

# Total Phosphorus Sampling Program for the Cayuga and Owasco Lake Watersheds

**2004**

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### **Executive Summary:**

Phosphorus is an essential nutrient for all life. Phosphorus exists in many forms in water but total phosphorus (TP) is the measure of all of these forms together.

Excess phosphorus entering lakes increases plant and algae growth and causes eutrophication. Eutrophication is a natural process where lakes become increasingly enriched with nutrients. Human activities can speed up this process significantly. The main nutrient that drives eutrophication in most surface waters is phosphorus. Other nutrients, such as nitrogen, are needed for aquatic plant growth, but they usually are found in adequate levels in lakes. In many surface waters phosphorus is the primary nutrient that may limit the growth of algae. Small amounts of phosphorus entering a lake can go a long way to stimulate growth of algae and other aquatic plants.

According to the New York State Department of Environmental Conservation, "Phosphorus inputs to a lake can come from either external (watershed and or atmosphere) sources or internal (benthic sediments) sources. External sources of phosphorus can be of natural (e.g., geological) and/or anthropogenic (e.g., agricultural runoff and municipal wastewater) origins...The magnitude of phosphorus loading to a lake, the identification of contributory sources, and the relative contribution from external and internal sources are all important factors in the management of lake water quality."<sup>1</sup>

For this project, tributaries to Owasco and Cayuga Lakes were sampled for total phosphorus (TP). The purpose of this project was to develop baseline information about TP in the tributaries so that watershed areas contributing high phosphorus loads could be pinpointed for future research and targeted education programs. A total of 20 sites were sampled on seven different days between May 2004 and October 2004. Every site exceeded Federal thresholds for TP on at least 4 of the 7 sampling dates (where sampling data was complete), with many sites exceeding the federal threshold every time.

The data indicate that continued phosphorous testing and further investigation of the possible contributing factors of phosphorus is a sensible route in order to reduce the phosphorus loading into Cayuga and Owasco Lakes.

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<sup>1</sup> *Water Quality Study of the Finger Lakes*. July 2001. New York State Department of Environmental Conservation, Division of Water. Page 51.

## **Introduction:**

### **Owasco Lake:**

A study published in 1987 of Owasco Lake showed decreases in epilimnetic total phosphorus between the early 1970's to the mid-1980's<sup>2</sup>. The study concluded that the decreases were most likely due to reduction in external loading of phosphorus. However, more recent research conducted by the New York State Department of Environmental Conservation (DEC) has found a reverse in this downward trend. DEC's *Water Quality Study of the Finger Lakes*<sup>3</sup> states that Owasco Lake has shown little reduction in ambient total phosphorus levels between the 1970's and 1990's. This lack of reduction in P levels is a marked difference from the other Finger Lakes. The report recommends "efforts to reduce external nutrient loading to Owasco Lake should continue." External sources of phosphorus may include chemical fertilizers, pet waste, yard waste disposal practices, use of phosphorus-containing cleaning products, agricultural run-off, municipal wastewater treatment facilities, and septic systems.

Owasco Lake is listed by the DEC in its 1996 Priority Waterbody Listings (PWL). The PWL indicates that nutrients, including phosphorus, impair many uses of the lake. High phosphorus causes excessive aquatic plant growth and massive algae blooms that directly impair recreation; taste, odor, and visual aesthetics; and public water systems. The City of Auburn and the Town of Owasco (public water systems that draw water from Owasco Lake), as well as the Cayuga County Department of Environmental Health have received numerous taste and odor complaints during the past two years.

Increased organic content in the water has also resulted in detectable amounts of disinfection by-products (DBP's) such as total trihalomethanes and haloacetic acids in the treated water from the City of Auburn. In 2003, trihalomethanes were detected at 0.068 mg/L, just below the NYS Department of Health (NYDOH) maximum contaminant level (MCL) of 0.080 mg/L.<sup>4</sup> Haloacetic acids were detected at 0.045 mg/L, just below the NYDOH MCL of 0.060 mg/L.

### **Cayuga Lake:**

In The Cayuga Lake Watershed Restoration and Protection Plan (RPP) (September 2001) phosphorus ranks second on the prioritized lists of water quality concerns. Runoff from residential and agricultural areas (often carried to surface water by stormwater), private septic systems, and wastewater treatment plants are significant sources of phosphorus to the lake. Elevated phosphorus levels lead to increased algal growth and algal blooms. Efforts to reduce phosphorus in the southern basin where phosphorus concentrations are particularly of concern include proposed upgrades to two wastewater treatment facilities. This will eliminate overflow discharges during storm events. Long-term, the improvements will further reduce phosphorus loading by extending sewer lines to areas where septic systems are at risk of inadequately treating wastewater.

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<sup>2</sup> Effler, S.W., M.G. Perkins, J.E. Garofalo, R. Roop. December 1987. *Limnological Analysis of Owasco Lake for 1986*. Upstate Freshwater Institute, Inc. Syracuse, New York.

<sup>3</sup> *Water Quality Study of the Finger Lakes*. July 2001. New York State Department of Environmental Conservation, Division of Water.

<sup>4</sup> Annual Drinking Water Quality Report for 2003. City of Auburn, 160 Swift Street, Auburn, NY 13021. Water Supply ID# 05 01 710.

The Restoration and Protection Plan supports the 1996 NYSDEC Priority Waterbody Listings (PWL) for the Oswego River basin that indicates nutrients, including phosphorus, impair boating, aesthetics, and fishing in Cayuga Lake. The PWL also states that water supply, bathing, and fish propagation are stressed, particularly in the northern and southern ends of the lake.

In addition to the PWL, the southern end of Cayuga Lake is on the federal 303(d) list for excessive phosphorus. While Cayuga Lake has also shown some minor reductions in phosphorus, NYSDEC, in responding to comments about the listing, states that the reductions are “insufficient” and that data from Upstate Fresh Water Institute shows phosphorus levels exceeded 20 µg/l (.020 mg/L) in 2 of the past 4 years. Two of the main tributaries feeding the southern end of Cayuga Lake, Fall and Salmon Creeks, originate in Cayuga County. The Bolton Point water treatment plant is on lakeshore between these two tributaries. Fall Creek, the drinking water supply for Cornell University has exceeded DBPs for several quarters.

The southern basin is not the only area of concern. A report from NYSDEC based on one year of data from 2002 Citizen's Statewide Lake Assessment Program (CSLAP) confirms phosphorus as the limiting nutrient and shows some phosphorus levels at two sampling locations at the north end of the lake (Union Springs and Aurora, both in Cayuga County) to be higher than two at the south end.

