SKANEATELES LAKE AND WATERSHED 2022 ANNUAL REPORT

VOLUME XLVIII

PREPARED BY:

Rich Abbott
Water Quality Management
Department of Water
City of Syracuse, New York

CITY OF SYRACUSE
DEPARTMENT OF WATER
WATER QUALITY MANAGEMENT

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1. SKANEATELES LAKE AND WATERSHED

1.1 General Lake and Watershed Characteristics

Skaneateles Lake lies within the Oswego River Drainage Basin. It is the fourth largest and third deepest of the Finger Lakes (Exhibit A) [1]. It has a surface area of 13.6 square miles and has a maximum depth of 300 feet It was formed during the Pleistocene Era by glacial scour and morainic damming. Thus, the lake basin is very steeply sloped with a small littoral zone, and is "U" shaped. Approximately 80% of the lake's volume is below a depth of 30 feet.

The lake is dimictic, and complete turnover occurs twice per year (Spring and Fall). Strong stratification develops during the summer. In winter a weaker, inverse stratification develops colder (and at times denser) water lies above warmer water. This occurs regardless of ice formation.

Skaneateles Lake is considered oligotrophic: it is low in nutrients and biological productivity. This is most likely a result of the small drainage basin to lake surface area ratio (4:1). Other features of oligotrophy include: (a) a deep, thick metalimnion resulting from greater light penetration, which forms during summer stratification, (b) an orthograde distribution of oxygen, also forming during summer stratification, (c) a blue-green color that demonstrates deep light penetration by the blue wavelengths due to the low concentrations of phytoplankton and humic substances, and (d) high transparency. The oligotrophic state of the lake makes it ideal for drinking water supply and recreation.

Much of the lake's shoreline is steeply sloped, especially at the southern end of the lake where cliffs can exceed 100 feet in height. Generally, the elevation is higher and the slopes are steeper in the southern portion of the watershed as compared to the northern area (Exhibit A). The highest elevation is found in the southeastern watershed at 1980 feet above sea level (USGS). Watershed acreage calculated by the Geographic Information System (GIS) is 37,724 acres or 58.94 square miles [2]. The physical characteristics of the lake and drainage basin are summarized in Table No. 1.

Table 1 Skaneateles Lake and Drainage Basin Characteristics

Parameter	Value
Mean High Water Elevation*	863.27 Syracuse Datum
Mean High Water Elevation*	865.02 NVD
Length	15 Miles
Average Width	0.90 Miles
Maximum Depth	300 Feet
Mean Depth	145 Feet
Lake Surface Area	13.6 Square Miles
Drainage Basin Area (Land)	58.94 Square Miles
Drainage Basin: Lake Surface Ratio	4.33: 1.0
Lake Volume	412 Billion Gallons
Highest Elevation*	1,980 NVD

* Feet Above Sea Level

[1] Lake data excerpted from: Effler, S.W., et al. 1989. Limnological Analysis of Skaneateles Lake, 1988. Upstate Freshwater Institute, Inc. Syracuse, NY

[2] Historically……

1.2 Watershed Soils

There are several soil associations within the watershed (Exhibit B and Table No. 2). The associations discussed below account for 80% of the watershed area and are considered representative of the character of the watershed. The remainder (20%) will not be discussed. It is noted that the associations generated by the GIS compare well, though not exactly, with the U.S. Department of Agriculture Soil Surveys prepared for each county. It would appear that this is due to the inherent discrepancies often found between maps and mapping systems.

The major soil associations found in the northern two-thirds of the watershed are: Honeoye-Lima, Lansing-Conesus, Honeoye-Lansing, and Aurora-Angola-Darien. These associations are generally characterized as deep, medium textured silt loams and gravelly silt loams. Slopes range from 2-8%, except the Honeoye-Lansing Association that has slopes of 15-25%. They are moderately well, to well drained. Permeability is slow to moderate, and seasonal ground water is generally 15" to <36".

The Langford-Erie Association comprises the southwestern portion of the watershed (about 15% of the watershed). It is considered a deep, medium textured silt loam with slopes from 2% to 25%. The soils are poorly to well drained, and slowly to moderately permeable. A medium textured fragipan can be observed in some areas. Seasonal ground water and bedrock are shallow at 6" to 20", and 20" to 40", for the Langford and Erie series, respectively.

