
Figure 3
Lake Rippowam
National Land Cover Dataset 2001



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
Lake Rippowam
Soil Septic Suitability, 100-Meter Stream Buffer Within the Watershed



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

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

Source	Input (kg/year)
Watershed Land Cover	13
Point Sources	--
Septic within 100m of surface water	29
Internal sediment loading	0.0049
Total	42

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

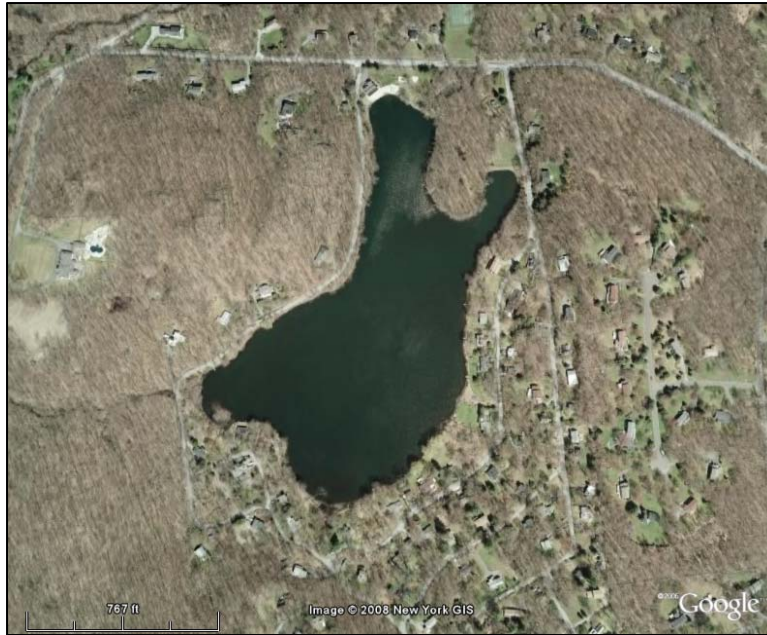
Parameter	Units	Result
W'	g/m ² /year	291
H	m	4.1
ρ	flushes per year	0.79
p	ug/l	22
<i>Summer (Jun 15 – Sep 15) average TP</i>		
<i>2002-2007, upper waters:</i>		21

REFERENCES

- Cedar Eden Environmental, LLC. 2006 State of the Lakes: 2004/2005 Water Quality of Lake Rippowam, Lake Oscaleta and Lake Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. April 2006.
- Cedar Eden Environmental, LLC. 2004 Diagnostic-Feasibility Study and Lake & Watershed Management Plan for Lake Rippowam, Lake Oscaleta, and Lake Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. May 2004.
- Cedar Eden Environmental, LLC. 2002 Lake & Watershed Management Recommendations for Lakes Oscaleta, Rippowam and Waccabuc. Prepared for The Three Lakes Council, South Salem, NY. December 2002.
- 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. 2007. 2006 Interpretive Summary, New York Citizens Statewide Lake Assessment Program (CSLAP) 2006 Annual Report - Lake Rippowam. September 2007. 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/>.

3.6. Lake Katonah

Lake Katonah



Surface water quality classification: Class B

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	7.8	NYSDEC 2007
		10	Shapefile
Watershed area	hectares	41	EcoLogic 2008 (excl lake)
Volume	mgal	40.8	EcoLogic 2008
Elevation	m	100	EcoLogic 2008
Maximum depth	m	3.1	EcoLogic 2008
Average Depth	m	1.6	EcoLogic 2008

Lake Inlet: There were no significant inlet streams identified. Numerous natural intermittent channels and stormwater discharges are present.

Lake Outlet: Lake level is controlled by a dam at the northwest shore.

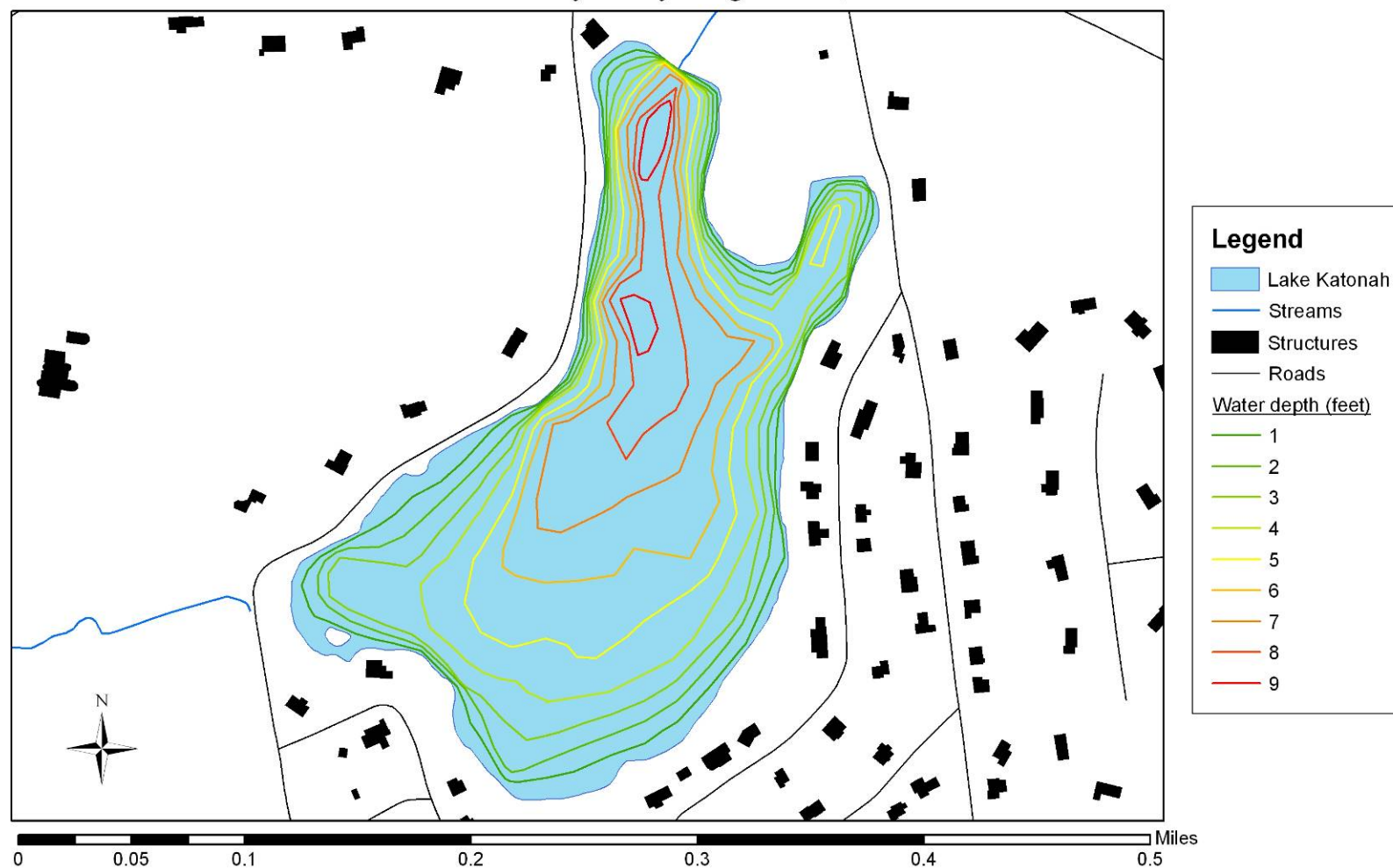
Recreational impacts: Water quality perception improves during the summer, consistent with seasonally decreasing aquatic plant coverage despite seasonally increasing lake productivity (NYSDEC 2008).

Lake Katonah has been described by the CSLAP sampling volunteers as “slightly” impaired during 38% of the CSLAP sampling sessions, and “substantially” impaired 13% of the time. Slightly impaired conditions were associated with excessive weeds during 13% of the sampling sessions and with excessive algae 38% of the time. Substantially

impaired conditions were due to excessive weeds and algae at a frequency of 13% each.
(NYSDEC 2008)

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

Figure 1
Lake Katonah
Bathymetry August 12, 2008

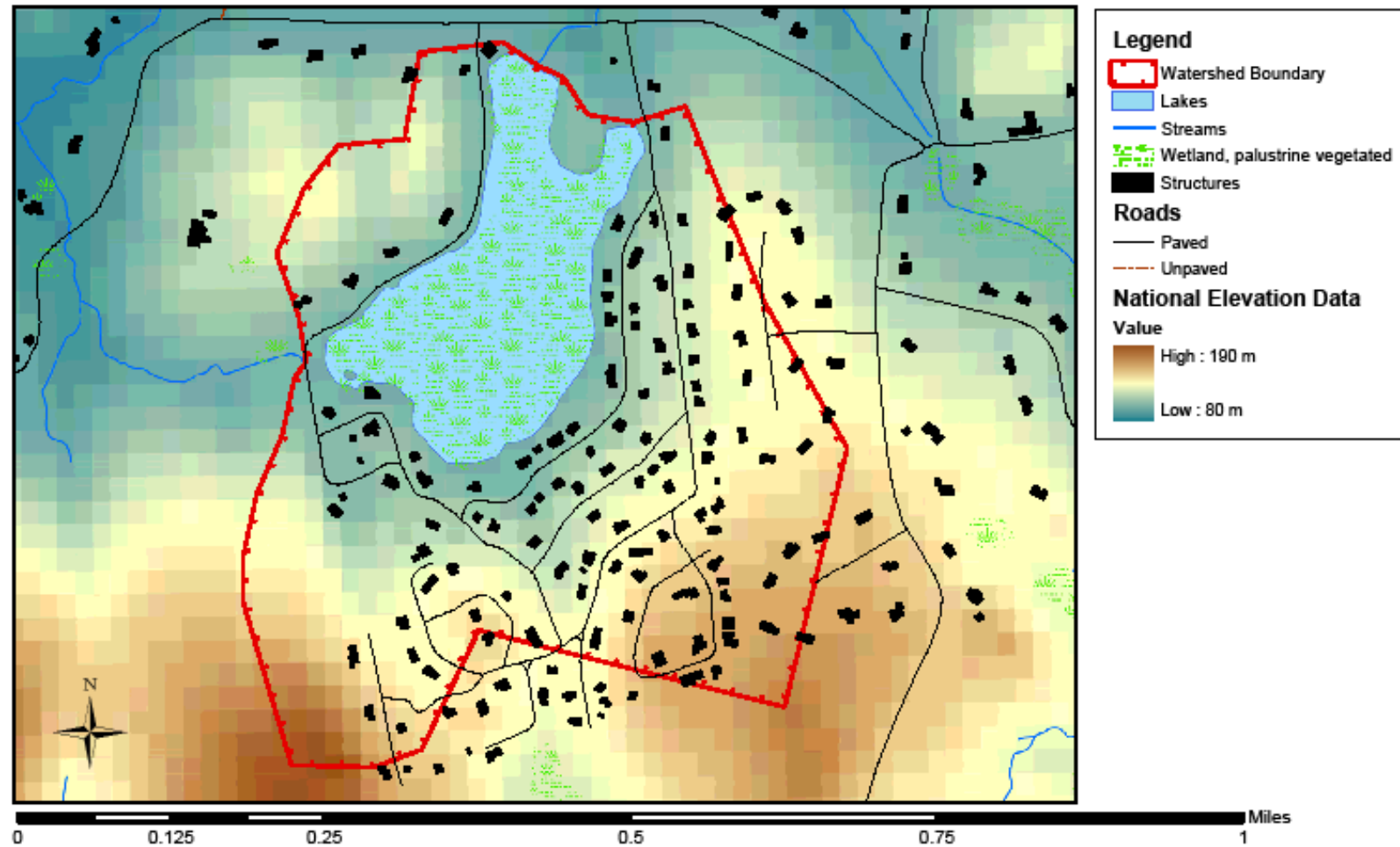


Sources:

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
Lake Katonah
Topographic and Human Features



Sources:

Lakes, Streams, Roads and Structures - On-line at Westchester County web site <http://olswwww.westchesterny.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://niedata.usgs.net/nied/>. 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)	2006-2007	4	26.28	32.5	28.88
Chlorophyll- α (ug/l)	2006-2007	16	6.29	79.08	34.61
Color (platinum color units)	2006-2007	16	16	45	30.7
Conductivity (umhos/cm; 25°C)	2006-2007	16	335	583.8	469.5
Dissolved Nitrogen (mg/l)	2007	8	0.61	1.24	0.87
NO ₃ Nitrates (mg/l)	2006-2007	14	0.0025	0.14	0.028
NH ₃ Nitrogen (mg/l)	2006-2007	15	0.006	0.558	0.084
Phosphorus (mg/l)	2006-2007	16	0.044	0.158	0.089
Nitrogen:Phosphorus Ratio	2007	8	7.92	20	13.47
pH (std units)	2006-2007	15	7.25	8.5	7.93
Secchi depth (m)	2006-2007	16	0.33	1.6	0.95
Temperature (°C)	2006-2007	16	17.0	28	23.7

<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)	2006-2007	11	6.29	79.08	38.18
Dissolved Nitrogen (mg/l)	2007	5	0.71	1.24	0.95
NO ₃ Nitrates (mg/l)	2006-2007	9	0.0025	0.14	0.031
NH ₃ Nitrogen (mg/l)	2006-2007	10	0.006	0.16	0.061
Phosphorus (mg/l)	2006-2007	11	0.046	0.159	0.094
Nitrogen:Phosphorus Ratio	2007	5	9.89	20	14.04
Secchi depth (m)	2006-2007	11	0.5	1.6	0.95

EcoLogic August 2008 water quality data summary:**A. Analytical Results 08/12/2008**

Parameter (units)	Surface (0 m)	Depth (2.4 m)
Secchi Transparency (m)	0.6	na
Chlorophyll-a (mg/l)	0.17	na
Alkalinity (mg/l)	60	na
<u>Phosphorus:</u>		
Total Phosphorus (mg/l)	0.092	0.084
Soluble Reactive Phosphorus (mg/l)	0.010 ^a	0.0098 ^{a,b}
<u>Nitrogen:</u>		
Nitrate/Nitrite as N (mg/l)	0.037 ^a	0.036 ^{a,c}
Total Kjeldahl Nitrogen as N (mg/l)	2.9 ^a	2.1 ^{a,b}
Total Nitrogen (mg/l)	2.9	2.1
na – not analyzed		
^a The result of the laboratory control sample was greater than the established limit.		
^b A trace amount of this analyte was found in the laboratory preparation blank.		
^c This analysis was performed beyond the holding time limit by EPA Method 353.1.		

B. Field Profiles

Depth ft (m)	Temperature (°C)	pH	Conductivity (us)	DO (mg/L)	DO (% sat)
1 (0.305)	24.7	8.2	651	8.4	108
2 (0.61)	24.2		652	7.9	94.6
3 (0.915)	24.0		653	6.0	71
4 (1.22)	23.9		653	5.6	66
5 (1.525)	23.8		654	5.2	61
6 (1.83)	23.8		654	4.9	57
7 (2.135)	23.7		655	4.6	53
8 (2.44)	23.7		658	4.2	50

Sediment data summary: Composite sample collected August 12, 2008 by EcoLogic.

Parameter	Analytical Method	Result (mg/kg dry wt)
Pesticides/PCBs	EPA 8081/8082	ND
TCL Volatiles	EPA 8260B	
Acetone		0.064
Other VOCs		ND
TCL PAHs	EPA 8270	ND
<u>RCRA Total Metals</u>	EPA 6010	
Arsenic		5.8
Barium		26
Cadmium		0.14
Chromium		2.2*
Copper		110
Lead		8.9
Selenium		0.13
Silver		ND

Parameter	Analytical Method	Result (mg/kg dry wt)
RCRA Mercury	EPA 7471	ND
Total Organic Carbon	EPA 9060	221,000
Total Solids	SM 18-20 2540B	9.9%
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 12, 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. Lake Katonah 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			Katonah 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	5.8	A
Cadmium	0.5	< 1.2	1.2 - 9.5	> 9.5	0.14	A
Copper*	2.5	< 33	33 – 207	> 207	110	B
Lead	5.0	< 33	33 – 166	> 166	8.9	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; ND – not detected

⁺ 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.

¹ For Sum of PAH, see Appendix E of TOGS 5.1.9. For Lake Katonah, each of the 18 PAH compounds were reported as non-detect (<0.8 mg/kg).

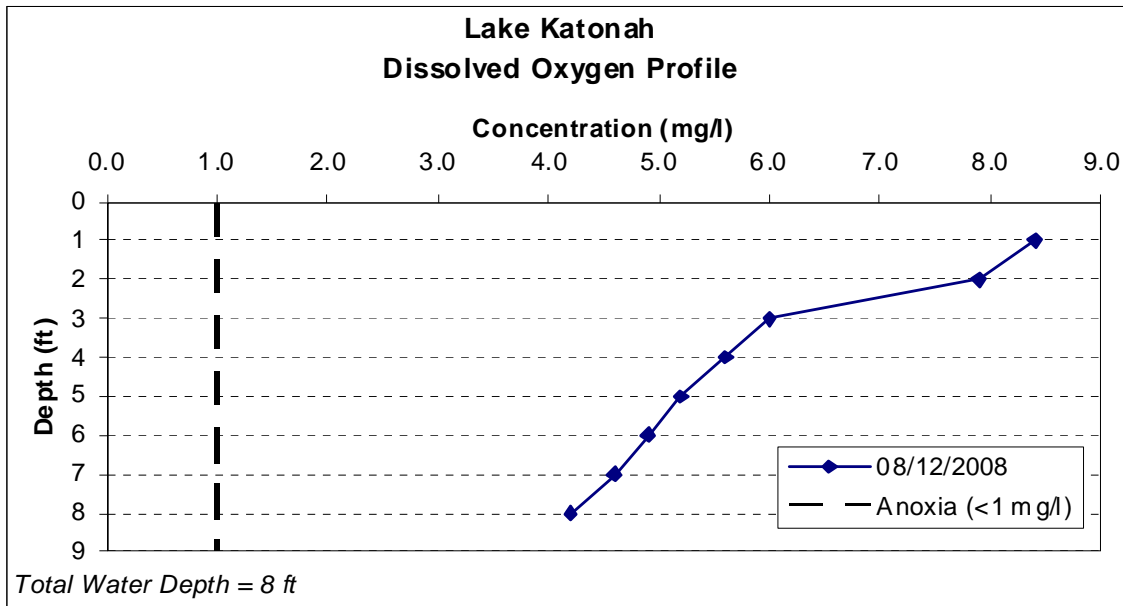
² For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. On Lake Katonah, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.

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

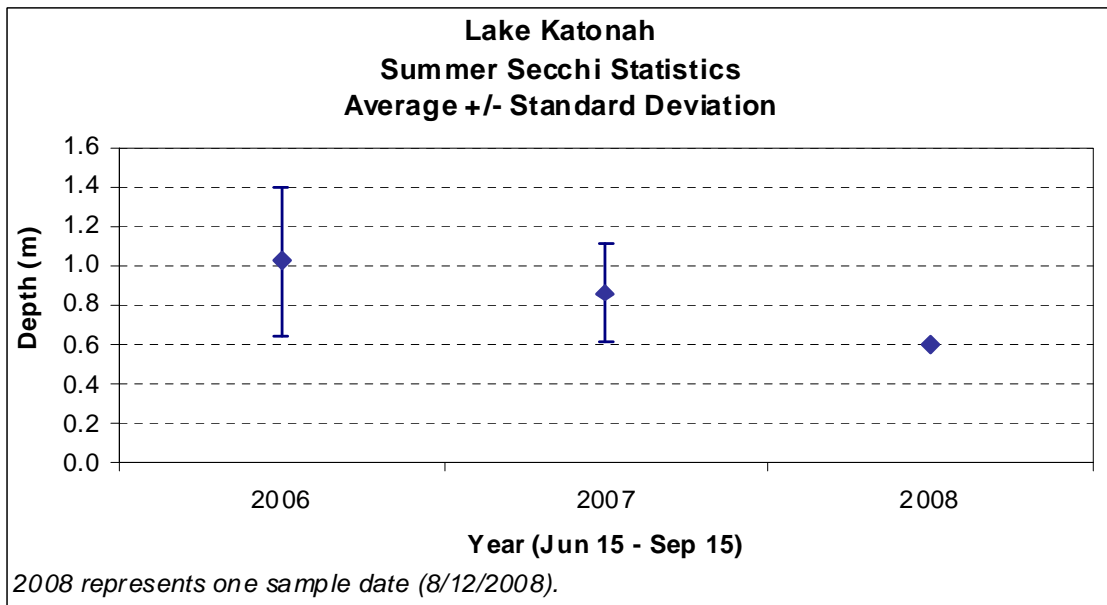
Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

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.

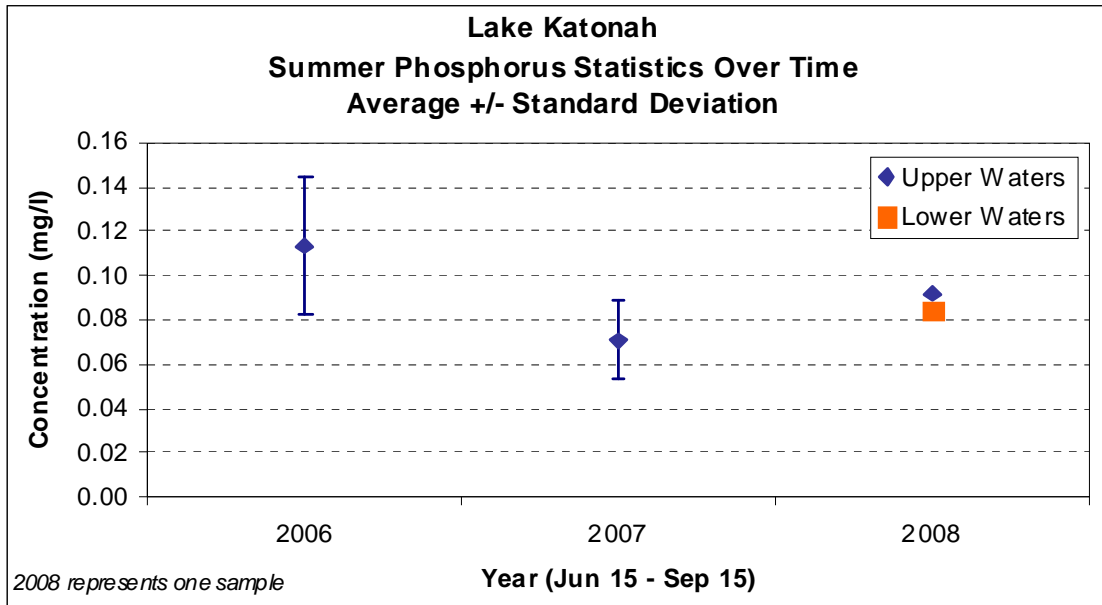
Anoxia: Based on the dissolved oxygen profile collected on August 12, 2008, oxygen levels were depleted in the lower waters, but anoxic conditions (concentrations less than 1 mg/l) were not observed in the lake.



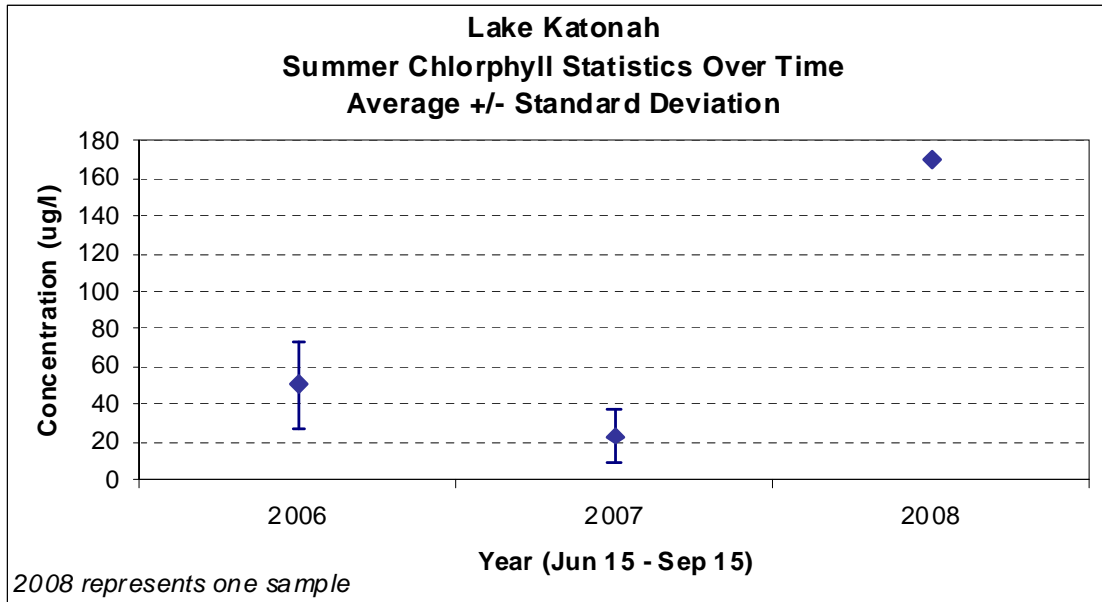
Water Clarity: There are three years of data for Secchi depth measurements.



Phosphorus Concentrations: There are three years of data for phosphorus concentrations during the summer.



Chlorophyll- α : There are three years of Chlorophyll- α data.



Trophic Status:

Parameter	Trophic State (shading indicates match to Lake)				Lake Katonah*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters (µg/l)	<10	10-35	35 -100	>100	94
Summer chlorophyll-a, upper waters (µg/l)	<2.5	2.5 - 8	8 - 25	>25	38
Peak chlorophyll-a (µg/l)	<8	8-25	25-75	>75	79
Summer average Secchi disk transparency, m	>6	6-3	3-1.5	<1.5	0.95
Minimum Secchi disk transparency, meters	>3	3-1.5	1.5-0.7	<0.7	0.5
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	50
*Data for the period 2006-2007, except for dissolved oxygen which EcoLogic collected at a depth of 8 feet on 08/12/2008. Summer defined as period June 15 to September 15.					

Aquatic Habitat:

- An aquatic macrophyte survey was conducted by Ecologic in August 2008 and found only sporadic sparse macrophyte growth around the lake. Large beds of curly pondweed are apparently present in spring but these are treated annually and were not present during the survey. Habitat for the lakes fish community appears largely limited to woody debris near the shoreline after treatment.

List of Aquatic Plants identified in 2008:

Scientific Name	Common Name
<i>Chara sp.</i>	Muskgrass
<i>Lemna minor</i>	Common duckweed
<i>Najas flexilis</i>	Slender naiad

Scientific Name	Common Name
<i>Potamogeton crispus</i>	Curly pondweed
<i>Zannichellia palustris</i>	Horned pondweed

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

Scientific Name	Common Name
<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>Felix 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 – Town of Lewisboro

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)	<u>Water Budget:</u>	
Precipitation (P)	48	99	Inflow to Lake [R+(P-ET)]	90 mgal/year
Evaporation (ET)	22	45	Lake Volume	41 mgal
Runoff (R)	26	221	Flushing Rate	2.2 times/year
			Residence Time	0.46 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	<u>Estim P Export</u> kg/year	Percent
Open water (all)	20	16	0.30	2.5	27
Developed, open space	61	48	0.20	4.9	55
Deciduous forest	39	31	0.07	1.1	12
Evergreen forest	6.9	5.4	0.20	0.56	6.2
Total Acres	127	100		9.1	100

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

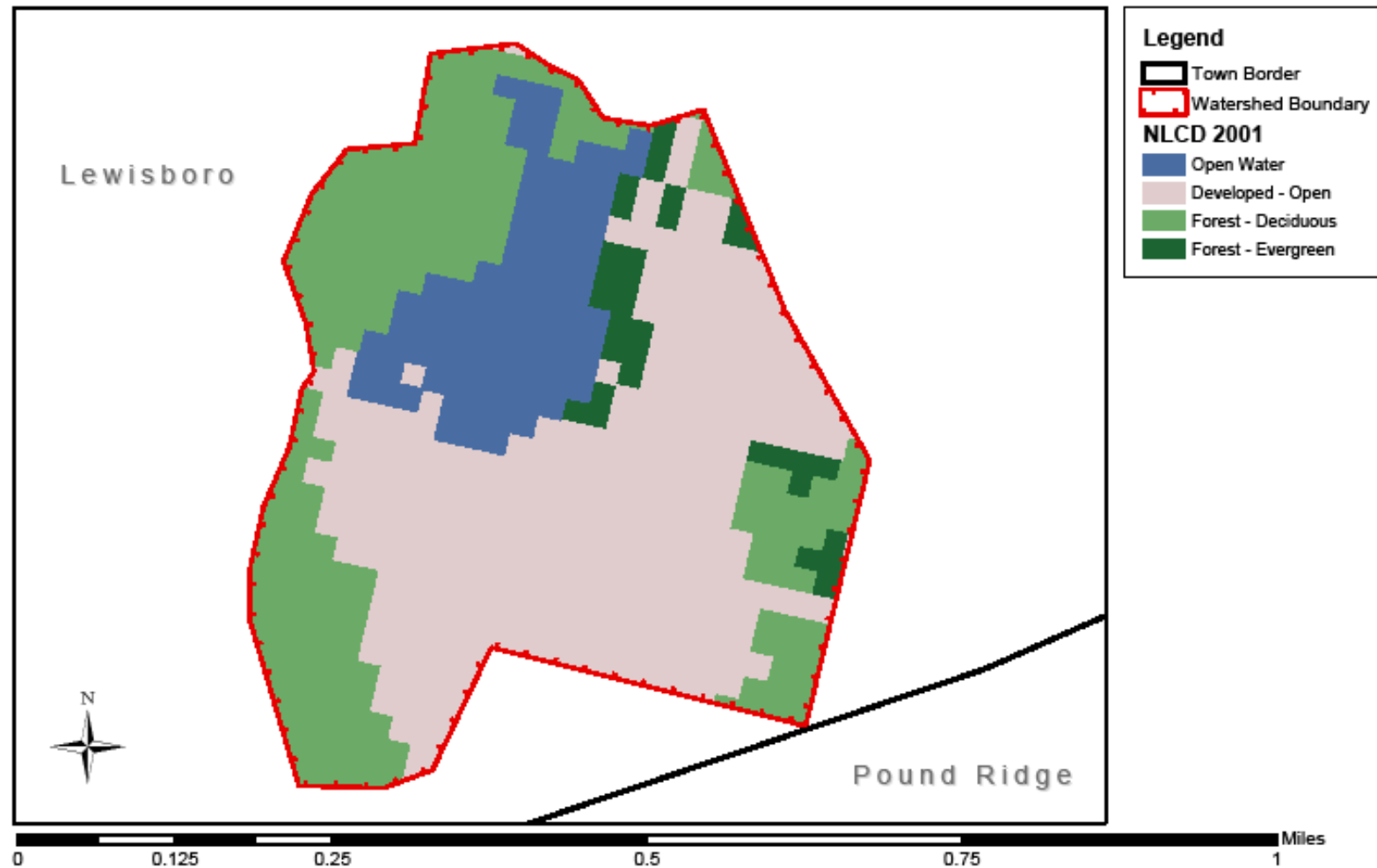
Estimated population on septic by soil suitability class with US 2000
Census household size for 100-meter buffer of surface water.

Class	N Structures	Average Household	Estimated Population
Not limited	0	3	0
Somewhat limited	6	3	18
Very limited	38	3	114
Total	44		132

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	17	0.6	30%	3.1
Very limited	108	0.6	60%	39
Failed systems (5%)	7	0.6	100%	4.0
Total	132			46

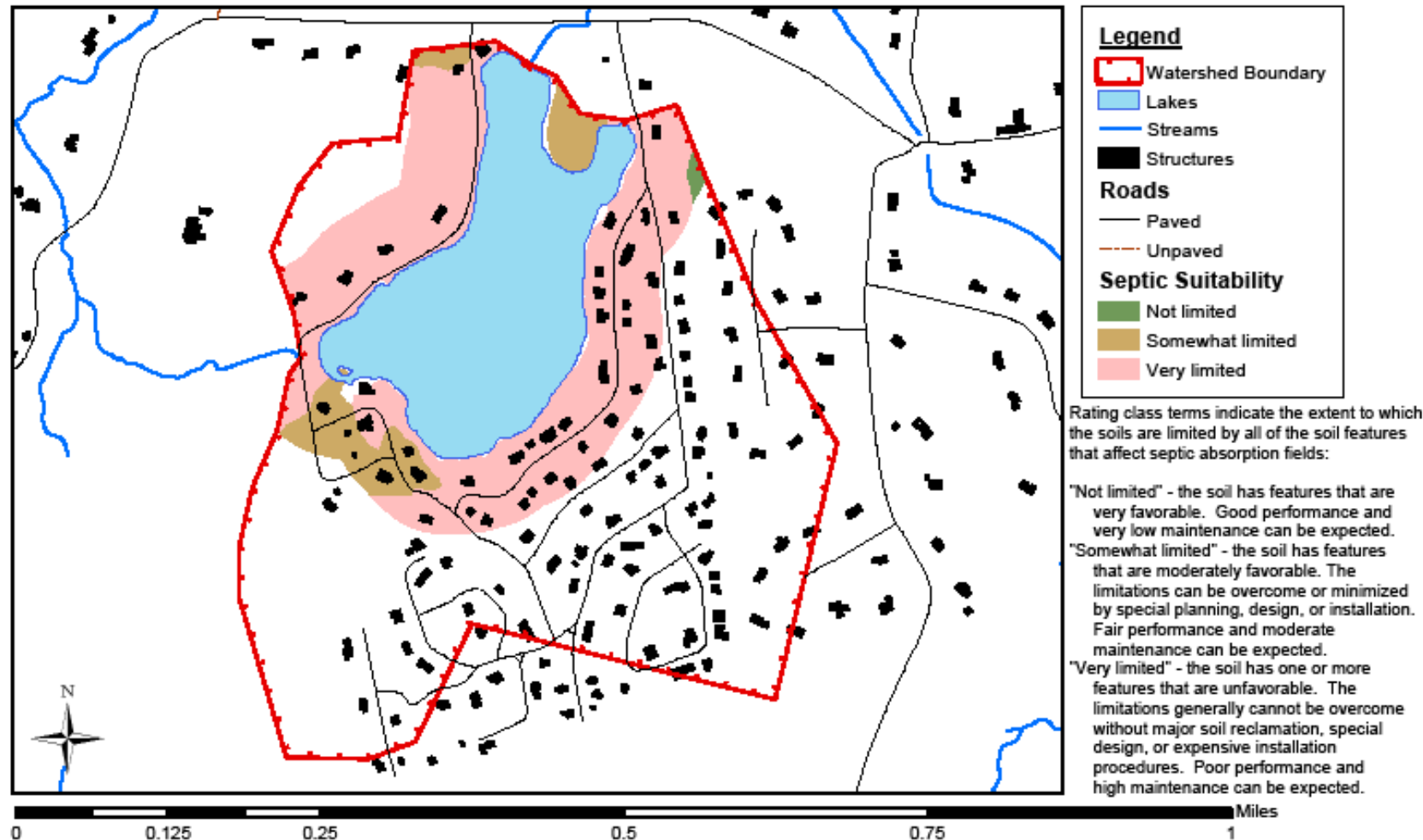
Figure 3
Lake Katonah
National Land Cover Dataset 2001



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
Lake Katonah
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.westchesternyc.gov/>. 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 Lake Katonah.

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

Source	Input (kg/year)
Watershed Land Cover	9.1
Point Sources	0
Septic within 100m of surface water	46
Internal loading (sediment)	0
Total	55

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	549
H	m	1.6
ρ	flushes per year	0.46
p	ug/l	51
<i>Summer (Jun 15-Sep 15) average TP, 2006-2008, upper waters:</i>		94 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. 2007. 2006 Interpretive Summay, New York Citizens Statewide Lake Assessment Program (CSLAP) 2006 Annual Report - Lake Katonah. February 2007. With New York Federation of Lake Associations. Scott A. Kishbaugh, PE.
- New York State Department of Environmental Conservation. 2008. 2007 Interpretive Summay, New York Citizens Statewide Lake Assessment Program (CSLAP) 2007 Abridged Annual Report - Lake Katonah. April 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/>.