**Methods:**

Water samples were tested for total phosphorus (TP) and were collected within 24 hours of the start of a storm event with the exception of the first sample which was taken as a baseline. Grab samples were collected in plastic bottles and stored upright in a cooler with ice for no more than 6 hours. Samples were transported to JLI Environmental Laboratories in Auburn, NY (New York State Lab Certification ID # 10008)<sup>5</sup> for testing. TP analysis was performed in the lab using NY State-approved methods.

The Owasco Lake Watershed and the Cayuga Lake Watershed each contained ten sampling sites. All sites were located in the tributaries to these two lakes.

Twenty water samples were taken on each sampling date. Sampling locations for the Owasco Lake Watershed (Table 1 and Map 1) and the Cayuga Lake Watershed (Table 1 a. and Map 1) were determined using input from the Cayuga County Water Quality Management Agency (WQMA), the Owasco Watershed Lake Association (OWLA) and the Cayuga Lake Watershed Network (The Network).

Most of the locations were sampled in mid-flow from bridges or banks, using a telescoping pole with an attachment to hold the sampling bottles. Some grab samples were taken by wading into streams during times of low flow. The sampling locations remained consistent throughout the project with one exception. Sampling at Big Salmon Creek required wading across Little Salmon Creek, which was sometimes impossible when the creek was running high. When this occurred researchers sampled downstream of the convergence of these two creeks.

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<sup>5</sup> The Environmental Laboratory Approval Program (ELAP) of the Wadsworth Center was established in 1984, under Section 502 of the Public Health Law and is responsible for the certification of laboratories performing environmental analyses on samples originating from New York State, thus ensuring the accuracy and reliability of these analyses. Accurate and reliable environmental analyses are a matter of vital concern, affecting the public health, safety and welfare of all NYS residents. All environmental laboratories analyzing samples from the State of New York must be certified.

**Table 1. Owasco Lake Watershed Sampling locations**

<b>Site #</b>	<b>GPS Location</b>	<b>Tributary</b>	<b>Site Location</b>
O-10	N 42°54'18.5" W 76°32'23.3"	Owasco Outlet	Emerson Park: sample from dock
O-15	N 42°54'03.9" W 076°31'37.8"	Sucker Brook	Sample from bridge on Rt. 38 near Owasco Country Club
O-20	N 42°51'50.3" W 076°30'28.5"	Dutch Hollow Brook	Sample from the bank next to bridge just off Rt. 38 on Brook Hollow Dr.
O-25	N 42°51'19.9" W 76°26'53.4"	Dutch Hollow Brook	Sample from bridge on Benson Rd. off of Rt. 38
O-40	N 42°46'16.1" W 076°27'28.9"	Owasco Inlet	Sampled from the stream bank off of Rockefeller Road, Fire Lane 32
OWL-111	N 42°42'38.2" W 076°26'02.6"	Owasco Inlet	Sample downstream of the Moravia Waste Water Treatment Plant from the stream bank by the bridge on Long Hill Road
OWL-112	N 42°41'25.8" W 076°25'31.3"	Owasco Inlet	Sample upstream of the Moravia Waste Water Treatment Plant from the stream bank on Rounds Lane
OWL154	N 42°40'07.7" W 076°25'50.4"	Owasco Inlet	Sample from the stream bank next to the bridge on Rt. 38, north of Locke
OWL-158	N 42°35'57.1" W 076°22'23.4"	Owasco Inlet	Sample from the bridge on Walpole Rd. downstream of the Groton Waste Water Treatment Plant
OWL-604	N 42°35'30.4" W 076°22'01.9"	Owasco Inlet	Sample upstream of the Groton Waste Water Treatment Plant from the stream bank by a blue wooden bridge in Groton

**Table 2. Cayuga Lake Watershed Sampling locations**

<b>Site #</b>	<b>GPS Location</b>	<b>Tributary</b>	<b>Site Location</b>
C-5	N 42°53'43.1" W 076°41'46.0"	Yawger's Creek	Sample from bridge on Townline Rd.
C-15	N 42°48'28.5" W 76°42'06.2"	Great Gully Creek	Sample approximately 50' upstream of Rt. 90 bridge
C-20	N 42°49'01.4 W 76°38'27.1"	Great Gully Creek	Use The Nature Conservancy access; site is downhill, then left into stream
C-25	N 42°38'05.9" W 76°32'43.9"	Little Salmon Creek	Little Salmon Creek upstream from the convergence with Big Salmon Creek
C-30	N 42°38'07.1" W 76°32'44.3"	Big Salmon Creek	Big Salmon Creek upstream from the convergence with Little Salmon Creek
C-31	N/A	Salmon Creek	25 yards downstream of convergence of Big and Little Salmon Creeks; sampled when the water level of Little Salmon is too high to ford
C-35	N 42°34'31.9" W 76°31'45.4"	Locke Creek	Locke Creek on Salmon Creek Rd., south of Lockerby Rd.
C-40	N 42°36'56.4" W 076°17'15.0"	Fall Creek	Sample from bridge on Groton City Road
C-45	N 42°39'46.8" W 076°17'10.4"	Fall Creek	Sample from bridge on Peth Road
C-50	N 42°40'24.3" W 076°17'50.7"	Fall Creek	Approx. 200 yards downstream from Lake Como. Sample from a beaver dam in the Dorothy McIlroy bird sanctuary off of Lake Como Rd.
C-55	N 42°40'54.1" W 076°18'20.3"	Fall Creek	Approx. 20 yards upstream of Lake Como. Sample from bridge on Branch Road off of Lake Como Road.

**Results:**

Attempts were made to sample during storm events. Precipitation records from Game Farm Road in Ithaca and the Auburn Water Filtration Plant were obtained for the day of sampling as well as the preceding 24-hour period (Table 3).

**Table 3. Precipitation at Ithaca and Auburn for sampling dates and preceding 24 hours**

	Precipitation (inches)	
	Game Farm Road, Ithaca, NY	Auburn Water Filtration Plant, Auburn, NY
Sampling Date		
May 13, 2004	0.06	0.17
May 24, 2004	1.44	1.93
June 17, 2004	0.04	0.44
July 14, 2004	0.45	2.17
August 30, 2004	0.72	1.74
September 9, 2004	1.50	2.32
October 15, 2004	0.10	0.62

Total phosphorus data are presented in mg/L (or ppm). The procedure used by JLI Environmental Laboratories is sensitive to .01 mg/L. The samples labeled <.01 indicates the TP content of the sample was less than the determinable limit of the test.