There are three (3) associations found primarily within Cortland County (southeastern portion of the watershed): Valois-Langford-Lansing, Volusia-Mardin-Lordstown, and Lordstown-Volusia-Mardin. This is equivalent to about 13% of the watershed. The soils are medium textured silt loams and gravelly silt loams. Slopes can be extreme and can exceed 55%. They are poorly to well drained and very slowly to moderately permeable. Seasonal ground water ranges from 18" to 60".

Typically, the soils of the watershed are gravelly to medium-textured silt loams that were formed in glacial till. Slopes are generally 2-25% but can exceed 55% in the southern portion of the watershed. The soils are poorly to moderately well drained, and very slowly to slowly permeable. The depth to seasonal ground water is generally <3.0 feet. All of the soils pose a severe risk of erosion if left bare, with increasing degree of slope compounding the potential for soil loss. The use of conventional onsite wastewater treatment systems (OWTS) is severely limited due to high seasonal ground water, degree of slope, and poor permeability.

Table 2 Soils of the Skaneateles Lake Watershed

<table>
<tr><th>Association</th><th>County</th><th>Percent of County</th><th>Dominant Location in Watershed</th><th>Percent of Watershed</th><th>Slope</th><th>Soil Type and Seasonal Ground Water</th><th>Drainage/ Permeability</th></tr>
<tr><td>Honeoye-Lima</td><td>Onondaga</td><td>39%</td><td>West & Northwest Onondaga</td><td>20%</td><td>2-8%</td><td rowspan="4">Deep, medium textured silt loams and gravelly silt loams
Groundwater: 15-36”</td><td rowspan="3">Moderately well, to well drained and very slow to moderately permeable</td></tr>
<tr><td>Lansing-Conesus</td><td>Onondaga & Cayuga</td><td>17% and 22%</td><td>Spafford Uplands and Northeast Cayuga</td><td>16%</td><td>2-8%</td></tr>
<tr><td>Honeoye-Lansing</td><td>Onondaga</td><td>9%</td><td>Spafford Shoreline</td><td>6%</td><td>15-25%</td></tr>
<tr><td>Aurora-Angola-Darien</td><td>Onondaga</td><td>14%</td><td>North of Spafford Town Line</td><td>8%</td><td>2-8%</td><td>Poorly to moderately well drained</td></tr>
<tr><td>Langford-Erie</td><td>Cayuga</td><td>45%</td><td>South Cayuga</td><td>15%</td><td>2-25%</td><td>Deep, medium textured silt loams
Groundwater: 6-20”</td><td>Poorly to well drained and slow to moderately permeable</td></tr>
<tr><td>Valois-Langford-Lansing</td><td rowspan="3">Cortland</td><td rowspan="3">87%</td><td>Lowlands</td><td rowspan="3">15%</td><td rowspan="3">2-55%</td><td rowspan="3">Medium textured and gravelly silt loams
Groundwater: 18-60”</td><td rowspan="3">Poorly to well drained</td></tr>
<tr><td>Volusia-Mardin-Lordstown</td><td>Uplands</td></tr>
<tr><td>Lordstown-Volusia-Mardin</td><td>Hewitt Forest</td></tr>
</table>

1.3 Demographics, Land Use and Land Ownership

The watershed population totals approximately 4,158 people residing in 2,819 dwelling units (Table Nos. 3 and 4) [3]. Of the total number of dwelling units, approximately 1,065 are lakeshore dwellings. Land ownership is estimated as 52% private/residential (developed or vacant), 37% agricultural, 9% public and 2% commercial (Table No. 5). Based upon the GIS land use coverages, land use is calculated as: 48.2% agricultural; 40.3% open/forest; 5.4% residential; 4.7% brush; 0.9% other development; 0.3% ponds; 0.2% commercial (Table No. 6). Land use is defined as land cover acreage derived from the aerial orthophotographs.