3.7. Timber Lake

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

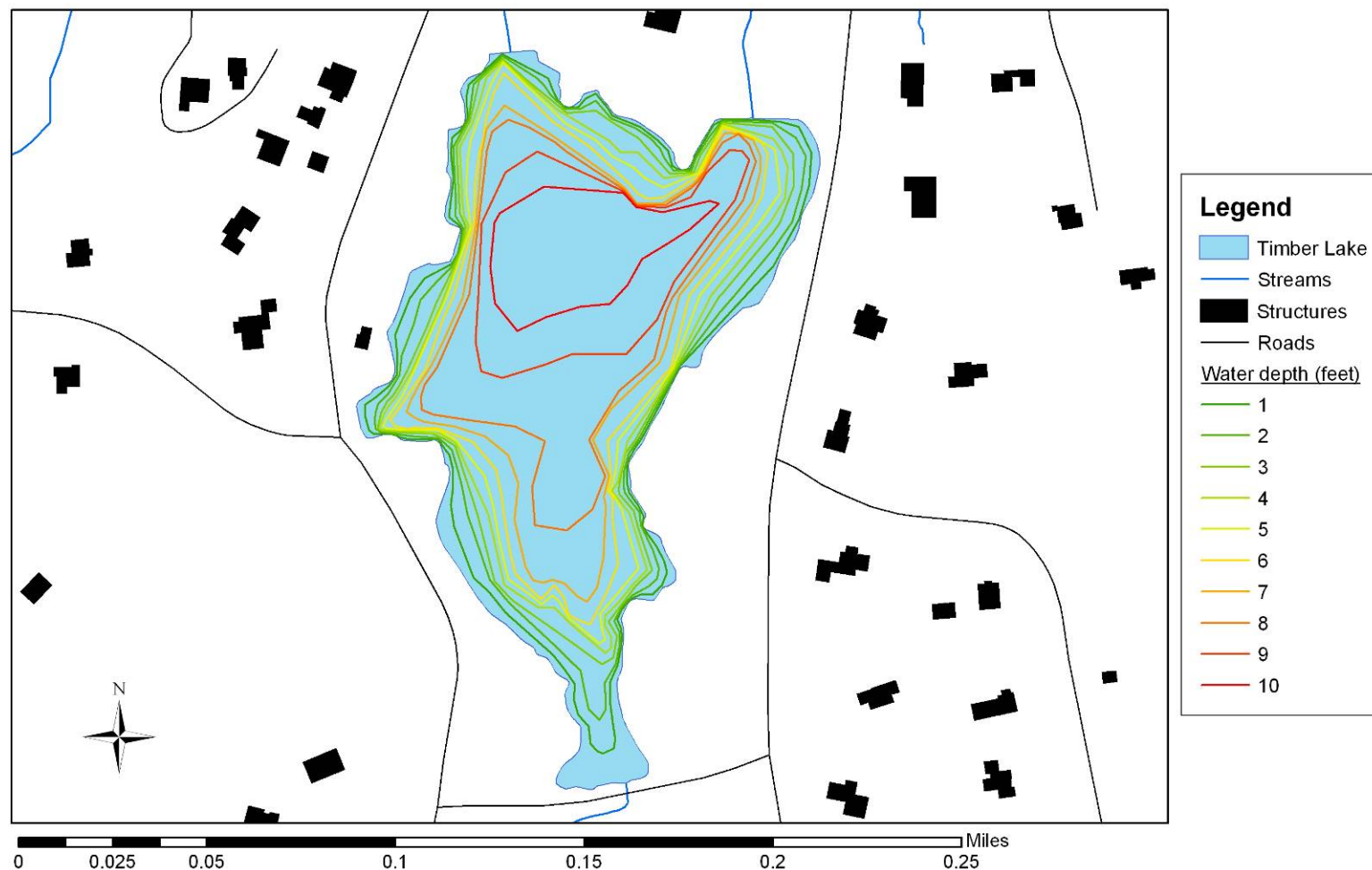
Lake Inlet: There is a small inlet entering on the south shore that drains a wetland area.

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

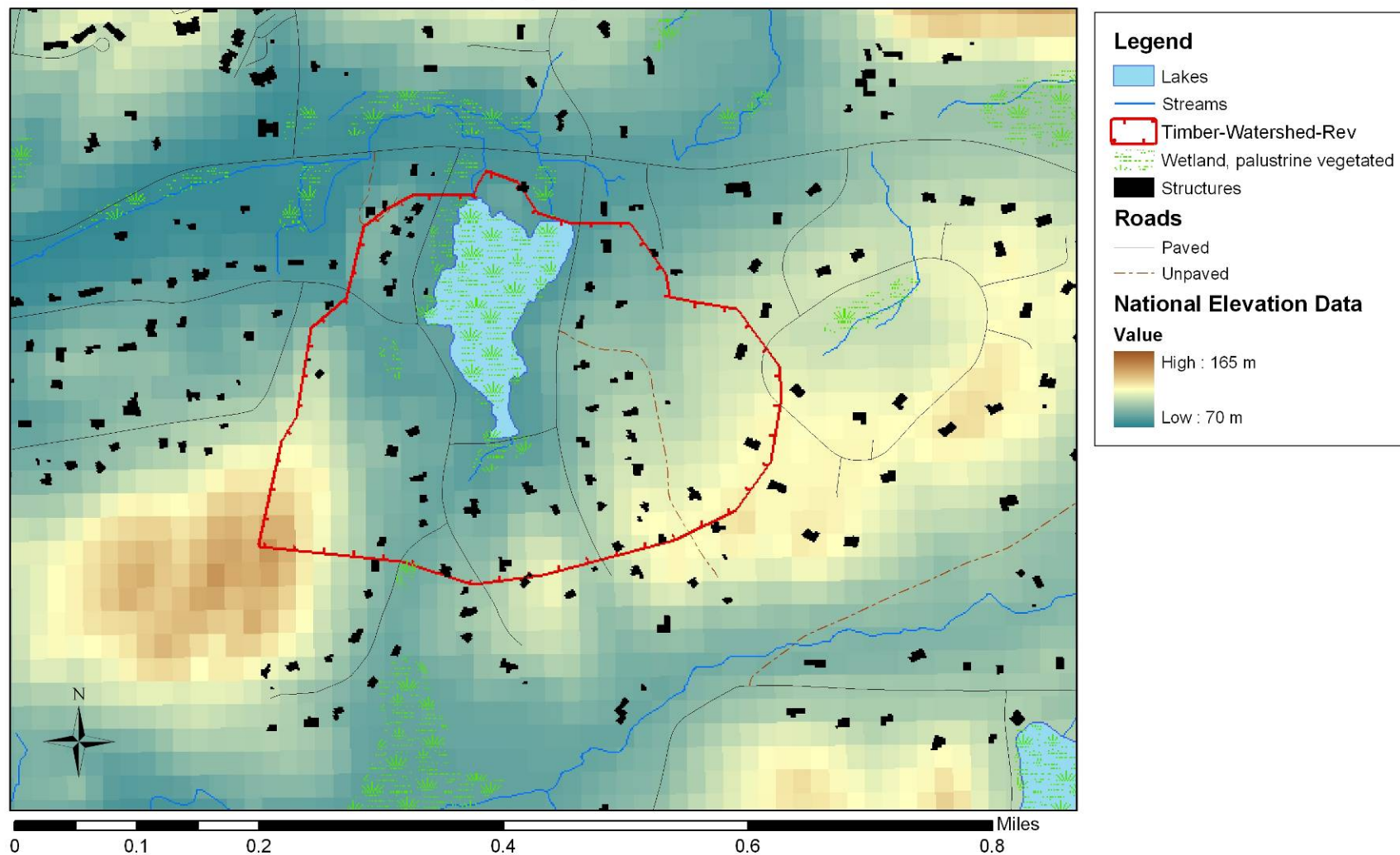


Sources:

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.

¹ For 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).

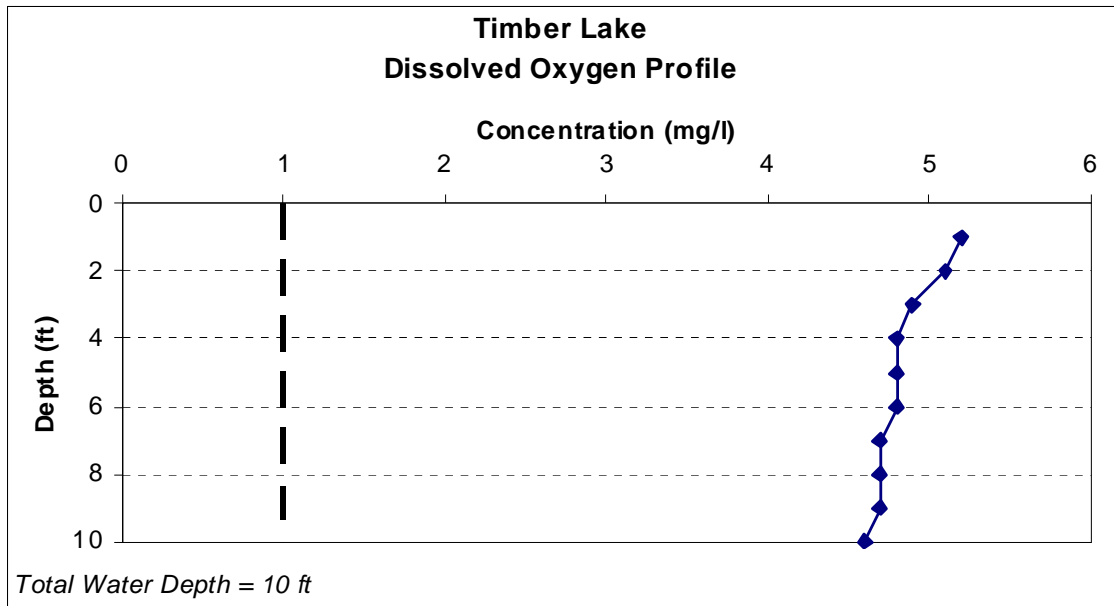
² For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. On Timber Lake, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.

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

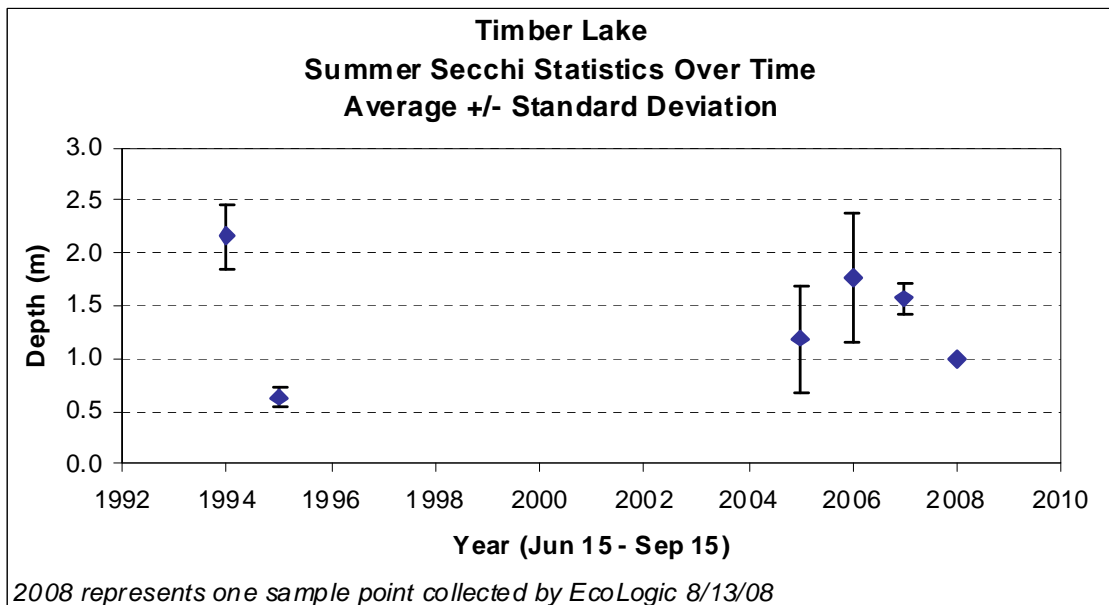
Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

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.

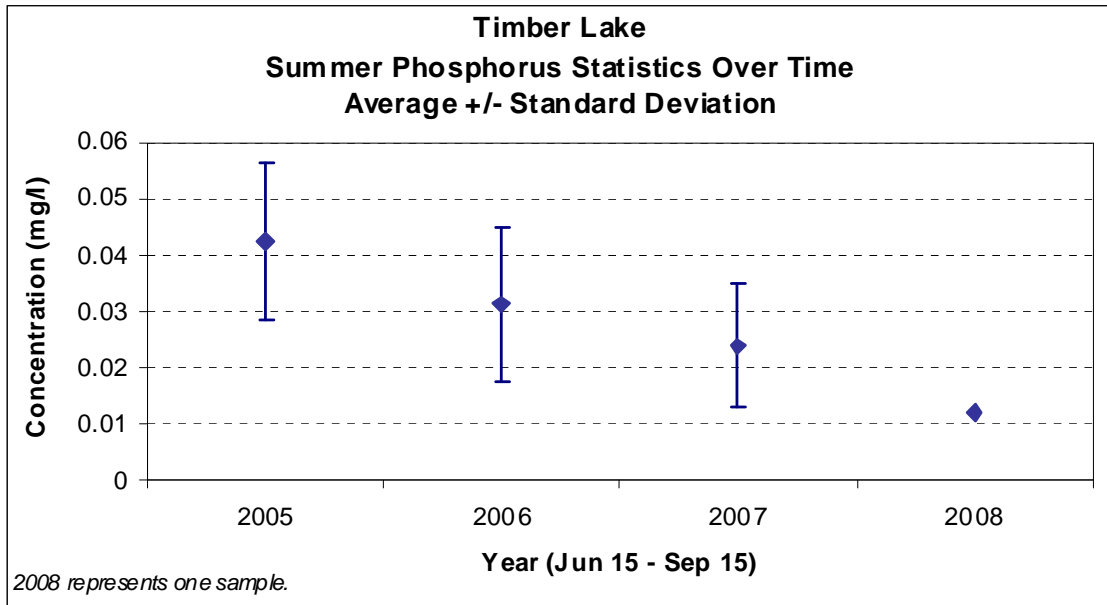
Anoxia: Based on the dissolved oxygen profile collected on August 13, 2008, oxygen levels were depleted in the lower waters, but anoxic conditions (concentrations less than 1 mg/l) were not observed in the lake.



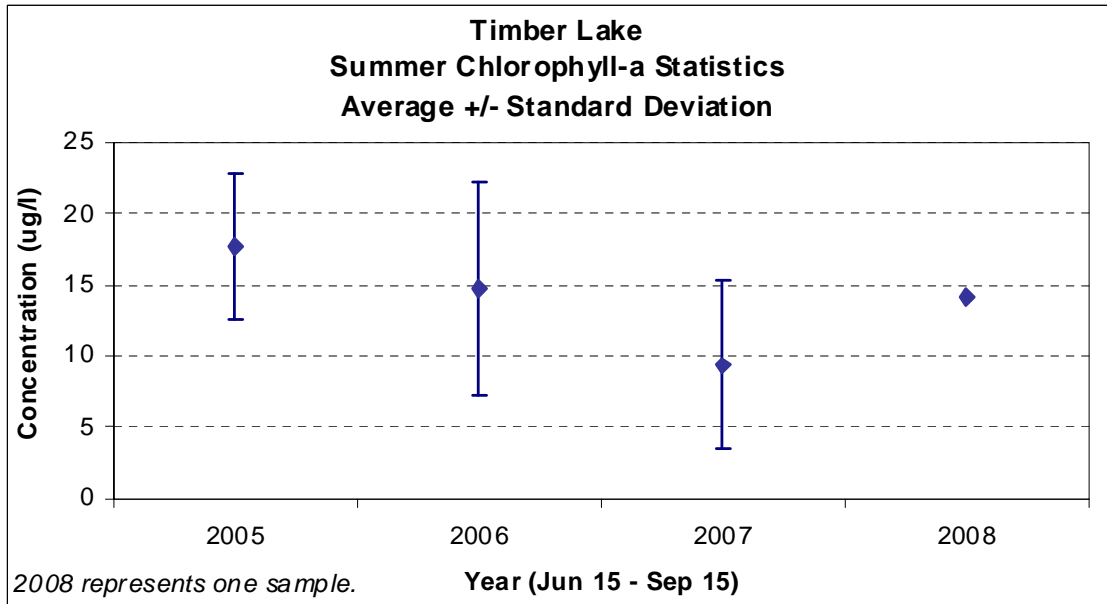
Water Clarity: While clarity in 1994 was about 2 meters, clarity was significantly reduced in 1995 at just over half a meter. The summer averages for 2005 through 2007 were generally around 1.5 meters; one measurement in 2008 was 1.0 meter.



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</i> (<i>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</i> (<i>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>Felix 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.

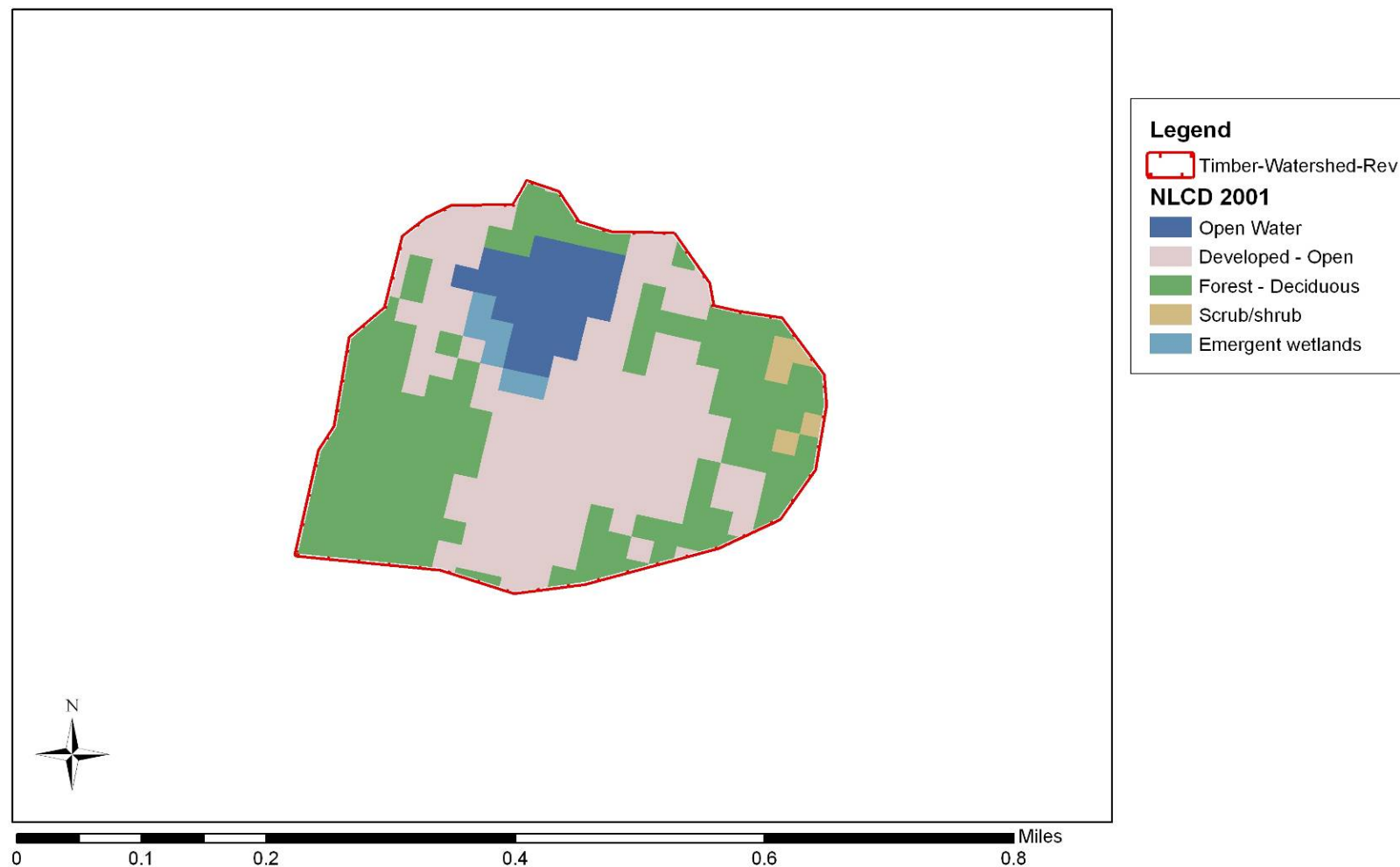
Estimated population on septic by soil suitability class with US 2000 Census household size for 100-meter buffer of surface water.

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

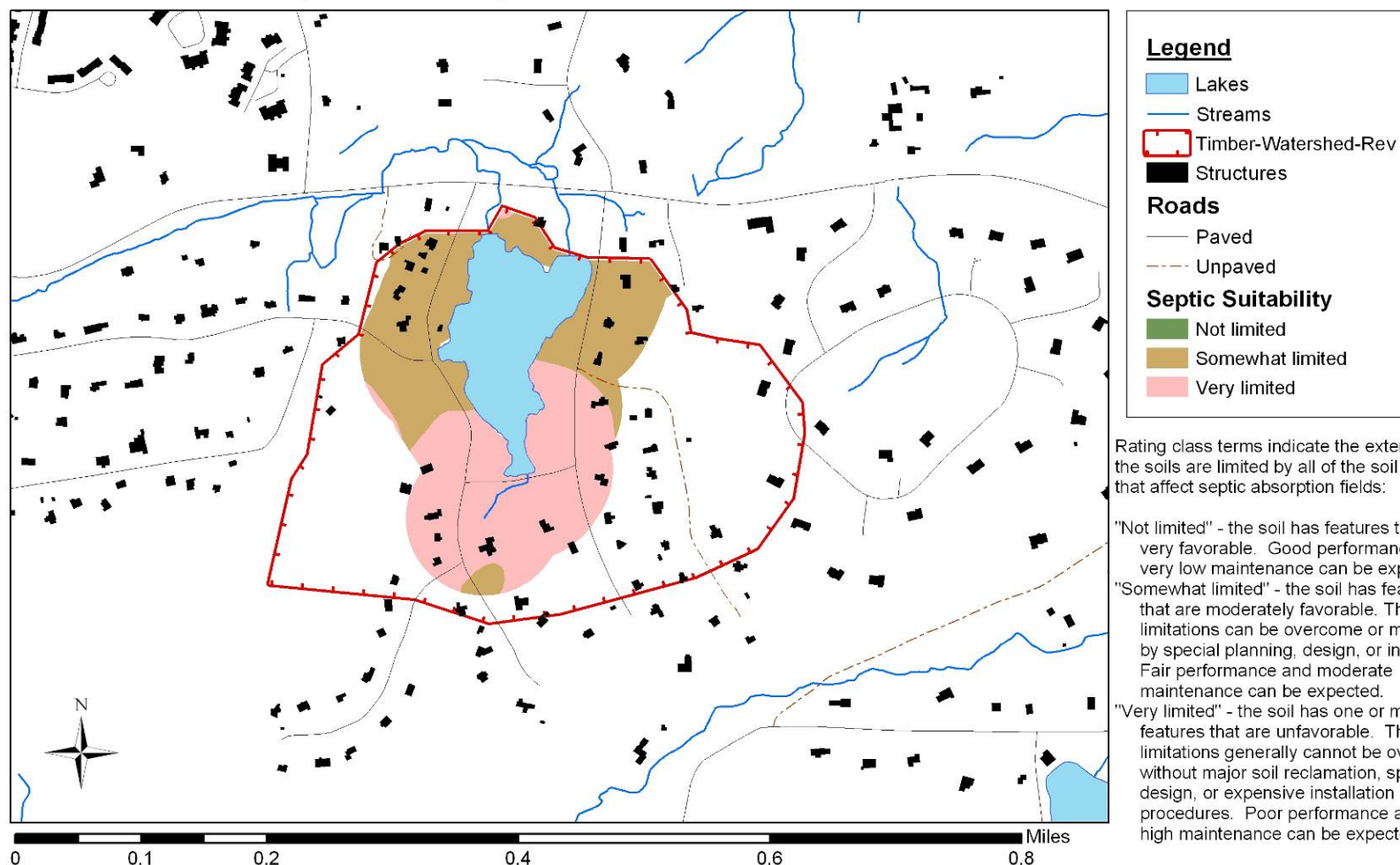


Source:

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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'.

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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/>.

4. Water Quality – Current Conditions

The fact sheets in Section 3 summarize the current conditions and temporal trends in water quality for each lake. This section assesses the current state of the Lewisboro Lakes as a whole.

4.1. Sources of data and information

The extent of water quality and habitat data available for the Lewisboro Lakes varied from lake to lake. The Three Lakes – Rippowam, Oscaleta and Waccabuc – had the most long-term water quality data; measurements extended from the 1970s to the present. In contrast, Lake Kitchawan was characterized only with two sampling events in 2007. The 2008 field collection program was designed to help fill data gaps.

Data utilized used for this analysis are summarized in [Table 4-1](#).

Table 4-1. Data sources utilized.

Lake	CSLAP* Program	Three Lakes Council	Other Lake Reports	Aquatic Macrophyte Surveys
Rippowam	2007	1978-2007	Cedar Eden 2004	Cedar Eden 2004
Oscaleta	2007	1972-2007	Cedar Eden 2004	Cedar Eden 2004
Waccabuc	1986-2007	1936-2007	Cedar Eden 2004	Cedar Eden 2004
Truesdale	1999-2007	--	Land-Tech 2001	Allied Biological 2005
Kitchawan	--	--	ENSR 2008	ENSR 2008
Katonah	2007	--	--	--
Timber	1994-2007	--	--	--

* CSLAP=Citizens State- wide Lake Assessment Program

4.2. Classification and use attainment

Classification

All waters in New York State are classified according to their best uses. Six of the Lewisboro Lakes hold a Surface Water Quality Classification of “B”, which indicates that the best usages are primary and secondary contact recreation and fishing, and that these waters shall be suitable for fish propagation and survival. Lake Waccabuc is designated Class A, which indicates that the best usages are a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing, and the waters shall be suitable for fish propagation and survival. Class A is designated for waters that may, if properly treated, meet New York State Department of Health drinking water standards and may be considered satisfactory for drinking water purposes.

Use Attainment

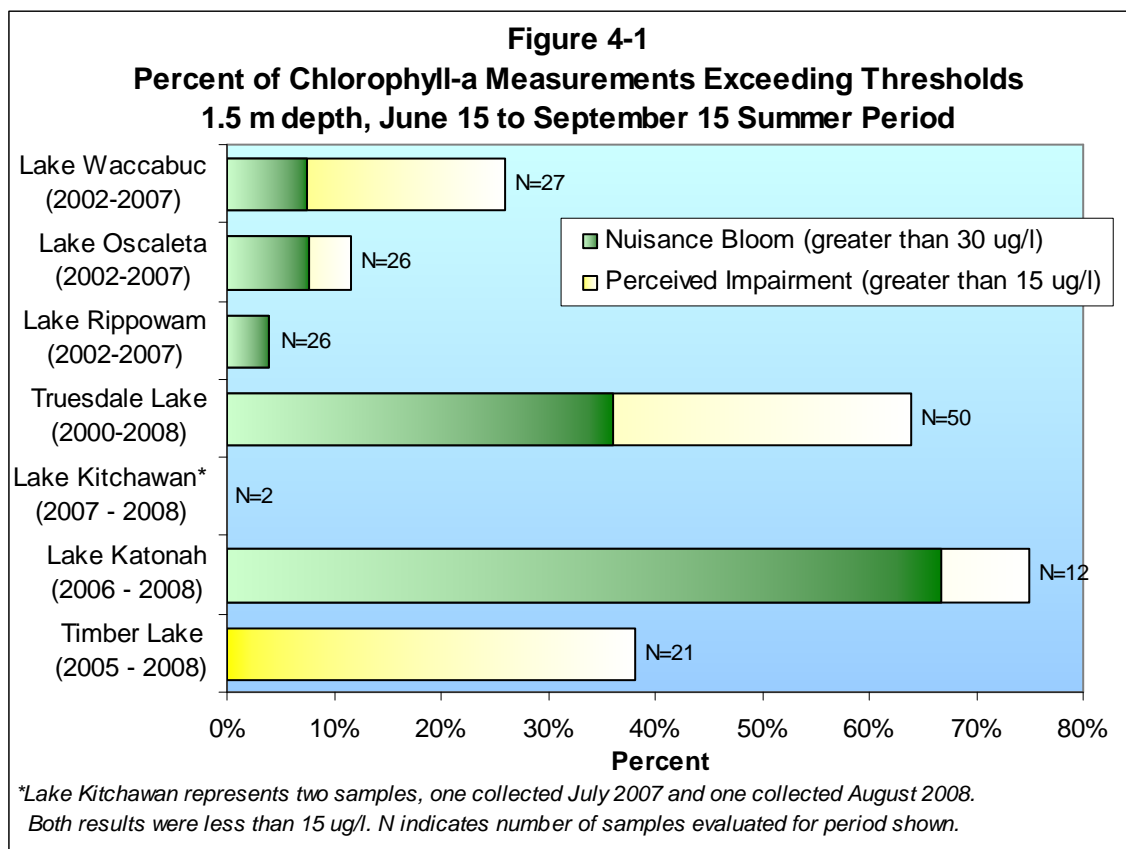
Six of the lakes (Kitchawan excepted) participate in the Citizens Statewide Lake Assessment Program (CSLAP). This volunteer lake monitoring program is jointly managed by the NYS Department of Environmental Conservation and the state’s Federation of Lake Associations (FOLA). CSLAP includes water quality monitoring and an evaluation of perceived suitability of the lake for recreational uses. Water quality assessment and perception survey results for some recent CSLAP annual reports are summarized in [Table 4-2](#).

Table 4-2. Summary of 2005-2007 CSLAP perception surveys and water quality assessments.

Lake	Water Quality Assessment	Volunteer Perceptions of Water Quality	
		Lake Conditions	Problems
Rippowam	may not be adequate to support some recreational uses during the summer	Excellent conditions Not quite crystal clear	Poor water clarity Excessive algae growth
Oscaleta	may not be adequate to support some recreational uses during the summer	Slightly impaired Definite algal greenness	Poor water clarity Weed density Excessive algae growth
Waccabuc	adequate to support most recreational uses during the summer	Excellent to slightly Impaired	Poor water clarity Excessive algae growth
Truesdale	sometimes adequate to support most recreational uses during the summer	Slightly to substantially impaired	Weed density Excessive algae growth
Kitchawan	No CLSAP data	No CLSAP data	No CLSAP data
Katonah	very minor aesthetic problems but excellent for overall use	Not quite crystal clear definite algal greenness	Weed density Excessive algae growth
Timber	may not be adequate to support recreational uses during at least part of the summer	Slightly to substantially impaired	Poor water clarity High algae levels

Overall, the Lewisboro Lakes exhibit some level of perceived impairment based on the CSLAP program results. The causes of this impairment are generally listed as poor water clarity, excessive algal growth and/or weed density in the Lewisboro Lakes. Conditions in lakes Rippowam, Oscaleta and Waccabuc are considered better (excellent to slightly impaired) than conditions in Truesdale, Timber, and Katonah (slightly to substantially impaired). These perceptions of recreational suitability are consistent with measured concentrations of phosphorus and chlorophyll-a.

Chlorophyll-a concentrations above 15 µg/l are associated with a perception of algal greenness; concentrations over 30 µg/l are considered nuisance blooms. The percent of chlorophyll-a measurements exceeding these thresholds during the summer recreational period (June 15 to September 15) for each of the Lewisboro Lakes is displayed in [Figure 4-1](#).



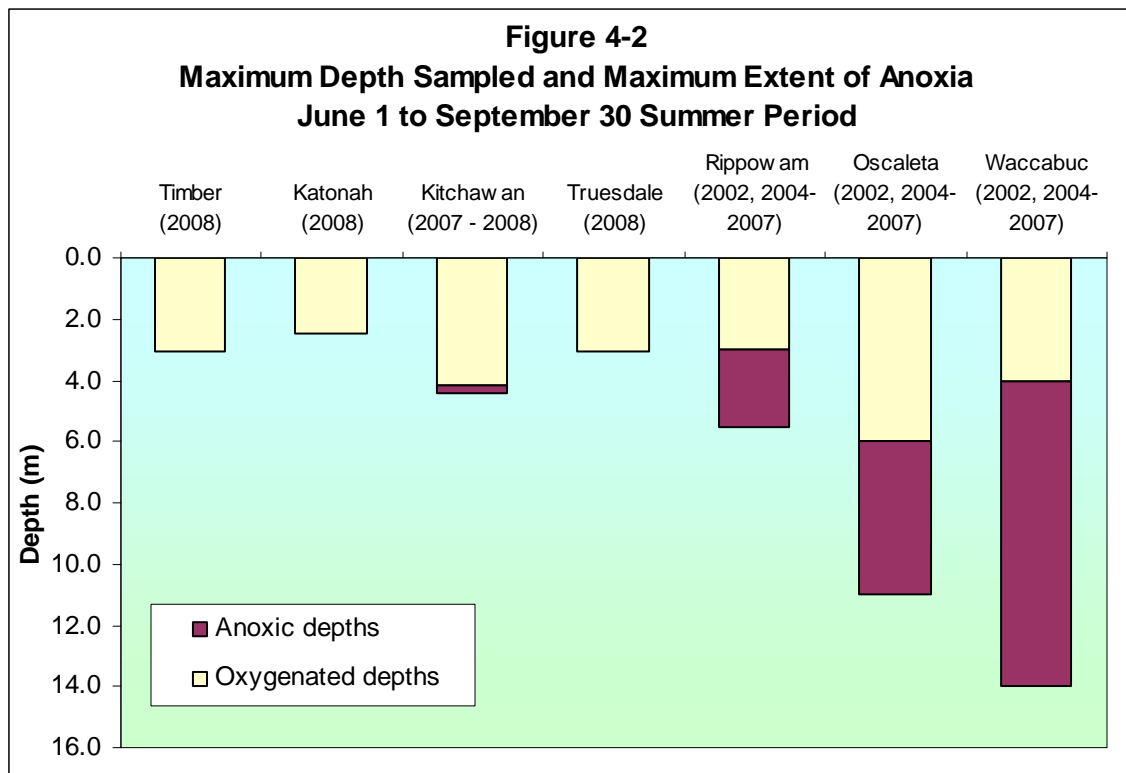
The perceived impairment and nuisance bloom percentages shown in [Figure 4-1](#) coincide with the public perception survey results of CSLAP – lakes with greater percentage of chlorophyll-a measurements above thresholds are those identified as slightly to substantially impaired for desired uses (Truesdale, Timber and Katonah). As expected, higher phosphorus concentrations are associated with elevated chlorophyll-a concentrations and a higher risk of algal blooms.

The lakes support recreational fisheries. Quality of the fishery is directly dependant on lake water and habitat quality. When lakes are deep enough to develop stable thermal stratification, the colder bottom waters become isolated from the atmosphere during the summer. As a result, bottom waters can become depleted of oxygen as the microbial community decomposes organic material. Under these conditions, coldwater fish species, that would typically seek refuge from warm surface waters in these deeper areas, cannot tolerate dissolved oxygen concentrations below about 5 mg/L for prolonged periods of time.