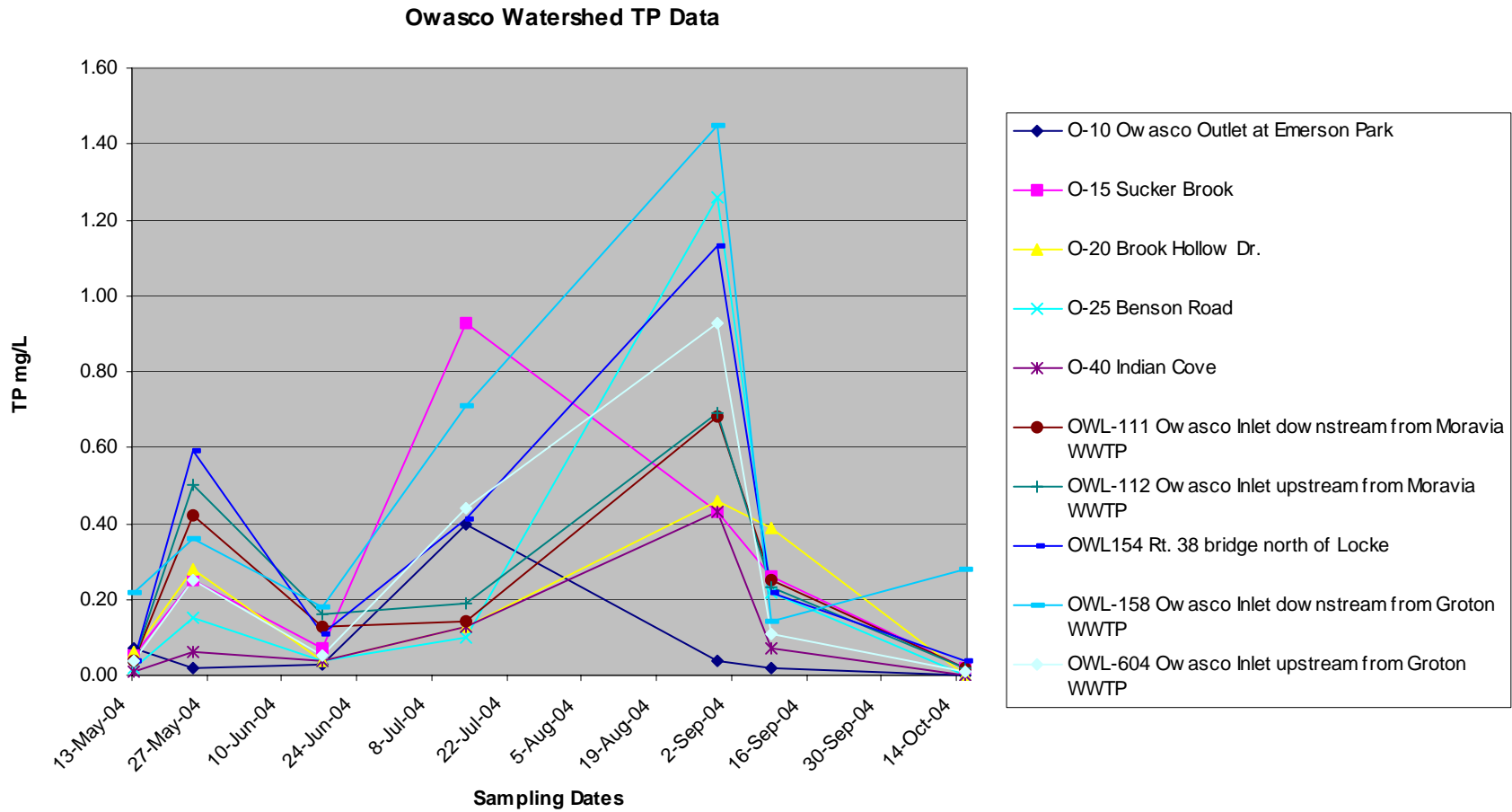
Owasco Lake Results

Table 3 shows the results of sampling in the Owasco Lake Watershed for TP. Chart 1 plots these points.

**Table4. Owasco Lake Watershed TP Results**

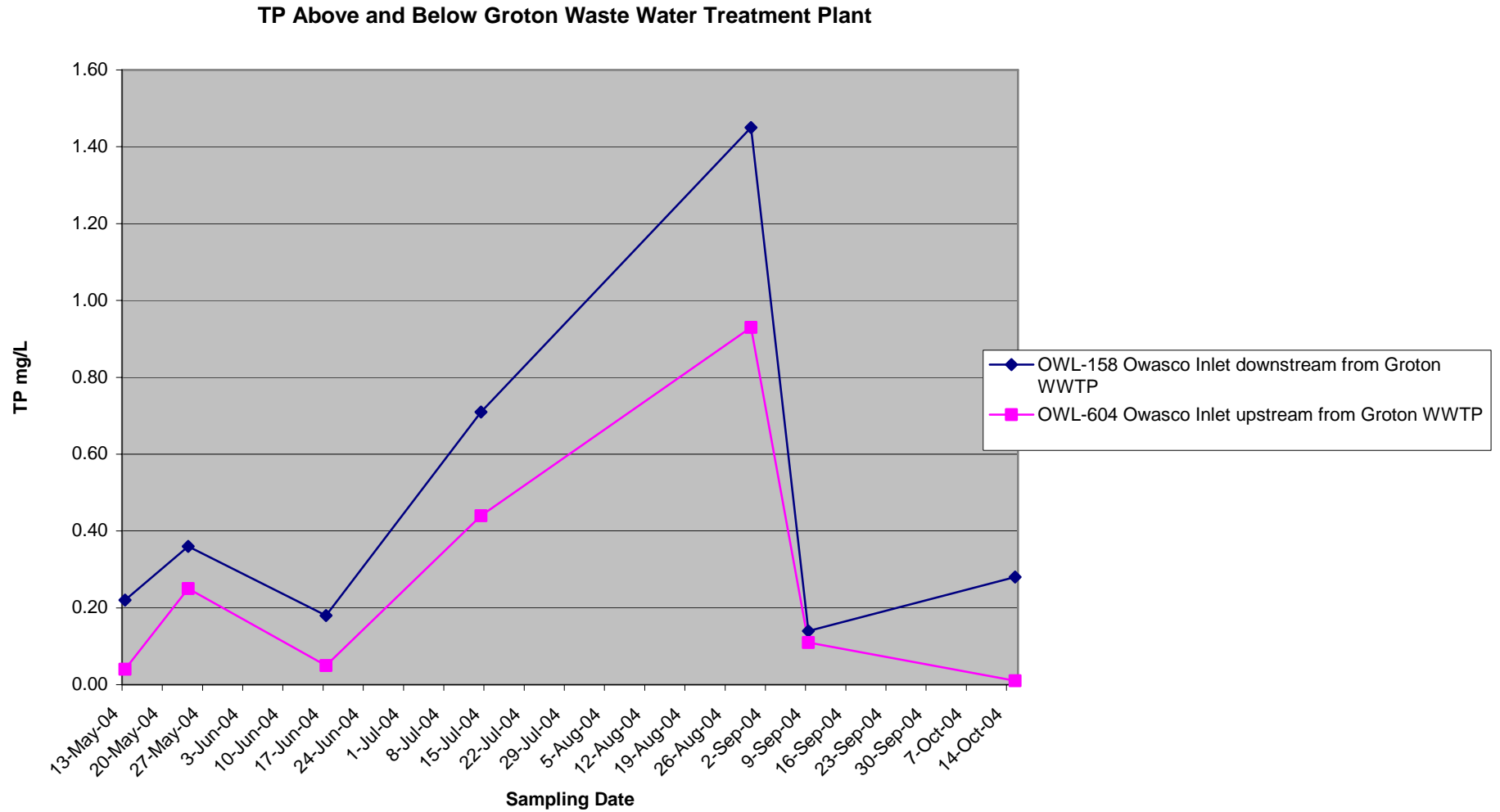
Site #	13-May-04	24-May-04	17-Jun-04	14-Jul-04	30-Aug-04	9-Sep-04	15-Oct-04
O-10	0.07	0.02	0.03	0.40	0.04	0.02	<.01
O-15	0.05	0.25	0.07	0.93	0.43	0.26	0.02
O-20	0.06	0.28	0.04	0.13	0.46	0.39	<.01
O-25	0.02	0.15	0.04	0.10	1.26	0.22	<.01
O-40	0.01	0.06	0.04	0.13	0.43	0.07	<.01
OWL-111	0.04	0.42	0.13	0.14	0.68	0.25	0.02
OWL-112	0.04	0.50	0.16	0.19	0.69	0.23	0.02
OWL154	0.04	0.59	0.11	0.41	1.13	0.22	0.04
OWL-158	0.22	0.36	0.18	0.71	1.45	0.14	0.28
OWL-604	0.04	0.25	0.05	0.44	0.93	0.11	0.01