Political subdivisions within the watershed include parts of three counties and seven townships. However, two of the towns, Marcellus and Owasco, account for less than 300 acres (or < 1.0% of the total watershed area). Onondaga County accounts for 51% of the watershed land area and 74% of the watershed population. Within the county are parts of the Towns of Skaneateles and Spafford, and the Village of Skaneateles. Forty-five percent (45%) of county lands are owned by the agricultural community. Of the estimated 2,148 dwelling units within the county, approximately 298 are connected to the Village of Skaneateles sanitary sewer system. The Village is the only municipality in the watershed having a public sewer system. The remaining watershed homes use Onsite Wastewater Treatment Systems (OWTS) or holding tanks for waste dispersal or collection (discussed in subsequent sections of this report). Several commercial buildings located on the south side of Route 20 in the village business district are within the watershed. All are connected to the municipal sanitary sewer system. Most buildings are 3-5 story structures. Various businesses occupy the ground level floors of these buildings, and a number of apartments/inhabitants occupy the upper stories.

Cayuga County accounts for 34% of the land and 10% of the population within the watershed, which includes two towns, Niles and Sempronius. Agricultural lands account for 29% of the county land area. Most of the residential development in this county is on the lakeshore and is predominantly seasonal. Much of the shoreline is very steeply sloped.

Cortland County accounts for 15% of the watershed. The Town of Scott is the single town within this portion of the watershed. It has a population of 655 or approximately 16% of the total watershed population. Soil conditions and extreme topography of the area limit development. Farming accounts for 28% of the watershed land area.

Table 3 Skaneateles Watershed Population Distribution and Watershed Land Area by Town

Town	Dwelling Units	Population	Percent of Total Population	Percent of Watershed Land Area
Skaneateles	1,376	2,216	53.3%	26.0%
Spafford	689	843	20.3%	25.0%
Niles	365	371	8.9%	17.0%
Sempronius	76	73	1.8%	17.0%
Scott	313	655	15.8%	15.0%
Totals	2,819	4,158	100%	100.0%

Table 4 Skaneateles Watershed Population Distribution and Watershed Land Area by County

County	Dwelling Units	County Population	Percent of Watershed Population	Percent of Watershed Land Area	Density People/mile^2
Onondaga	2,148	3,059	73.6%	51%	74.3
Cayuga	441	444	10.7%	34%	20.3
Cortland	313	655	15.8%	15%	70.3
Totals	2,819	4,158	100%	100%	57.5*

* Average density

Table 5 Land Ownership in the Skaneateles Watershed

Land Ownership	Acres	Percent of Total
Agricultural	13,734	37%
Public	3,575	9%
Commercial	672	2%
Residential/Private	19,740	52%
Total	37,720	100%

Table 6 Land Use in the Skaneateles Watershed

Land Use	Acres	Percent of Total
Agricultural	18,191	48.2%
Commercial	58	0.2%
Residential	2,029	5.4%
Forest/Open	15,212	40.3%
Brush	1,792	4.7%
Pond	116	0.3%
Other Development	322	0.9%
Total	37,720	100.0%

1.4 Skaneateles Lake Watershed Water Budget

The Skaneateles Lake Watershed receives an average 42.91” of precipitation per year. Of this amount approximately 50% of the total precipitation produces runoff, or yield, to the lake [4,5]. Yield or runoff is the actual amount of water that reaches the lake as a result of precipitation. The yield coefficient (also called the hydrologic response coefficient) is an expression of the proportion of precipitation that reaches the lake.

Expressed as volume, annual precipitation produces approximately 53 billion gallons of water [6]. The runoff (26 billion gallons) provides the equivalent of about 9 feet of lake elevation (2.836 billion gallons/foot) [7]. Approximately one-third of the yield is precipitation that falls directly onto the lake surface, i.e., water that does not flow across or percolate through the soil before entering the lake. This is important to take into consideration when attempting to determine potential contaminant loading to the lake, since not all yield can be attributed to surface or sub-surface runoff. The remaining 26 billion gallons (50% of the total precipitation) is the net loss due to evapotranspiration, soil moisture recharge and groundwater recharge.

Of the total yield produced, the Water Department utilizes about 13 billion gallons per year for water supply to the City. The Village and Town of Skaneateles use approximately 0.27 billion gallons. About 9.0 billion gallons are discharged through the outlet of the lake to Skaneateles Creek. The latter is done in order to maintain elevations that satisfy the many uses of the lake: public and private water supply, storage for seasonal runoff, fishery spawning areas and recreation.