Lakes deeper than about 5 meters typically exhibit some degree of thermal stratification during the summer. Of the seven Lewisboro Lakes, three are deeper than 5 meters – Rippowam, Osaleta and Waccabuc. These lakes develop stable thermal stratification with maximum temperature difference between surface and deep waters ranging from 17.8°C to 23.4°C. Dissolved oxygen concentrations in the deeper waters of these three lakes fall to very low levels during the summer,

The depth to which low oxygen conditions extend has a profound impact on the nature of the aquatic community. The maximum extent of anoxia (tracked as dissolved oxygen levels below 1

mg/l) for the Lewisboro Lakes is displayed in [Figure 4-2](#). The bars illustrate the shallowest depth at which dissolved oxygen less than 1 mg/l has been measured. For example, in Lake Waccabuc, only the top 4 meters of the lake water column has dissolved oxygen concentrations that would support aquatic life during the summer.



Based on this analysis, the Lewisboro Lakes may be grouped into categories describing current water quality and habitat conditions and use attainment. This grouping is presented in [Table 4-3](#).

Table 4-3. Summary of current water quality conditions and use attainment

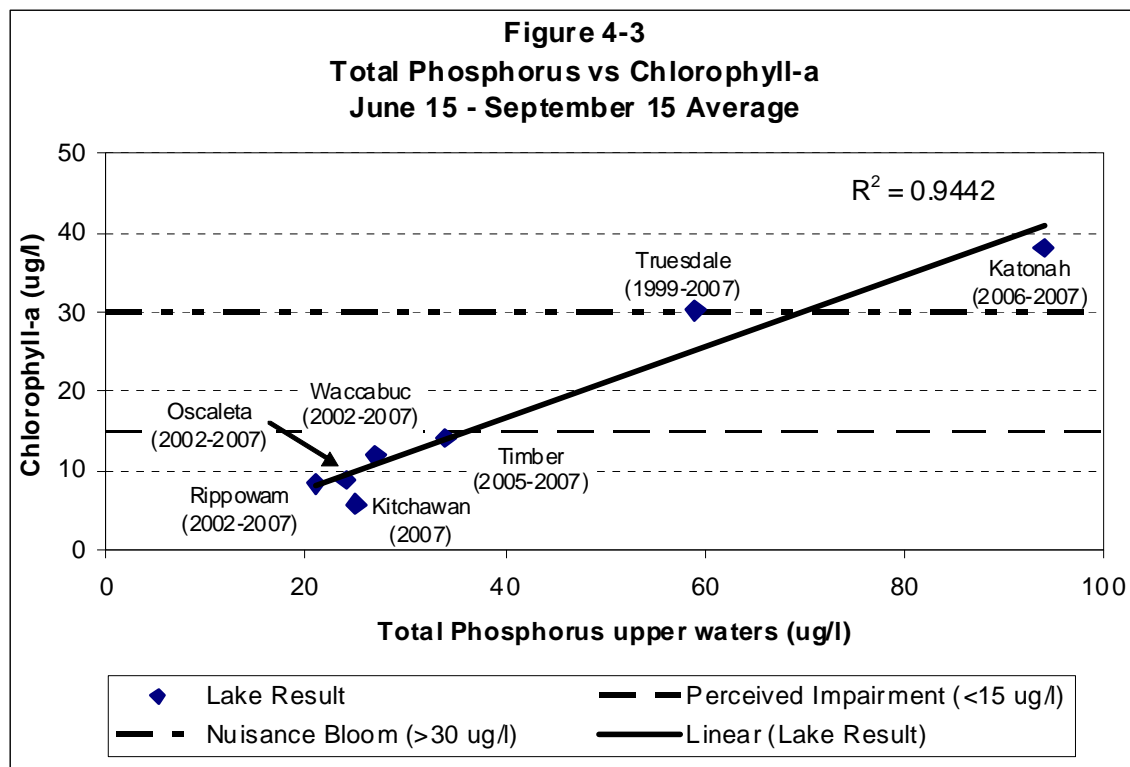
Depth Categories	Water Quality and Aquatic Habitat Status		
	<i>Meets Desired Uses,</i>		
	<i>Meets Desired Uses</i>	<i>with Evidence of Degradation</i>	<i>Do Not Meet Desired Uses</i>
Shallow (less than 3 m maximum depth)			Timber Katonah
Medium (3 – 8 m maximum depth)		Kitchawan Rippowam	Truesdale
Deep (greater than 8 m maximum depth)		Oscaleta Waccabuc	

4.3. Phosphorus and Algae Correlation

Total phosphorus in the upper waters is one measure of nutrients in the water column available for algae and plant growth. In general, higher concentrations of phosphorus in lakes results in increased amounts of algal growth, which in turn reduce water clarity.

Average chlorophyll-a concentrations, which are an indicator of algae in the water, are highly correlated with total phosphorus in the Lewisboro Lakes (**Figure 4-3**). This relationship is important when considering priorities for lake protection and restoration. Certain lakes will require reductions in the supply of phosphorus to reduce the frequency of nuisance algae blooms; other lakes need protective measures to keep nuisance blooms from developing.

On average, total phosphorus and chlorophyll-a concentrations are lowest in Lakes Rippowam, Oscaleta, Kitchawan, and Waccabuc, highest in Lake Katonah, and intermediate in Timber and Truesdale Lakes.



4.4. Trophic State

The available water quality and aquatic habitat data collected in recent years indicate that the Lewisboro Lakes are in various stages of eutrophication. While the data for some lakes are somewhat limited, representing few sampling points, they do provide a basis for making an assessment of trophic state using the standard indicators described in **Table 1-1**. The final row in **Table 4-4** represents a professional judgment of trophic state.

Table 4-4. Summary of Trophic State Parameters, Lewisboro Lakes

	Surface Water Data						
	Rippowam (2002-2007)	Osaleta (2002-2007)	Waccabuc (2002-2007)	Truesdale (1999-2007)	Kitchawan (2007-2008)	Katonah (2006-2007)	Timber (2005-2007)
Average Total Phosphorus, upper waters (µg/l)	21	24	27	59	23	94	34
Summer chlorophyll-a, upper waters (µg/l)	8.4	8.8	12	30	5.6 ^a	38	14
Peak chlorophyll-a (µg/l)	39	54	40	116	5.8 ^a	79	28
Average Secchi disk transparency, m	2.2	3.2	2.4	1.1	1.5 ^b	0.95	1.5
Minimum Secchi disk transparency, meters	0.50	0.50	1.1	0.53	1.5 ^b	0.50	0.70
Dissolved oxygen in lower waters (% saturation)	8.5% ^d	2.8% ^d	2.5% ^d	--	--	--	--
Trophic State^c	M	E	E	E	M	H	E

Notes:

Statistics represent summer period (June 15-September 15).

^a Kitchawan chlorophyll-a data from one in-lake samples on July 26, 2007.

^b Secchi disk transparency for Lake Kitchawan measured by EcoLogic in August 2008.

^c Trophic State: E - eutrophic; M - mesotrophic, H - Hypereutrophic

^d Percent saturation of DO calculated from DO concentration and temperature for Rippowam, Osaleta and Waccabuc, using June-September data 2002-2007 as available. Since Truesdale, Timber, Katonah and Kitchawan do not stratify, the lower waters DO percent saturation is not presented.

4.5. Sources of phosphorus

Two important processes have been quantified for many aquatic systems:

- (1) the relationship between watershed activities and loading (quantity of material that enters a lake over a defined period; for example kilograms of phosphorous per year), and
- (2) the relationship between loading and resultant water quality conditions.

For the first relationship, scientists, engineers, and planners have quantified nutrient runoff from various conditions of land use and population density. For the second, limnologists and oceanographers have determined the physical and hydrologic features such as depth and water residence time that contribute to a lakes assimilative capacity. These relationships form the basis for defining an acceptable loading to aquatic systems to meet water quality objectives.

Standard limnological methods have been developed to quantify the relationship between external loading and in-lake concentration as a function of mean depth and water residence time. These

standard methods were developed based on empirical observations of a large number of lakes, with defined inlets and outlets.

The phosphorus budget for the Lewisboro Lakes is based on existing data describing water quality conditions in the Lewisboro Lakes, and land use and vegetative cover data throughout the watershed. Several measures were taken into account:

- Water balance (volume in and volume out)
- Land cover types in the watersheds
- Septic contributions
- Point sources
- Internal loading from sediments

Watershed boundaries were delineated for the Lewisboro Lakes, using existing watershed boundaries from Westchester County² and Connecticut Department of Environmental Protection³, with topographic information from the National Elevation Dataset⁴ and professional judgment. The watershed boundaries provide the spatial basis for the phosphorus budget.

4.6. Water Balance

The first step in developing a phosphorus budget is to quantify the water balance. A water balance essentially estimates the total amount of water that enters and leaves a lake each year. The water balance is important because runoff from the watershed delivers phosphorus and other materials to the lake. In addition, the period of time that water stays in the lake affects the amount of phosphorus available. All else being equal, lakes with faster flushing rates will tend to grow less algae than lakes with slower flushing rates. For calculating the water balances of each of the Lewisboro Lakes, USGS mean annual values for the area were used as estimates of precipitation (48 inches/year), evaporation (22 inches/year) and runoff (26 inches/year)⁵.

The water balance for each lake is displayed in [Table 4-5](#). Flushing rate is the approximate number of times per year that all the water in the lake would be replaced in a typical year. Residence time is the opposite of this (how many years water stays in the lake, on average). The flushing rates vary from 0.4 times per year in Waccabuc to 18 times per year in Truesdale.

² Westchester County GIS, July 1998. Westchester County Drainage Basin Boundaries. On-line at <http://giswww.westchestergov.com/westchester/emap/wc1.htm>.

³ Connecticut DEP, Office of Information Management 1988. Local Basins. On-line at http://www.ct.gov/dep/cwp/view.asp?a=2698&q=322898&depNav_GID=1707.

⁴ U.S. Geological Survey (USGS), EROS Data Center, 1999. National Elevation Dataset. On-line at <http://gisdata.usgs.net/ned/>.

⁵ USGS Mean annual runoff, precipitation and evapotranspiration in the glaciated Northeastern US 1951-1980. Plates 1 and 2.

Table 4-5. Flushing rate and residence times for the Lewisboro Lakes.

Lake	Inflow to Lake (mgal/year)	Lake Volume (mgal)	Flushing Rate (times/year)	Residence Time (years)
Rippowam	191	150 ^a	1.3	0.8
Oscaleta	908	412 ^a	2.2	0.5
Waccabuc	1,528	3,696 ^a	0.4	2.4
Truesdale	1,756	180 ^b	10	0.1
Kitchawan	468	174 ^c	2.7	0.4
Katonah	90	41	2.2	0.5
Timber	44	16	2.8	0.4

Sources:

^aCedar Eden 2004^bLand-Tech, 2001^cENSR 2008

4.7. Phosphorus Loading and Sources

The next step in developing a phosphorus budget is to estimate phosphorus loading. Phosphorus loading to the Lewisboro lakes occurs through several mechanisms:

- Phosphorus carried in runoff from surrounding watershed; the amount of phosphorus runoff varies by land cover type;
- Phosphorus from septic systems that have failed, or septic systems located in poor soils that allow phosphorus to migrate to surface water
- Phosphorus from point sources; outlets of other lakes are considered point sources for the purpose of this analysis.

4.7.1. Land Cover Contributions

Nonpoint source phosphorus export from watersheds may be estimated by applying regionally-appropriate phosphorus export coefficients as a function of land use and vegetative cover using an Export Coefficient model. This estimate does not include loading from on-site wastewater disposal systems; contributions from these sources are calculated separately.

Topography can also play a role in the quantity of phosphorus exported to the lakes. More steeply-sloped watersheds pose a greater risk of soil erosion, although this relationship can be mitigated by soil type and land cover. Topography is not factored into the land use calculations, but is considered in the interpretation of the results.

For the Lewisboro Lakes, phosphorus transport from surrounding land uses was estimated using land cover GIS files; phosphorus export coefficients were derived from established literature values. The export coefficients (units of kg/ha/year) were multiplied by the area of land cover class in each watershed to get an estimate of annual phosphorus loading from each cover class (Table 4-6). The total amount of phosphorus from a given land cover is a function of both the size of the area and the loading coefficient. Overall, developed lands contribute more phosphorus per unit area than natural lands.

Table 4-6. Watershed phosphorus loading by land cover class.

Land Cover Type	Phosphorus Loading by Land Cover Class (kg/yr)						
	Rippowam	Oscaleta	Waccabuc	Truesdale	Kitchawan	Katonah	Timber
Open water	3.8	12	16	11	9.5	2.5	0.70
Developed*	1.5	4.7	20	32	11	4.9	2.2
Forest/Shrub**	6.9	32	18	54	12	1.7	0.8
Grassland/Pasture/Crops	0.29	2.5	3.7	15	1.0	--	0.11
Wetlands (woody/emergent)	0.81	2.1	0.90	9.6	4.0	--	0.05
Total	13	53	58	122	37	9.1	3.9
Totals are approximate due to rounding errors. Shaded cells indicate the highest contribution for land cover class in each watershed. *Developed – sum of three Developed classes: open space, low intensity and medium intensity. **Forest/Shrub – sum of four classes: Forest Deciduous, Forest Evergreen, Forest Mixed, and Shrub/scrub.							

Of the significant contributors by land cover class, Forest/Shrub and Open Water contributions are natural; in contrast, Developed contributions are directly influenced by human activity. Most of the phosphorus from land cover classes in the Lewisboro Lakes watersheds is contributed by natural sources; only Timber, Katonah and Waccabuc land cover contributions were mainly from areas affected by human activity (Table 4-6). Residential development increases phosphorus export.

4.7.2. On-site Wastewater Disposal System Contributions

The Lewisboro Lakes' watersheds are not served by sanitary sewers. Residents dispose of wastewater using individual on-site wastewater treatment systems, primarily septic tanks with leach fields. Several sources of data were compiled to estimate the potential contribution of these onsite wastewater disposal systems to the phosphorus budget of the Lewisboro Lakes.

Environmental factors influence the total potential phosphorus migration from on-site systems to the lakes. Important factors include soil texture (particle size), mineralogy, depth to groundwater/seasonal saturation, and permeability/infiltration rate. Other factors include slope, oxygen, pH, and temperature conditions. Finally, how systems are loaded and maintained affects the potential for phosphorus migration.

For this analysis, the estimated phosphorus loading from on-site systems was assumed to be a factor of soil suitability, population density, and proximity to surface waters. There is a substantial body of research demonstrating that on-site systems in close proximity to surface waters have the potential to be a source of phosphorus, and that systems distant from surface waters have a low probability of phosphorus migration into surface waters. There is a general correlation between the number of persons living within 100m of water and the total phosphorus concentration in the lakes (Figure 4-4). Therefore, only systems located within 100 m of surface

waters were included in the septic phosphorus budget. In addition an overall on-site system failure rate of 5% was used for each watershed.

An algorithm was applied to estimate the contribution of phosphorus from on-site systems (South Nation Conservation, Ontario Ministry of Environment, 2003):

$$\text{Phosphorus contribution} = 0.6 \text{ kg/cap/yr} * (\text{population}) * 1-A$$

“A” represents an attenuation factor such that phosphorus loading is scaled by soil suitability classes of:

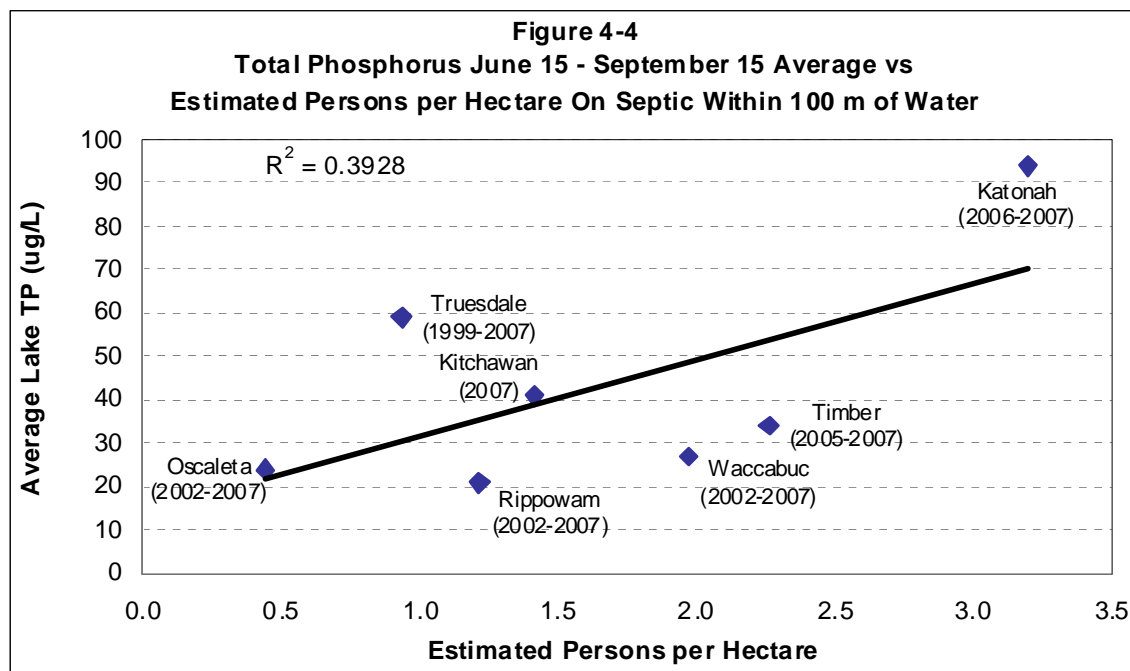
- Not limited- 10% of phosphorus is transported to the lake.
- Somewhat limited- 30% of phosphorus is transported to the lake.
- Very limited- 60% of phosphorus is transported to the lake.
- Somewhat limited- 30% of phosphorus is transported to the lake.
- Failed systems- 100% of phosphorus is transported to the lake (it was assumed that 5% of systems are failing for each watershed).

The results of this analysis are presented in **Table 4-7**. It is important to keep in mind that a large number of assumptions were built into this estimate of phosphorus contribution from on-site wastewater disposal systems. A range of +/- 50% around the estimated total is reasonable.

Table 4-7. Estimated phosphorus loading from septic by soil types.

Soil Suitability (percent P transport to surface water)	Phosphorus Loading from Septic by Soil Type (kg/yr)						
	Rippowam	Oscate	Waccabuc	Truesdale	Kitchawan	Katonah	Timber
Not Limited (10%)	1.0	1.7	3.0	1.5	0	0	0
Somewhat Limited (30%)	9.1	20	61	102	24	3.1	6
Very Limited (60%)	15	7.7	62	98	60	39	9.2
Failed Systems (100%)	3.5	5.1	18	27	10	4.0	1.8
Total	29	35	144	229	94	46	17
<p>Totals are approximate due to rounding errors. Shaded cells indicate the highest percentage in each watershed. Soil Suitability: "Not Limited" - the soil has features that are very favorable. Good performance and very low maintenance can be expected. "Somewhat Limited" - the soil has features that are moderately favorable. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very Limited" - the soil has one or more features that are unfavorable. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.</p>							

As shown in the soil suitability maps in each lake's Fact Sheet (Section 3.0), the soils in Lewisboro are mostly either "Somewhat" or "Very" limited with respect to their ability to prevent phosphorus from on-site systems from reaching the lakes. This results in very high phosphorus loads from on-site systems to the Town's lakes. The contribution from this source alone is usually greater than the combined total of the other sources. On average, on-site systems contribute about 75% of the anthropogenic phosphorus to the lakes on an annual basis, with a range of 29% to 94%.



4.7.3. Point Sources

Based on the available information, there are no significant point sources of phosphorus in the watersheds of the Lewisboro Lakes, such as wastewater treatment plant discharges. However, there are three inter-connected lakes: Rippowam, Oscaleta and Waccabuc. The upstream lakes may be considered point sources of phosphorus loading to the downstream lakes – Rippowam discharges to Oscaleta, and Oscaleta discharges to Waccabuc. The estimated loading from the upstream to the downstream lakes are shown in [Table 4-8](#). Overall, the phosphorus contribution from upstream lakes is small compared with other sources.

Table 4-8. Contribution of upstream lakes

Drainage Basin	Discharges to:	Water Volume		Surface Average TP		Estimated Export to Downstream
		Input (m ³ /year)	Output (m ³ /year)	Concentration (ug/l)	N samples	
Rippowam	Oscaleta	721,943	721,943	24	42	17 kg/yr
Oscaleta	Waccabuc	3,438,272	3,438,272	24	43	83 kg/yr

Surface average total phosphorus (TP) concentrations represent summer average (June 15 – September 15) upper waters (<=1.0 m depth) for the period 2002-2007.

4.7.4. Internal Phosphorus Loading

The three lakes that exhibit thermal stratification during the summer – Rippowam, Oscaleta and Waccabuc – develop anoxic conditions in their lower waters that allow phosphorus in sediments to be released into the water column. This is a consequence of chemical reactions at the sediment surface. As iron and manganese compounds are reduced, phosphorus held in mineral complexes is released from the sediments. Much of this phosphorus remains in the deeper waters during the stratified period and is not available to algae growing in the sunlit layers above. This can change during certain conditions such as high winds or low barometric pressure when water from deep in the lake mixes with the shallow layers. In the fall, when the lake waters cool and mix, phosphorus from sediments can be distributed throughout the water column.

To estimate the potential for sediment phosphorus to contribute to the lakes' phosphorus budget, the difference in lower water phosphorus concentration between spring and late summer was calculated. This difference in concentrations was multiplied by the volume of water in the lower waters to estimate the mass of phosphorus released from the sediments (**Table 4-9**).

Table 4-9. Estimated sediment phosphorus load

Drainage basin	Phosphorus in Lower Waters (ug/l)			Lower Waters Volume (m ³)	Estimated internal Loading (kg)
	Spring	Late Summer	Difference		
Rippowam	42	53	11	456	<1
Oscaleta	46	99	53	230,898	12.2
Waccabuc	114	300	190	1,398,107	260

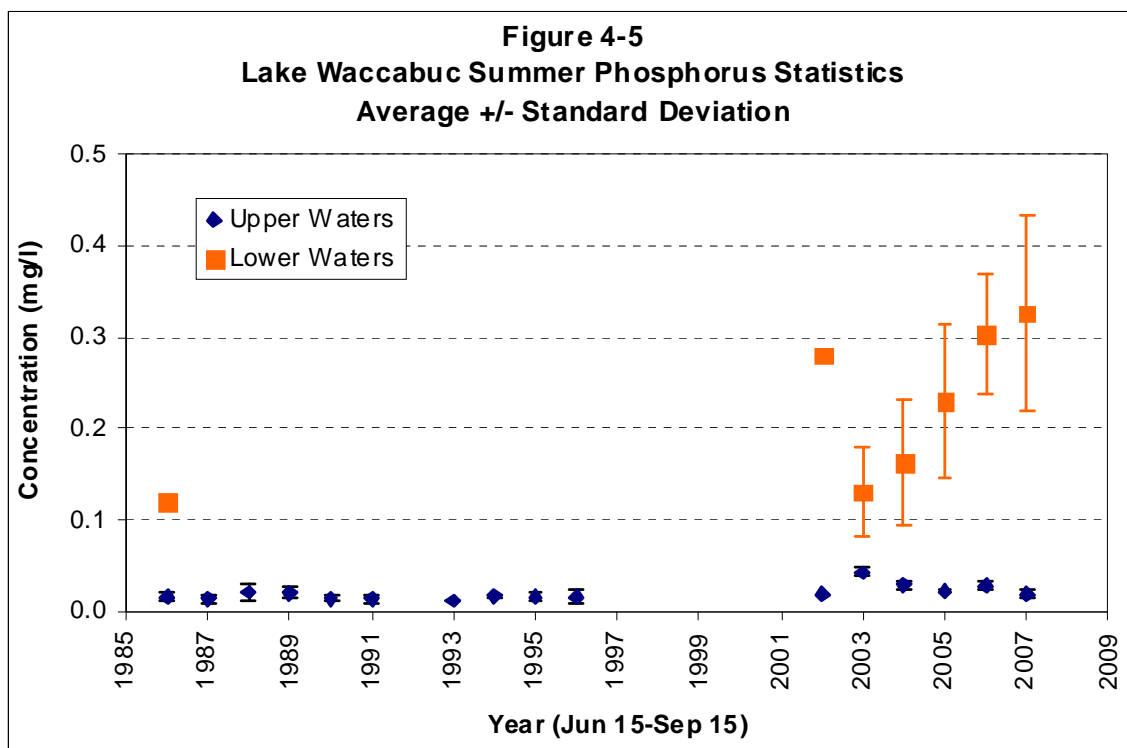
Notes:

Spring concentration represents the average of May averages over time in lowest 2 meters sampled. Includes these years: Rippowam (2003, 2006, 2007); Oscaleta (1975, 2003, 2006, 2007); Waccabuc (1975, 2003, 2006, 2007).

Late summer concentration represents the average of September averages over time in lowest 2 meters sampled. Includes these years: Rippowam (2002-2006), Oscaleta (2002-2007), Waccabuc (1975, 2002-2007)

Hypolimnetic (lower water) volumes from Cedar Eden (2004).

The estimated internal load in Lakes Rippowam and Oscaleta represents a small percentage of the external annual loading. However, as the lakes become increasingly eutrophic, the extent and duration of oxygen depletion is likely to increase, leading to increased sediment phosphorus release. The estimated internal loading in Lake Waccabuc is a more significant source of phosphorus to the lake's annual phosphorus budget; moreover, the deep water phosphorus concentrations appear to be increasing (**Figure 4-5**). It is notable that the total P levels in the upper waters appear to be stable.



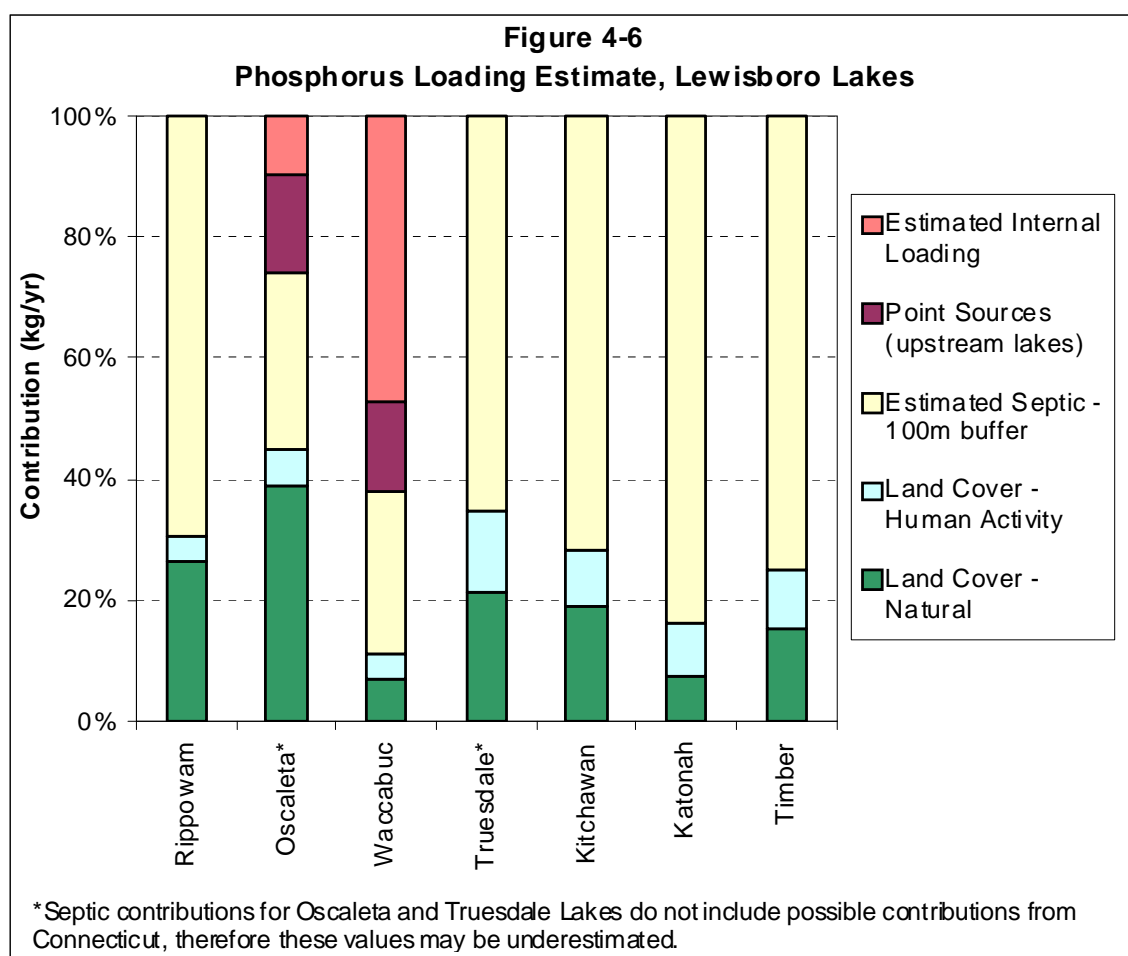
4.8. Phosphorus Loading Summary

The summary of phosphorus loading for each of the Lewisboro Lakes is summarized in [Table 4-10](#) and [Figure 4-6](#). The shaded values represent the highest annual loading estimated for that watershed. It is clear that contributions from on-site wastewater disposal systems represent the primary source of phosphorus, with the exceptions of Lakes Oscaleta and Waccabuc. In Lake Oscaleta the generally undeveloped nature of the watershed resulted in natural land uses being the primary source. However, of the anthropogenic source of phosphorus, on-site wastewater disposal systems were the primary source. In Lake Waccabuc, internal loading appears to be the largest source of phosphorus to the annual budget. This pool of phosphorus does not appear to affect concentrations of phosphorus in the upper waters during the summer growing season. However, this lake has the longest water residence time (over 2 years), and at least a fraction of the phosphorus released during the summer will be present in the upper waters next spring. Phosphorus from on-site wastewater disposal systems in this watershed will be available to support algal growth during the summer recreational season, thus underscoring their significance.

Table 4-10. Phosphorus loading contribution summary.

Watershed	Land Cover Contribution		Estimated 100m Septic (kg/year)	Point Sources (upstream lakes) (kg/year)	Internal Loading (kg/year)	Total Loading (kg/year)
	Natural (kg/year)	Human Activity (kg/year)				
Rippowam	11	1.8	29	0	0.0049	42
Oscaleta	46	7.2	35*	17	12.2	117
Waccabuc	37	22	143	83	260	544
Truesdale	75	47	229*	0	0	351
Kitchawan	25	12	94	0	0	131
Katonah	4.1	4.9	46	0	0	55
Timber	6.4	4.0	17	0	0	21

* Estimated septic input from New York portion of the watershed only; Connecticut portion not calculated due to lack of data.



5. Reductions in Phosphorus Needed to Meet State Guidance Targets

The Lewisboro Lakes are in various stages of eutrophication. A small decrease in the phosphorus concentrations in some lakes may have noticeable effects on water quality while in others only a substantial reduction in phosphorus is likely to result in perceptible improvement. In order to quantify reductions in loading, an in-lake target concentration is needed.

New York State has a narrative standard for phosphorus: *“None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.”* The narrative standard is interpreted for lakes using a guidance value for phosphorus to protect recreational quality. A target concentration of 20 ug/l was adopted; this is measured as a summer average mid-lake sample at 1 m depth. This concentration was selected based on a statistical analysis relating perceived water quality impairment for recreational use to total phosphorus concentration.

Reduction targets for the Lewisboro Lakes were estimated using 20 ug/l total phosphorus concentration as a target concentration. For lakes with phosphorus levels near this concentration (Oscaleta, Rippowam, and Waccabuc) 20 ug/L appears to be achievable with a focused effort to reduce the phosphorus loading. For lakes currently exhibiting higher concentrations (Kitchawan, Timber, Truesdale, and Katonah) major reductions in loading would be necessary.

The estimated percent reduction needed in each lake to approach the NYS phosphorus guidance values is summarized in Table 5-1. The table also presents the reductions in external phosphorus loading based upon two management scenarios: reducing watershed load from developed lands by 50% (through best management practices), and removing the phosphorus contribution from on-site wastewater disposal systems (through installing sanitary sewers). Clearly, approaching the guidance concentration for phosphorus in most lakes is unlikely unless the contribution from on-site systems is addressed.

Table 5-1. Estimated percent reduction needed to approach state guidance targets in relation to estimated load reductions from BMPs in watershed and elimination of on-site wastewater disposal systems.

Lake	Estimated Percent Reduction in Phosphorus load needed to meet 20 ug/l target concentration	Estimated percent reduction achieved with 50% decrease in phosphorus load in runoff from developed areas	Estimated Percent Reduction achieved with installation of sanitary sewers
Oscaleta	9%	6%	29%
Rippowam	27%	4%	68%
Waccabuc	28%	4%	27%
Kitchawan	46%	9%	72%
Timber	52%	10%	75%
Truesdale	63%	13%	65%
Katonah	82%	9%	84%

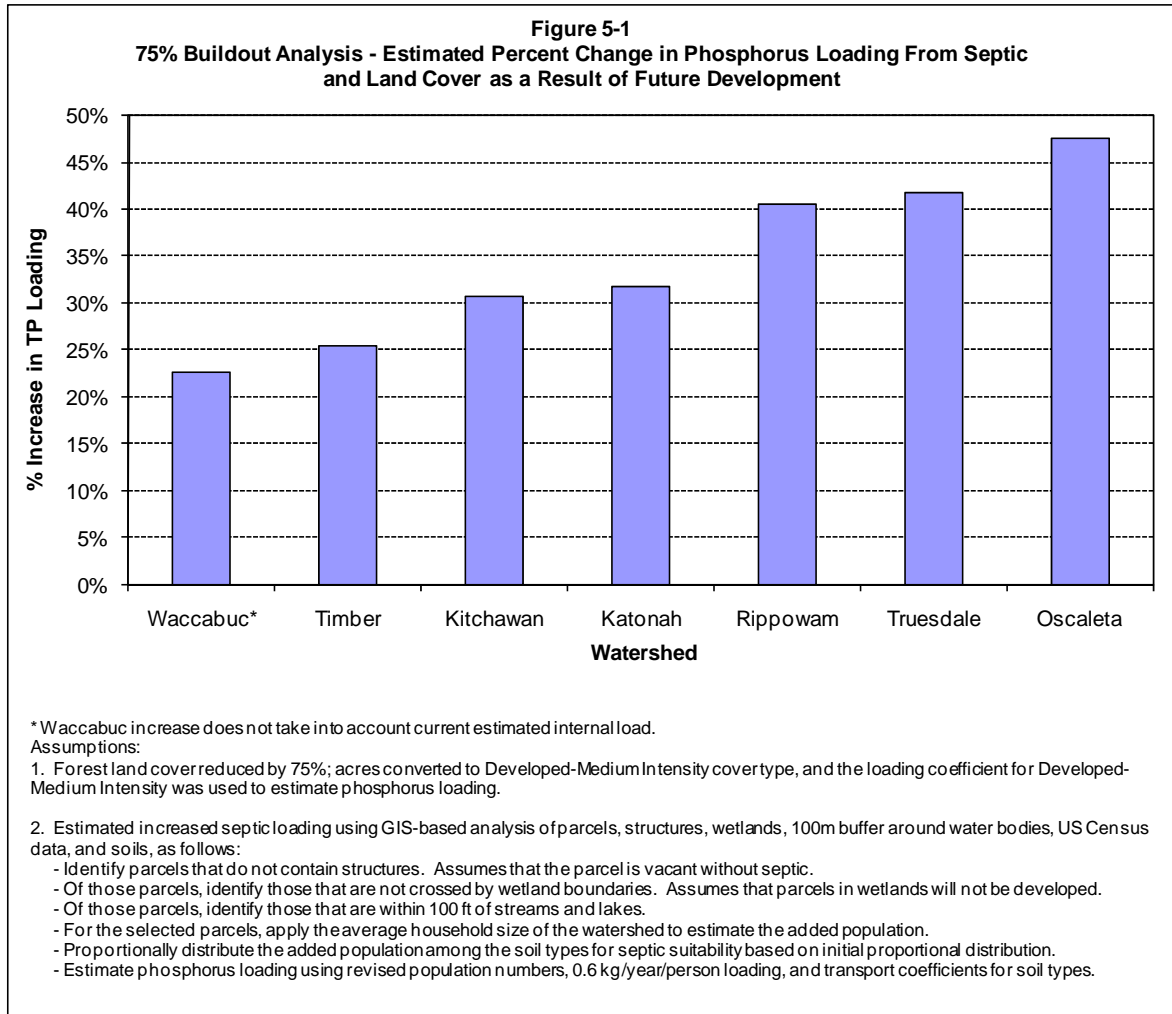
5.1. Factors Affecting Progress

There are currently numerous efforts, either underway or planned, within the watersheds of the Lewisboro Lakes intend to reduce phosphorus loading. The goal of improving water quality in the lakes cannot focus only on current phosphorus sources; the potential impact of continued development must be considered. Improved best management practices on new development can mitigate, but not eliminate, increased nutrient losses. The aging on-site wastewater disposal systems represent a continued source. The majority of soils types in the town have limited assimilative capacity for septic waste. Many areas are likely approaching saturation levels for phosphorus binding capacity. In addition, the failure rate of currently functioning septic systems will likely increase as the septic age.