**Chart 1. Owasco Lake Watershed TP Results**



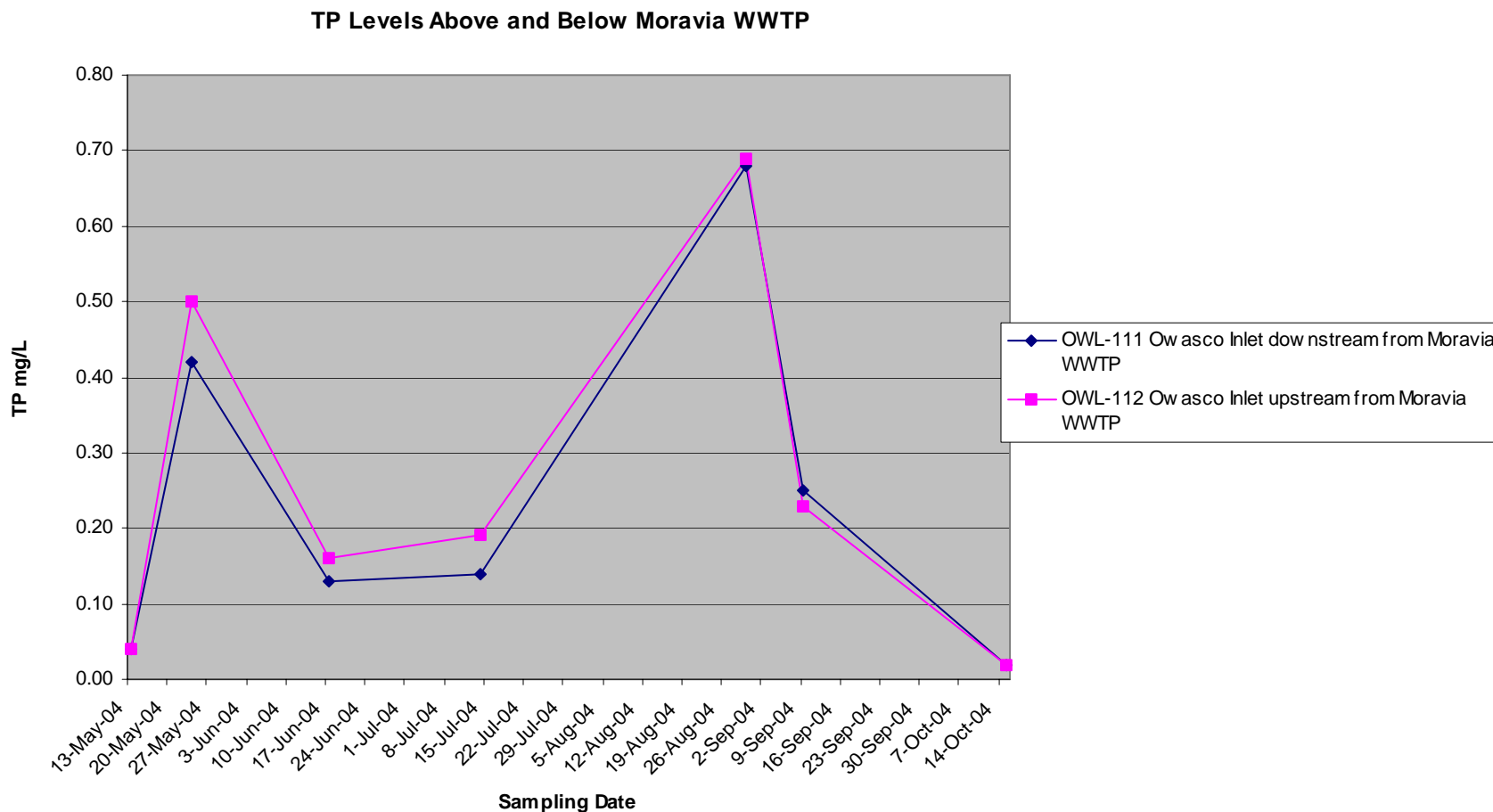
Total phosphorus was consistently **higher** downstream of the Groton wastewater treatment plant (WWTP) (OWL-158) than upstream of the Groton WWTP (OWL-604) (Chart 2).

**Chart 2. Total Phosphorus above and below the Groton Waste Water Treatment Plant**



In contrast to the sites above and below the Groton WWTP, total phosphorus was consistently **lower** downstream of the Moravia WWTP (OWL-111) than upstream of the Moravia WWTP (OWL-112) (Chart 3).