Three criteria are used to determine the rate of discharge through the lake’s outlet for lake elevation management. 1: current levels as compared to the drawdown guideline levels 2: current rates of precipitation 3: the amount of water stored in the snowpack. For the latter, cores of snowpack at eighteen (18) locations within the watershed are analyzed weekly for water content.

1.5 Watershed Precipitation, Yield, Lake Level and Dam Discharges

The January 1 lake level was 863.20, just below the mean high-water mark of 863.27. To draw down the elevation within January and February’s Monthly High Drawdown Guideline Desired Range of 861.75, dam discharges were maintained significantly above January’s monthly average at 156 million gallons per day (MGD) (av. 40.82). The lake level decreased consistently throughout the month, declining 1.44’ to 861.76 on January 31.

February’s lake level increase was minimal at .12’. Monthly dam discharges averaged 78 MGD (av. 38.05). Recorded precipitation in February through April were above monthly average’s, at 3.20” (av. 2.55”), 3.70” (av. 3.10”) and 3.87” (av. 3.45) respectively. Lake levels increased from 861.82 on March 1 to 862.18 on March 31, just above the Monthly High Drawdown Guideline Desired Range of 862.00. Dam discharges for March and April were consistent, averaging 100.06 MGD (av. 37.13 MGD) and 95.46 MGD (av. 49.31 MGD) respectively. There was minimal lake elevation change in April and May. The lake elevation on May 31 was 862.29, resulting in .11’ increase from March 31. Recorded precipitation for May was just below average at 3.21” (av. 3.58”).

For the January-May period, precipitation totaled 15.62” (av.15.84”). The yield and yield coefficient were 136.66 MGD (av. 118.24 MGD) and 1.06 (av. 0.89) respectively.

Snowfall for the 2021-22 season totaled 81.50” (av. 87.23”), the third consecutive season of below average snowfall (documented snowfall totals commenced in 1980 at the Skaneateles Lake Gatehouse). Measurable snowpack was recorded on 15 (weekly) sample dates from November 2021 through April 2022.

June’s above average rainfall total of 5.55” (av. 3.94”) had minimal effect on the lake elevation, resulting in a monthly lake elevation decline of .08’. Dam discharges averaged 6.58 MGD (av. 21.47 MGD). July’s precipitation total was 2.32” (av. 4.06”). The lake elevation decreased from 862.18 on July 1 to 861.68 on July 31.

August and September precipitation totals were above average at 5.66” (av. 3.91”) and 5.24” (av. 3.96”) respectively. There was one significant rain event in the third week of each month, a three-day 3.04” rain event in August and a 1.83” one-day event in September. Over the two-month period the lake elevation decreased .64’, from 861.67 on August 1 to 861.03 on September 30. Dam releases remained at the minimum discharge rate for both months, averaging 6.4 MGD.

Precipitation for the June-August period totaled 13.53” (av. 11.91”). The yield and yield coefficient were below average at 10.77 MGD (av. 36.33 MGD) and .06 (av. 0.19) respectively.

September 1 lake elevation was below the Monthly Drawdown Guideline Desired Range at 861.25, declining, gradually throughout the month to 861.00 on October 1. Although the October rainfall total was above average at 5. 63” (av. 3.96), the lake elevation decreased 0.65’ to 860.35 on October 31. Total rainfall for October was 1.14” (av. 4.10”), the second lowest October rainfall total dating back to 1951. Dam discharges remained at a minimum through September and October.

November’s precipitation total was 4.07” (av. 3.68”). A five-day event in mid-November accounted for 2.78” of the monthly total. The lake level decreased 0.04 feet for the month. The lake elevation on December 1 was 860.31. Although monthly precipitation was below average at 3.10” (av. 3.42”), the elevation increased .74’, to 860.69 on December 31.

Precipitation for the September-December period totaled 13.93” (av. 15.14”). Yield for the period was 30.71 MGD (av. 48.37 MGD) and the yield coefficient was 0.21 (av. 0.28). Dam discharges for the period averaged 6.11 MGD.