All potential future sources of phosphorus must be considered when planning remedial measures. It is not difficult to imagine scenarios where extensive investments are made to reduce current sources of phosphorus only to have progress towards improvement offset by increased development in the watershed or other factors. The restoration of the Lewisboro Lakes is not simply a phosphorus reduction effort; it needs to be viewed as a combined reduction/prevention effort.

5.1.1. Build-Out Analysis

Because of the potential effects of increased development, a generic build-out analysis was performed to gauge the magnitude of increased phosphorus load to the lakes. The analysis was not meant to be a projection tool for planning purpose, but rather a technique to understand how increased development could potentially affect the lakes. It was assumed that 75% of the land area currently classified as forested is developed. The land use and septic contributions were adjusted accordingly and a revised loading estimate was calculated for each lake. The estimated percent increase in loading to each lake (**Figure 5-1**) demonstrates a range of impacts. The effect on smaller and more developed watershed is less dramatic. Overall, it is clear that future development needs to be managed in a pro-active manner to mitigate the potential for increased nutrient inputs to the lakes.



6. Town-wide management options

Existing data show that phosphorus is the primary nutrient supporting algae and weed growth in the Lewisboro Lakes, and that phosphorus enrichment is adversely affecting recreational quality. The estimates of phosphorus loading indicate that on-site wastewater disposal systems represent the most significant cultural source of phosphorus; non-point runoff from residential development is a secondary source. In addition, some of the deeper lakes exhibit anoxic conditions that allow phosphorus stored in sediments to enter the water column. Because of the high proportion of phosphorus originating from wastewater, strategies for mitigating loading should focus primarily on this source, with secondary efforts directed at storm water runoff from developed areas. The importance of phosphorus released from sediment in deeper lakes needs to be explored further.

The town has three general management options to consider:

- Do nothing

Under this option, the town would not implement watershed management actions to address water quality issues in the lakes. It is assumed that development in the town would continue, that septic system issues would not be addressed, and that enforcement of existing town codes regarding erosion control would remain as-is. It is predicted that if no actions are taken, water quality conditions in the seven lakes will gradually deteriorate over time. It is assumed that the Town of Lewisboro would not choose this approach; therefore our recommendations will focus on the following options.

- Actions to maintain/slightly improve current water quality conditions

Under this option, the objective is to maintain or slightly improve water quality conditions in the lakes. If there are changes in the watershed that result in increased nutrient loading to the lakes, remedial measures would be implemented to compensate for added nutrient loading in order to maintain net loading of nutrients. This option is most warranted in those lakes experiencing only minor levels of eutrophication: Lakes Waccabuc, Rippowam, Oscaleta, and Kitchawan.

- Actions to substantially improve water quality conditions

Under this option, the objective is to improve water quality conditions in the lakes from their present levels to the extent that it is noticeable to lake residents. This will require stronger measures to reduce, rather than maintain, nutrient loading and erosion. This option is most warranted in those lakes that are currently either in a stable eutrophic state: Lakes Truesdale, and Timber, or a stable hypereutrophic state: Katonah.

Greater levels of phosphorus reduction are associated with greater levels of effort, cost, and control over development in the watersheds. Examples of measures that could be used to address these objectives are presented in [Table 6-1](#), specific recommendations to restore/protect the Lewisboro lakes are presented in Section 7.

The Town Codes provide the primary means by which the Town of Lewisboro can begin to address the water quality issues of the seven lakes. The existing Town Codes were reviewed to

identify whether codes are already in place to address watershed management issues, and to identify gaps where issues are not addressed. This code review is detailed in [Attachment 1](#).

Table 6-1. Examples of measures for implementing phosphorus loading reductions.

Objective	Measures
Small reductions to slow the eutrophication process	<ul style="list-style-type: none"> • Storm water runoff controls <ul style="list-style-type: none"> ○ Catch basins ○ Street sweeping ○ Erosion controls • Restrict use of fertilizers containing phosphorus • On-site wastewater disposal system controls <ul style="list-style-type: none"> ○ Test for and fix failed systems ○ Require that older systems are upgraded when properties are transferred • Implement goose controls on lakes with large populations. • Public education and outreach
Moderate reductions to maintain current conditions	<ul style="list-style-type: none"> • Storm water controls – list above plus: <ul style="list-style-type: none"> ○ Require homeowners to establish and maintain vegetative buffers on properties adjacent to surface water • On-site wastewater disposal system controls– list above plus: <ul style="list-style-type: none"> ○ Require routine (e.g annual, biennial) inspection of all septic systems located within 100 m of water bodies ○ Require periodic inspection of all septic systems not located near water bodies ○ Require maintenance/repair of tested systems that are not performing properly ○ Prohibit construction of new septic systems near water bodies or in soils of very limited septic suitability ○ Conversion to composting toilets or similar technology • Development controls <ul style="list-style-type: none"> ○ Restrict new construction near water bodies ○ Require storm runoff plans for new developments ○ Mandate utilization of Low Impact Development (LID) strategies for new development and re-developmnet • Public education and outreach

Objective	Measures
Significant reductions to improve conditions	<ul style="list-style-type: none"> • On-site wastewater disposal system controls - listed above plus: <ul style="list-style-type: none"> ○ Eliminate septic systems in populated areas by installing sewers and treatment plants • Development controls – listed above plus <ul style="list-style-type: none"> ○ Prohibit new construction near water bodies ○ Restrict all new development • Public education and outreach

6.1. Feasibility of Dredging

The potential benefit of sediment removal by dredging was brought up by members of several local Lake Associations. A detailed dredging feasibility study is beyond the scope of this assignment. However, sediment samples were collected in six of the lakes during the 2008 field effort and tested for analytes used to screen dredged material for disposal options. Results are included in the Fact Sheets of the individual lakes. The detailed lab results of all 85 analytes are included as Attachment 2.

6.1.2. Sediment screening results

Sediments collected at the connections between Lakes Oscaleta and Waccabuc were composited and analyzed. This sample was classified as “uncontaminated” based on the NYS guidance for disposal of dredged material. Only trace concentrations of lead and copper were detected; all analytes were well below criteria for unrestricted disposal.

One composite sediment sample was collected in Lake Kitchawan near the bathing beach. Again, the analytes present were below thresholds for contamination. The sample exhibited detectable concentrations of the metals barium, cadmium, chromium, copper, lead, and selenium.

Two composite sediment samples were collected in Truesdale Lake (refer to Attachment 2 for map of locations). The sediments exhibited detectable concentrations of the metals: barium, cadmium, chromium, copper and lead. All except copper were below thresholds for unrestricted disposal as fill. However, copper was well above these thresholds; this is likely a result of previous algaecide applications.

Lake Katonah had a single composite sediment sample collected from its south end. Detectable levels of arsenic, barium, cadmium, chromium, copper, lead, and selenium were reported. All analytes, with the exception of copper, were below thresholds for unrestricted disposal.

A composite of Timber Lake sediments were collected along the mid-axis of the lake. They had detectable levels of barium, cadmium, chromium, copper, and lead. All were below State thresholds for being considered contaminated sediments.

These results indicate that sediments near the connection between Oscaleta and Waccabuc, near the bathing beach in Kitchawan, and along the mid-axis of Timber are likely suitable for recreational dredging. Truesdale Lake and Lake Katonah would need additional testing to draw a

conclusion regarding the potential for additional restrictions associated with sediment handling and disposal, due to the copper levels.

6.2. Progress Towards Improvement

Each individual lake association is striving to improve and protect their lake. The result of these efforts is an extensive set of recommendations by the associations and, in many cases, their consultants. In some cases, recommended actions have been or are being implemented; other lakes are not yet to that stage. A summary of the recommendations provided in other studies is presented in Table 6-2.

The current state of efforts in each lake is summarized below:

Rippowam, Oscaleta and Waccabuc: The Three Lakes Council, which coordinates the environmental efforts for the Waccabuc - Oscaleta - Rippowam watershed, monitors the water quality of the lakes. As of 2007, the Council obtained some funding for storm water runoff controls on Twin Lakes Road by the Rippowam-Oscaleta channel⁶.

Truesdale: Truesdale Lake appears to be farthest along with mitigation activities. Engineering designs were available for controlling storm runoff at six sites. In 2007, two homeowner associations proposed establishing a tax district to raise the money for repairing the dam and implementing projects in the watershed to reduce sediment and nutrient loading⁷.

Kitchawan: In November 2006, the Town of Pound Ridge was awarded a Water Quality Planning and Implementation Grant for New York City Watershed Communities to perform a Comprehensive Watershed Study of Lake Kitchawan. The outcome of this study was the ENSR report (March 2008), which recommended a management plan for the lake.

Katonah and Timber: Based on the available data, Katonah and Timber Lakes are presently in the Problem Definition stage, and are part of the CSLAP monitoring program.

⁶ Three Lakes Council website, minutes of October 2007 meeting.

⁷ Truesdale Lake Website

Table 6-2. Summary of management recommendations already made to individual lake associations.

		Rippowam	Oscaleta	Waccabuc	Truesdale	Kitchawan	Katonah	Timber
<u>Watershed Management</u>								
	<u>Nutrient Controls</u>							
	Homeowner BMPs:	X	X	X	X			X
	• Increase use of buffers; use non-phosphorus fertilizers; manage pet waste							
	Golf course management	X	X	X				
	Replace orthophosphorus with an alternate corrosion inhibitor in drinking water supply	X	X					
	Replace old on-site wastewater disposal systems with non-polluting alternatives	X	X	X				
	Wastewater management					X		
	• ongoing maintenance and inspections							
	• septic inventory/wastewater study							
	Maintaining septic systems							X
	Stormwater management					X		X
	• Buffer strips and swales; created pocket wetlands							
	• Rain garden							
	• Street sweeping/catch basin cleaning							
	<u>Erosion Controls</u>							
	Utilize effective erosion and sediment control measures during construction	X	X	X		X		
	Minimize land disturbances near surface waters							X
	Stabilize eroding gullies and streambanks	X	X	X		X		
	Maintain roads and culvert	X	X	X				
	Maintain riparian corridors	X	X	X				
	Control inlet stream sediment sources; install forebays				X			
	Address sedimentation problems in six identified areas				X			
	Zoning and Land Use Planning					X		

		Rippowam	Oscaleta	Waccabuc	Truesdale	Kitchawan	Katonah	Timber
<u>Watershed Management (continued)</u>								
	<i>Invasive species</i>							
	Control purple loosestrife	X	X	X				
	Establish invasive species task force	X	X	X				
	<i>Public Education</i>	X	X	X	X	X		
<u>In-Lake Management</u>								
	<i>Phosphorus and algae</i>							
	Alum treatment program	X	X	X				
	Lake aeration		X	X				
	Introduce rooted emergents along shores to take up nutrients, improve aesthetics & habitat				X			
	Discourage waterfowl				X			
	<i>Plant controls</i>							
	Mechanical controls	X	X	X				
	Herbicides	X	X	X		X		
	Allow bassweed to out-compete Eurasian water milfoil		X	X				
	Dredge coves to increase habitat diversity				X			
	Dredging to control plants					X		
	Benthic barriers					X		
	Hand pulling (with manual removal)					X		
	Harvesting with collection					X		

			Rippowam	Oscaleta	Waccabuc	Truesdale	Kitchawan	Katonah	Timber
		Hydroraking					X		
		Invasive species control plan					X		
		Minimize introductions of additional exotic plants and animals from public and private launch areas into lake							X
		Selective planting					X		
<u>Channel Management</u>									
		Between Rippowam and Oscaleta	X	X					
		Between Oscaleta and Waccabuc		X	X				
<u>Sources:</u> Rippowam, Oscaleta and Waccabuc – Cedar Eden 2004; Truesdale – Land-Tech 2001; Kitchawan – ENSR draft 2008; Timber – CSLAP 2006									

7. Recommended Strategies

The lakes in Lewisboro can be placed into three groups; those that are in the beginning stages of eutrophication (Waccabuc, Rippowam, Oscaleta, and Kitchawan), those that are in a stable eutrophic state (Truesdale and Timber), and those that are hypereutrophic (Katonah). Those in the beginning stages of eutrophication would likely see some improvements with only relatively moderate reductions in phosphorus loading. The eutrophic lakes will require more intensive efforts before improvements are realized. Lake Katonah's phosphorus concentrations are extreme and will require a large reduction in phosphorus before significant improvements are realized. Although there are many options available to decrease phosphorus loading, effective solutions must be tailored to reflect the most significant sources and consider the nature of the watersheds.

7.1. Reduction in phosphorus migration from on-site wastewater disposal systems

Because on-site wastewater disposal systems are by far the most significant source of anthropogenic phosphorus to the surface waters of all the Town's lakes, effective strategies to minimize this source should be the primary focus. Unless this source is mitigated, it is unlikely that other efforts will result in noticeable long term improvements to water quality.

7.1.1. Sewers

It is estimated that between 27% and 85% of the phosphorus entering the lakes originates in septic systems. The single best way to reduce/eliminate this load would be to install a wastewater treatment system (sewers) in each watershed. All lakes would be expected to show water quality improvements after the elimination of this load. The benefits would likely not be realized immediately however. Phosphorus laden groundwater from septic tanks takes a varying amount of time to reach the lakes. In some cases it could be decades before the full benefit of sewers is realized.

An example of a watershed community facing similar challenge is nearby Peach Lake (see text box). The municipalities in this watershed are constructing a wastewater collection and treatment system to mitigate water quality degradation associated with wastewater disposal. The following recommendation is offered:

The Peach Lake Example

In 2003 Putnam and Westchester Counties retained Stearns & Wheler, LLC to perform a wastewater study of Peach Lake. It was concluded that septic systems around the lakeshore were failing and discharging effluent into the lake. Due to the limiting conditions for enhanced on-site septic systems along the lake shore properties, it was decided that the construction of a sewer system and new treatment plant was the only option to eliminate the health risks and stop the lake degradation. The proposed service area for the low pressure, sanitary sewer system includes approximately 470 properties located in four associations around the Lake and a cluster of nearby businesses.

The treatment plant will discharge into the outlet of Peach Lake Brook (extensive wetlands permitting will be required). The plant will be designed with a permitted capacity (maximum month) of 170,000 gallons per day and an expected average annual flow of 120,000 gpd.

Any new surface discharging plant within the drinking water supply watershed requires a variance under New York City Watershed Rules and Regulations. The location of the plant places it under the jurisdiction of both the NYSDEC and NYCDEP. As such, it requires an advanced level of treatment including ammonia removal, sand and membrane filtration, and ultraviolet disinfection.

Estimated project costs:
Treatment plant: \$10 million
Collection system: \$14 million.
Average cost per resident \$1200 per year for 30 years

Funding:
Putnam County: \$2.5 million
Westchester County: \$10 million
NYCDEP: TBD (they will reimburse for the tertiary level of treatment which is currently estimated to be \$2.4 million)

- ✓ The Town of Lewisboro should work with an engineering firm to conduct a feasibility/cost/benefit analysis associated with installing sewers in the

watersheds of each lake. Priority watersheds should be those with the highest phosphorus levels: Katonah, Truesdale, and Timber.

7.1.2. Mitigation of Existing On-site Wastewater Disposal Systems

Until a decision is made regarding the financial and technical feasibility of installing sanitary sewers, stringent requirements for maintenance and inspection of the on-site systems is recommended. Financial incentives for installation of technologies separating gray water and using non-discharge alternatives (such as composting toilets) for toilet waste should be considered. Discussion with the County Health Department will need to take place to outline the permitting process.

This option is likely to be significantly less effective than installations of sewers and will require constant monitoring and maintenance. It will also be costly to home owners. It may be a feasible alternative in the less eutrophic lakes; Waccabuc, Rippowam, Oscaleta, and possibly Kitchawan, where the recommended phosphorus reductions are less than other lakes. The overall effectiveness of this option is not predictable because the failure rate and current conditions of the septic systems are not known.

The effectiveness of this option may also be limited because of the poor soil suitability of the watersheds. Properly functioning on-site wastewater disposal systems located on soils with limited assimilative capacity will still result in phosphorus transport to surface waters. Unfortunately much of the Lewisboro watershed in proximity to the lakes is limited with regards to its phosphorus assimilative capacity, meaning that inspection and maintenance will do little to reduce phosphorus loads in these areas. The following recommendations are offered:

- ✓ In areas of lake watersheds where sewers are not installed the Town of Lewisboro should institute a septic inspection and maintenance program whereas septic are inspected every five years and pumped biennially.
- ✓ The Town of Lewisboro should offer financial incentives to homeowners who convert to new technologies designed to reduce impact from septic systems. Some examples of these types of technologies are: composting toilets, and gray water recycling systems.

7.2. Management of Stormwater Runoff

Stormwater has been identified as a major conduit for phosphorus traveling from developed areas of the watersheds to the lakes. The Town of Lewisboro recognizes this and has already taken a number of steps to reduce stormwater impacts, including forming a Stormwater Management Committee in September 2007, and passing two stormwater ordinances in December 2007 to address illicit discharges, stormwater management, and sediment and erosion control measures. In addition a number of stormwater management projects have been completed, or are underway, in several watersheds. These projects include activities such as construction of catch basins and identifying storm drains and discharge points.

The current stormwater management efforts by the Town should continue and expand, as reflected in the following recommended actions.

- ✓ The Town of Lewisboro should continue to identify stormwater discharge points and drains.
- ✓ The Town of Lewisboro should expand its funding of stormwater management BMPs such as catch basins. The recommendations provided by each lakes association should be used as guidance.
- ✓ The Town of Lewisboro should form watershed tax districts in order to provide a dedicated funding source to upgrade the Towns stormwater management program.

7.3. Development / Land Acquisition

New development will result in increases in phosphorus loading to the lakes. Unless controlled, new development will reduce the effectiveness of efforts to decrease phosphorus elsewhere in the watershed. Three recommendations are offered to address this issue.

- ✓ Consider adopting a moratorium on new construction of homes in affected watersheds until a sewer feasibility study is completed.
- ✓ The Town of Lewisboro should pass an ordinance that prohibits new septic constructed in areas of lake watersheds that are within 100 meters of a waterbody that is hydrologically connected to one of the Towns lakes.
- ✓ The Town of Lewisboro should identify and acquire key parcels of open space. Place high priority for acquisition of properties in riparian areas.

7.4. Fertilizer Restrictions

There are a large number of homes on or near most of the Lewisboro Lakes; many with cultivated lawns. Fertilizers applied to lawns are potentially a significant source of nutrients to nearby lakes. Several recommendations are offered:

- ✓ The Town of Lewisboro should introduce a local law restricting application of phosphorus as a fertilizer. The local law should consider the following provisions: “Fertilizers containing phosphorus cannot be used on lawns and turf in the watersheds of the Lewisboro Lakes unless one of the following situations exists:
 - A soil test or plant tissue test shows a need for phosphorus.
 - A new lawn is being established by seeding or laying sod.
 - Phosphorus fertilizer is being applied on a golf course by trained staff.
 - Phosphorus fertilizer is being applied on farm cropland.
- ✓ Fertilizers containing phosphorus should not be used on lawns and turf within 100m of a lake or waterbody hydrologically connected to one of the lakes.

7.5. Canadian Geese Controls

The number of geese on the lakes and phosphorus contribution from their waste is not quantified for the Lewisboro Lakes. An estimate as to the benefits, if any, of instituting/continuing controls cannot be made without further quantitative study. However, control efforts can be implemented rather easily and at low cost. Some reduction in overall phosphorus load would likely occur, although it is highly unlikely

that these reduction would result in any notable changes in water quality. Benefits beyond phosphorus reduction are also likely to result. We recommend that:

- ✓ The Town of Lewisboro continues with their egg oiling program on the Three Lakes and Truesdale Lake, and considers implementing a similar program on the other Town lakes.
- ✓ On lakes where goose populations become large the Town should implement a volunteer goose harassment program designed to deter geese from staying on the lakes for long periods.

7.6. Education/Involvement

Educating and involving the public in the decision making process will be essential for successful implementation of a protection/restoration plan. The following recommendations are offered:

- ✓ The Town of Lewisboro, in collaboration with the Lake Associations, should convene a public forum to discuss lake ecology, the range of current water quality conditions in the seven lakes, and potential mitigating measures
- ✓ The Town, in collaboration with the Lake Associations, should prepare an annual Lewisboro Lakes Report Card to enhance public understanding of water quality conditions and contributing factors.

7.7. Summary of Findings and Recommendations for Each Lake

Specific observations and recommendations summaries for the seven Lewisboro Lakes are summarized in **Table 7-1**.

Table 7-1. Summary of Major Findings and Specific Recommendations for Lewisboro Lakes, ordered by lake surface area.

Pond	Findings	Recommended Actions
Lake Waccabuc	Borderline eutrophic, generally good clarity, periodic algal blooms, elevated lower water phosphorus, Brazilian elodea in '08, on-site wastewater disposal systems primary P source	Education, protection, small/moderate reductions in phosphorus, additional study needed on impact of lower water phosphorus, immediate management of Brazilian elodea, consider dredging channels between other lakes, routine bacteria testing, stormwater management, consider sewers
Lake Kitchawan	Borderline eutrophic, algal blooms less than expected given phosphorus, macrophytes probably tying up phosphorus in biomass, stormwater,	Education, moderate reductions in phosphorus, benthic barriers in swimming area, do not try to reduce macrophyte growth, routine bacteria

	on-site wastewater disposal systems primary phosphorus source,	testing, stormwater management, consider sewers
Truesdale Lake	Eutrophic, algal bloom prevalent, poor clarity, copper contaminated sediments, stormwater very problematic, on-site wastewater disposal systems primary phosphorus source	Education, significant reductions in phosphorus, routine bacteria testing at beaches, stormwater management, sewers needed
Lake Oscaleta	Borderline eutrophic, generally good clarity, periodic algal blooms, somewhat elevated lower water phosphorus, on-site wastewater disposal systems primary phosphorus source	Education, protection, small/moderate reductions in phosphorus, additional study needed on impact of sediment phosphorus release, consider dredging channels, routine bacteria testing, consider sewers
Lake Rippowam	Borderline eutrophic, generally good clarity, periodic algal blooms, elevated phosphorus in the lower waters, on-site wastewater disposal systems primary phosphorus source	Education, protection, small/moderate reductions in phosphorus, more information needed on impact of sediment phosphorus release, consider dredging channels, routine bacteria testing, consider sewers
Lake Katonah	Hypereutrophic, poor clarity, nuisance algal blooms, sediment has elevated concentration of some metals, especially copper, watershed unsuitable for on-site wastewater disposal systems, stormwater issues significant, on-site wastewater disposal systems primary phosphorus source	Education, large reduction in phosphorus load needed, routine bacteria testing, stormwater management and sewers critical
Timber Lake	Eutrophic, algal blooms, moderate clarity, elevated levels of some metals, especially copper in sediments, stormwater problematic, on-site wastewater disposal systems primary phosphorus source	Education, significant reductions in phosphorus, routine bacteria testing, stormwater management, sewers likely needed

8. Priority Actions for the Town of Lewisboro

Actions recommended for 2009

Convene a public educational forum to discuss current water quality and habitat conditions of the lakes of Lewisboro. Solicit public input on the desired future for the lakes (overall and for individual lakes). Major topics include:

- The eutrophication process
- How have conditions changed in recent decades
- What can be done
- Why each lake may require slightly different strategies (protection, active intervention) based on physical characteristics, current conditions, and desired use
- How will a wastewater facilities affect the lakes
- What are the costs and benefits associated with alternatives

Continue and expand the annual lakes monitoring program to improve baseline data and gather data needed to apply for permits and funding for implementation of control measures. The recommended monitoring plan would collect water the standard CSLAP variables monthly from May to October in all lakes. Stratified lakes would include a near bottom water sample analyzed for phosphorus. Prepare an annual Lewisboro Lakes Report Card to enhance public understanding of water quality conditions and contributing factors.

Convene technical committee (or select consultant) to initiate detailed planning, cost estimating, and identify funding sources for construction regional wastewater treatment facilities to serve the Town of Lewisboro Lakes watersheds.

Propose creation of watershed tax districts to help fund stormwater management.

Propose an initiative program to encourage the use of “green” technologies as they relate to onsite waste water treatment.

Propose a moratorium on septic system construction in lake watersheds until decision is made on wastewater treatment facilities.

Introduce a local law prohibiting septic system construction within 100 meters of a waterbody hydrologically connected to one of the Towns lakes.

Actions recommended for 2010 - 2011

Propose a local law requiring periodic inspection, maintenance, and pumping of individual on-site wastewater treatment systems if wastewater facility option not initiated. The frequency can be linked to distance to lakes and hydrologically connected waterbodies, with more stringent requirements within a defined buffer zone.

If wastewater facilities are not approved, propose an ordinance that prohibits any septic system construction within 100 meters of a waterbody that is hydrologically connected to one of the Towns lakes.

Continue to convene periodic public educational forums that focus on current conditions and what needs to be done.

Continue the expanded annual lakes monitoring program and Lewisboro Lakes Report Card

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Attachment 1

Local Laws to Regulate Actions that Affect Water Quality

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Attachment 1

Local Laws to Regulate Actions that Affect Water Quality

The Town of Lewisboro has implemented local laws that can regulate actions which may impact water quality in the lakes. Best Management Practices (BMPs) are used to mitigate the impact of regulated actions on water quality. These BMPs can be grouped into four categories¹:

- Reduction of nutrients in nonpoint and point source runoff
- Control and minimization of erosion and sedimentation
- Management of stormwater runoff
- Pollution prevention measures

Using these four categories, the Town Codes of Lewisboro were reviewed to identify existing codes that require implementation of BMPs and gaps where BMP opportunities are not addressed.

The Town Codes for other towns in New York State, as well as the Town of Ridgefield in Connecticut, were reviewed to find examples of how other communities are implementing local regulations to address BMPs and water quality. The Town of Ridgefield, Connecticut, was included in this review since a portion of the town lies within the watersheds of Truesdale and Oscaleta Lakes. These examples provide Lewisboro with ideas for how to improve their Town Codes and manage water quality for the town's lakes.

1. Lewisboro Town Code Review

Review and analysis of the existing data associated with the seven lakes in the Town of Lewisboro revealed that water quality is most impacted by nutrient loading to the lakes. Therefore, reduction of nutrients in nonpoint and point source runoff is the first priority for the Town to address. Erosion and sedimentation, stormwater runoff management, and pollution prevention measures are also important, but these issues may be considered a secondary priority relative to the greater impact that nutrient loading has on the lakes.

1.1. Reduction of nutrients in nonpoint and point source runoff

Nutrients such as phosphorus and nitrogen are necessary to support aquatic plant life in lakes. However, when levels of nutrients are too high, algal blooms occur. These blooms reduce water clarity, cutting off sunlight to aquatic plants and impairing recreational uses. There may be mats of algae floating in the lake, and there may be unpleasant odors from decaying mats washed up along the shoreline.

When the algal blooms die, bacteria decompose the dead algae and consume dissolved oxygen in the lake, affecting fish and other aquatic organisms.

¹ Derived from Local Laws to Protect Finger Lakes Water Quality Project – Canandaigua, Cayuga and Conesus Lake Watersheds. Phase 1: Assessment of Ordinances and Practices. Genesee/Finger Lakes Regional Planning Council, July 2005.

To reduce algal growth in lakes, it is important to control nutrient loading to the lake. Sources of these nutrients include septic systems, commercial fertilizers, manure, compost, and overpopulation of waterfowl.

Based on review of the existing lake water quality data, septic system contributions appear to be the most significant source of nutrients to the lakes. During field observations, EcoLogic staff noted that many well-maintained, green lawns directly abut many of the lakes; fertilizer applications to these lawns would also contribute to nutrient loading to the lakes. Manure, compost and waterfowl contribute a relatively smaller proportion of nutrients.

1.1.1. Septic system contributions

Septic systems contribute nutrients to nearby water bodies, especially when the systems are failing. Suggested BMPs include:

- Routine inspection and maintenance of septic systems to identify failure problems early.
- Require certification of existing on-site septic systems for property transfers or building expansions.
- Maintain septic fields at a distance from water bodies to reduce the potential for nutrient transport.
- Eliminate the use of septic systems by connecting to municipal sanitary systems whenever possible.

The Town of Lewisboro Code includes prohibited, allowable, and regulated activities in wetlands relating to septic systems. Placement of a sewage disposal tank or plant or septic field is prohibited within any wetland or watercourse. Septic tank pumping is an allowable activity which does not require a permit. Repair of existing septic disposal facilities is a regulated activity and requires a permit (§217-5). In addition, the placement of sewage disposal tanks, plants and septic fields within the 150-foot buffer area of a wetland is discouraged (§217-6).

Connection to municipal sanitary sewer system is required where, in the opinion of the Planning Board, connection is possible and warranted (§195-23 and §220-26)

Chapter	Article	Sections
Chapter 217 Wetlands	n/a	§217-5. Prohibited, allowable and regulated activities. §217-6 - Permit procedures
Chapter 195 Subdivision of Land	Article V Design Standards	§195-23 – Improvements
Chapter 220 Zoning	Article IV District Regulations	§220-26. R-MF Multifamily Residence District

There are no Town Codes specifying the frequency of inspection of septic systems, or requiring certification of septic systems for property transfers or building expansion.

1.1.2. Lawns, golf courses, parks – fertilizers

Commercial fertilizers applied to lawns, golf courses and parks are sources of nutrients to the lakes. To protect water quality, suggested BMPs include:

- Minimize the use of fertilizers and establish buffer zones between fertilized areas and surface water bodies.
- Use indigenous vegetation as much as possible to reduce fertilizer requirements, which also minimizes the potential for introduction of invasive species.

There are no Town Codes that address application of fertilizers in the landscape. Buffer zones are identified in some Town Codes with respect to septic system placement and wetlands; however, buffer zones are not highlighted with respect to fertilizer applications.

1.1.3. Agriculture/manure/pet waste

Manure, compost piles, leaf litter, and pet wastes are sources of nutrients to the lakes. Suggested BMPs include:

- Keep runoff from manure, compost and other organic wastes away from streams and shorelines, either through containment structures or by establishing buffers.
- In agricultural practices, runoff of nutrients can also be minimized using Best Management Practices recommended by federal, state and local agricultural agencies.

The Town of Lewisboro Codes requires a Horse Management Plan, approved by the Planning Board, which includes “provisions for the storage, disposal or removal of manure and other wastes....” (§220-23) As part of this Code, storage and disposal of manure, soiled bedding and other materials that may impact water quality are prohibited within 150 feet of a watercourse or wetlands area, and wetland areas are to be designated and measures identified to prevent animal wastes from entering the area. Also in this code is the extension of the 150-foot boundary to include situations with farm animals and poultry.

Chapter	Article	Sections
Chapter 220 Zoning	Article IV District Regulations	§220-23 Schedule of regulations for residential districts.

The requirements under the Horse Management Plan could be extended to include compost piles. Agricultural BMPs to control nutrient loading are not specifically called out in the Town Code; however, since there is very little agriculture in the lakes’ watersheds, the inclusion of agricultural BMPs in the Town Code would not likely have an effect on the water quality of the lakes.

1.1.4. Waterfowl populations

In areas where geese are numerous, flocks may contribute too many nutrients to lakes through their wastes. Suggested BMPs include:

- Flocks should be managed to keep numbers in check.
- Town visitors and residents should be discouraged from feeding the birds, which will encourage the birds to find forage elsewhere.

There are no Town Codes that address controlling waterfowl sources of nutrients to the lakes.

1.2. Control and minimization of erosion and sedimentation

Erosion in upland areas and along stream banks transports soils, nutrients and other contaminants into the lakes. Accumulation of sediment reduces water depths in the lake over time, which impacts boating, swimming, and other uses. Dredging projects are typically implemented to restore the lake depth. By controlling erosion and reducing the volume of sediment transported to the lake, dredging – an expensive activity - would be required less frequently.

The transport of nutrients and other contaminants into the lakes also affect the quality of the water. This transport can be reduced by controlling erosion.

1.2.1. Upland areas – grading, construction (pre-, during and post-).

In areas upland of lakes and other waterbodies, development disturbs the vegetation and soils, leading to increased erosion. To minimize the potential for erosion, suggested BMPs include:

- Take into account the natural topography and soil type at the development site. Development should be limited to sites with stable soils and gentle slopes.
- Retain natural vegetation as much as possible in and around the site.
- When grading a site, road, or driveway, the grade should be limited.
- During construction, care should be taken to minimize the length of time soils are exposed, and disturbed soils should be stabilized as soon as possible. Erosion control measures that may be implemented during construction would include temporary vegetation or mulching.
- In addition to development sites, other sites in the watershed that are susceptible to erosion should be identified and plans made to stabilize these soils.

The watersheds for the seven lakes in Lewisboro have very steeply sloped areas. The Town of Lewisboro Code addresses upland erosion issues in several sections of

the Town Code, including sections on development, flood, wetlands, zoning, illicit stormwater discharge, and stormwater management:

Chapter	Article	Sections
Chapter 195 Subdivision of Land	Article V Design Standards	§195-21 - General provisions §195-23 - Improvements §195-25 - Erosion control standards.
Chapter 126 Flood		§126-2. Purpose <ul style="list-style-type: none"> • control development that may increase erosion; • control alteration of floodplains
Chapter 217 Wetlands	n/a	§217-1. Requirement that activities in wetlands/watercourses are not to increase erosion/sedimentation
Chapter 220 Zoning	Article III General Regulations	§220-15. Landscaping, screening and buffer areas
	Article VI Development Plan	§220-55. Parking areas will be designed to avoid erosion.
Chapter 188 Illicit discharge	Article IV Prohibition	§188-6 – Prohibition against activities contaminating stormwater
Chapter 189 Stormwater Mgmt	Article IV Stormwater Pollution Prevention Plans	§189-7 – SWPPPs for land development activities must address erosion/sediment controls, and water quantity/quality controls (post-construction stormwater runoff controls)
	Article V Requirements	§189-8 (A) - An application for approval of a SWPPP shall provide the information and erosion and sediment controls as listed. §189-8 (B, C) – Land development activities will include post-construction stormwater runoff controls; including inspection and maintenance

1.2.2. In lakes and streams – wakes, shoreline stabilization etc

Erosion and sedimentation also occur along shorelines and in streams, contributing to sediment loading to the lakes. Shoreline erosion can be controlled by these BMPs:

- Establishing no-wake zones, where boat speeds are regulated and near-shore wakes minimized.
- Use vegetation and bioengineering methods for controlling shoreline and stream bank erosion, although manmade structures may be used where necessary.
- In-stream crossings by heavy equipment or animals should be minimized.
- In-stream sedimentation can be controlled by designing structures such as bridge abutments in ways that minimize erosion energy.