**Chart 3. Total Phosphorus above and below the Moravia Waste Water Treatment Plant**



A statistical analysis was conducted of OWL sites 111 and 112 (downstream and upstream of the Moravia WWTP, respectively) and OWL sites 158 and 604 (downstream and upstream of the Groton WWTP, respectively) (Table 4). These sites were of particular interest because of their potential impact on phosphorus loading to the Owasco Inlet, the main tributary to Owasco Lake. The statistical analysis was conducted using Microsoft Excel and determined that the standard deviations for each site analyzed was < 1.0. This suggests that the data for each of these four sites is scientifically reliable.

**Table 5. Statistical analysis of Owasco Lake watershed site.**

Site #	Site Description	13-May-04	24-May-04	17-Jun-04	14-Jul-04	30-Aug-04	9-Sep-04	15-Oct-04	Mean	Standard Deviation
OWL-111	Long Hill Road Bridge, downstream of Moravia WWTP	0.04	0.42	0.13	0.14	0.68	0.25	0.02	0.2400	0.2369
OWL-112	Rounds Lane, upstream of Moravia WWTP	0.04	0.52	0.16	0.19	0.69	0.23	0.02	0.2643	0.2497
OWL-158	Walpole Rd, downstream of Groton WWTP	0.22	0.36	0.18	0.71	1.45	0.14	0.28	0.4771	0.4693
OWL-604	Memorial Wood Bridge, upstream of Groton WWTP	0.04	0.25	0.05	0.44	0.93	0.11	0.01	0.2614	0.3314

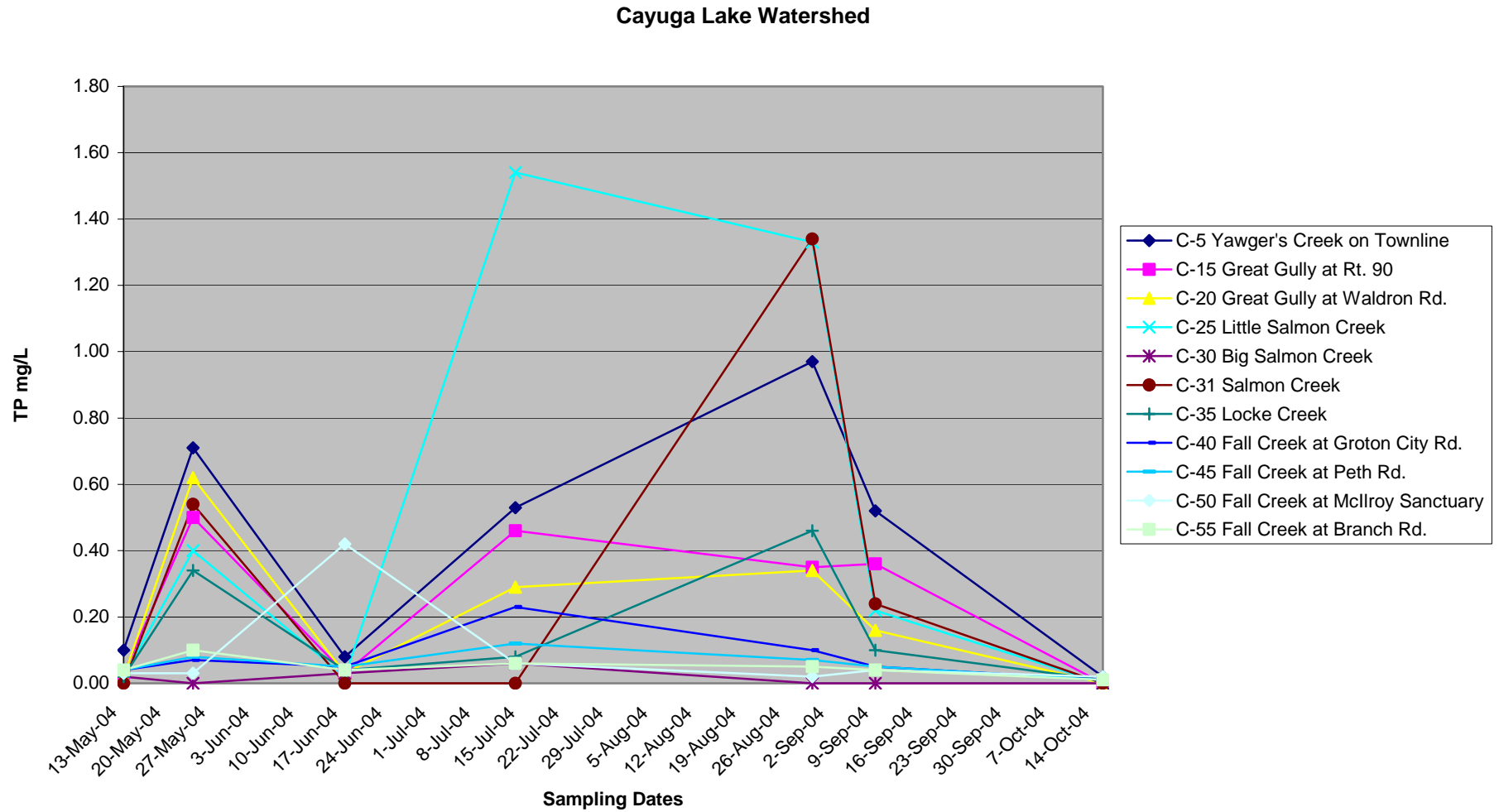
Cayuga Lake

Table 5 shows the results of sampling sites in the Cayuga Lake Watershed for TP.

**Table 6. Cayuga Lake Watershed TP Results**

Site #	13-May-04	24-May-04	17-Jun-04	14-Jul-04	30-Aug-04	9-Sep-04	15-Oct-04
C-5	0.10	0.71	0.08	0.53	0.97	0.52	0.02
C-15	0.03	0.50	0.03	0.46	0.35	0.36	<.01
C-20	0.02	0.62	0.03	0.29	0.34	0.16	<.01
C-25	0.02	0.40	0.02	1.54	1.33	0.22	<.01
C-30	0.02	no sample	0.03	0.06	no sample	no sample	<.01
C-31	no sample	0.54	no sample	no sample	1.34	0.24	no sample
C-35	0.02	0.34	0.04	0.08	0.46	0.10	0.01
C-40	0.04	0.07	0.05	0.23	0.10	0.05	0.01
C-45	0.04	0.08	0.05	0.12	0.07	0.05	0.01
C-50	0.03	0.03	0.42	0.06	0.02	0.04	0.02
C-55	0.04	0.10	0.04	0.06	0.05	0.04	0.01

Chart 4. Cayuga Lake Watershed TP Results



## **Discussion:**

Eutrophication is a natural process where lakes become increasingly enriched with nutrients. Human activities can speed up this process significantly. The main nutrient that drives eutrophication in most surface waters is phosphorus. According to the United States Environmental Protection Agency (EPA), the recommended criteria for TP is 14.75 ug/L (0.01475 mg/L) for lakes and reservoirs and 33.00 ug/L (0.03300 mg/L) for rivers and streams in the Oswego River Basin (EPA aggregate nutrient ecoregion VII)<sup>6</sup>.