The Skaneateles Watershed received 40.72” of precipitation for the year (av. 42.91”). The average annual yield to the lake was 60.23 MGD (av. 74.51 MGD) with a yield coefficient of 0.40 (av. 49.). Total discharge through the lake outlet for 2022 was 14,690 MG or 5.18’ of elevation (av. 10,317 MG or 3.64’, respectively). A summary of the above information can be found in Table No. 7.

Table 7 Skaneateles Watershed Data

Month	Precipitation in Inches		Yield in MGD		Elevation Feet Above Sea Level *;**		Dam Discharges in MGD	
	71 Year Average	2022	71 Year Average	2022	71 Year Average	2022	71 Year Average	2022
January	2.76	1.96	82.22	62.12	860.75	863.20	40.82	156.27
February	2.66	3.20	100.19	135.95	860.71	861.82	38.05	78.48
March	3.20	3.50	154.70	180.13	860.87	861.82	37.13	100.06
April	3.55	3.91	163.72	145.83	861.65	862.23	49.31	95.46
May	3.67	3.06	90.78	42.42	862.38	862.35	35.92	10.66
June	3.94	5.55	61.48	35.49	862.47	862.26	21.47	6.58
July	4.06	2.32	33.75	-7.91	862.40	862.18	21.08	6.72
August	3.91	5.66	13.78	5.86	862.02	861.67	13.81	6.47
September	3.96	5.63	12.13	23.82	861.50	861.25	12.34	6.34
October	4.10	1.14	30.77	-13.58	861.01	861.00	13.38	6.14
November	3.68	4.07	61.45	39.05	860.71	860.35	22.15	5.94
December	3.42	0.72	89.14	73.52	860.66	860.31	34.49	6.02
Annual	**42.91**	**40.72**	**74.51**	**60.23**			**28.33**	**40.43**

* Syracuse Datum

** 1st Day of Month Lake Elevation

2. SAMPLING AND ANALYSIS

2.1 Turbidity Sampling and Analysis

The City of Syracuse Department of Water continued to operate under the guidelines of Title 10, Part 5 of the Official Compilation of Codes, Rules and Regulations of New York (10 NYCRR Part 5). All water quality criteria were met. Turbidity for each intake was recorded continuously using Hach 1720E turbidimeters (one per intake). The meters are calibrated routinely against readings taken on a Hach TU5200 model. The latter is calibrated every three months using the formazin method outlined in *Standards Methods for the Examination of Water and Wastewater, 20th Edition.*

Readings were recorded by Water Plant personnel at four-hour intervals using the Hach TU5200 turbidimeter and Hach 1720E continuously recording turbidimeters. The results were included in the monthly reports submitted to the New York State Department of Health (NYSDOH) and are summarized in Table No. 8 of this report. The 2022 average turbidity readings for Intakes #1 and #2 were 0.51 NTU and 0.49 NTU, respectively.

Figure 1 illustrates relatively stable annual turbidity averages at Intake #1 and #2 through 2022. Following a significant spike in the September average from 2012 – 2014 (Figure 2), the trend line declined significantly through 2016 resulting in turbidity recordings consistent with the long-term average. A spike in 2021 September turbidity averages was comparable to averages recorded from 2012 – 2014, however September 2022 turbidity recordings on Intake #1 decreased to averages consistent with 2018 – 2020 recordings.

Daily maximum turbidity measurements at Intake #1 over the period from 2004 through 2016 indicate that fluctuations in turbidity have become more pronounced beginning in 2009 (Figure 3). The turbidity range narrowed in 2017, resembling pre-2014 measurements. In 2022, daily maximum turbidity levels did not reach 10 NTU.

Since monthly average data can mask spikes in turbidity, Figure 4 illustrates the number of occurrences with a daily maximum turbidity over 1 NTU for each month from 2004 – 2022. Daily maximum turbidity above 1 NTU was recorded on 44 days in 2022 at Intake #1. Twenty-nine of the 44 occurrences were between August and October in 2022 (Figure 4 &Table No. 9).

Both Table No. 9 and Figure 4 display the variance in the number of days with maximum turbidity greater than 1 NTU at Intake #1 from 2004 to 2022.