The Town of Lewisboro Code addresses issues of temporary erosion control structures in streams during construction, and restricts in-stream crossings by heavy equipment:

Chapter	Article	Sections
Chapter 195 Subdivision of Land	Article V Design Standards	§195-25 - Erosion control standards
Chapter 189 Stormwater Mgmt	Article VII Maintenance, Inspection and Repair	§189-12 – Maintenance, inspection and repair of stormwater facilities 189-13 – Maintenance easement(s) 189-14 – Maintenance after construction 189-15 – Maintenance agreement 189-16 – Administration and inspection

No-wake zones and other shoreline erosion controls are not established in the Town Code. However, boat wakes in these lakes may not be a significant source of shoreline erosion due to limitation on motor boats:

- The Three Lakes (Waccabuc, Oscaleta and Rippowam) are called out in Chapter 89 with specific horsepower limitations, which limit the speed of the boats and reduce wakes.
- Gas-powered boats are not permitted on Truesdale Lake, or Timber Lake².

1.3. Management of stormwater runoff

Stormwater runoff represents a volume of water that does not infiltrate into the ground. Rather, it runs off impervious surfaces directly into streams and lakes, contributing to flooding, erosion, and the transport of nutrients and other contaminants. The volume and velocity of runoff should be controlled to minimize the transport of soils and contaminants to the lakes. Stormwater runoff may be reduced by limiting the amount of impervious surfaces in the watershed. Runoff may be controlled using basins and other structures.

1.3.1. Impervious surfaces (roads and roofs); loss of vegetative cover

Roadways, roofs, parking lots and other impervious surfaces allow stormwater to run off quickly rather than infiltrate into soils to recharge groundwater. The runoff also picks up pollutants from these surfaces and carries them to nearby waterbodies. By minimizing impervious surfaces in the watershed, the volume of runoff – and subsequent transport of contaminants – will be reduced.

Where vegetative cover is maintained, stormwater collects on leaves and drips through to the soil, gradually infiltrating to the groundwater. The presence of impervious surfaces allows stormwater to run off rapidly, contributing to erosion.

The Town of Lewisboro Code encourages preserving natural vegetative cover for land to be subdivided (Chapter 195) and restricts, in non-residential districts, the creation of impervious surfaces that do not conform to the site development plan approval procedures (Chapter 220). Stormwater management BMPs are mentioned

² <http://www.truesdalelake.com/modules/mydownloads/images/downloads/truesdaleboatsticker.pdf>

in the context of remediating discharge violations (Chapter 188), and are defined generally as:

“Schedules of activities, prohibitions of practices, general good house keeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.” (*Chapter 188*)

Chapter	Article	Sections
Chapter 195 Subdivision of Land	Article V Design Standards	§195-21-General provisions
Chapter 220 Zoning	Article VI Site Development	§220-44-Plan approval
Chapter 188 Illicit discharge	Article V Enforcement	§188-9 – Prevent, control and reduce stormwater pollutants using BMPs

1.3.2. Basins and control structures – prevent flooding, reduce volumes

The recommended BMPs to prevent flooding and reduce volumes of runoff include:

- Retention basins or other structures should be installed to reduce flow velocity, allow settling of materials carried by the runoff, and reduce the flood peak downstream. Shallow, vegetated basins are generally preferred. These structures should be maintained and inspected frequently to ensure that they function properly.
- In new developments, stormwater runoff plans should be required. Runoff calculations should include contributions from upgradient of the development site, as well as the potential impacts to runoff volumes downgradient of the site.

The Town of Lewisboro Code specifies that “stormwater retention ponds shall be considered as an integral part of the design wherever deemed feasible” (§195-23). Direct discharge of untreated stormwater runoff is prohibited under §217-5.

The Town Code also states that “A culvert or drainage facility shall, in each case, be large enough to accommodate potential runoff from its entire upstream drainage area, whether inside or outside the subdivision.” It is the responsibility of the Planning Board to “consider the effect of each subdivision on existing downstream drainage facilities outside the area of the subdivision. Where it is anticipated that the additional runoff incident to the development of the subdivision will overload an existing downstream drainage facility, the Planning Board shall notify the Town Board or other appropriate owners of downstream property of such potential condition” (§195-23).

Stormwater Pollution Prevention Plan (SWPPP) is “a plan for controlling stormwater runoff and pollutants from a site during and after construction activities”. SWPPP are required for land development activities in Lewisboro that are not exempted (§189.5). Maintenance of stormwater runoff control structures is also addressed in the Town Codes (§189-12).

The Town has implemented two codes to comply with Federal and State Phase II stormwater management requirements – Chapters 188 and 189.

Chapter	Article	Sections
Chapter 195 Subdivision of Land	Article III Application Procedure	§195-14 - Sketch plan conference and Planning Board review.
	Article V Design Standards	§195-23 – Improvements, (C) Drainage improvements
Chapter 217 Wetlands		§217-5 - Prohibited, allowable and regulated activities
Chapter 188 Illicit discharge	Article IV Prohibitions	§188-5(B) – continued existence of illicit connection §188-6 – Prohibition against activities contaminating stormwater
	Article V Enforcement	§188-8 – Enforcement, notification and remedy §188-9 – Prevent, control and reduce stormwater pollutants
Chapter 189 Stormwater Mgmt	Article IV SWPPP	§189-7 (D) SWPPP Review §189-7 (E) – Land development permits
	Article V Requirements	§189-8 – Stormwater pollution prevention plan requirements <ul style="list-style-type: none"> • A16&16 – Structural practices to divert flows from exposed soils • B&C – Water quantity and water quality controls §189-9 – Other environmental permits
	Article VI Performance & Design	§189-11 – Land development activities subject to design criteria §189-11(A) – Performance and design
	Article VII Maintenance, inspection & repair	§189-12 – Maintenance, inspection and repair of facilities
		§189-16 – Administration and inspection

1.4. Pollution prevention measures

Water quality is also affected by other forms of pollution. Sources of other pollutants include waste disposal, littering, spills, and road sanding or salting.

1.4.1. Waste disposal/littering

Chemical and other wastes should be kept from entering the water. Proper disposal of these wastes should be encouraged by providing easy ways for town residents and businesses to comply. Littering should be prohibited. Disposal areas such as landfills or incinerators should be located away from streams, wetlands and lake shorelines.

The Town of Lewisboro Code addresses garbage, rubbish and refuse under Chapter 134, and littering under Chapter 150. Overall, Chapter 134 addresses licensing for collectors, fees, acceptable and prohibited wastes, and compliance standards for pre-collection, collection practices, vehicle maintenance, and hours of operation. These contribute toward keeping waste contained and out of the waterways. Stormwater discharges and management are addressed under Chapters 188 and 189, respectively.

Chapter	Article	Sections
Chapter 134 Garbage, rubbish and refuse	n/a	all
Chapter 150 Littering	n/a	all
Chapter 188 Illicit discharge	Article 1 Purpose	§188-2 (E) - Public awareness
	Article V Enforcement	§188-12 – Access and monitoring of discharges §188-17 Alternative Remedies (B2) – Storm drain stenciling
Chapter 189 Stormwater Mgmt	Article V Requirements	§189-8 Stormwater pollution prevention plan requirements; A5&6 – Pollution prevention and construction/waste materials

1.4.2. Spill controls, emergency response

Control measures for liquid spills should be implemented to reduce accidental discharge of liquid contaminants to waterways. Storage tanks for fuels and other liquids should include proper secondary containment, with routine monitoring for leaks. Liquid transfer practices should be implemented to minimize the risk of spills. Persons responsible for maintaining liquid transfer and storage should have proper training in how to deal with spills.

There is one Town Code addressing spills, specifically the reporting and response requirements where such spills enter the Town's municipal separate storm sewer system.

Chapter	Article	Sections
Chapter 188 Illicit discharge	Article IV Prohibition	§188-6 – Prohibition against activities contaminating stormwater
	Article V - Enforcement	§188-8 (C) – Notification and response procedures §188-13 – Notification of spills

1.4.3. Marina activities

Located adjacent to waterways, marinas are prime areas for activities that may degrade water quality. Fuel storage and use should be carefully controlled to minimize release into the water. Boat wastes must be handled and disposed of properly by both boaters and marina staff. Any maintenance activities, such as

cleaning boat hulls, painting, or sand blasting, should be conducted away from the water under controlled conditions.

There are no Town Codes addressing marina activities. Since marinas were not observed on the seven Lewisboro Lakes during EcoLogic's field surveys, there would be no need for Town Codes addressing these activities.

1.4.4. Road sands and salts

Road sands and salts are dispersed throughout the town during winter months. These can impact water quality, particularly when applied near waterways. Application near waterways should be limited, and the amount applied to roads should be minimized as much as possible to protect water quality. Alternate products can be used. In the spring, street sweepers can be used to collect sand and salt before it runs off into surface water.

There are no Town Codes addressing road sanding or salting as it pertains to protecting lake water quality.

2. Other Town Codes Review

There are some gaps in the Town of Lewisboro Codes that, if filled, may provide more protection for the water quality in the Town's lakes. The Town of Ridgefield, Connecticut, as well as other communities around New York State, have implemented local laws³ that could be used as guidance as the Town of Lewisboro considers modifying their codes.

The following sections highlight those areas where a gap was identified in the Town of Lewisboro Codes, and how other communities have addressed the problem. Since review of existing data suggest that nutrient loading is the most significant impact to water quality in the lakes – particularly originating from septic systems – the emphasis for this review focused on septic regulations.

2.1. Reduction of nutrients in nonpoint and point source runoff

2.1.1. Septic system contributions

Septic systems have been identified as a significant source of nutrients to the lakes.

Town of Lewisboro Codes: There are no Town Codes addressing frequency of inspection of septic systems, or requiring certification of septic systems for property transfers or building expansion.

Other Town Codes: Other towns have addressed issues of septic systems and water quality in several different ways, as summarized below.

- **Steep Slope Protection**
Steep slopes are protected to minimize the impacts of development activities. Project review and permit approval are

³ Town codes can be found at www.generalcode.com

required prior to project commencement. This would include the approval of construction and placement of a sewage disposal system including septic tanks, drainage or leach fields.

- Establish minimum setback for sewage/septic
 - Minimum setback distances from water bodies are established for on-site sewage facilities and septic systems – for example, one town has required that a septic system may not be constructed within 100 feet of the lake body.
 - Specified distances from a wetland or watercourse are required based on the activity being performed. (see Town of Ridgefield Code, table under Section 4 for Permitted and non-Regulated Uses).
 - Permits are required before any activity can take place. Any permitted activity may be required to be conducted further from a water source than initially designated in order to protect said water source. Any septic system in an upland review area under construction or in need of repair should be permitted and not deemed as a regulated activity.
- Construction requirements
Single residences, multiple family residences, commercial properties or subdivisions near a water source are required to have a distribution box for septic tank overflow and an effluent disposal area in proper relation to the groundwater table.
- Public sewers
When public sewer becomes available to a property, that property is required to make a direct connection and the septic tank, cesspools and private sewage disposal facilities shall be abandoned and filled in.
- Routine testing and certification
 - One town requires testing with a conventional dye test and certification of septic systems every five years.
 - Some towns are requiring regular tank inspections in water quality protection zones to be pumped at least once every five years, the tanks inspected for damage and the system is running efficiently. After tank pumping, an inspection report must be done and filed with the NYSDEC.
- Restrictions on septic disposal
Towns require septic system users to restrict or eliminate materials that go into the septic. These restrictions include:
 - non-usage of septic tank additives
 - avoid use excessive quantities of detergents, kitchen wastes, laundry wastes and household chemicals

- avoid placing non-disposable items in the tank.

2.1.2. *Lawns, golf courses, parks – fertilizers*

Fertilizer application to lawns, parks or golf courses that abut lakes or streams may be direct sources of nutrients to the lakes.

Town of Lewisboro Codes: There are no Town Codes that address fertilizer application in the landscape.

Other Town Codes: Other towns in the region have implemented codes to address fertilizer application. For example, the Town of Ridgefield, in their Mamanasco Lake Protection Guidelines, requires the application of only organic slow release fertilizers, the amount of which is based on soil fertility tests.

2.2. Ridgefield Inland Wetlands and Watercourses Regulations⁴

The Town of Ridgefield has implemented Inland Wetlands and Watercourses Regulations. These regulations provide detailed guidelines for protecting water quality by protecting shorelines and using vegetative buffers with other best management practices consistent with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control (DEP Bulletin 34). Two appendices to the regulations are summarized below.

2.2.1. *Mamanasco Lake Protection Guidelines (Appendix A of the Ridgefield Inland Wetlands and Watercourses Regulations)*

The Town of Ridgefield developed these guidelines from a review of the literature and land use practices employed by other communities. Regions were defined as Region #1 (Shoreline and Shoreline Protection Area, from the lake surface to a point 100 ft inland) and Region #2 (the remainder of the watershed beyond Region #1).

The primary objectives within Region #1 on both developed and undeveloped parcels were (1) the creation of a vegetative littoral zone (0–3 ft in depth) and (2) upland buffer to filter surface runoff before it enters the lake.

For Region #2, recommendations were proposed to minimize runoff, including:

- Limited clear cutting of vegetation on individual lots
- Limit impervious surfaces on lots, and control runoff
- Provide upland vegetative buffers

Additional recommendations addressed topics such as:

- Improvements of infrastructure like roadways and drainage system

⁴ http://www.ridgefieldct.org/filestorage/46/78/1389/Microsoft_Word_-_IWWR_Appendix.pdf

- Turf grass management
- Septic system maintenance
- Riparian buffers

2.2.2. *Operation and Maintenance Guidelines (Appendix B of the Ridgefield Inland Wetlands and Watercourses Regulations)*

The Town of Ridgefield developed Operation and Maintenance Guidance for Low Impact Development Best Management Practices. These guidelines were intended for use of both the residential homeowner and the staff of the municipal department responsible for the maintenance of structures within the public rights of way. These guidelines were detailed in Appendix B of the Inland Wetlands and Watercourses Regulations.

2.2.2.1. *Biofiltration*

Examples of biofiltration practices discussed in Appendix B included:

- “Rain Garden” bioretention system - use plantings of native vegetation to maintain infiltrative capacity, provide soil stabilization and attenuation of nutrients and potential of nonpoint source pollutants
- Grassed lined swales - provide transmission of post-development runoff.
- Stormwater wetland - treatment is designed to accept stormwater runoff from impervious surfaces into a wetland basin to improve water quality.
- Infiltration level spreader - designed to accept pre-treated runoff from impervious surfaces associated with dwelling development.
- Stone trench drains - collect surface flows and roof runoff and infiltrate the runoff into the surrounding soil matrix.
- Vegetative filter strip - designed to accept stormwater runoff from the grass lined level spreader, roof runoff and sheet flow

2.2.2.2. *Stormwater Structures*

Examples of stormwater structures discussed in Appendix B included:

- Catch basins with deep sumps and hooded outlet - intended to collect stormwater runoff from the driveways, streets, parking areas and provide partial sediment removal and collection of floatables

- Large particle separators - provided to remove suspended sediment, floatable debris and solids and absorb pollutants from stormwater stream from travel surfaces
- Drop-inlet structures - intended to create shallow pools to pond water, entrap water borne sediment, reduce the erosion of stream beds and banks and provide a stable transition in stream elevations.

Attachment 2

Water Quality and Sediment Data Collected in 2008 by EcoLogic, LLC

EcoLogic 2008 Water Quality / Sediment Sampling

Sample Location Maps:

Lake Kitchawan

Truesdale Lake

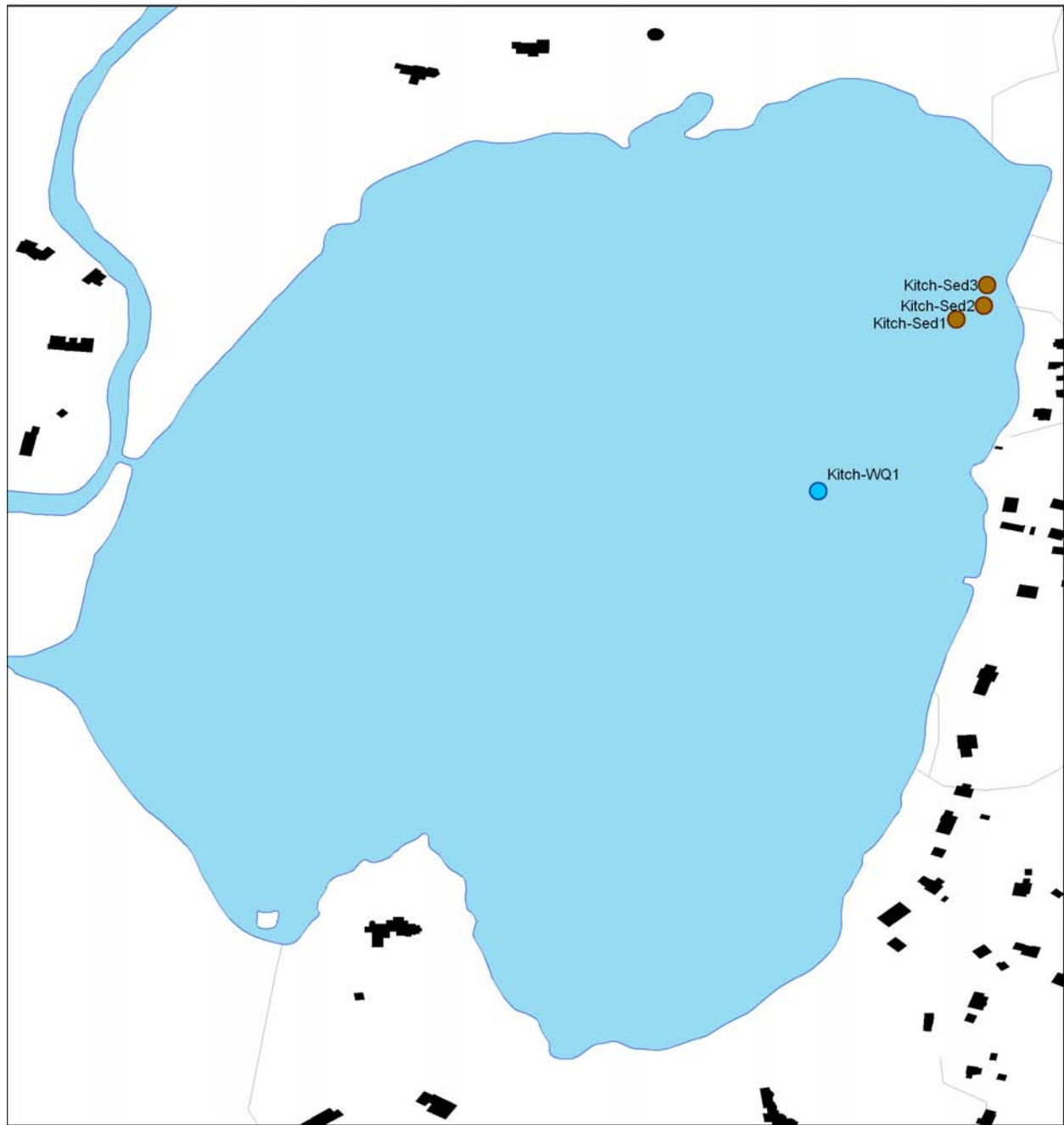
Lake Katonah

Timber Lake

Lake Waccabuc

Lake Oscaleta

Sample Locations August 2008
Lake Kitchawan



0 200 400 800 1,200 1,600 2,000 Feet

Legend

— Roads

■ Structures

Sample Type

● Sediment

● Water Quality

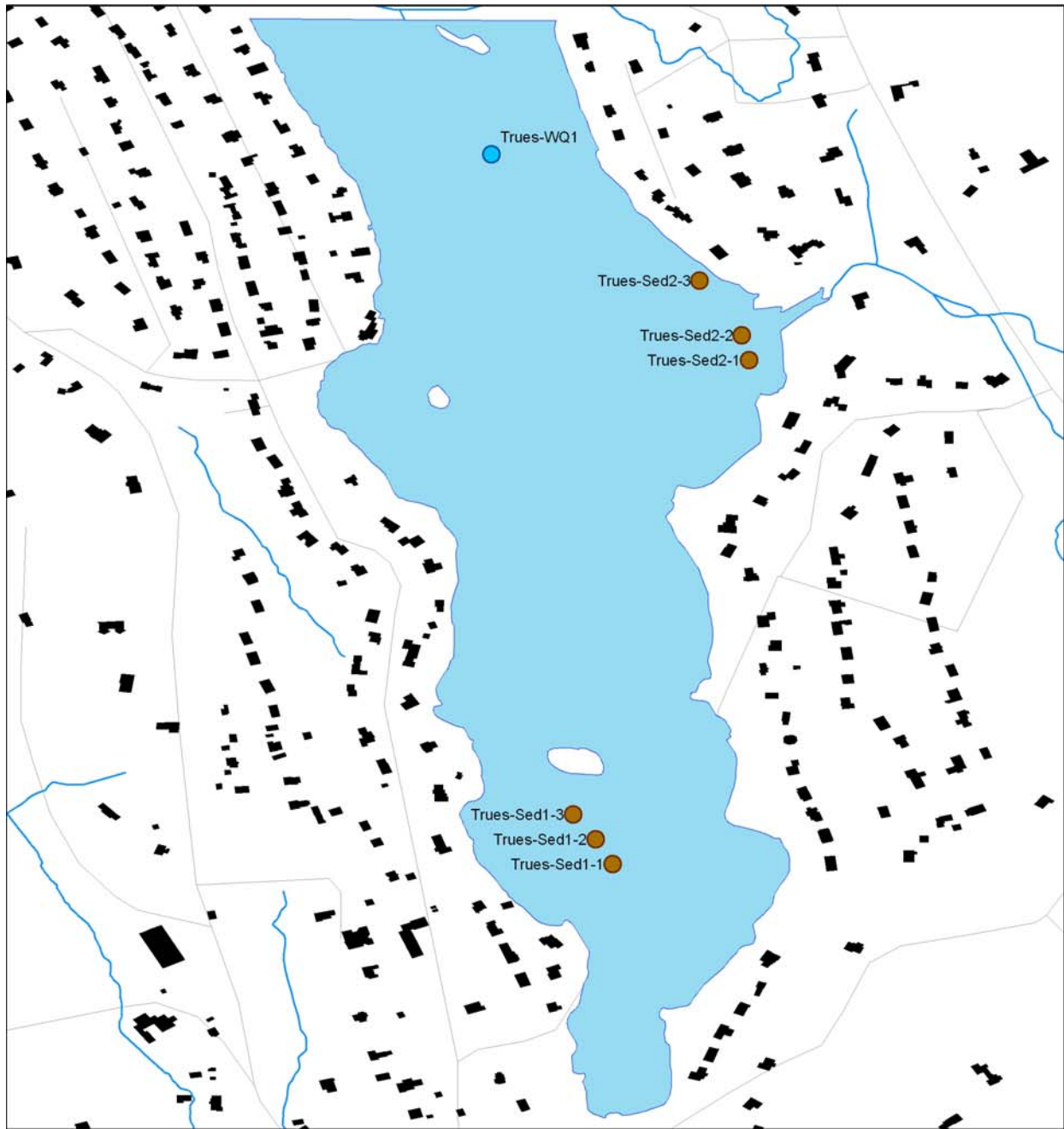
Sources:

Roads, structures and lakes: Obtained from the 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'.



Sample Locations August 2008
Truesdale Lake



0 300 600 1,200 1,800 2,400 3,000 Feet

Legend

- Roads
- Structures
- Rivers

Sample Type

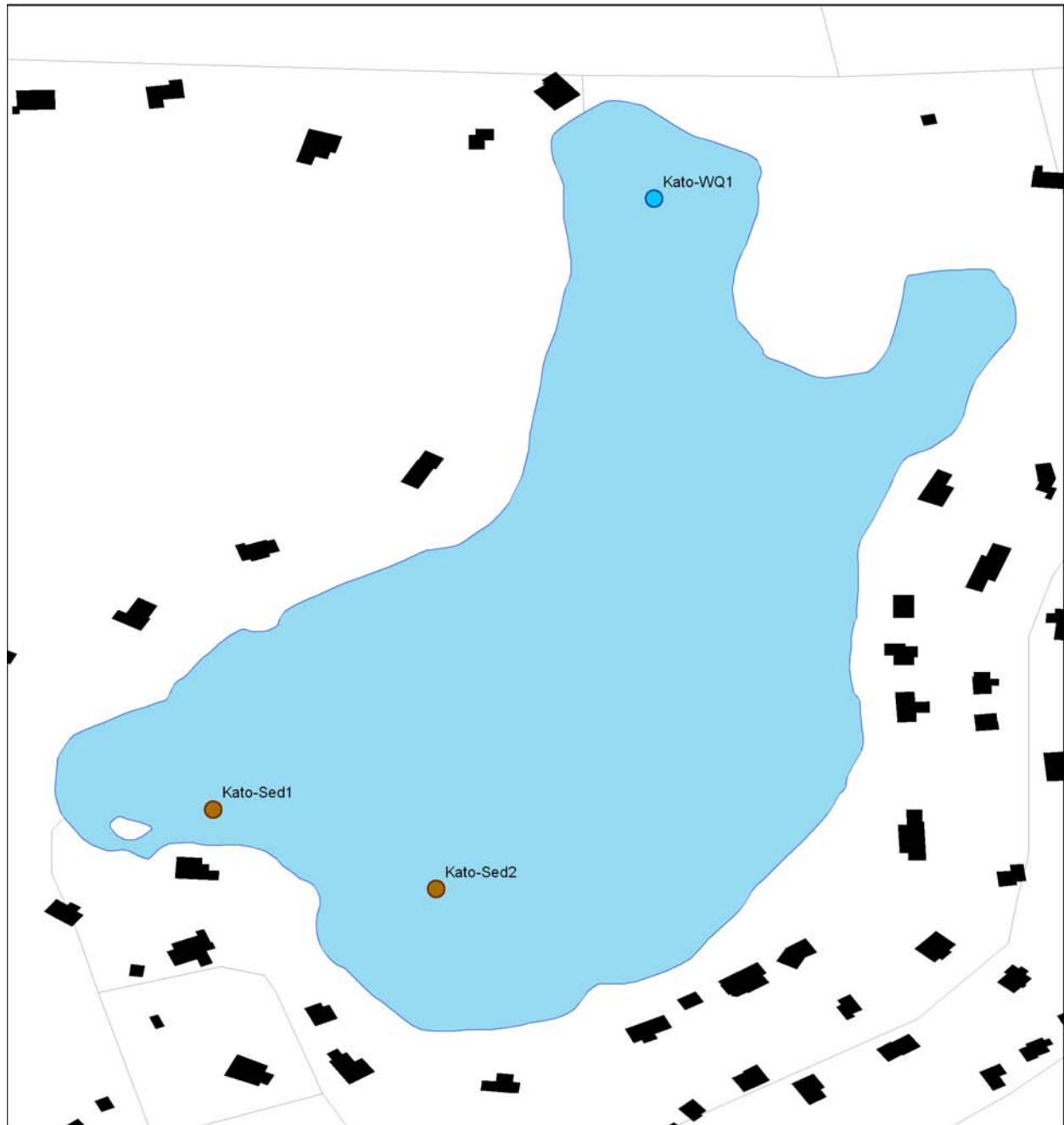
- Sediment
- Water Quality

Sources:

Roads, structures, rivers and lakes: Obtained from the 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'.



Sample Locations August 2008
Lake Katonah



0 100 200 400 600 800 1,000 Feet

Legend

— Roads

■ Structures

Sample Type

● Sediment

● Water Quality

Sources:

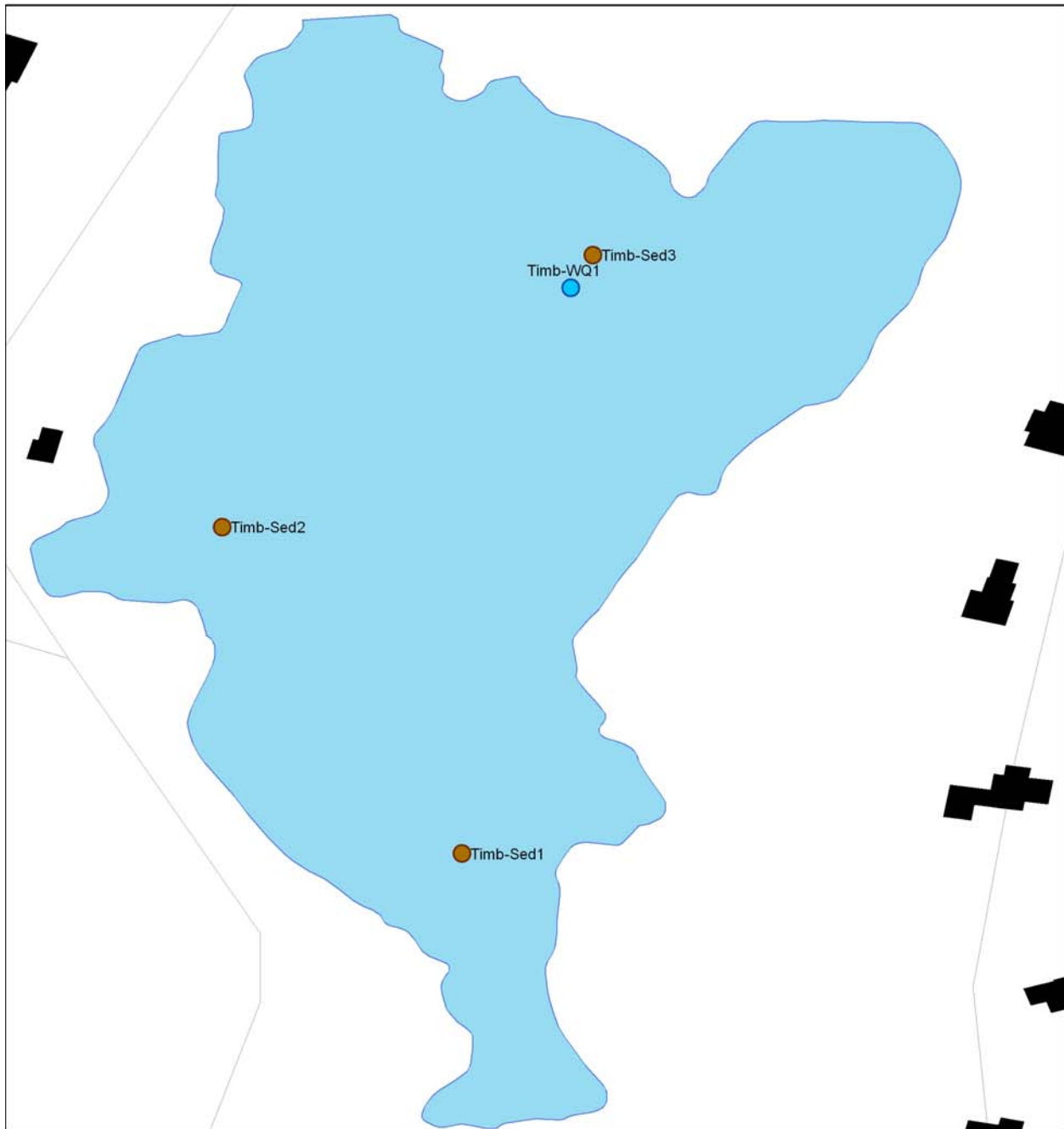
Roads, structures and lakes: Obtained from the Westchester County web site

<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'.



**Sample Locations August 2008
Timber Lake**



0 50 100 200 300 400 500 Feet

Legend

- Roads
- Structures

Sample Type

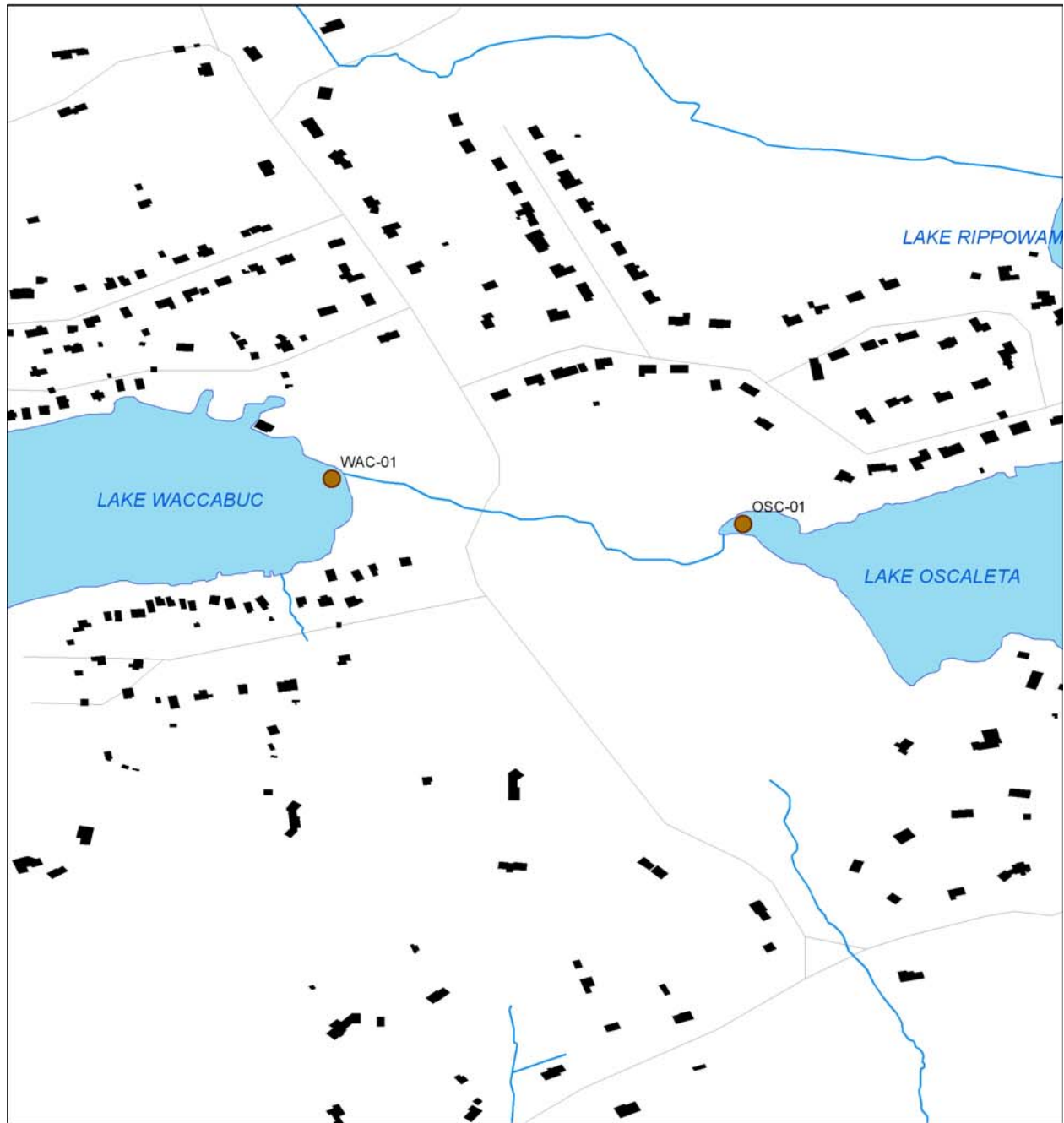
- Sediment
- Water Quality

Sources:

Roads, structures and lakes: Obtained from the 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'.



Sample Locations May 2008
Lakes Oscaleta and Waccabuc



0 0.05 0.1 0.2 0.3 0.4 0.5 Miles

Legend

- Roads
- Rivers
- Structures

Type

- Sediment

Sources:

Roads, structures, rivers and lakes: Obtained from the 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'.