New York State previously adopted a guidance value for total phosphorus of 20 ug/L (0.020 mg/L) in ponded waters.<sup>7</sup> This guidance value has not been updated after EPA issued its 2002 nutrient criteria documents.

In the Owasco Lake Watershed, 57 samples from the 70 total samples were at or above EPA's 2002 threshold of 0.03 mg/L TP for streams. Sites OWL 154, 158, and 604 were above that threshold every time they were sampled and sites O-20, and OWL 111 and 112 were above 0.03 mg/L six out of seven times. In the Cayuga Lake Watershed, the following sites were greater than the 0.03 mg/L threshold six out of seven times: C5, C15, and all of the Fall Creek sites (C40, C45, C50, C55).

### **Additional Concerns in the Owasco Lake Watershed:**

The primary area of concern is the Owasco Inlet downstream of the Groton Waste Water Treatment Plant (OWL-158), which shows statistically significant higher levels of TP than the Inlet upstream of the Groton Waste Water Treatment Plant (OWL-604). The current NY Water Discharge Permit for the Groton WWTP (NPDES #: NY0025585) does not limit TP discharges. It expires July 31, 2006.

### **Additional Concerns in the Cayuga Lake Watershed:**

Phosphorus loading, into Cayuga Lake, in general is of concern. Reports have confirmed higher levels in both the southern and northern ends of the lake. These data indicate there is a slight trend of elevated phosphorus readings when there is some precipitation recorded in the southern end of the watershed. The large and diverse nature of the watershed makes it difficult to apply recorded precipitation measurements from any one point in the basin to the entire watershed. Flow data on each tributary would add to the phosphorous data collected and enable better analysis and correlation of the phosphorous levels. Continued phosphorous testing and further investigation of the possible contributing factors of phosphorus is a sensible route in order to reduce the phosphorus loading into Cayuga Lake.

## **Conclusions and Next Steps:**

### **Future Research**

The Cayuga County Water Quality Management Agency (WQMA) has allotted a portion of their 2005 FL-LOWPA funds to CCE Cayuga to continue this water-sampling regimen for another year. The data received from 2005's sampling regimen, combined with the data we collected in 2004, will help target outreach toward residents in the subwatersheds that contribute the most TP to Owasco and Cayuga Lakes.

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<sup>6</sup> Summary Table for the Nutrient Criteria Documents. EPA. July 2002. Supplement to "Ambient Water quality Criteria Recommendations." EPA 822-B-00-009.  
<http://www.epa.gov/waterscience/criteria/nutrient/ecoregions/sumtable.pdf>

<sup>7</sup> NYSDEC Bureau of Technical Services and Research, October 22, 1993, New York State Fact Sheet: Ambient Water Quality Value for Protection of Recreational Uses

**Appendix**

**OWASCO LAKE WATERSHED DATA**

<b>Wind Conditions:</b>	Calm	Moderate	Windy	
<b>Sky Conditions:</b>	Clear	Partly Cloudy	Overcast	Rainy

**Date:** 13-May-04  
**Sampled by:** Kelly Fallone & Claire Lobdell

<b>Site #</b>	<b>Site Name</b>	<b>Time</b>	<b>Water Temp.</b>	<b>Past 24 hrs: Wind</b>	<b>Past 24 hrs.: Sky</b>	<b>Today: Wind</b>	<b>Today: Sky</b>	<b>TP (mg/l)</b>
O-10	Owasco Outlet at Emerson Park	1:00p	59F	CALM	PC/O	CALM	H/C	0.07
O-15	Sucker Brook	12:55p	64F	CALM	PC/O	CALM	H/C	0.05
O-20	Brook Hollow Dr.	12:45p	60F	CALM	PC/O	CALM	H/C	0.06
O-25	Benson Road	12:30p	58F	CALM	PC/O	CALM	H/C	0.02
O-40	Indian Cove	12:15p	N/A	CALM	PC/O	CALM	H/C	0.01
OWL-111	Long Hill Road Bridge	11:45a	59F	CALM	PC/O	CALM	H/C	0.04
OWL-112	Rounds Lane	11:35a	58F	CALM	PC/O	CALM	H/C	0.04
OWL154	Rt. 38 bridge north of Locke	11:30a	58F	CALM	PC/O	CALM	H/C	0.04
OWL-158	Walpole Rd, Groton N.	10:25a	56F	CALM	PC/O	CALM	H/C	0.22
OWL-604	Rt. 38 Groton Memorial Wood Bridge	10:20a	56F	CALM	PC/O	CALM	H/C	0.04

**Date:** 24-May-04  
**Sampled by:** Kelly Fallone & Claire Lobdell

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
O-10	Owasco Outlet at Emerson Park	1:50pm	55F	M	R	M	PC	0.02
O-15	Sucker Brook	1:45pm	59F	M	R	M	PC	0.25
O-20	Brook Hollow Dr.	1:33pm	58F	M	R	M	PC	0.28
O-25	Benson Road	1:30pm	58F	M	R	M	PC	0.15
O-40	Indian Cove	1:05pm	56F	M	R	M	PC	0.06
OWL-111	Long Hill Road Bridge	12:35pm	58F	M	R	M	PC	0.42
OWL-112	Rounds Lane	12:30pm	58F	M	R	M	PC	0.50
OWL154	Rt. 38 bridge north of Locke	12:20pm	57F	M	R	M	PC	0.59
OWL-158	Walpole Rd, Groton N.	11:20am	58F	M	R	C	PC	0.36
OWL-604	Rt. 38 Groton Memorial Wood Bridge	11:10am	55F	M	R	C	PC	0.25

**Date:** 17-Jun-04  
**Sampled by:** Kelly Fallone & Claire Lobdell

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
O-10	Owasco Outlet at Emerson Park	1:45p	n/a	M	R	C	R	0.03
O-15	Sucker Brook	1:35p	n/a	M	R	C	R	0.07
O-20	Brook Hollow Dr.	1:23p	n/a	M	R	C	R	0.04
O-25	Benson Road	1:20p	n/a	M	R	C	R	0.04
O-40	Indian Cove	1:00p	n/a	M	R	C	R	0.04
OWL-111	Long Hill Road Bridge	12:40p	60F	M	R	C	R	0.13
OWL-112	Rounds Lane	12:28p	59F	M	R	M	R	0.16
OWL154	Rt. 38 bridge north of Locke	12:20p	60F	M	R	C	R	0.11
OWL-158	Walpole Rd, Groton N.	11:10a	61F	M	R	M	R	0.18
OWL-604	Rt. 38 Groton Memorial Wood Bridge	11:05a	60F	M	R	C	O	0.05