Figure 1 2000-2022 Annual Turbidity Average

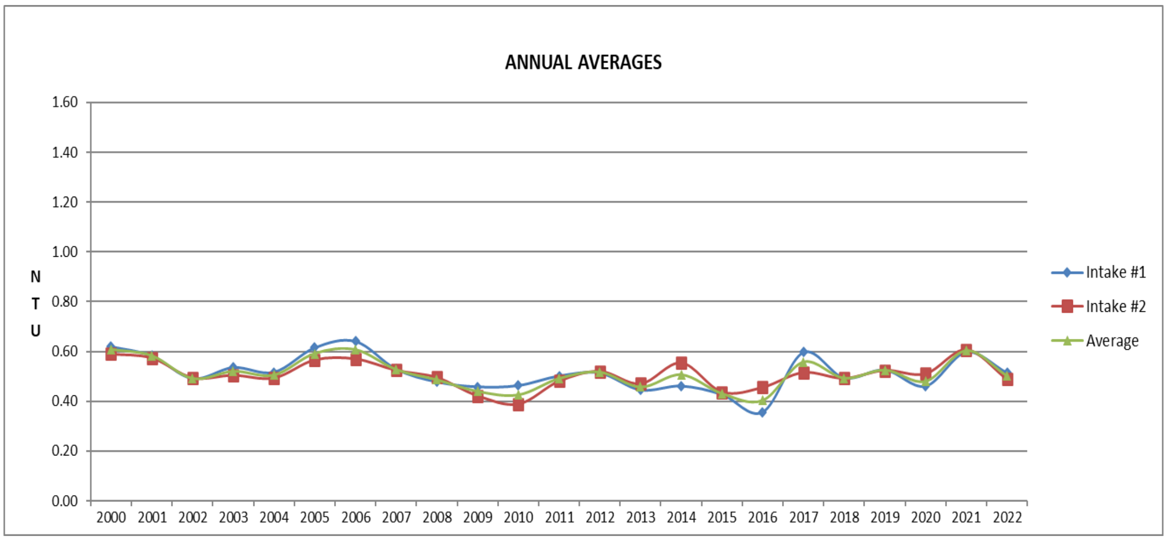


Figure 2 2000-2022 September Annual Turbidity Average

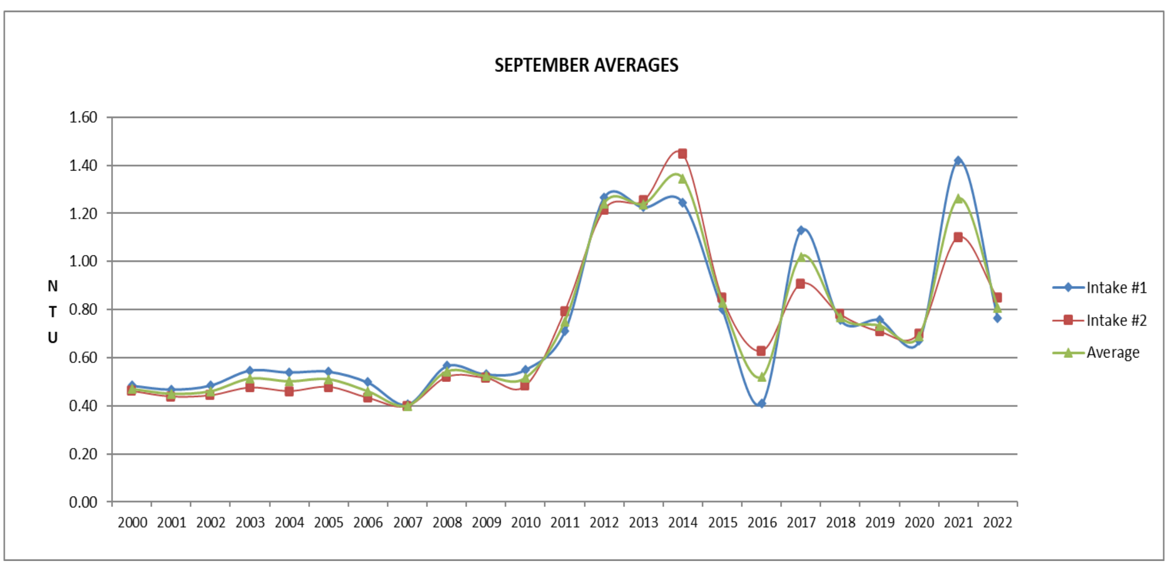


Figure 3 2004-2022 Daily Maximum Turbidity (NTU) Intake #1 & Intake #2

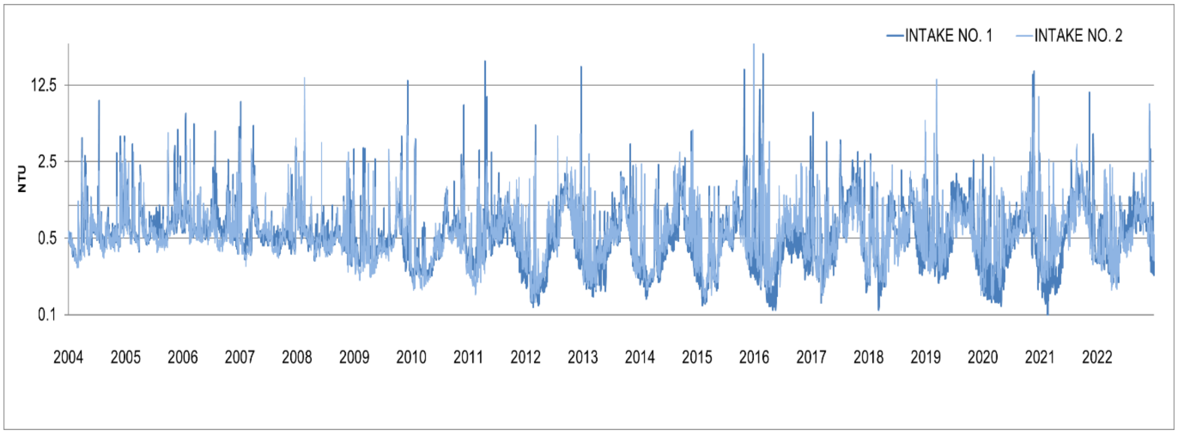


Figure 4 Monthly Counts of Turbidity >1 NTU at Intake 1, 2004-2022

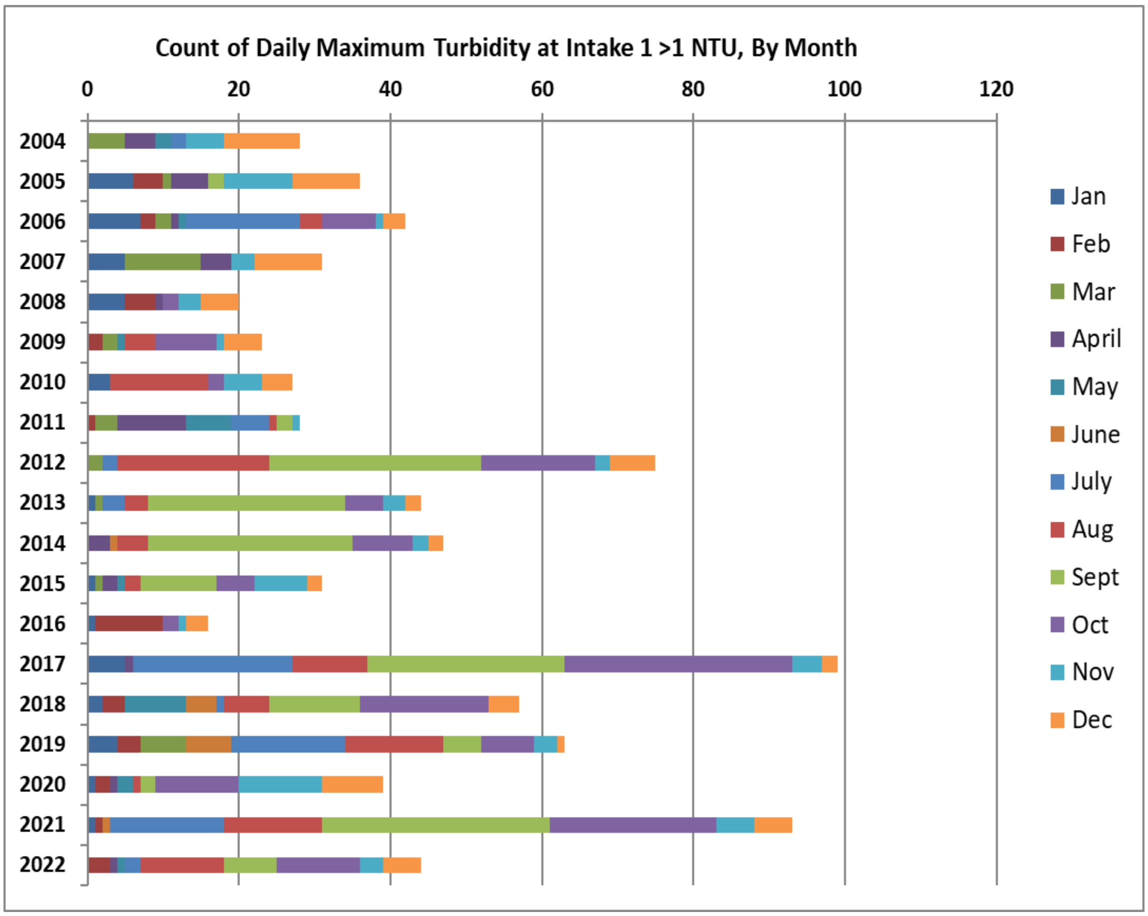


Table 8 Syracuse Water Plant Raw Water Maximum, Minimum, and Average Monthly Turbidity in NTU for 2022 (Both Intake 1 & 2)

Month	Intake 1 Maximum	Intake 1 Minimum	Intake 2 Maximum	Intake 2 Minimum	Intake 1 Average	Intake 2 Average
January	0.83	0.21	0.85	0.22	0.33	0.31
February	1.42	0.18	2.11	0.21	0.39	0.52
March	0.98	0.13	2.37	0.18	0.31	0.36