EcoLogic 2008 Water Quality / Sediment Sampling

Water Quality Laboratory Analytical Results:

Lake Kitchawan

Truesdale Lake

Lake Katonah

Timber Lake

*Note that water quality data collected in 2008 for the Citizens State- wide
Lake Assessment Program (CSLAP) may be found through the web site
<http://lakelist.nysfola.org/>*



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Atwell Mill Annex, Suite S-2
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Cazenovia, NY 13035

Phone: (315) 655-8305

FAX: (315) 655-4086

Laboratory Analysis Report

For

EcoLogic, LLC

Client Project ID:

Town of Lewisboro

LSL Project ID: **0814565**

Receive Date/Time: 08/14/08 15:34

Project Received by: LZ

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- (6) LSL Brittonfield Lab, East Syracuse, NY

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NYS DOH ELAP #11369
NYS DOH ELAP #10155

This report was reviewed by:


Life Science Laboratories, Inc.

Date:



A copy of this report was sent to:

Page 1 of 2

Date Printed:

9/18/08

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Kitchawon Top LSL Sample ID: 0814442-001
Location:
Sampled: 08/12/08 8:30 Sampled By: MA
Sample Matrix: NPW

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(I) EPA 365.3 Total Phosphorus, Low Level					
Phosphorus, Total as P	0.013	mg/l	8/19/08	8/19/08	KBB
(I) EPA 351.2 TKN as N					
Total Kjeldahl Nitrogen	0.98*	mg/l	8/19/08	8/20/08	DRB
As per NELAC regulation, disclosure of the following condition is required; *The result of the laboratory control sample was greater than the established limit.					
(I) EPA 365.3 Soluble Orthophosphate as P					
Orthophosphate as P	0.0087*	mg/l		8/14/08	TER
(I) EPA Method 300.0 A					
Nitrate/Nitrite as N	0.049*	mg/l		9/23/08	DRB
(I) Filtering Charge					
Laboratory filtration charge				8/14/08	TER
(I) SM 18 10200H Chlorophyll-a					
Chlorophyll-a	0.014	mg/l		8/22/08	RAF
(I) SM 18 2320B, Alkalinity as CaCO3					
Alkalinity	54	mg/l		8/14/08	MP
(I) Total Nitrogen					
Total Nitrogen	1.0	mg/l		9/23/08	DRB

Sample ID: Kitchawon Bottom LSL Sample ID: 0814442-002
Location:
Sampled: 08/12/08 8:30 Sampled By: MA
Sample Matrix: NPW

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(I) EPA 365.3 Total Phosphorus, Low Level					
Phosphorus, Total as P	0.035	mg/l	8/19/08	8/19/08	KBB
(I) EPA 351.2 TKN as N					
Total Kjeldahl Nitrogen	1.3*	mg/l	8/19/08	8/20/08	DRB
(I) EPA 365.3 Soluble Orthophosphate as P					
Orthophosphate as P	0.014*	mg/l		8/14/08	TER
(I) EPA Method 300.0 A					
Nitrate/Nitrite as N	0.17*	mg/l		9/23/08	DRB
(I) Filtering Charge					
Laboratory filtration charge				8/14/08	TER
(I) Total Nitrogen					
Total Nitrogen	1.5	mg/l		9/23/08	DRB

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Truesdale Top LSL Sample ID: 0814442-003
Location:
Sampled: 08/12/08 10:30 Sampled By: MA
Sample Matrix: NPW

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(I) EPA 365.3 Total Phosphorus, Low Level Phosphorus, Total as P	0.092	mg/l	8/19/08	8/19/08	KBB
(I) EPA 351.2 TKN as N Total Kjeldahl Nitrogen	1.3*	mg/l	8/19/08	8/20/08	DRB
(I) EPA 365.3 Soluble Orthophosphate as P Orthophosphate as P	0.0070*	mg/l		8/14/08	TER
(I) EPA Method 300.0 A Nitrate/Nitrite as N	0.065*	mg/l		9/23/08	DRB
(I) Filtering Charge Laboratory filtration charge				8/14/08	TER
(I) SM 18 10200H Chlorophyll-a Chlorophyll-a	0.12	mg/l		8/22/08	RAF
(I) SM 18 2320B, Alkalinity as CaCO3 Alkalinity	80	mg/l		8/14/08	MP
(I) Total Nitrogen Total Nitrogen	1.4	mg/l		9/23/08	DRB

Sample ID: Truesdale Bottom LSL Sample ID: 0814442-004
Location:
Sampled: 08/12/08 10:30 Sampled By: MA
Sample Matrix: NPW

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(I) EPA 365.3 Total Phosphorus, Low Level Phosphorus, Total as P	0.096	mg/l	8/19/08	8/19/08	KBB
(I) EPA 351.2 TKN as N Total Kjeldahl Nitrogen	1.6*	mg/l	8/19/08	8/20/08	DRB
(I) EPA 365.3 Soluble Orthophosphate as P Orthophosphate as P	0.021*	mg/l		8/14/08	TER
(I) EPA Method 300.0 A Nitrate/Nitrite as N	0.092*	mg/l		9/23/08	DRB
(I) Filtering Charge Laboratory filtration charge				8/14/08	TER
(I) Total Nitrogen Total Nitrogen	1.7	mg/l		9/23/08	DRB

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID:	Katonah Top		LSL Sample ID:	0814442-005		
Location:						
Sampled:	08/12/08 14:30	Sampled By: MA				
Sample Matrix:	NPW					
Analytical Method			Prep	Analysis	Analyst	
Analyte	Result	Units	Date	Date & Time	Initials	
(1) EPA 365.3 Total Phosphorus, Low Level Phosphorus, Total as P	0.092	mg/l	8/19/08	8/19/08	KBB	
(1) EPA 351.2 TKN as N Total Kjeldahl Nitrogen	2.9*	mg/l	8/19/08	8/20/08	DRB	
(1) EPA 365.3 Soluble Orthophosphate as P Orthophosphate as P	0.010*	mg/l		8/14/08	TER	
(1) EPA Method 300.0 A Nitrate/Nitrite as N	0.037*	mg/l		9/23/08	DRB	
(1) Filtering Charge Laboratory filtration charge				8/14/08	TER	
(1) SM 18 10200H Chlorophyll-a Chlorophyll-a	0.17	mg/l		8/22/08	RAF	
(1) SM 18 2320B, Alkalinity as CaCO3 Alkalinity	60	mg/l		8/14/08	MP	
(1) Total Nitrogen Total Nitrogen	2.9	mg/l		9/23/08	DRB	

Sample ID:	Katonah Bottom		LSL Sample ID:	0814442-006	
Location:					
Sampled:	08/12/08 14:30	Sampled By: MA			
Sample Matrix:	NPW				
Analytical Method			Prep	Analysis	Analyst
Analyte	Result	Units	Date	Date & Time	Initials
(I) EPA 365.3 Total Phosphorus, Low Level					
Phosphorus, Total as P	0.084	mg/l	8/19/08	8/19/08	KBB
(I) EPA 351.2 TKN as N					
Total Kjeldahl Nitrogen	2.1*	mg/l	8/19/08	8/20/08	DRB
As per NELAC regulation, disclosure of the following condition is required; *The result of the laboratory control sample was greater than the established limit. A trace amount of this analyte was found in the laboratory preparation blank.					
(I) EPA 365.3 Soluble Orthophosphate as P					
Orthophosphate as P	0.0098*	mg/l		8/14/08	TER
A trace amount of this analyte was detected in the laboratory blank.					
(I) EPA Method 300.0 A					
Nitrate/Nitrite as N	0.036*	mg/l		9/23/08	DRB
This analysis was performed beyond the holding time limit by EPA Method 353.1					
(I) Filtering Charge					
Laboratory filtration charge				8/14/08	TER
(I) Total Nitrogen					
Total Nitrogen	2.1	mg/l		9/23/08	DRB

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Page 4 of 4
Date Printed: 9/23/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Timber Top LSL Sample ID: 0814565-001
Location:
Sampled: 08/13/08 9:30 Sampled By: MA
Sample Matrix: NPW

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(I) EPA 365.3 Total Phosphorus, Low Level Phosphorus, Total as P	0.012	mg/l	8/19/08	8/19/08	KBB
(I) EPA 351.2 TKN as N Total Kjeldahl Nitrogen	0.60	mg/l	8/27/08	8/29/08	DRB
(I) EPA 365.3 Soluble Orthophosphate as P Orthophosphate as P	<0.003	mg/l		8/14/08 17:04	TER
(I) Filtering Charge Laboratory filtration charge				8/14/08	TER
(I) SM 18 10200H Chlorophyll-a Chlorophyll-a	0.026	mg/l	8/13/08	8/22/08	RAF
(I) SM 18 2320B, Alkalinity as CaCO3 Alkalinity	68	mg/l		8/19/08	TER
(I) SM 18-20 4500-NO3 H Nitrate/Nitrite as N Nitrate/Nitrite as N	0.055	mg/l		9/8/08	DRB
(I) Total Nitrogen Total Nitrogen	0.66	mg/l		9/17/08	DRB

Sample ID: Timber Bottom LSL Sample ID: 0814565-002
Location:
Sampled: 08/13/08 9:30 Sampled By: MA
Sample Matrix: NPW

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(I) EPA 365.3 Total Phosphorus, Low Level Phosphorus, Total as P	0.017	mg/l	8/19/08	8/19/08	KBB
(I) EPA 351.2 TKN as N Total Kjeldahl Nitrogen	0.68	mg/l	8/27/08	8/29/08	DRB
(I) EPA 365.3 Soluble Orthophosphate as P Orthophosphate as P	0.0056*	mg/l		8/14/08 17:05	TER
A trace amount of this analyte was detected in the laboratory blank.					
(I) Filtering Charge Laboratory filtration charge				8/14/08	TER
(I) SM 18-20 4500-NO3 H Nitrate/Nitrite as N Nitrate/Nitrite as N	0.054	mg/l		9/8/08	DRB
(I) Total Nitrogen Total Nitrogen	0.73	mg/l		9/17/08	DRB



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Laboratory Analysis Report

For

EcoLogic, LLC

Client Project ID:

Town of Lewisboro

LSL Project ID: **0814442**

Receive Date/Time: 08/13/08 16:47

Project Received by: RD

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This report was reviewed by:

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Date:

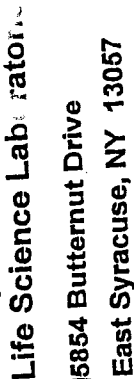
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0814442

Ecologic

East Syracuse, NY 13057

LSL Project

Telefax # (315) 445-1301

Phone # (315) 445-1105

Phone #

8-559-118

Address: 132 1/2 Albany Street

Fax # 315-659-5115

Carpenter, NY

Client's Site I.D.:

Town of Lewisboro

Client's Project I.D.: Lewis bard

[illegible]

Witness and Hazard Identifications:

Received By: Mark Asci

Received By:

Received By:

Received By:

Relinquished By: Malay

CONFIDENTIAL

Polished By:

Received for LAD by:

Samples Received Intact:		Y	N
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
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85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

30C .. ON ICE

EcoLogic 2008 Water Quality / Sediment Sampling

Sediment Laboratory Analytical Results:

Lake Waccabuc

Lake Oscaleta



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Laboratory Analysis Report For

EcoLogic, LLC

Client Project ID:

Lewisboro Lakes

LSL Project ID: **0808644**

Receive Date/Time: 05/29/08 15:36

Project Received by: GS

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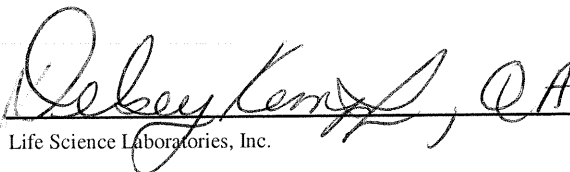
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NYS DOH ELAP #11369
NYS DOH ELAP #10155

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Date:

6/26/08

A copy of this report was sent to:

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6/25/08

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	WAC-01 - Composite	LSL Sample ID:	0808644-001
Location:			
Sampled:	05/29/08 8:30	Sampled By:	Client
Sample Matrix:	SHW as Recd		

Analytical Method			Prep	Analysis	Analyst
Analyte	Result	Units	Date	Date & Time	Initials
(1) EPA 6010 RCRA Total Metals					
Copper	1.5	mg/kg	6/10/08	6/11/08	DP
Arsenic	<1	mg/kg	6/10/08	6/11/08	DP
Barium	<20	mg/kg	6/10/08	6/11/08	DP
Cadmium	<1	mg/kg	6/10/08	6/11/08	DP
Chromium	<1	mg/kg	6/10/08	6/11/08	DP
Lead	4.2	mg/kg	6/10/08	6/11/08	DP
Selenium	<1	mg/kg	6/10/08	6/11/08	DP
Silver	<1	mg/kg	6/10/08	6/11/08	DP
(1) EPA 7471 Mercury					
Mercury	<0.02	mg/kg	6/11/08	6/12/08	DP
(1) EPA 8081/8082 Pesticides/PCB's					
Aldrin	<0.002	mg/kg	6/9/08	6/12/08	KIW
alpha-BHC	<0.002	mg/kg	6/9/08	6/12/08	KIW
beta-BHC	<0.002	mg/kg	6/9/08	6/12/08	KIW
delta-BHC	<0.002	mg/kg	6/9/08	6/12/08	KIW
gamma-BHC (Lindane)	<0.002	mg/kg	6/9/08	6/12/08	KIW
alpha-Chlordane	<0.002	mg/kg	6/9/08	6/12/08	KIW
gamma-Chlordane	<0.002	mg/kg	6/9/08	6/12/08	KIW
4,4'-DDD	<0.004	mg/kg	6/9/08	6/12/08	KIW
4,4'-DDE	<0.004	mg/kg	6/9/08	6/12/08	KIW
4,4'-DDT	<0.004	mg/kg	6/9/08	6/12/08	KIW
Dieldrin	<0.002	mg/kg	6/9/08	6/12/08	KIW
Endosulfan I	<0.002	mg/kg	6/9/08	6/12/08	KIW
Endosulfan II	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endosulfan sulfate	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endrin	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endrin aldehyde	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endrin ketone	<0.004	mg/kg	6/9/08	6/12/08	KIW
Heptachlor	<0.002	mg/kg	6/9/08	6/12/08	KIW
Heptachlor epoxide	<0.002	mg/kg	6/9/08	6/12/08	KIW
Methoxychlor	<0.02	mg/kg	6/9/08	6/12/08	KIW
Toxaphene	<0.5	mg/kg	6/9/08	6/12/08	KIW
Aroclor-1016	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1221	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1232	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1242	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1248	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1254	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1260	<0.2	mg/kg	6/9/08	6/10/08	KIW
Surrogate (TCMX)	82	%R	6/9/08	6/12/08	KIW
Surrogate (DCB)	110	%R	6/9/08	6/10/08	KIW
(1) EPA 8260B TCL Volatiles					
Acetone	<50	ug/kg		6/5/08	CRT
Benzene	<10	ug/kg		6/5/08	CRT
Bromodichloromethane	<10	ug/kg		6/5/08	CRT
Bromoform	<10	ug/kg		6/5/08	CRT

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Page 2 of 7

Date Printed: 6/25/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brüttonfield

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID: WAC-01 - Composite

LSL Sample ID: 0808644-001

Location:

Sampled: 05/29/08 8:30

Sampled By: Client

Sample Matrix: SHW as Recd

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
(I) EPA 8260B TCL Volatiles					
Bromomethane	<10	ug/kg		6/5/08	CRT
2-Butanone (MEK)	<20	ug/kg		6/5/08	CRT
Carbon disulfide	<10	ug/kg		6/5/08	CRT
Carbon tetrachloride	<10	ug/kg		6/5/08	CRT
Chlorobenzene	<10	ug/kg		6/5/08	CRT
Chloroethane	<10	ug/kg		6/5/08	CRT
Chloroform	<10	ug/kg		6/5/08	CRT
Chloromethane	<10	ug/kg		6/5/08	CRT
Dibromochloromethane	<10	ug/kg		6/5/08	CRT
1,1-Dichloroethane	<10	ug/kg		6/5/08	CRT
1,2-Dichloroethane	<10	ug/kg		6/5/08	CRT
1,1-Dichloroethene	<10	ug/kg		6/5/08	CRT
1,2-Dichloroethene, Total	<10	ug/kg		6/5/08	CRT
1,2-Dichloropropane	<10	ug/kg		6/5/08	CRT
cis-1,3-Dichloropropene	<10	ug/kg		6/5/08	CRT
trans-1,3-Dichloropropene	<10	ug/kg		6/5/08	CRT
Ethyl benzene	<10	ug/kg		6/5/08	CRT
2-Hexanone	<20	ug/kg		6/5/08	CRT
Methylene chloride	<20	ug/kg		6/5/08	CRT
4-Methyl-2-pentanone (MIBK)	<20	ug/kg		6/5/08	CRT
Styrene	<10	ug/kg		6/5/08	CRT
1,1,2,2-Tetrachloroethane	<10	ug/kg		6/5/08	CRT
Tetrachloroethene	<10	ug/kg		6/5/08	CRT
Toluene	<10	ug/kg		6/5/08	CRT
1,1,1-Trichloroethane	<10	ug/kg		6/5/08	CRT
1,1,2-Trichloroethane	<10	ug/kg		6/5/08	CRT
Trichloroethene	<10	ug/kg		6/5/08	CRT
Vinyl chloride	<10	ug/kg		6/5/08	CRT
Xylenes (Total)	<10	ug/kg		6/5/08	CRT
Surrogate (1,2-DCA-d4)	105	%R		6/5/08	CRT
Surrogate (Tol-d8)	96	%R		6/5/08	CRT
Surrogate (4-BFB)	117	%R		6/5/08	CRT
(I) EPA 8270 TCL PAH's					
Acenaphthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Acenaphthylene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Anthracene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(a)anthracene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(b)fluoranthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(k)fluoranthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(ghi)perylene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(a)pyrene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Chrysene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Dibenz(a,h)anthracene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Fluoranthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Fluorene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Indeno(1,2,3-c,d)pyrene	<0.5	mg/kg	6/6/08	6/13/08	CRT

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: WAC-01 - Composite

LSL Sample ID: 0808644-001

Location:

Sampled: 05/29/08 8:30

Sampled By: Client

Sample Matrix: SHW as Recd

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(I) EPA 8270 TCL PAH's					
Naphthalene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Phenanthrene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Pyrene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Surrogate (Nitrobenzene-d5)	50	%R	6/6/08	6/13/08	CRT
Surrogate (2-Fluorobiphenyl)	54	%R	6/6/08	6/13/08	CRT
Surrogate (Terphenyl-d14)	121	%R	6/6/08	6/13/08	CRT
(I) Modified EPA 160.3 Total Solids					
Total Solids @ 103-105 C	6.9	%		6/3/08	MM
(I) Particle Size Distribution					
Particle Size Distribution	See Attached				
This analysis was performed by PW Laboratories, Inc.					
(I) Total Organic Carbon, EPA 9060					
Total Organic Carbon	See Attached				
This analysis was performed by NYS DOH ELAP laboratory number 11342					

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	OSC-01 - Composite	LSL Sample ID:	0808644-002
Location:			
Sampled:	05/29/08 9:30	Sampled By:	Client
Sample Matrix:	SHW as Recd		

Analytical Method			Prep	Analysis	Analyst
Analyte	Result	Units	Date	Date & Time	Initials
(1) EPA 6010 RCRA Total Metals					
Copper	1.1	mg/kg	6/10/08	6/11/08	DP
Arsenic	<1	mg/kg	6/10/08	6/11/08	DP
Barium	<20	mg/kg	6/10/08	6/11/08	DP
Cadmium	<1	mg/kg	6/10/08	6/11/08	DP
Chromium	<1	mg/kg	6/10/08	6/11/08	DP
Lead	2.0	mg/kg	6/10/08	6/11/08	DP
Selenium	<1	mg/kg	6/10/08	6/11/08	DP
Silver	<1	mg/kg	6/10/08	6/11/08	DP
(1) EPA 7471 Mercury					
Mercury	<0.02	mg/kg	6/11/08	6/12/08	DP
(1) EPA 8081/8082 Pesticides/PCB's					
Aldrin	<0.002	mg/kg	6/9/08	6/12/08	KIW
alpha-BHC	<0.002	mg/kg	6/9/08	6/12/08	KIW
beta-BHC	<0.002	mg/kg	6/9/08	6/12/08	KIW
delta-BHC	<0.002	mg/kg	6/9/08	6/12/08	KIW
gamma-BHC (Lindane)	<0.002	mg/kg	6/9/08	6/12/08	KIW
alpha-Chlordane	<0.002	mg/kg	6/9/08	6/12/08	KIW
gamma-Chlordane	<0.002	mg/kg	6/9/08	6/12/08	KIW
4,4'-DDD	<0.004	mg/kg	6/9/08	6/12/08	KIW
4,4'-DDE	<0.004	mg/kg	6/9/08	6/12/08	KIW
4,4'-DDT	<0.004	mg/kg	6/9/08	6/12/08	KIW
Dieldrin	<0.002	mg/kg	6/9/08	6/12/08	KIW
Endosulfan I	<0.002	mg/kg	6/9/08	6/12/08	KIW
Endosulfan II	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endosulfan sulfate	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endrin	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endrin aldehyde	<0.004	mg/kg	6/9/08	6/12/08	KIW
Endrin ketone	<0.004	mg/kg	6/9/08	6/12/08	KIW
Heptachlor	<0.002	mg/kg	6/9/08	6/12/08	KIW
Heptachlor epoxide	<0.002	mg/kg	6/9/08	6/12/08	KIW
Methoxychlor	<0.02	mg/kg	6/9/08	6/12/08	KIW
Toxaphene	<0.5	mg/kg	6/9/08	6/12/08	KIW
Aroclor-1016	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1221	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1232	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1242	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1248	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1254	<0.2	mg/kg	6/9/08	6/10/08	KIW
Aroclor-1260	<0.2	mg/kg	6/9/08	6/10/08	KIW
Surrogate (TCMX)	100	%R	6/9/08	6/12/08	KIW
Surrogate (DCB)	103	%R	6/9/08	6/10/08	KIW
(1) EPA 8260B TCL Volatiles					
Acetone	<50	ug/kg		6/5/08	CRT
Benzene	<10	ug/kg		6/5/08	CRT
Bromodichloromethane	<10	ug/kg		6/5/08	CRT
Bromoform	<10	ug/kg		6/5/08	CRT

Life Science Laboratories, Inc.

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Date Printed: 6/25/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID: OSC-01 - Composite

LSL Sample ID: 0808644-002

Location:

Sampled: 05/29/08 9:30

Sampled By: Client

Sample Matrix: SHW as Recd

Analytical Method			Prep	Analysis	Analyst
Analyte	Result	Units	Date	Date & Time	Initials
(I) EPA 8260B TCL Volatiles					
Bromomethane	<10	ug/kg		6/5/08	CRT
2-Butanone (MEK)	<20	ug/kg		6/5/08	CRT
Carbon disulfide	<10	ug/kg		6/5/08	CRT
Carbon tetrachloride	<10	ug/kg		6/5/08	CRT
Chlorobenzene	<10	ug/kg		6/5/08	CRT
Chloroethane	<10	ug/kg		6/5/08	CRT
Chloroform	<10	ug/kg		6/5/08	CRT
Chloromethane	<10	ug/kg		6/5/08	CRT
Dibromochloromethane	<10	ug/kg		6/5/08	CRT
1,1-Dichloroethane	<10	ug/kg		6/5/08	CRT
1,2-Dichloroethane	<10	ug/kg		6/5/08	CRT
1,1-Dichloroethene	<10	ug/kg		6/5/08	CRT
1,2-Dichloroethene, Total	<10	ug/kg		6/5/08	CRT
1,2-Dichloropropane	<10	ug/kg		6/5/08	CRT
cis-1,3-Dichloropropene	<10	ug/kg		6/5/08	CRT
trans-1,3-Dichloropropene	<10	ug/kg		6/5/08	CRT
Ethyl benzene	<10	ug/kg		6/5/08	CRT
2-Hexanone	<20	ug/kg		6/5/08	CRT
Methylene chloride	<20	ug/kg		6/5/08	CRT
4-Methyl-2-pentanone (MIBK)	<20	ug/kg		6/5/08	CRT
Styrene	<10	ug/kg		6/5/08	CRT
1,1,2,2-Tetrachloroethane	<10	ug/kg		6/5/08	CRT
Tetrachloroethene	<10	ug/kg		6/5/08	CRT
Toluene	<10	ug/kg		6/5/08	CRT
1,1,1-Trichloroethane	<10	ug/kg		6/5/08	CRT
1,1,2-Trichloroethane	<10	ug/kg		6/5/08	CRT
Trichloroethene	<10	ug/kg		6/5/08	CRT
Vinyl chloride	<10	ug/kg		6/5/08	CRT
Xylenes (Total)	<10	ug/kg		6/5/08	CRT
Surrogate (1,2-DCA-d4)	107	%R		6/5/08	CRT
Surrogate (Tol-d8)	94	%R		6/5/08	CRT
Surrogate (4-BFB)	108	%R		6/5/08	CRT
(I) EPA 8270 TCL PAH's					
Acenaphthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Acenaphthylene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Anthracene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(a)anthracene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(b)fluoranthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(k)fluoranthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(ghi)perylene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Benzo(a)pyrene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Chrysene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Dibenz(a,h)anthracene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Fluoranthene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Fluorene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Indeno(1,2,3-c,d)pyrene	<0.5	mg/kg	6/6/08	6/13/08	CRT

Life Science Laboratories, Inc.

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Date Printed: 6/25/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID: OSC-01 - Composite

LSL Sample ID: 0808644-002

Location:

Sampled: 05/29/08 9:30

Sampled By: Client

Sample Matrix: SHW as Recd

Analytical Method			Prep	Analysis	Analyst
Analyte	Result	Units	Date	Date & Time	Initials
(I) EPA 8270 TCL PAH's					
Naphthalene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Phenanthrene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Pyrene	<0.5	mg/kg	6/6/08	6/13/08	CRT
Surrogate (Nitrobenzene-d5)	41	%R	6/6/08	6/13/08	CRT
Surrogate (2-Fluorobiphenyl)	42	%R	6/6/08	6/13/08	CRT
Surrogate (Terphenyl-d14)	109	%R	6/6/08	6/13/08	CRT
(I) Modified EPA 160.3 Total Solids					
Total Solids @ 103-105 C	6.1	%		6/3/08	MM
(I) Particle Size Distribution					
Particle Size Distribution	See Attached				
This analysis was performed by PW Laboratories, Inc.					
(I) Total Organic Carbon, EPA 9060					
Total Organic Carbon	See Attached				
This analysis was performed by NYS DOH ELAP laboratory number 11342					



SURROGATE RECOVERY CONTROL LIMITS FOR ORGANIC METHODS

<u>Method</u>	<u>Surrogate(s)</u>	<u>Water Limits, %R</u>	<u>SHW Limits, %R</u>
EPA 504	TCMX	80-120	NA
EPA 508	DCB	70-130	NA
EPA 515.4	DCAA	70-130	NA
EPA 524.2	1,2-DCA-d4, 4-BFB	80-120	NA
EPA 525.2	1,3-DM-2-NB, TPP, Per-d12	70-130	NA
EPA 526	1,3-DM-2-NB, TPP	70-130	NA
EPA 528	2-CP-3,4,5,6-d4, 2,4,6-TBP	70-130	NA
EPA 551.1	Decafluorobiphenyl	80-120	NA
EPA 552.2	2,3-DBPA	70-130	NA
EPA 601	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 602	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 608	TCMX, DCB	30-150	NA
EPA 624	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 625, AE	2-Fluorophenol	21-110	NA
EPA 625, AE	Phenol-d5	10-110	NA
EPA 625, AE	2,4,6-Tribromophenol	10-123	NA
EPA 625, BN	Nitrobenzene-d5	35-114	NA
EPA 625, BN	2-Fluorobiphenyl	43-116	NA
EPA 625, BN	Terphenyl-d14	33-141	NA
EPA 8010	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8020	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8021	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8081	TCMX, DCB	30-150	30-150
EPA 8082	DCB	30-150	30-150
EPA 8151	DCAA	30-130	30-120
EPA 8260	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8270, AE	2-Fluorophenol	21-110	25-121
EPA 8270, AE	Phenol-d5	10-110	24-113
EPA 8270, AE	2,4,6-Tribromophenol	10-123	19-122
EPA 8270, BN	Nitrobenzene-d5	35-114	23-120
EPA 8270, BN	2-Fluorobiphenyl	43-116	30-115
EPA 8270, BN	Terphenyl-d14	33-141	18-137
DOH 310-13	Terphenyl-d14	40-110	40-110
DOH 310-14	Terphenyl-d14	40-110	40-110
DOH 310-15	Terphenyl-d14	40-110	40-110
DOH 310-34	4-BFB	50-150	50-150
DOH 313-4	DCB	NA	30-150
8015M_GRO	4-BFB	50-150	50-150
8015M_DRO	Terphenyl-d14	50-150	50-150

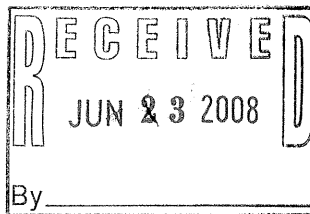
Units Key:	ug/l = microgram per liter
	ug/kg = microgram per kilogram
	mg/l = milligram per liter
	mg/kg = milligram per kilogram
	%R = Percent Recovery



PW LABORATORIES, INC.
P.O. BOX 56, 5879 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 • 866-7PW-LABS • Fax 315-437-1752

June 19, 2008

Mr. Greg Smith
Life Science Laboratories
5000 Brittonfield Parkway
Suite 200
East Syracuse, New York 13057



Re: L-08090
Laboratory Testing
PO #S052433

Dear Mr. Smith:

Enclosed are the results of laboratory testing performed at your request on two jar soil samples delivered to our laboratory on June 13, 2008 for the above referenced project. Results include:

1. Sieve Analysis ASTM D422 & D1140
Laboratory I.D. #'s 23327 & 23328

2 each

All requested tests have been completed on the previously received sample(s) for the above project. All sample remains are scheduled to be disposed of on July 19, 2008. Please notify PW Laboratories, Inc. by letter or telephone prior to July 19, 2008 if you would prefer to pick up the sample(s) or that the sample(s) be retained by PW Laboratories, Inc. for an additional period of time.

Thank you for this opportunity to work with you.

Very truly yours,

PW LABORATORIES, INC.

A handwritten signature in cursive script, appearing to read 'Virginia J. Thoma'.

Virginia J. Thoma
Manager - Laboratory Services
VJT/bll
Encs:



Project Title: Laboratory Testing

Project #: L-08090

Report #: 1

Test Method: ASTM D422 & D1140

Report Date: June 19, 2008

Sample mass, as received, meets minimum mass requirements of test method:

Remarks:

No
X

Performed By:

V.J. Thoma

June 10, 2008 9:59:53AM

Client: Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn: Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Nbr: 0808644
P/O Nbr: SO52414
Date Received: 06/03/08

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
0808644-001B WAC-01	NRF0051-01	05/29/08 00:01
0808644-002B OSC-01	NRF0051-02	05/29/08 00:01

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution, or copying of this material is strictly prohibited. If you have received this material in error, please notify us immediately at 615-726-0177.

New York Certification Number: 11342

The Chain(s) of Custody, 2 pages, are included and are an integral part of this report.

These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

All solids results are reported in wet weight unless specifically stated.

Estimated uncertainty is available upon request.

This report has been electronically signed.

Report Approved By:



Jennifer Gambill

Project Manager

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Number: 0808644
Received: 06/03/08 10:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NRF0051-01 (0808644-001B WAC-01 - Misc. Solid) Sampled: 05/29/08 00:01								
General Chemistry Parameters								
Total Organic Carbon	366000		mg/Kg dry	1000	1	06/09/08 10:15	SW846 9060M	8060887
Sample ID: NRF0051-02 (0808644-002B OSC-01 - Misc. Solid) Sampled: 05/29/08 00:01								
General Chemistry Parameters								
Total Organic Carbon	110000		mg/Kg dry	1000	1	06/09/08 10:15	SW846 9060M	8060887

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Number: 0808644
Received: 06/03/08 10:15

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
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General Chemistry Parameters

8060887-BLK1

Total Organic Carbon	<172		mg/Kg dry	8060887	8060887-BLK1	06/09/08 10:15
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Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Number: 0808644
Received: 06/03/08 10:15

PROJECT QUALITY CONTROL DATA

Duplicate

Analyte	Orig. Val.	Duplicate	Q	Units	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
General Chemistry Parameters									
8060887-DUP1									
Total Organic Carbon	4770	4770		mg/Kg dry	0	35	8060887	NRF0139-01	06/09/08 10:15

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Number: 0808644
Received: 06/03/08 10:15

PROJECT QUALITY CONTROL DATA

LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
General Chemistry Parameters								
8060887-BS1								
Total Organic Carbon	29900	29500		mg/Kg dry	99%	85 - 110	8060887	06/09/08 10:15

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Number: 0808644
Received: 06/03/08 10:15

CERTIFICATION SUMMARY

TestAmerica Nashville

Method	Matrix	AIHA	Nelac	New York
SW846 9060M	Soil	N/A	N/A	N/A

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Number: 0808644
Received: 06/03/08 10:15

NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

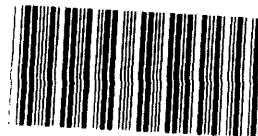
Analyte

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRF0051
Project Name: Life Science
Project Number: 0808644
Received: 06/03/08 10:15

DATA QUALIFIERS AND DEFINITIONS

ND Not detected at the reporting limit (or method detection limit if shown)



Cooler Received/Opened On 06/03/2008 @ 1015

NRF0051

1. Tracking # 6213 X 926134318 5007

Courier: UPS IR Gun ID 102594

2. Temperature of rep. sample or temp blank when opened: 6.5 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: NA

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (initial)

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (initial)

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here _____

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial)

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

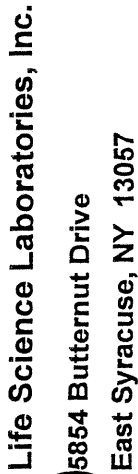
19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial)

I certify that I attached a label with the unique LIMS number to each container (initial)

21. Were there Non-Conformance issues at login? YES...NO Was a PIPE generated? YES...NO...# 48865



0808644
Ecologic

Phone # (315) 445-1105		Telefax # (315) 445-1301		Contact Person:		LSL Project #:	
Client: ECOLOGIC LLC		Phone # (315) 655-8305		MARK ARRIGO			
Address: 132 1/2 ALBANY STREET CHATEAUNY NY 13035		Fax # 315 655-4086				Client's Site I.D.: LEWISBORO LAKES	

Authorization:				Client's Project I.D.:			
LSL Sample Number	Client's Sample Identifications	Sample Date	Sample Time	Type	Preserv. Added	Containers # size/type	Analyses
001 A-F	WAC-01	5/29/08	8:30 a.m.	X		6 glass	METALS (As, Cd, Cu, Pb, Hg) PAH's (Benzene, TBTEX, TPAH) PESTICIDES (DDT+DDT+DD, mirex, chlordane, Dieldrin) PCB's and PAH's Grain Size TQC, Grain Size same as above
002 A-F	OSC-01	5/29/08	9:30 a.m.	X		6	
<p>Called Mark To clarify recent LTT message. 5-29-08 JS</p> <p>Mark called back To Request That only those parameters reported in Hush's quote be performed (See attached notes). Items include ALPA metals + Cu, 8220 pH, 8260, Put/Ph 808Vg085, Total Solids, TOC, Grain Size. Mark said Olegan's (Tox) material are not needed. JS 5-30-08</p>							

Notes and Hazard Identifications:		Custody Transfers	
Sampled By:	Received By:	Date	Time
Relinquished By:	Received By:		
Relinquished By: <i>Kerry Thurst</i>	Received for Lab By: <i>JS</i>	05-29-08	15:35 R

Shipment Method: *5:30 a.m. on 5/30/08*

EcoLogic 2008 Water Quality / Sediment Sampling

Sediment Laboratory Analytical Results:

Lake Kitchawan

Truesdale Lake (2 samples)



Mark Arrigo
EcoLogic, LLC
Atwell Mill Annex, Suite S-2
132 1/2 Albany Street
Cazenovia, NY 13035

Phone: (315) 655-8305

FAX: (315) 655-4086

Laboratory Analysis Report

For

EcoLogic, LLC

Client Project ID:

Town of Lewisboro

LSL Project ID: **0814440**

Receive Date/Time: 08/13/08 16:47

Project Received by: RD

Life Science Laboratories, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose. By the Client's acceptance and/or use of this report, the Client agrees that LSL is hereby released from any and all liabilities, claims, damages or causes of action affecting or which may affect the Client as regards to the results contained in this report. The Client further agrees that the only remedy available to the Client in the event of proven non-conformity with the above warranty shall be for LSL to re-perform the analytical test(s) at no charge to the Client. The data contained in this report are for the exclusive use of the Client to whom it is addressed, and the release of these data to any other party, or the use of the name, trademark or service mark of Life Science Laboratories, Inc. especially for the use of advertising to the general public, is strictly prohibited without express prior written consent of Life Science Laboratories, Inc. This report may only be reproduced in its entirety. No partial duplication is allowed. The Chain of Custody document submitted with these samples is considered by LSL to be an appendix of this report and may contain specific information that pertains to the samples included in this report. The analytical result(s) in this report are only representative of the sample(s) submitted for analysis. LSL makes no claim of a sample's representativeness, or integrity, if sampling was not performed by LSL personnel.