**Date:** 14-Jul-04  
**Sampled by:** Kelly Fallone

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
O-10	Owasco Outlet at Emerson Park	3:22p	19C			W	R	0.4
O-15	Sucker Brook	3:17p	19C			W	R	0.93
O-20	Brook Hollow Dr.	3:10p	19C			W	R	0.13
O-25	Benson Road	3:03p	18C			W	R	0.1
O-40	Indian Cove	2:45p	17C			C	R	0.13
OWL-111	Long Hill Road Bridge	2:20p	18C			C	O/R	0.14
OWL-112	Rounds Lane	2:10p	19C			C	O/R	0.19
OWL154	Rt. 38 bridge north of Locke	2:00p	19C			C	O/R	0.41
OWL-158	Walpole Rd, Groton N.	12:50p	19C			C	O/R	0.71
OWL-604	Rt. 38 Groton Memorial Wood Bridge	12:45p	18C			C	O/R	0.44

**Date:** 30-Aug-04  
**Sampled by:** Kelly Fallone and Claire Lobdell

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
O-10	Owasco Outlet at Emerson Park	1:28p	22.5 C	C	O	C	R	0.040
O-15	Sucker Brook	1:20p	20.5 C	C	O	C	R	0.430
O-20	Brook Hollow Dr.	1:15p	20.5 C	C	O	C	R	0.460
O-25	Benson Road	12:55p	19.5 C	C	O	C	R	1.260
O-40	Indian Cove	12:39p	20 C	C	O	M	R	0.430
OWL-111	Long Hill Road Bridge	12:27p	19.5 C	C	O	M	R	0.680
OWL-112	Rounds Lane	12:15p	20 C	C	O	M	R	0.690
OWL154	Rt. 38 bridge north of Locke	12:05p	20 C	C	O	M	R	1.130
OWL-158	Walpole Rd, Groton N.	10:55a	20 C	C	O	M	R	1.450
OWL-604	Rt. 38 Groton Memorial Wood Bridge	10:50a	20 C	C	O	M	R	0.930

**Date:** 9-Sep-04

**Sampled by: Kelly Fallone and Claire Lobdell**

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
O-10	Owasco Outlet at Emerson Park	8:54am	22 C	W	R	M	O	0.020
O-15	Sucker Brook	8:55am	21 C	W	R	M	O	0.260
O-20	Brook Hollow Dr.	9:05am	20 C	W	R	M	O	0.390
O-25	Benson Road	9:10am	21 C	W	R	M	O	0.220
O-40	Indian Cove	9:33am	21 C	W	R	M	O	0.070
OWL-111	Long Hill Road Bridge	9:50am	21 C	W	R	W	O	0.250
OWL-112	Rounds Lane	10:00am	19 C	W	R	W	O	0.230
OWL154	Rt. 38 bridge north of Locke	10:05am	19 C	W	R	M	PC	0.220
OWL-158	Walpole Rd, Groton N.	11:05am	19 C	W	R	M	O	0.140
OWL-604	Rt. 38 Groton Memorial Wood Bridge	11:12am	18 C	W	R	M	O	0.110

**Date: 15-Oct-04**

**Sampled by: Claire Lobdell and Renee Lippold**

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
O-10	Owasco Outlet at Emerson Park	3:13 PM	11 C	M	O/R	M	O/R	<.01
O-15	Sucker Brook	3:05 PM	14 C	M	O/R	M	O/R	0.02
O-20	Brook Hollow Dr.	3:00 PM	16 C	M	O/R	M	O/R	<.01
O-25	Benson Road	2:55 PM	15.5 C	M	O/R	M	O/R	<.01
O-40	Indian Cove	2:30 PM	13.5 C	M	O/R	M	O/R	<.01
OWL-111	Long Hill Road Bridge	2:05 PM	15.5 C	M	O/R	M	O/R	0.02
OWL-112	Rounds Lane	1:45 PM	14 C	M	O/R	M	O/R	0.02
OWL154	Rt. 38 bridge north of Locke	1:38 PM	14 C	M	O/R	M	O/R	0.04
OWL-158	Walpole Rd, Groton N.	12:20 PM	13 C	M	O/R	M	O/R	0.28
OWL-604	Rt. 38 Groton Memorial Wood Bridge	12:15 PM	14 C	M	O/R	M	O/R	0.01

**CAYUGA LAKE WATERSHED DATA**

<b>Wind Conditions:</b>	Calm	Moderate	Windy	
<b>Sky Conditions:</b>	Clear	Partly Cloudy	Overcast	Rainy

**Date:** 13-May-04

**Sampled by:** Kelly Fallone & Claire Lobdell

<b>Site #</b>	<b>Site Name</b>	<b>Time</b>	<b>Water Temp.</b>	<b>Past 24 hrs: Wind</b>	<b>Past 24 hrs.: Sky</b>	<b>Today: Wind</b>	<b>Today: Sky</b>	<b>TP (mg/l)</b>
C-5	Yawger's Creek on Townline	8:00A	52F	CALM	PC/O	CALM	CLEAR	0.10
C-15	Great Gully at Rt. 90	8:20A	52F	CALM	PC/O	CALM	CLEAR	0.03
C-20	Great Gully at Waldron Rd.	9:00A		CALM	PC/O	CALM	CLEAR	0.02
C-25	Little Salmon Creek	9:30A	54F	CALM	PC/O	CALM	HAZY	0.02
C-30	Big Salmon Creek	9:35A	54F	CALM	PC/O	CALM	HAZY	0.02
C-35	Locke Creek	9:50A	65F	CALM	PC/O	CALM	HAZY	0.02
C-40	Fall Creek at Groton City Rd.	10:35A	58F	CALM	PC/O	CALM	HAZY	0.04
C-45	Fall Creek at Peth Rd.	10:45A	58F	CALM	PC/O	CALM	HAZY	0.04
C-50	Fall Creek at McIlroy Sanctuary	10:55A	61F	CALM	PC/O	CALM	HAZY	0.03
C-55	Fall Creek at Branch Rd.	11:05A	58F	CALM	PARTLY CLOUDY/ OVERCAST	CALM	HAZY	0.04

Date: 24-May-04

Sampled by: Kelly Fallone & Claire Lobdell

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
C-5	Yawger's Creek on Townline	9:00am	53F	M	R	M	R	0.71
C-15	Great Gully at Rt. 90	9:25am	53F	M	R	M	R	0.50
C-20	Great Gully at Waldron Rd.	9:45am	52F	M	R	C	R/O	0.62
C-25	Little Salmon Creek	10:15am	54F	M	R	C	R/O	0.40
C-30	Big Salmon Creek	n/a						
C-31	Salmon Creek	10:20am	54F	M	R	C	PC	0.54
C-35	Locke Creek	10:35am	57F	M	R	C	PC	0.34
C-40	Fall Creek at Groton City Rd.	11:30am	56F	M	R	C	PC	0.07
C-45	Fall Creek at Peth Rd.	11:40am	58F	M	R	C	PC	0.08
C-50	Fall Creek at McIlroy Sanctuary	11:55am	63F	M	R	C	PC	0.03
C-55	Fall Creek at Branch Rd.	12:00pm	57F	M	R	C	PC	0.10

Date: 17-Jun-04

Sampled by: Kelly Fallone & Claire Lobdell

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
C-5	Yawger's Creek on Townline	9:16a	60F	M	R	C	O	0.08
C-15	Great Gully at Rt. 90	9:30a	59F	M	R	C	O	0.03
C-20	Great Gully at Waldron Rd.	9:51a	58F	M	R	C	O	0.03
C-25	Little Salmon Creek	10:20a	60F	M	R	C	PC	0.02
C-30	Big Salmon Creek	10:23a	60F	M	R	C	PC	0.03
C-35	Locke Creek	10:31a	60F	M	R	C	PC	0.04
C-40	Fall Creek at Groton City Rd.	11:25a	52F	M	R	C	O	0.05
C-45	Fall Creek at Peth Rd.	11:35a	57F	M	R	C	O	0.05
C-50	Fall Creek at McIlroy Sanctuary	11:45a		M	R	C	O	0.42
C-55	Fall Creek at Branch Rd.	12:00p	62F	M	R	C	R	0.04

**Date:** 14-Jul-04  
**Sampled by:** Kelly Fallone

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
C-5	Yawger's Creek on Townline	10:45a	19C	C	PC	C	R	0.53
C-15	Great Gully at Rt. 90	11:05a	19C	C	PC	C	R	0.46
C-20	Great Gully at Waldron Rd.	11:15a	18C	C	PC	C	R	0.29
C-25	Little Salmon Creek	11:50a	18C	C	PC	C	R	1.54
C-30	Big Salmon Creek	11:55a	19C	C	PC	C	O	0.06
C-35	Locke Creek	12:05p	18C	C	PC	C	R	0.08
C-40	Fall Creek at Groton City Rd.	1:06p	19C	C	PC	C	O	0.23
C-45	Fall Creek at Peth Rd.	1:15p	19C	C	PC	C	O	0.12
C-50	Fall Creek at McIlroy Sanctuary	1:25p	20C	C	PC	C	O	0.06
C-55	Fall Creek at Branch Rd.	1:35p	19C	C	PC	C	O	0.06

**Date:** 30-Aug-04  
**Sampled by:** Kelly Fallone and Claire Lobdell

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
C-5	Yawger's Creek on Townline	9:05a	20 C	C	O	M	R	0.970
C-15	Great Gully at Rt. 90	9:15a	20 C	C	O	M	R	0.350
C-20	Great Gully at Waldron Rd.	9:35a	20 C	C	O	M	R	0.340
C-25	Little Salmon Creek	10:05a	19.5 C	C	O	M	R	1.330
C-30	Big Salmon Creek	n/a	n/a	C	O	M	R	n/a
	Salmon Creek (downstream from convergence)	10:10a	19.5 C	C	O	M	R	1.340
C-35	Locke Creek	10:20a	20 C	C	O	C	R	0.460
C-40	Fall Creek at Groton City Rd.	11:05a	19.5 C	C	O	C	R	0.100
C-45	Fall Creek at Peth Rd.	11:20a	22 C	C	O	C	R	0.070
C-50	Fall Creek at McIlroy Sanctuary	11:30a	21 C	C	O	C	R	0.020
C-55	Fall Creek at Branch Rd.	11:40a	20 C	C	O	C	R	0.050

Date: 9-Sep-04

Sampled by: Kelly Fallone and Claire Lobdell

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
C-5	Yawger's Creek on Townline	1pm	20.5 C	W	R	M	R	0.520
C-15	Great Gully at Rt. 90	12:45pm	22 C	W	R	M	R	0.360
C-20	Great Gully at Waldron Rd.	12:30pm	20 C	W	R	M	R	0.160
C-25	Little Salmon Creek	11:55pm	21 C	W	R	M	O	0.220
C-30	Big Salmon Creek							
	Salmon Creek (downstream from convergence)	12:00pm	22 C	W	R	W	O	0.240
C-35	Locke Creek	11:45am	20 C	W	R	W	O	0.100
C-40	Fall Creek at Groton City Rd.	10:50am	19 C	W	R	W	PC	0.050
C-45	Fall Creek at Peth Rd.	10:40am	19 C	W	R	W	O	0.050
C-50	Fall Creek at McIlroy Sanctuary	10:33am	23 C	W	R	W	O	0.040
C-55	Fall Creek at Branch Rd.	10:25am	18.5 C	W	R	M	O	0.040

Date: 15-Oct-04

Sampled by: Claire Lobdell and Renee Lippold

Site #	Site Name	Time	Water Temp.	Past 24 hrs: Wind	Past 24 hrs.: Sky	Today: Wind	Today: Sky	TP (mg/l)
C-5	Yawger's Creek on Townline	10:05am	15 C	M	O/R	M	O/R	0.02
C-15	Great Gully at Rt. 90	10:25am	13.5 C	M	O/R	M	R	<.01
C-20	Great Gully at Waldron Rd.	10:35am	14 C	M	O/R	M	O/R	<.01
C-25	Little Salmon Creek	11:13am	13 C	M	O/R	M	O/R	<.01
C-30	Big Salmon Creek	11:15am	13 C	M	O/R	M	O/R	<.01
C-35	Locke Creek	11:25am	12.5 C	M	O/R	M	O/R	0.01
C-40	Fall Creek at Groton City Rd.	12:35pm	13 C	M	O/R	M	O/R	0.01
C-45	Fall Creek at Peth Rd.	12:50pm	12 C	M	O/R	M	O/R	0.01
C-50	Fall Creek at McIlroy Sanctuary	1:00pm	13.5 C	M	O/R	M	O/R	0.02
C-55	Fall Creek at Branch Rd.	1:14pm	12 C	M	O/R	M	O/R	0.01