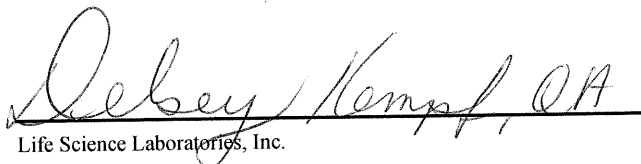
Life Science Laboratories, Inc.

- (1) LSL Central Lab, East Syracuse, NY
- (2) LSL North Lab, Waddington, NY
- (3) LSL Finger Lakes Lab, Wayland, NY
- (4) LSL Southern Tier Lab, Cuba, NY
- (5) LSL MidLakes Lab, Canandaigua, NY
- (6) LSL Brittonfield Lab, East Syracuse, NY

(315) 445-1105
(315) 388-4476
(585) 728-3320
(585) 968-2640
(585) 396-0270
(315) 437-0200

NYS DOH ELAP #10248 PA DEP #68-2556
NYS DOH ELAP #10900
NYS DOH ELAP #11667
NYS DOH ELAP #10760
NYS DOH ELAP #11369
NYS DOH ELAP #10155

This report was reviewed by:


Life Science Laboratories, Inc.

Date:

10/8/08

A copy of this report was sent to:

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Kitchawon	LSL Sample ID:	0814440-001
Location:			
Sampled:	08/12/08 9:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
<i>(I)</i> EPA 6010 RCRA Total Metals					
Copper	8.5	mg/kg	8/21/08	8/22/08	DP
Arsenic	<0.05	mg/kg	8/21/08	8/22/08	DP
Barium	16	mg/kg	8/21/08	8/22/08	DP
Cadmium	0.24	mg/kg	8/21/08	8/22/08	DP
Chromium	3.1	mg/kg	8/21/08	8/22/08	DP
Lead	11	mg/kg	8/21/08	8/22/08	DP
Selenium	0.054	mg/kg	8/21/08	8/22/08	DP
Silver	<0.05	mg/kg	8/21/08	8/22/08	DP
<i>(I)</i> EPA 7471 Mercury					
Mercury	<0.005	mg/kg	8/25/08	8/27/08	DP
<i>(I)</i> EPA 8081/8082 Pesticides/PCB's					
Aldrin	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
beta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
delta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-BHC (Lindane)	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDD	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDE	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDT	<0.04	mg/kg	8/26/08	9/12/08	KIW
Dieldrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan I	<0.02	mg/kg	8/26/08	9/12/08	KIW
Endosulfan II	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan sulfate	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin aldehyde	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin ketone	<0.04	mg/kg	8/26/08	9/12/08	KIW
Heptachlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Heptachlor epoxide	<0.02	mg/kg	8/26/08	9/12/08	KIW
Methoxychlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Toxaphene	<5	mg/kg	8/26/08	9/12/08	KIW
Aroclor-1016	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1221	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1232	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1242	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1248	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1254	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1260	<0.2	mg/kg	8/26/08	8/29/08	KIW
Surrogate (TCMX)	89	%R	8/26/08	9/12/08	KIW
Surrogate (DCB)	75	%R	8/26/08	8/29/08	KIW
<i>(I)</i> EPA 8260B TCL Volatiles					
Acetone	<60	ug/kg		8/14/08	CRT
Benzene	<30	ug/kg		8/14/08	CRT
Bromodichloromethane	<30	ug/kg		8/14/08	CRT
Bromoform	<30	ug/kg		8/14/08	CRT

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Kitchawon	LSL Sample ID:	0814440-001
Location:			
Sampled:	08/12/08 9:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
<i>(1)</i> EPA 8260B TCL Volatiles					
Bromomethane	<30	ug/kg		8/14/08	CRT
2-Butanone (MEK)	<60	ug/kg		8/14/08	CRT
Carbon disulfide	<30	ug/kg		8/14/08	CRT
Carbon tetrachloride	<30	ug/kg		8/14/08	CRT
Chlorobenzene	<30	ug/kg		8/14/08	CRT
Chloroethane	<30	ug/kg		8/14/08	CRT
Chloroform	<30	ug/kg		8/14/08	CRT
Chloromethane	<30	ug/kg		8/14/08	CRT
Dibromochloromethane	<30	ug/kg		8/14/08	CRT
1,1-Dichloroethane	<30	ug/kg		8/14/08	CRT
1,2-Dichloroethane	<30	ug/kg		8/14/08	CRT
1,1-Dichloroethene	<30	ug/kg		8/14/08	CRT
1,2-Dichloroethene, Total	<30	ug/kg		8/14/08	CRT
1,2-Dichloropropane	<30	ug/kg		8/14/08	CRT
cis-1,3-Dichloropropene	<30	ug/kg		8/14/08	CRT
trans-1,3-Dichloropropene	<30	ug/kg		8/14/08	CRT
Ethyl benzene	<30	ug/kg		8/14/08	CRT
2-Hexanone	<60	ug/kg		8/14/08	CRT
Methylene chloride	<60	ug/kg		8/14/08	CRT
4-Methyl-2-pentanone (MIBK)	<60	ug/kg		8/14/08	CRT
Styrene	<30	ug/kg		8/14/08	CRT
1,1,2,2-Tetrachloroethane	<30	ug/kg		8/14/08	CRT
Tetrachloroethene	<30	ug/kg		8/14/08	CRT
Toluene	<30	ug/kg		8/14/08	CRT
1,1,1-Trichloroethane	<30	ug/kg		8/14/08	CRT
1,1,2-Trichloroethane	<30	ug/kg		8/14/08	CRT
Trichloroethene	<30	ug/kg		8/14/08	CRT
Vinyl chloride	<30	ug/kg		8/14/08	CRT
Xylenes (Total)	<30	ug/kg		8/14/08	CRT
Surrogate (1,2-DCA-d4)	98	%R		8/14/08	CRT
Surrogate (Tol-d8)	96	%R		8/14/08	CRT
Surrogate (4-BFB)	108	%R		8/14/08	CRT
<i>(1)</i> EPA 8270 TCL Semi-Volatiles (B/N)					
Acenaphthene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Acenaphthylene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Anthracene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Benzo(a)anthracene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Benzo(b)fluoranthene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Benzo(k)fluoranthene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Benzo(ghi)perylene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Benzo(a)pyrene	<0.7	mg/kg	8/25/08	8/29/08	CRT
4-Bromophenyl-phenylether	<0.7	mg/kg	8/25/08	8/29/08	CRT
Butylbenzylphthalate	<0.7	mg/kg	8/25/08	8/29/08	CRT
Carbazole	<0.7	mg/kg	8/25/08	8/29/08	CRT
4-Chloroaniline	<0.7	mg/kg	8/25/08	8/29/08	CRT
bis(2-Chloroethoxy)methane	<0.7	mg/kg	8/25/08	8/29/08	CRT

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Kitchawon	LSL Sample ID:	0814440-001
Location:			
Sampled:	08/12/08 9:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
(I) EPA 8270 TCL Semi-Volatiles (B/N)					
bis(2-Chloroethyl)ether	<0.7	mg/kg	8/25/08	8/29/08	CRT
2-Chloronaphthalene	<0.7	mg/kg	8/25/08	8/29/08	CRT
4-Chlorophenyl-phenylether	<0.7	mg/kg	8/25/08	8/29/08	CRT
Chrysene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Dibenz(a,h)anthracene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Dibenzofuran	<0.7	mg/kg	8/25/08	8/29/08	CRT
Di-n-butylphthalate	<0.7	mg/kg	8/25/08	8/29/08	CRT
1,2-Dichlorobenzene	<0.7	mg/kg	8/25/08	8/29/08	CRT
1,3-Dichlorobenzene	<0.7	mg/kg	8/25/08	8/29/08	CRT
1,4-Dichlorobenzene	<0.7	mg/kg	8/25/08	8/29/08	CRT
3,3'-Dichlorobenzidine	<2	mg/kg	8/25/08	8/29/08	CRT
Diethylphthalate	<0.7	mg/kg	8/25/08	8/29/08	CRT
Dimethylphthalate	<0.7	mg/kg	8/25/08	8/29/08	CRT
2,4-Dinitrotoluene	<0.7	mg/kg	8/25/08	8/29/08	CRT
2,6-Dinitrotoluene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Di-n-octylphthalate	<0.7	mg/kg	8/25/08	8/29/08	CRT
bis(2-Ethylhexyl)phthalate	<0.7	mg/kg	8/25/08	8/29/08	CRT
Fluoranthene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Fluorene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Hexachlorobenzene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Hexachlorobutadiene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Hexachlorocyclopentadiene	<2	mg/kg	8/25/08	8/29/08	CRT
Hexachloroethane	<0.7	mg/kg	8/25/08	8/29/08	CRT
Indeno(1,2,3-c,d)pyrene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Isophorone	<0.7	mg/kg	8/25/08	8/29/08	CRT
2-Methylnaphthalene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Naphthalene	<0.7	mg/kg	8/25/08	8/29/08	CRT
2-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
3-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
4-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
Nitrobenzene	<0.7	mg/kg	8/25/08	8/29/08	CRT
N-Nitrosodiphenylamine	<0.7	mg/kg	8/25/08	8/29/08	CRT
N-Nitroso-di-n-propylamine	<0.7	mg/kg	8/25/08	8/29/08	CRT
Phenanthrene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Pyrene	<0.7	mg/kg	8/25/08	8/29/08	CRT
1,2,4-Trichlorobenzene	<0.7	mg/kg	8/25/08	8/29/08	CRT
Surrogate (Nitrobenzene-d5)	44	%R	8/25/08	8/29/08	CRT
Surrogate (2-Fluorobiphenyl)	57	%R	8/25/08	8/29/08	CRT
Surrogate (Terphenyl-d14)	83	%R	8/25/08	8/29/08	CRT
(I) Modified SM 18-20 2540B Total Solids					
Total Solids @ 103-105 C	12	%		8/19/08	MM
(I) Particle Size Distribution					
Particle Size Distribution	See Attached				
This analysis was performed by PW Laboratories, Inc.					
(I) Total Organic Carbon, EPA 9060					
Total Organic Carbon	See Attached			8/27/08 09:21	TA

Life Science Laboratories, Inc.

Page 4 of 13

Date Printed: 10/7/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Kitchawon LSL Sample ID: 0814440-001
Location:
Sampled: 08/12/08 9:30 Sampled By: MA
Sample Matrix: SHW as Recd

Analytical Method	Prep	Analysis	Analyst
Analyte	Date	Date & Time	Initials

(1) Total Organic Carbon, EPA 9060

This analysis was sub-contracted.

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Truesdale - 1	LSL Sample ID:	0814440-002
Location:			
Sampled:	08/12/08 10:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
(1) EPA 6010 RCRA Total Metals					
Copper	240	mg/kg	8/21/08	8/22/08	DP
Arsenic	<0.05	mg/kg	8/21/08	8/22/08	DP
Barium	19	mg/kg	8/21/08	8/22/08	DP
Cadmium	0.23	mg/kg	8/21/08	8/22/08	DP
Chromium	3.3	mg/kg	8/21/08	8/22/08	DP
Lead	7.8	mg/kg	8/21/08	8/22/08	DP
Selenium	<0.05	mg/kg	8/21/08	8/22/08	DP
Silver	<0.05	mg/kg	8/21/08	8/22/08	DP
(1) EPA 7471 Mercury					
Mercury	<0.005	mg/kg	8/25/08	8/27/08	DP
(1) EPA 8081/8082 Pesticides/PCB's					
Aldrin	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
beta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
delta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-BHC (Lindane)	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDD	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDE	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDT	<0.04	mg/kg	8/26/08	9/12/08	KIW
Dieldrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan I	<0.02	mg/kg	8/26/08	9/12/08	KIW
Endosulfan II	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan sulfate	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin aldehyde	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin ketone	<0.04	mg/kg	8/26/08	9/12/08	KIW
Heptachlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Heptachlor epoxide	<0.02	mg/kg	8/26/08	9/12/08	KIW
Methoxychlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Toxaphene	<5	mg/kg	8/26/08	9/12/08	KIW
Aroclor-1016	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1221	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1232	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1242	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1248	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1254	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1260	<0.2	mg/kg	8/26/08	8/29/08	KIW
Surrogate (TCMX)	89	%R	8/26/08	9/12/08	KIW
Surrogate (DCB)	86	%R	8/26/08	8/29/08	KIW
(1) EPA 8260B TCL Volatiles					
Acetone	<60	ug/kg		8/14/08	CRT
Benzene	<30	ug/kg		8/14/08	CRT
Bromodichloromethane	<30	ug/kg		8/14/08	CRT
Bromoform	<30	ug/kg		8/14/08	CRT

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Truesdale - 1	LSL Sample ID:	0814440-002
Location:			
Sampled:	08/12/08 10:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
<i>(1)</i> EPA 8260B TCL Volatiles					
Bromomethane	<30	ug/kg		8/14/08	CRT
2-Butanone (MEK)	<60	ug/kg		8/14/08	CRT
Carbon disulfide	<30	ug/kg		8/14/08	CRT
Carbon tetrachloride	<30	ug/kg		8/14/08	CRT
Chlorobenzene	<30	ug/kg		8/14/08	CRT
Chloroethane	<30	ug/kg		8/14/08	CRT
Chloroform	<30	ug/kg		8/14/08	CRT
Chloromethane	<30	ug/kg		8/14/08	CRT
Dibromochloromethane	<30	ug/kg		8/14/08	CRT
1,1-Dichloroethane	<30	ug/kg		8/14/08	CRT
1,2-Dichloroethane	<30	ug/kg		8/14/08	CRT
1,1-Dichloroethene	<30	ug/kg		8/14/08	CRT
1,2-Dichloroethene, Total	<30	ug/kg		8/14/08	CRT
1,2-Dichloropropane	<30	ug/kg		8/14/08	CRT
cis-1,3-Dichloropropene	<30	ug/kg		8/14/08	CRT
trans-1,3-Dichloropropene	<30	ug/kg		8/14/08	CRT
Ethyl benzene	<30	ug/kg		8/14/08	CRT
2-Hexanone	<60	ug/kg		8/14/08	CRT
Methylene chloride	<60	ug/kg		8/14/08	CRT
4-Methyl-2-pentanone (MIBK)	<60	ug/kg		8/14/08	CRT
Styrene	<30	ug/kg		8/14/08	CRT
1,1,2,2-Tetrachloroethane	<30	ug/kg		8/14/08	CRT
Tetrachloroethene	<30	ug/kg		8/14/08	CRT
Toluene	<30	ug/kg		8/14/08	CRT
1,1,1-Trichloroethane	<30	ug/kg		8/14/08	CRT
1,1,2-Trichloroethane	<30	ug/kg		8/14/08	CRT
Trichloroethene	<30	ug/kg		8/14/08	CRT
Vinyl chloride	<30	ug/kg		8/14/08	CRT
Xylenes (Total)	<30	ug/kg		8/14/08	CRT
Surrogate (1,2-DCA-d4)	100	%R		8/14/08	CRT
Surrogate (Tol-d8)	96	%R		8/14/08	CRT
Surrogate (4-BFB)	107	%R		8/14/08	CRT
<i>(1)</i> EPA 8270 TCL Semi-Volatiles (B/N)					
Acenaphthene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Acenaphthylene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Anthracene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Benzo(a)anthracene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Benzo(b)fluoranthene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Benzo(k)fluoranthene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Benzo(ghi)perylene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Benzo(a)pyrene	<0.8	mg/kg	8/25/08	8/29/08	CRT
4-Bromophenyl-phenylether	<0.8	mg/kg	8/25/08	8/29/08	CRT
Butylbenzylphthalate	<0.8	mg/kg	8/25/08	8/29/08	CRT
Carbazole	<0.8	mg/kg	8/25/08	8/29/08	CRT
4-Chloroaniline	<0.8	mg/kg	8/25/08	8/29/08	CRT
bis(2-Chloroethoxy)methane	<0.8	mg/kg	8/25/08	8/29/08	CRT

Life Science Laboratories, Inc.

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Date Printed: 10/7/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Truesdale - 1	LSL Sample ID:	0814440-002
Location:			
Sampled:	08/12/08 10:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(1) EPA 8270 TCL Semi-Volatiles (B/N)					
bis(2-Chloroethyl)ether	<0.8	mg/kg	8/25/08	8/29/08	CRT
2-Chloronaphthalene	<0.8	mg/kg	8/25/08	8/29/08	CRT
4-Chlorophenyl-phenylether	<0.8	mg/kg	8/25/08	8/29/08	CRT
Chrysene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Dibenz(a,h)anthracene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Dibenzofuran	<0.8	mg/kg	8/25/08	8/29/08	CRT
Di-n-butylphthalate	<0.8	mg/kg	8/25/08	8/29/08	CRT
1,2-Dichlorobenzene	<0.8	mg/kg	8/25/08	8/29/08	CRT
1,3-Dichlorobenzene	<0.8	mg/kg	8/25/08	8/29/08	CRT
1,4-Dichlorobenzene	<0.8	mg/kg	8/25/08	8/29/08	CRT
3,3'-Dichlorobenzidine	<2	mg/kg	8/25/08	8/29/08	CRT
Diethylphthalate	<0.8	mg/kg	8/25/08	8/29/08	CRT
Dimethylphthalate	<0.8	mg/kg	8/25/08	8/29/08	CRT
2,4-Dinitrotoluene	<0.8	mg/kg	8/25/08	8/29/08	CRT
2,6-Dinitrotoluene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Di-n-octylphthalate	<0.8	mg/kg	8/25/08	8/29/08	CRT
bis(2-Ethylhexyl)phthalate	<0.8	mg/kg	8/25/08	8/29/08	CRT
Fluoranthene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Fluorene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Hexachlorobenzene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Hexachlorobutadiene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Hexachlorocyclopentadiene	<2	mg/kg	8/25/08	8/29/08	CRT
Hexachloroethane	<0.8	mg/kg	8/25/08	8/29/08	CRT
Indeno(1,2,3-c,d)pyrene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Isophorone	<0.8	mg/kg	8/25/08	8/29/08	CRT
2-Methylnaphthalene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Naphthalene	<0.8	mg/kg	8/25/08	8/29/08	CRT
2-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
3-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
4-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
Nitrobenzene	<0.8	mg/kg	8/25/08	8/29/08	CRT
N-Nitrosodiphenylamine	<0.8	mg/kg	8/25/08	8/29/08	CRT
N-Nitroso-di-n-propylamine	<0.8	mg/kg	8/25/08	8/29/08	CRT
Phenanthrene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Pyrene	<0.8	mg/kg	8/25/08	8/29/08	CRT
1,2,4-Trichlorobenzene	<0.8	mg/kg	8/25/08	8/29/08	CRT
Surrogate (Nitrobenzene-d5)	27	%R	8/25/08	8/29/08	CRT
Surrogate (2-Fluorobiphenyl)	42	%R	8/25/08	8/29/08	CRT
Surrogate (Terphenyl-d14)	84	%R	8/25/08	8/29/08	CRT
(1) Modified SM 18-20 2540B Total Solids					
Total Solids @ 103-105 C	9.2	%		8/19/08	MM
(1) Particle Size Distribution					
Particle Size Distribution	See Attached				
This analysis was performed by PW Laboratories, Inc.					
(1) Total Organic Carbon, EPA 9060					
Total Organic Carbon	See Attached			8/27/08 09:21	TA

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Truesdale - 1 LSL Sample ID: 0814440-002

Location:

Sampled: 08/12/08 10:30 Sampled By: MA

Sample Matrix: SHW as Recd

Analytical Method	Prep	Analysis	Analyst
Analyte	Date	Date & Time	Initials

(1) Total Organic Carbon, EPA 9060

This analysis was sub-contracted.

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Truesdale - 2	LSL Sample ID:	0814440-003
Location:			
Sampled:	08/12/08 14:20	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
<i>(1)</i> EPA 6010 RCRA Total Metals					
Copper	210	mg/kg	8/21/08	8/22/08	DP
Arsenic	<0.05	mg/kg	8/21/08	8/22/08	DP
Barium	26	mg/kg	8/21/08	8/22/08	DP
Cadmium	0.32	mg/kg	8/21/08	8/22/08	DP
Chromium	4.7	mg/kg	8/21/08	8/22/08	DP
Lead	8.2	mg/kg	8/21/08	8/22/08	DP
Selenium	<0.05	mg/kg	8/21/08	8/22/08	DP
Silver	<0.05	mg/kg	8/21/08	8/22/08	DP
<i>(1)</i> EPA 7471 Mercury					
Mercury	<0.005	mg/kg	8/25/08	8/27/08	DP
<i>(1)</i> EPA 8081/8082 Pesticides/PCB's					
Aldrin	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
beta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
delta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-BHC (Lindane)	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDD	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDE	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDT	<0.04	mg/kg	8/26/08	9/12/08	KIW
Dieldrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan I	<0.02	mg/kg	8/26/08	9/12/08	KIW
Endosulfan II	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan sulfate	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin aldehyde	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin ketone	<0.04	mg/kg	8/26/08	9/12/08	KIW
Heptachlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Heptachlor epoxide	<0.02	mg/kg	8/26/08	9/12/08	KIW
Methoxychlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Toxaphene	<5	mg/kg	8/26/08	9/12/08	KIW
Aroclor-1016	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1221	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1232	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1242	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1248	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1254	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1260	<0.2	mg/kg	8/26/08	8/29/08	KIW
Surrogate (TCMX)	92	%R	8/26/08	9/12/08	KIW
Surrogate (DCB)	111	%R	8/26/08	8/29/08	KIW
<i>(1)</i> EPA 8260B TCL Volatiles					
Acetone	<60	ug/kg		8/14/08	CRT
Benzene	<30	ug/kg		8/14/08	CRT
Bromodichloromethane	<30	ug/kg		8/14/08	CRT
Bromoform	<30	ug/kg		8/14/08	CRT

Life Science Laboratories, Inc.

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Date Printed: 10/7/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Truesdale - 2	LSL Sample ID:	0814440-003
Location:			
Sampled:	08/12/08 14:20	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
<i>(1)</i> EPA 8260B TCL Volatiles					
Bromomethane	<30	ug/kg		8/14/08	CRT
2-Butanone (MEK)	<60	ug/kg		8/14/08	CRT
Carbon disulfide	<30	ug/kg		8/14/08	CRT
Carbon tetrachloride	<30	ug/kg		8/14/08	CRT
Chlorobenzene	<30	ug/kg		8/14/08	CRT
Chloroethane	<30	ug/kg		8/14/08	CRT
Chloroform	<30	ug/kg		8/14/08	CRT
Chloromethane	<30	ug/kg		8/14/08	CRT
Dibromochloromethane	<30	ug/kg		8/14/08	CRT
1,1-Dichloroethane	<30	ug/kg		8/14/08	CRT
1,2-Dichloroethane	<30	ug/kg		8/14/08	CRT
1,1-Dichloroethene	<30	ug/kg		8/14/08	CRT
1,2-Dichloroethene, Total	<30	ug/kg		8/14/08	CRT
1,2-Dichloropropane	<30	ug/kg		8/14/08	CRT
cis-1,3-Dichloropropene	<30	ug/kg		8/14/08	CRT
trans-1,3-Dichloropropene	<30	ug/kg		8/14/08	CRT
Ethyl benzene	<30	ug/kg		8/14/08	CRT
2-Hexanone	<60	ug/kg		8/14/08	CRT
Methylene chloride	<60	ug/kg		8/14/08	CRT
4-Methyl-2-pentanone (MIBK)	<60	ug/kg		8/14/08	CRT
Styrene	<30	ug/kg		8/14/08	CRT
1,1,2,2-Tetrachloroethane	<30	ug/kg		8/14/08	CRT
Tetrachloroethene	<30	ug/kg		8/14/08	CRT
Toluene	<30	ug/kg		8/14/08	CRT
1,1,1-Trichloroethane	<30	ug/kg		8/14/08	CRT
1,1,2-Trichloroethane	<30	ug/kg		8/14/08	CRT
Trichloroethene	<30	ug/kg		8/14/08	CRT
Vinyl chloride	<30	ug/kg		8/14/08	CRT
Xylenes (Total)	<30	ug/kg		8/14/08	CRT
Surrogate (1,2-DCA-d4)	98	%R		8/14/08	CRT
Surrogate (Tol-d8)	97	%R		8/14/08	CRT
Surrogate (4-BFB)	110	%R		8/14/08	CRT
<i>(1)</i> EPA 8270 TCL Semi-Volatiles (B/N)					
Acenaphthene	<1	mg/kg	8/25/08	8/29/08	CRT
Acenaphthylene	<1	mg/kg	8/25/08	8/29/08	CRT
Anthracene	<1	mg/kg	8/25/08	8/29/08	CRT
Benzo(a)anthracene	<1	mg/kg	8/25/08	8/29/08	CRT
Benzo(b)fluoranthene	<1	mg/kg	8/25/08	8/29/08	CRT
Benzo(k)fluoranthene	<1	mg/kg	8/25/08	8/29/08	CRT
Benzo(ghi)perylene	<1	mg/kg	8/25/08	8/29/08	CRT
Benzo(a)pyrene	<1	mg/kg	8/25/08	8/29/08	CRT
4-Bromophenyl-phenylether	<1	mg/kg	8/25/08	8/29/08	CRT
Butylbenzylphthalate	<1	mg/kg	8/25/08	8/29/08	CRT
Carbazole	<1	mg/kg	8/25/08	8/29/08	CRT
4-Chloroaniline	<1	mg/kg	8/25/08	8/29/08	CRT
bis(2-Chloroethoxy)methane	<1	mg/kg	8/25/08	8/29/08	CRT

- - LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Truesdale - 2	LSL Sample ID:	0814440-003
Location:			
Sampled:	08/12/08 14:20	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep	Analysis	Analyst
Analyte	Result	Units	Date	Date & Time	Initials
(1) EPA 8270 TCL Semi-Volatiles (B/N)					
bis(2-Chloroethyl)ether	<1	mg/kg	8/25/08	8/29/08	CRT
2-Chloronaphthalene	<1	mg/kg	8/25/08	8/29/08	CRT
4-Chlorophenyl-phenylether	<1	mg/kg	8/25/08	8/29/08	CRT
Chrysene	<1	mg/kg	8/25/08	8/29/08	CRT
Dibenz(a,h)anthracene	<1	mg/kg	8/25/08	8/29/08	CRT
Dibenzofuran	<1	mg/kg	8/25/08	8/29/08	CRT
Di-n-butylphthalate	<1	mg/kg	8/25/08	8/29/08	CRT
1,2-Dichlorobenzene	<1	mg/kg	8/25/08	8/29/08	CRT
1,3-Dichlorobenzene	<1	mg/kg	8/25/08	8/29/08	CRT
1,4-Dichlorobenzene	<1	mg/kg	8/25/08	8/29/08	CRT
3,3'-Dichlorobenzidine	<2	mg/kg	8/25/08	8/29/08	CRT
Diethylphthalate	<1	mg/kg	8/25/08	8/29/08	CRT
Dimethylphthalate	<1	mg/kg	8/25/08	8/29/08	CRT
2,4-Dinitrotoluene	<1	mg/kg	8/25/08	8/29/08	CRT
2,6-Dinitrotoluene	<1	mg/kg	8/25/08	8/29/08	CRT
Di-n-octylphthalate	<1	mg/kg	8/25/08	8/29/08	CRT
bis(2-Ethylhexyl)phthalate	<1	mg/kg	8/25/08	8/29/08	CRT
Fluoranthene	<1	mg/kg	8/25/08	8/29/08	CRT
Fluorene	<1	mg/kg	8/25/08	8/29/08	CRT
Hexachlorobenzene	<1	mg/kg	8/25/08	8/29/08	CRT
Hexachlorobutadiene	<1	mg/kg	8/25/08	8/29/08	CRT
Hexachlorocyclopentadiene	<2	mg/kg	8/25/08	8/29/08	CRT
Hexachloroethane	<1	mg/kg	8/25/08	8/29/08	CRT
Indeno(1,2,3-c,d)pyrene	<1	mg/kg	8/25/08	8/29/08	CRT
Isophorone	<1	mg/kg	8/25/08	8/29/08	CRT
2-Methylnaphthalene	<1	mg/kg	8/25/08	8/29/08	CRT
Naphthalene	<1	mg/kg	8/25/08	8/29/08	CRT
2-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
3-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
4-Nitroaniline	<2	mg/kg	8/25/08	8/29/08	CRT
Nitrobenzene	<1	mg/kg	8/25/08	8/29/08	CRT
N-Nitrosodiphenylamine	<1	mg/kg	8/25/08	8/29/08	CRT
N-Nitroso-di-n-propylamine	<1	mg/kg	8/25/08	8/29/08	CRT
Phenanthrene	<1	mg/kg	8/25/08	8/29/08	CRT
Pyrene	<1	mg/kg	8/25/08	8/29/08	CRT
1,2,4-Trichlorobenzene	<1	mg/kg	8/25/08	8/29/08	CRT
Surrogate (Nitrobenzene-d5)	44	%R	8/25/08	8/29/08	CRT
Surrogate (2-Fluorobiphenyl)	59	%R	8/25/08	8/29/08	CRT
Surrogate (Terphenyl-d14)	74	%R	8/25/08	8/29/08	CRT
(1) Modified SM 18-20 2540B Total Solids					
Total Solids @ 103-105 C	26	%		8/19/08	MM
(1) Particle Size Distribution					
Particle Size Distribution	See Attached				
This analysis was performed by PW Laboratories, Inc.					
(1) Total Organic Carbon, EPA 9060					
Total Organic Carbon	See Attached			8/27/08 09:21	TA

Life Science Laboratories, Inc.

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Date Printed: 10/7/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

-- LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Truesdale - 2 LSL Sample ID: 0814440-003
Location:
Sampled: 08/12/08 14:20 Sampled By: MA
Sample Matrix: SHW as Recd

Analytical Method	Prep	Analysis	Analyst
Analyte	Date	Date & Time	Initials

(1) Total Organic Carbon, EPA 9060

This analysis was sub-contracted.



SURROGATE RECOVERY CONTROL LIMITS FOR ORGANIC METHODS

<u>Method</u>	<u>Surrogate(s)</u>	<u>Water Limits, %R</u>	<u>SHW Limits, %R</u>
EPA 504	TCMX	80-120	NA
EPA 508	DCB	70-130	NA
EPA 515.4	DCAA	70-130	NA
EPA 524.2	1,2-DCA-d4, 4-BFB	80-120	NA
EPA 525.2	1,3-DM-2-NB, TPP, Per-d12	70-130	NA
EPA 526	1,3-DM-2-NB, TPP	70-130	NA
EPA 528	2-CP-3,4,5,6-d4, 2,4,6-TBP	70-130	NA
EPA 551.1	Decafluorobiphenyl	80-120	NA
EPA 552.2	2,3-DBPA	70-130	NA
EPA 601	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 602	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 608	TCMX, DCB	30-150	NA
EPA 624	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 625, AE	2-Fluorophenol	21-110	NA
EPA 625, AE	Phenol-d5	10-110	NA
EPA 625, AE	2,4,6-Tribromophenol	10-123	NA
EPA 625, BN	Nitrobenzene-d5	35-114	NA
EPA 625, BN	2-Fluorobiphenyl	43-116	NA
EPA 625, BN	Terphenyl-d14	33-141	NA
EPA 8010	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8020	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8021	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8081	TCMX, DCB	30-150	30-150
EPA 8082	DCB	30-150	30-150
EPA 8151	DCAA	30-130	30-120
EPA 8260	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8270, AE	2-Fluorophenol	21-110	25-121
EPA 8270, AE	Phenol-d5	10-110	24-113
EPA 8270, AE	2,4,6-Tribromophenol	10-123	19-122
EPA 8270, BN	Nitrobenzene-d5	35-114	23-120
EPA 8270, BN	2-Fluorobiphenyl	43-116	30-115
EPA 8270, BN	Terphenyl-d14	33-141	18-137
DOH 310-13	Terphenyl-d14	40-110	40-110
DOH 310-14	Terphenyl-d14	40-110	40-110
DOH 310-15	Terphenyl-d14	40-110	40-110
DOH 310-34	4-BFB	50-150	50-150
DOH 313-4	DCB	NA	30-150
8015M_GRO	4-BFB	50-150	50-150
8015M_DRO	Terphenyl-d14	50-150	50-150

Units Key:	ug/l = microgram per liter
	ug/kg = microgram per kilogram
	mg/l = milligram per liter
	mg/kg = milligram per kilogram
	%R = Percent Recovery



PW LABORATORIES, INC.
P.O. BOX 56, 5879 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 • 866-7PW-LABS • Fax 315-437-1752

September 25, 2008

Mr. Greg Smith
Life Science Laboratories
5854 Butternut Drive
East Syracuse, New York 13057

RECEIVED
SEP 30 2008

Re: L-08090
Laboratory Testing
PO #S052572
PO #S052573

Dear Mr. Smith:

Enclosed are the results of laboratory testing performed at your request on five jar material samples delivered to our laboratory on September 18, 2008 for the above referenced project. Results include:

1. Sieve Analysis ASTM D422 & D1140
Laboratory I.D. #'s 23639 - 23643 5 each

All requested tests have been completed on the previously received sample(s) for the above project. All sample remains are scheduled to be disposed of on October 25, 2008. Please notify PW Laboratories, Inc. by letter or telephone prior to October 25, 2008 if you would prefer to pick up the sample(s) or that the sample(s) be retained by PW Laboratories, Inc. for an additional period of time.

Thank you for this opportunity to work with you.

Very truly yours,

PW LABORATORIES, INC.

A handwritten signature in cursive script, appearing to read 'Virginia J. Thoma'.

Virginia J. Thoma
Manager - Laboratory Services
VJT/bll
Encs:



Project Title:	Laboratory Testing
	PO# S052572
	LSL Project #0814440

Project #:	L-08090	Report #:	1
Test Method:	ASTMD422 & D1140	Report Date:	September 25, 2008

[illegible]

Sample mass, as received, meets minimum mass requirements of test method:	Yes	X	No	
Remarks:				
Prewashed:	Yes	X	No	
Performed By:	LS			
Checked By:	V.J. Thoma			

August 27, 2008 11:55:19AM

Client: Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn: Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Nbr: 0814440
P/O Nbr: SO52516
Date Received: 08/21/08

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
0814440-001B Kitchawen	NRH1945-01	08/12/08
0814440-002B Truesdale (1)	NRH1945-02	08/12/08
0814440-003B Truesdale (2)	NRH1945-03	08/12/08

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution, or copying of this material is strictly prohibited. If you have received this material in error, please notify us immediately at 615-726-0177.

New York Certification Number: 11342

The Chain(s) of Custody, 2 pages, are included and are an integral part of this report.

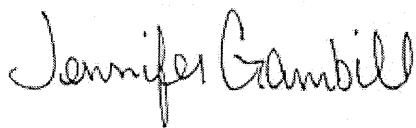
These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

All solids results are reported in wet weight unless specifically stated.

Estimated uncertainty is available upon request.

This report has been electronically signed.

Report Approved By:



Jennifer Gambill

Project Manager

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Number: 0814440
Received: 08/21/08 10:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NRH1945-01 (0814440-001B Kitchawen - Soil) Sampled: 08/12/08								
General Chemistry Parameters								
Total Organic Carbon	94000		mg/Kg dry	1000	1	08/27/08 09:21	SW846 9060M	8083520
Sample ID: NRH1945-02 (0814440-002B Truesdale (1) - Soil) Sampled: 08/12/08								
General Chemistry Parameters								
Total Organic Carbon	132000		mg/Kg dry	1000	1	08/27/08 09:21	SW846 9060M	8083520
Sample ID: NRH1945-03 (0814440-003B Truesdale (2) - Soil) Sampled: 08/12/08								
General Chemistry Parameters								
Total Organic Carbon	39300		mg/Kg dry	1000	1	08/27/08 09:21	SW846 9060M	8083520

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Number: 0814440
Received: 08/21/08 10:15

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
---------	-------------	---	-------	------------	------------	--------------------

General Chemistry Parameters

8083520-BLK1

Total Organic Carbon	<172		mg/Kg dry	8083520	8083520-BLK1	08/27/08 09:21
----------------------	------	--	-----------	---------	--------------	----------------

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Number: 0814440
Received: 08/21/08 10:15

PROJECT QUALITY CONTROL DATA

Duplicate

Analyte	Orig. Val.	Duplicate	Q	Units	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
General Chemistry Parameters									
8083520-DUP1									
Total Organic Carbon	103000	99600		mg/Kg dry	4	35	8083520	NRH1948-02	08/27/08 09:21



THE LEADER IN ENVIRONMENTAL TESTING

2960 Foster Creighton Road Nashville, TN 37204 * 800-765-0980 * Fax 615-726-3404

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Number: 0814440
Received: 08/21/08 10:15

PROJECT QUALITY CONTROL DATA
LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
General Chemistry Parameters								
8083520-BS1								
Total Organic Carbon	2.99	2.96		%	99%	85 - 110	8083520	08/27/08 09:21

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Number: 0814440
Received: 08/21/08 10:15

CERTIFICATION SUMMARY

TestAmerica Nashville

Method	Matrix	AIHA	Nelac	New York
SW846 9060M	Soil	N/A	N/A	N/A

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Number: 0814440
Received: 08/21/08 10:15

NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

Analyte

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1945
Project Name: NY Site
Project Number: 0814440
Received: 08/21/08 10:15

DATA QUALIFIERS AND DEFINITIONS

ND Not detected at the reporting limit (or method detection limit if shown)

COOLER RECEIPT



PH1945

Cooler Received/Opened On 08/21/2008 @ 1015

1. Tracking # 1213X926134575 9698

Courier: UPS IR Gun ID 102594

2. Temperature of rep. sample or temp blank when opened: 5.4 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: NA

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (initial) M

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #

I certify that I unloaded the cooler and answered questions 7-14 (initial) J

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) J

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) J

I certify that I attached a label with the unique LIMS number to each container (initial) J

21. Were there Non-Conformance issues at login? YES...NO... Was a PIPE generated? YES...NO...#

EcoLogic 2008 Water Quality / Sediment Sampling

Sediment Laboratory Analytical Results:

Lake Katonah

Timber Lake



Mark Arrigo
EcoLogic, LLC
Atwell Mill Annex, Suite S-2
132 1/2 Albany Street
Cazenovia, NY 13035

Phone: (315) 655-8305

FAX: (315) 655-4086

Revised Laboratory Analysis Report

For

EcoLogic, LLC

Client Project ID:

Town of Lewisboro

LSL Project ID: **0814563**

Receive Date/Time: 08/14/08 15:34

Project Received by: LZ

Life Science Laboratories, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose. By the Client's acceptance and/or use of this report, the Client agrees that LSL is hereby released from any and all liabilities, claims, damages or causes of action affecting or which may affect the Client as regards to the results contained in this report. The Client further agrees that the only remedy available to the Client in the event of proven non-conformity with the above warranty shall be for LSL to re-perform the analytical test(s) at no charge to the Client. The data contained in this report are for the exclusive use of the Client to whom it is addressed, and the release of these data to any other party, or the use of the name, trademark or service mark of Life Science Laboratories, Inc. especially for the use of advertising to the general public, is strictly prohibited without express prior written consent of Life Science Laboratories, Inc. This report may only be reproduced in its entirety. No partial duplication is allowed. The Chain of Custody document submitted with these samples is considered by LSL to be an appendix of this report and may contain specific information that pertains to the samples included in this report. The analytical result(s) in this report are only representative of the sample(s) submitted for analysis. LSL makes no claim of a sample's representativeness, or integrity, if sampling was not performed by LSL personnel.

Life Science Laboratories, Inc.

- (1) LSL Central Lab, East Syracuse, NY
- (2) LSL North Lab, Waddington, NY
- (3) LSL Finger Lakes Lab, Wayland, NY
- (4) LSL Southern Tier Lab, Cuba, NY
- (5) LSL MidLakes Lab, Canandaigua, NY
- (6) LSL Brittonfield Lab, East Syracuse, NY

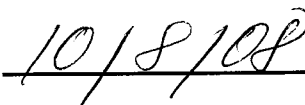
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(315) 388-4476
(585) 728-3320
(585) 968-2640
(585) 396-0270
(315) 437-0200

NYS DOH ELAP #10248 PA DEP #68-2556
NYS DOH ELAP #10900
NYS DOH ELAP #11667
NYS DOH ELAP #10760
NYS DOH ELAP #11369
NYS DOH ELAP #10155

This report was reviewed by:


Life Science Laboratories, Inc.

Date:



A copy of this report was sent to:

Original Report Date: 10/07/08

Page 1 of 9

Date Printed:

10/8/08



Eco Logic, LLC, LSL project 0814563

Dear Eco Logic representative,

As per your request, I checked result associated with positive Acetone hit in sample Katonah. Our department supervisor confirmed original Acetone result of 64 (ug/Kg). In regard of Acetone result, we confirm that method blank acetone concentration was <5.0 (ug/Kg). This trace amount did not contribute significantly to the Acetone concentration. Acetone contamination is common in organic laboratory since it is common solvent used in many preparatory procedures.

If you have any further questions, please let me know. I apologize for error that was originally introduced in your report.

Best Regards,
Emina Osmanovic
LSL Quality Control Officer

- - REVISED LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Katonah	LSL Sample ID:	0814563-001
Location:			
Sampled:	08/12/08 14:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
(1) EPA 6010 RCRA Total Metals					
Copper	110	mg/kg	9/4/08	9/9/08	DP
Arsenic	5.8	mg/kg	9/4/08	9/9/08	DP
Barium	26	mg/kg	9/4/08	9/9/08	DP
Cadmium	0.14	mg/kg	9/4/08	9/9/08	DP
Chromium	2.2*	mg/kg	9/4/08	9/9/08	DP
Lead	8.9	mg/kg	9/4/08	9/9/08	DP
Selenium	0.13	mg/kg	9/4/08	9/9/08	DP
Silver	<0.03	mg/kg	9/4/08	9/9/08	DP
(1) EPA 7471 Mercury					
Mercury	<0.005	mg/kg	8/25/08	8/27/08	DP
(1) EPA 8081/8082 Pesticides/PCB's					
Aldrin	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
beta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
delta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-BHC (Lindane)	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDD	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDE	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDT	<0.04	mg/kg	8/26/08	9/12/08	KIW
Dieldrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan I	<0.02	mg/kg	8/26/08	9/12/08	KIW
Endosulfan II	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan sulfate	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin aldehyde	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin ketone	<0.04	mg/kg	8/26/08	9/12/08	KIW
Heptachlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Heptachlor epoxide	<0.02	mg/kg	8/26/08	9/12/08	KIW
Methoxychlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Toxaphene	<5	mg/kg	8/26/08	9/12/08	KIW
Aroclor-1016	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1221	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1232	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1242	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1248	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1254	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1260	<0.2	mg/kg	8/26/08	8/29/08	KIW
Surrogate (TCMX)	56	%R	8/26/08	9/12/08	KIW
Surrogate (DCB)	99	%R	8/26/08	9/12/08	KIW
(1) EPA 8260B TCL Volatiles					
Acetone	64	ug/kg		8/15/08	CRT
Benzene	<20	ug/kg		8/15/08	CRT
Bromodichloromethane	<20	ug/kg		8/15/08	CRT
Bromoform	<20	ug/kg		8/15/08	CRT

Page 2 of 9

Original Report Date: 10/07/08

Life Science Laboratories, Inc.

Date Printed: 10/8/08

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

- - REVISED LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID: **Katonah** LSL Sample ID: **0814563-001**
 Location:
 Sampled: **08/12/08 14:30** Sampled By: **MA**
 Sample Matrix: **SHW as Recd**

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
<i>(1) EPA 8260B TCL Volatiles</i>					
Bromomethane	<20	ug/kg		8/15/08	CRT
2-Butanone (MEK)	<50	ug/kg		8/15/08	CRT
Carbon disulfide	<20	ug/kg		8/15/08	CRT
Carbon tetrachloride	<20	ug/kg		8/15/08	CRT
Chlorobenzene	<20	ug/kg		8/15/08	CRT
Chloroethane	<20	ug/kg		8/15/08	CRT
Chloroform	<20	ug/kg		8/15/08	CRT
Chloromethane	<20	ug/kg		8/15/08	CRT
Dibromochloromethane	<20	ug/kg		8/15/08	CRT
1,1-Dichloroethane	<20	ug/kg		8/15/08	CRT
1,2-Dichloroethane	<20	ug/kg		8/15/08	CRT
1,1-Dichloroethene	<20	ug/kg		8/15/08	CRT
1,2-Dichloroethene, Total	<20	ug/kg		8/15/08	CRT
1,2-Dichloropropane	<20	ug/kg		8/15/08	CRT
cis-1,3-Dichloropropene	<20	ug/kg		8/15/08	CRT
trans-1,3-Dichloropropene	<20	ug/kg		8/15/08	CRT
Ethyl benzene	<20	ug/kg		8/15/08	CRT
2-Hexanone	<50	ug/kg		8/15/08	CRT
Methylene chloride	<50	ug/kg		8/15/08	CRT
4-Methyl-2-pentanone (MIBK)	<50	ug/kg		8/15/08	CRT
Styrene	<20	ug/kg		8/15/08	CRT
1,1,2,2-Tetrachloroethane	<20	ug/kg		8/15/08	CRT
Tetrachloroethene	<20	ug/kg		8/15/08	CRT
Toluene	<20	ug/kg		8/15/08	CRT
1,1,1-Trichloroethane	<20	ug/kg		8/15/08	CRT
1,1,2-Trichloroethane	<20	ug/kg		8/15/08	CRT
Trichloroethene	<20	ug/kg		8/15/08	CRT
Vinyl chloride	<20	ug/kg		8/15/08	CRT
Xylenes (Total)	<20	ug/kg		8/15/08	CRT
Surrogate (1,2-DCA-d4)	103	%R		8/15/08	CRT
Surrogate (Tol-d8)	98	%R		8/15/08	CRT
Surrogate (4-BFB)	115	%R		8/15/08	CRT
<i>(1) EPA 8270 TCL Semi-Volatiles (B/N)</i>					
Acenaphthene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Acenaphthylene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Anthracene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Benzo(a)anthracene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Benzo(b)fluoranthene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Benzo(k)fluoranthene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Benzo(ghi)perylene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Benzo(a)pyrene	<0.8	mg/kg	8/25/08	8/28/08	CRT
4-Bromophenyl-phenylether	<0.8	mg/kg	8/25/08	8/28/08	CRT
Butylbenzylphthalate	<0.8	mg/kg	8/25/08	8/28/08	CRT
Carbazole	<0.8	mg/kg	8/25/08	8/28/08	CRT
4-Chloroaniline	<0.8	mg/kg	8/25/08	8/28/08	CRT
bis(2-Chloroethoxy)methane	<0.8	mg/kg	8/25/08	8/28/08	CRT

- - REVISED LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Katonah	LSL Sample ID:	0814563-001
Location:			
Sampled:	08/12/08 14:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
(1) EPA 8270 TCL Semi-Volatiles (B/N)					
bis(2-Chloroethyl)ether	<0.8	mg/kg	8/25/08	8/28/08	CRT
2-Chloronaphthalene	<0.8	mg/kg	8/25/08	8/28/08	CRT
4-Chlorophenyl-phenylether	<0.8	mg/kg	8/25/08	8/28/08	CRT
Chrysene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Dibenz(a,h)anthracene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Dibenzofuran	<0.8	mg/kg	8/25/08	8/28/08	CRT
Di-n-butylphthalate	<0.8	mg/kg	8/25/08	8/28/08	CRT
1,2-Dichlorobenzene	<0.8	mg/kg	8/25/08	8/28/08	CRT
1,3-Dichlorobenzene	<0.8	mg/kg	8/25/08	8/28/08	CRT
1,4-Dichlorobenzene	<0.8	mg/kg	8/25/08	8/28/08	CRT
3,3'-Dichlorobenzidine	<2	mg/kg	8/25/08	8/28/08	CRT
Diethylphthalate	<0.8	mg/kg	8/25/08	8/28/08	CRT
Dimethylphthalate	<0.8	mg/kg	8/25/08	8/28/08	CRT
2,4-Dinitrotoluene	<0.8	mg/kg	8/25/08	8/28/08	CRT
2,6-Dinitrotoluene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Di-n-octylphthalate	<0.8	mg/kg	8/25/08	8/28/08	CRT
bis(2-Ethylhexyl)phthalate	<0.8	mg/kg	8/25/08	8/28/08	CRT
Fluoranthene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Fluorene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Hexachlorobenzene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Hexachlorobutadiene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Hexachlorocyclopentadiene	<2	mg/kg	8/25/08	8/28/08	CRT
Hexachloroethane	<0.8	mg/kg	8/25/08	8/28/08	CRT
Indeno(1,2,3-c,d)pyrene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Isophorone	<0.8	mg/kg	8/25/08	8/28/08	CRT
2-Methylnaphthalene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Naphthalene	<0.8	mg/kg	8/25/08	8/28/08	CRT
2-Nitroaniline	<2	mg/kg	8/25/08	8/28/08	CRT
3-Nitroaniline	<2	mg/kg	8/25/08	8/28/08	CRT
4-Nitroaniline	<2	mg/kg	8/25/08	8/28/08	CRT
Nitrobenzene	<0.8	mg/kg	8/25/08	8/28/08	CRT
N-Nitrosodiphenylamine	<0.8	mg/kg	8/25/08	8/28/08	CRT
N-Nitroso-di-n-propylamine	<0.8	mg/kg	8/25/08	8/28/08	CRT
Phenanthrene	<0.8	mg/kg	8/25/08	8/28/08	CRT
1,2,4-Trichlorobenzene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Pyrene	<0.8	mg/kg	8/25/08	8/28/08	CRT
Surrogate (Nitrobenzene-d5)	31	%R	8/25/08	8/28/08	CRT
Surrogate (2-Fluorobiphenyl)	42	%R	8/25/08	8/28/08	CRT
Surrogate (Terphenyl-d14)	69	%R	8/25/08	8/28/08	CRT
(1) Modified SM 18-20 2540B Total Solids					
Total Solids @ 103-105 C	9.9	%		8/19/08	MM
(1) Particle Size Distribution					
Particle Size Distribution	See Attached				
This analysis was performed by PW Laboratories, Inc.					
(1) Total Organic Carbon, EPA 9060					
Total Organic Carbon	See Attached			8/27/08 09:21	TA

Original Report Date: 10/07/08

Life Science Laboratories, Inc.

Date Printed: 10/8/08

Page 4 of 9

Analysis performed at: (1) LSL Central, (2) LSL North, (3) LSL Finger Lakes, (4) LSL Southern Tier, (5) LSL MidLakes, (6) LSL Brittonfield

-- REVISED LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Katonah LSL Sample ID: 0814563-001
Location:
Sampled: 08/12/08 14:30 Sampled By: MA
Sample Matrix: SHW as Recd

Analytical Method	Prep	Analysis	Analyst
Analyte	Date	Date & Time	Initials

(1) Total Organic Carbon, EPA 9060

This analysis was sub-contracted.

- - REVISED LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Timber	LSL Sample ID:	0814563-002
Location:			
Sampled:	08/13/08 9:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
<i>(1) EPA 6010 RCRA Total Metals</i>					
Copper	18	mg/kg	9/4/08	9/9/08	DP
Arsenic	<0.05	mg/kg	9/4/08	9/9/08	DP
Barium	19	mg/kg	9/4/08	9/9/08	DP
Cadmium	0.26	mg/kg	9/4/08	9/9/08	DP
Chromium	3.8*	mg/kg	9/4/08	9/9/08	DP
<i>*As per NELAC regulation, disclosure of the following condition is required; *The result of the laboratory control sample for this analyte was less than the established limit.</i>					
Lead	13	mg/kg	9/4/08	9/9/08	DP
Selenium	<0.05	mg/kg	9/4/08	9/9/08	DP
Silver	<0.05	mg/kg	9/4/08	9/9/08	DP
<i>(1) EPA 7471 Mercury</i>					
Mercury	<0.005	mg/kg	8/25/08	8/27/08	DP
<i>(1) EPA 8081/8082 Pesticides/PCB's</i>					
Aldrin	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
beta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
delta-BHC	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-BHC (Lindane)	<0.02	mg/kg	8/26/08	9/12/08	KIW
alpha-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
gamma-Chlordane	<0.02	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDD	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDE	<0.04	mg/kg	8/26/08	9/12/08	KIW
4,4'-DDT	<0.04	mg/kg	8/26/08	9/12/08	KIW
Dieldrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan I	<0.02	mg/kg	8/26/08	9/12/08	KIW
Endosulfan II	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endosulfan sulfate	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin aldehyde	<0.04	mg/kg	8/26/08	9/12/08	KIW
Endrin ketone	<0.04	mg/kg	8/26/08	9/12/08	KIW
Heptachlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Heptachlor epoxide	<0.02	mg/kg	8/26/08	9/12/08	KIW
Methoxychlor	<0.02	mg/kg	8/26/08	9/12/08	KIW
Toxaphene	<5	mg/kg	8/26/08	9/12/08	KIW
Aroclor-1016	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1221	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1232	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1242	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1248	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1254	<0.2	mg/kg	8/26/08	8/29/08	KIW
Aroclor-1260	<0.2	mg/kg	8/26/08	8/29/08	KIW
Surrogate (TCMX)	82	%R	8/26/08	9/12/08	KIW
Surrogate (DCB)	123	%R	8/26/08	9/12/08	KIW
<i>(1) EPA 8260B TCL Volatiles</i>					
Acetone	<100	ug/kg		8/15/08	CRT
Benzene	<40	ug/kg		8/15/08	CRT

- - REVISED LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Timber	LSL Sample ID:	0814563-002
Location:			
Sampled:	08/13/08 9:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method			Prep Date	Analysis Date & Time	Analyst Initials
Analyte	Result	Units			
(1) EPA 8260B TCL Volatiles					
Bromodichloromethane	<40	ug/kg		8/15/08	CRT
Bromoform	<40	ug/kg		8/15/08	CRT
Bromomethane	<40	ug/kg		8/15/08	CRT
2-Butanone (MEK)	<100	ug/kg		8/15/08	CRT
Carbon disulfide	<40	ug/kg		8/15/08	CRT
Carbon tetrachloride	<40	ug/kg		8/15/08	CRT
Chlorobenzene	<40	ug/kg		8/15/08	CRT
Chloroethane	<40	ug/kg		8/15/08	CRT
Chloroform	<40	ug/kg		8/15/08	CRT
Chloromethane	<40	ug/kg		8/15/08	CRT
Dibromochloromethane	<40	ug/kg		8/15/08	CRT
1,1-Dichloroethane	<40	ug/kg		8/15/08	CRT
1,2-Dichloroethane	<40	ug/kg		8/15/08	CRT
1,1-Dichloroethene	<40	ug/kg		8/15/08	CRT
1,2-Dichloroethene, Total	<40	ug/kg		8/15/08	CRT
1,2-Dichloropropane	<40	ug/kg		8/15/08	CRT
cis-1,3-Dichloropropene	<40	ug/kg		8/15/08	CRT
trans-1,3-Dichloropropene	<40	ug/kg		8/15/08	CRT
Ethyl benzene	<40	ug/kg		8/15/08	CRT
2-Hexanone	<100	ug/kg		8/15/08	CRT
Methylene chloride	<100	ug/kg		8/15/08	CRT
4-Methyl-2-pentanone (MIBK)	<100	ug/kg		8/15/08	CRT
Styrene	<40	ug/kg		8/15/08	CRT
1,1,2,2-Tetrachloroethane	<40	ug/kg		8/15/08	CRT
Tetrachloroethene	<40	ug/kg		8/15/08	CRT
Toluene	<40	ug/kg		8/15/08	CRT
1,1,1-Trichloroethane	<40	ug/kg		8/15/08	CRT
1,1,2-Trichloroethane	<40	ug/kg		8/15/08	CRT
Trichloroethene	<40	ug/kg		8/15/08	CRT
Vinyl chloride	<40	ug/kg		8/15/08	CRT
Xylenes (Total)	<40	ug/kg		8/15/08	CRT
Surrogate (1,2-DCA-d4)	100	%R		8/15/08	CRT
Surrogate (Tol-d8)	96	%R		8/15/08	CRT
Surrogate (4-BFB)	108	%R		8/15/08	CRT

Elevated detection limit due to matrix interference.

(1) EPA 8270 TCL Semi-Volatiles (B/N)					
Acenaphthene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Acenaphthylene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Anthracene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Benzo(a)anthracene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Benzo(b)fluoranthene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Benzo(k)fluoranthene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Benzo(ghi)perylene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Benzo(a)pyrene	<0.9	mg/kg	8/25/08	8/28/08	CRT
4-Bromophenyl-phenylether	<0.9	mg/kg	8/25/08	8/28/08	CRT
Butylbenzylphthalate	<0.9	mg/kg	8/25/08	8/28/08	CRT
Carbazole	<0.9	mg/kg	8/25/08	8/28/08	CRT

- - REVISED LABORATORY ANALYSIS REPORT - -

EcoLogic, LLC Cazenovia, NY

Sample ID:	Timber	LSL Sample ID:	0814563-002
Location:			
Sampled:	08/13/08 9:30	Sampled By:	MA
Sample Matrix:	SHW as Recd		

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					
<i>(1) EPA 8270 TCL Semi-Volatiles (B/N)</i>					
4-Chloroaniline	<0.9	mg/kg	8/25/08	8/28/08	CRT
bis(2-Chloroethoxy)methane	<0.9	mg/kg	8/25/08	8/28/08	CRT
bis(2-Chloroethyl)ether	<0.9	mg/kg	8/25/08	8/28/08	CRT
2-Chloronaphthalene	<0.9	mg/kg	8/25/08	8/28/08	CRT
4-Chlorophenyl-phenylether	<0.9	mg/kg	8/25/08	8/28/08	CRT
Chrysene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Dibenz(a,h)anthracene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Dibenzofuran	<0.9	mg/kg	8/25/08	8/28/08	CRT
Di-n-butylphthalate	<0.9	mg/kg	8/25/08	8/28/08	CRT
1,2-Dichlorobenzene	<0.9	mg/kg	8/25/08	8/28/08	CRT
1,3-Dichlorobenzene	<0.9	mg/kg	8/25/08	8/28/08	CRT
1,4-Dichlorobenzene	<0.9	mg/kg	8/25/08	8/28/08	CRT
3,3'-Dichlorobenzidine	<2	mg/kg	8/25/08	8/28/08	CRT
Diethylphthalate	<0.9	mg/kg	8/25/08	8/28/08	CRT
Dimethylphthalate	<0.9	mg/kg	8/25/08	8/28/08	CRT
2,4-Dinitrotoluene	<0.9	mg/kg	8/25/08	8/28/08	CRT
2,6-Dinitrotoluene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Di-n-octylphthalate	<0.9	mg/kg	8/25/08	8/28/08	CRT
bis(2-Ethylhexyl)phthalate	<0.9	mg/kg	8/25/08	8/28/08	CRT
Fluoranthene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Fluorene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Hexachlorobenzene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Hexachlorobutadiene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Hexachlorocyclopentadiene	<2	mg/kg	8/25/08	8/28/08	CRT
Hexachloroethane	<0.9	mg/kg	8/25/08	8/28/08	CRT
Indeno(1,2,3-c,d)pyrene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Isophorone	<0.9	mg/kg	8/25/08	8/28/08	CRT
2-Methylnaphthalene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Naphthalene	<0.9	mg/kg	8/25/08	8/28/08	CRT
2-Nitroaniline	<2	mg/kg	8/25/08	8/28/08	CRT
3-Nitroaniline	<2	mg/kg	8/25/08	8/28/08	CRT
4-Nitroaniline	<2	mg/kg	8/25/08	8/28/08	CRT
Nitrobenzene	<0.9	mg/kg	8/25/08	8/28/08	CRT
N-Nitrosodiphenylamine	<0.9	mg/kg	8/25/08	8/28/08	CRT
N-Nitroso-di-n-propylamine	<0.9	mg/kg	8/25/08	8/28/08	CRT
Phenanthrene	<0.9	mg/kg	8/25/08	8/28/08	CRT
1,2,4-Trichlorobenzene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Pyrene	<0.9	mg/kg	8/25/08	8/28/08	CRT
Surrogate (Nitrobenzene-d5)	39	%R	8/25/08	8/28/08	CRT
Surrogate (2-Fluorobiphenyl)	47	%R	8/25/08	8/28/08	CRT
Surrogate (Terphenyl-d14)	67	%R	8/25/08	8/28/08	CRT

(1) Modified SM 18-20 2540B Total Solids

Total Solids @ 103-105 C	18	%		8/19/08	MM
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(1) Particle Size Distribution

Particle Size Distribution	See Attached
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This analysis was performed by PW Laboratories, Inc.

-- REVISED LABORATORY ANALYSIS REPORT --

EcoLogic, LLC Cazenovia, NY

Sample ID: Timber LSL Sample ID: 0814563-002

Location:

Sampled: 08/13/08 9:30 Sampled By: MA

Sample Matrix: SHW as Recd

Analytical Method	Result	Units	Prep Date	Analysis Date & Time	Analyst Initials
Analyte					

(1) Total Organic Carbon, EPA 9060

Total Organic Carbon

See Attached

8/27/08 09:21

TA

This analysis was sub-contracted.



SURROGATE RECOVERY CONTROL LIMITS FOR ORGANIC METHODS

<u>Method</u>	<u>Surrogate(s)</u>	<u>Water Limits, %R</u>	<u>SHW Limits, %R</u>
EPA 504	TCMX	80-120	NA
EPA 508	DCB	70-130	NA
EPA 515.4	DCAA	70-130	NA
EPA 524.2	1,2-DCA-d4, 4-BFB	80-120	NA
EPA 525.2	1,3-DM-2-NB, TPP, Per-d12	70-130	NA
EPA 526	1,3-DM-2-NB, TPP	70-130	NA
EPA 528	2-CP-3,4,5,6-d4, 2,4,6-TBP	70-130	NA
EPA 551.1	Decafluorobiphenyl	80-120	NA
EPA 552.2	2,3-DBPA	70-130	NA
EPA 601	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 602	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 608	TCMX, DCB	30-150	NA
EPA 624	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	NA
EPA 625, AE	2-Fluorophenol	21-110	NA
EPA 625, AE	Phenol-d5	10-110	NA
EPA 625, AE	2,4,6-Tribromophenol	10-123	NA
EPA 625, BN	Nitrobenzene-d5	35-114	NA
EPA 625, BN	2-Fluorobiphenyl	43-116	NA
EPA 625, BN	Terphenyl-d14	33-141	NA
EPA 8010	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8020	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8021	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8081	TCMX, DCB	30-150	30-150
EPA 8082	DCB	30-150	30-150
EPA 8151	DCAA	30-130	30-120
EPA 8260	1,2-DCA-d4, Tol-d8, 4-BFB	70-130	70-130
EPA 8270, AE	2-Fluorophenol	21-110	25-121
EPA 8270, AE	Phenol-d5	10-110	24-113
EPA 8270, AE	2,4,6-Tribromophenol	10-123	19-122
EPA 8270, BN	Nitrobenzene-d5	35-114	23-120
EPA 8270, BN	2-Fluorobiphenyl	43-116	30-115
EPA 8270, BN	Terphenyl-d14	33-141	18-137
DOH 310-13	Terphenyl-d14	40-110	40-110
DOH 310-14	Terphenyl-d14	40-110	40-110
DOH 310-15	Terphenyl-d14	40-110	40-110
DOH 310-34	4-BFB	50-150	50-150
DOH 313-4	DCB	NA	30-150
8015M_GRO	4-BFB	50-150	50-150
8015M_DRO	Terphenyl-d14	50-150	50-150

Units Key: ug/l = microgram per liter
 ug/kg = microgram per kilogram
 mg/l = milligram per liter
 mg/kg = milligram per kilogram
 %R = Percent Recovery



PW LABORATORIES, INC.
P.O. BOX 56, 5879 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 • 866-7PW-LABS • Fax 315-437-1752

September 25, 2008

Mr. Greg Smith
Life Science Laboratories
5854 Butternut Drive
East Syracuse, New York 13057

RECEIVED
SEP 30 2008

Re: L-08090
Laboratory Testing
PO #S052572
PO #S052573

Dear Mr. Smith:

Enclosed are the results of laboratory testing performed at your request on five jar material samples delivered to our laboratory on September 18, 2008 for the above referenced project. Results include:

1. Sieve Analysis ASTM D422 & D1140
Laboratory I.D. #'s 23639 - 23643 5 each

All requested tests have been completed on the previously received sample(s) for the above project. All sample remains are scheduled to be disposed of on October 25, 2008. Please notify PW Laboratories, Inc. by letter or telephone prior to October 25, 2008 if you would prefer to pick up the sample(s) or that the sample(s) be retained by PW Laboratories, Inc. for an additional period of time.

Thank you for this opportunity to work with you.

Very truly yours,

PW LABORATORIES, INC.

A handwritten signature in cursive script, appearing to read 'Virginia J. Thoma'.

Virginia J. Thoma
Manager - Laboratory Services
VJT/bll
Encs:



SIEVE ANALYSIS OF
SOIL / AGGREGATE

Project Title: Laboratory Testing
PO# S052573
LSL Project #0814563

Project #:	L-08090	Report #:	1
Test Method:	ASTMD422 & D1140	Report Date:	September 25, 2008

[illegible]

Sample mass, as received, meets minimum mass requirements of test method:	Yes	X	No	
Prewashed:	Yes	X	No	
Performed By:	LS			
Checked By:	V.J. Thoma			
Remarks:				

August 27, 2008

11:53:38AM

Client: Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn: Greg Smith

Work Order: NRH1948
Project Name: NY Site
Project Nbr: 0814563
P/O Nbr: SO52515
Date Received: 08/21/08

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
0814563-001B Katonah	NRH1948-01	08/12/08 00:01
0814563-002B Timber	NRH1948-02	08/13/08 00:01

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution, or copying of this material is strictly prohibited. If you have received this material in error, please notify us immediately at 615-726-0177.

New York Certification Number: 11342

The Chain(s) of Custody, 2 pages, are included and are an integral part of this report.

These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

All solids results are reported in wet weight unless specifically stated.

Estimated uncertainty is available upon request.

This report has been electronically signed.

Report Approved By:



Jennifer Gambill

Project Manager

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1948
Project Name: NY Site
Project Number: 0814563
Received: 08/21/08 10:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NRH1948-01 (0814563-001B Katonah - Soil) Sampled: 08/12/08 00:01								
General Chemistry Parameters								
Total Organic Carbon	221000		mg/Kg dry	1000	1	08/27/08 09:21	SW846 9060M	8083520
Sample ID: NRH1948-02 (0814563-002B Timber - Soil) Sampled: 08/13/08 00:01								
General Chemistry Parameters								
Total Organic Carbon	103000		mg/Kg dry	1000	1	08/27/08 09:21	SW846 9060M	8083520

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1948
Project Name: NY Site
Project Number: 0814563
Received: 08/21/08 10:15

PROJECT QUALITY CONTROL DATA
Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
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General Chemistry Parameters

8083520-BLK1

Total Organic Carbon	<172		mg/Kg dry	8083520	8083520-BLK1	08/27/08 09:21
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Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1948
Project Name: NY Site
Project Number: 0814563
Received: 08/21/08 10:15

PROJECT QUALITY CONTROL DATA

Duplicate

Analyte	Orig. Val.	Duplicate	Q	Units	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
General Chemistry Parameters									
8083520-DUP1									
Total Organic Carbon	103000	99600		mg/Kg dry	4	35	8083520	NRH1948-02	08/27/08 09:21

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1948
Project Name: NY Site
Project Number: 0814563
Received: 08/21/08 10:15

PROJECT QUALITY CONTROL DATA LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
General Chemistry Parameters								
8083520-BS1								
Total Organic Carbon	2.99	2.96		%	99%	85 - 110	8083520	08/27/08 09:21

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

Work Order: NRH1948
Project Name: NY Site
Project Number: 0814563
Received: 08/21/08 10:15

CERTIFICATION SUMMARY

TestAmerica Nashville

Method	Matrix	AIHA	Nelac	New York
SW846 9060M	Soil	N/A	N/A	N/A

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

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NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

Analyte

Client Life Science Lab, Inc. (9896)
5854 Butternut
East Syracuse, NY 13057
Attn Greg Smith

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DATA QUALIFIERS AND DEFINITIONS

ND Not detected at the reporting limit (or method detection limit if shown)

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT



PH1948

Cooler Received/Opened On 08/21/2008 @ 1015

1. Tracking # 1213X926134575 9698

Courier: UPS IR Gun ID 102594

2. Temperature of rep. sample or temp blank when opened: 5.4 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: NA

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (Initial) [Signature]

7. Were custody seals on containers: YES NO and intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #

I certify that I unloaded the cooler and answered questions 7-14 (Initial) [Signature]

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (Initial) [Signature]

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

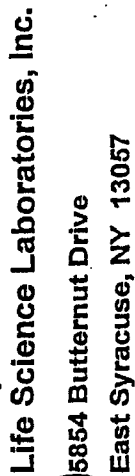
19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (Initial) [Signature]

I certify that I attached a label with the unique LIMS number to each container (Initial) [Signature]

21. Were there Non-Conformance issues at login? YES...NO... Was a PIPE generated? YES...NO...#



Ecologic
0914563

Chain of Custody Record

Telefax # (315) 445-1301

Phone # (315) 445-1105

Phone #
Telefax #

Client:

Client: Ecologic
Address: 132 1/2 Albany Street

Address:

Capnobia, NY

Contact Person: Mark Arrigo

LSL Project #:

Client's Site I.D.:

TOWN of Lewisboro

Client's Project I.D.: *Lewis baro*

[illegible]

Notes and Hazard Identifications:

Times as written on bottles.

2A 8/14/08

Sampled By: Mark A. Sells

Received By:

Relinquished By: Indy

Received By: LZ

Received for Lab Rev:

Shipment Method:

Samples Received Intact: Y N

7°C on ice

Attachment 3

Lewisboro Lakes Water Quality Database

(delivered on CD in electronic format)