April	0.32	0.14	1.02	0.18	0.18	0.40
May	1.20	0.16	0.88	0.16	0.33	0.33
June	0.90	0.31	1.05	0.30	0.54	0.44
July	1.19	0.34	0.62	0.28	0.53	0.42
August	1.96	0.42	1.01	0.32	0.76	0.55
September	1.31	0.48	1.33	0.56	0.76	0.85
October	1.64	0.41	1.96	0.22	0.76	0.68
November	4.93	0.32	8.48	0.39	0.73	0.73
December	7.19	0.16	2.49	0.21	0.48	0.42
				Cumulative Average	0.51	0.49

Table 9 Number of Days with Maximum Turbidity > 1 NTU, Intake 1

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Summed by Month
Jan	0	6	7	5	5	0	3	0	0	1	0	1	1	5	2	4	1	1	0	42
Feb	0	4	2	0	4	2	0	1	0	0	0	0	9	0	3	3	2	1	3	34
Mar	5	1	2	10	0	2	0	3	2	1	0	1	0	0		6	0	0	0	33
April	4	5	1	4	1	0	0	9	0	0	3	2	0	1		0	1	0	1	32
May	2	0	1	0	0	1	0	6	0	0	0	1	0	0	8	0	2	0	1	22
June	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	6	0	1	0	12
July	2	0	15	0	0	0	0	5	2	3	0	0	0	21	1	15	0	15	2	81
Aug	0	0	3	0	0	4	13	1	20	3	4	2	0	10	6	13	1	13	11	104
Sept	0	2	0	0	0	0	0	2	28	26	27	10	0	26	12	5	2	30	7	177
Oct	0	0	7	0	2	8	2	0	15	5	8	5	2	30	17	7	11	22	11	152
Nov	5	9	1	3	3	1	5	1	2	3	2	7	1	4		3	11	5	3	69
Dec	10	9	3	9	5	5	4	0	6	2	2	2	3	2	4	1	8	5	5	85
Summed by Year	28	36	42	31	20	23	27	28	75	44	47	31	16	99	57	63	39	93	44	

2.2 Intake Closures

The Intakes may be closed in order to prevent a Treatment Technique Violation (TTV: any day with a turbidity reading exceeding 5.0 NTU) or Turbidity Event (a series of consecutive days during which at least one turbidity measurement each day exceeds 5.0 NTU).

Typically, Intake #2 is impacted by high wind events that re-suspend bottom sediments. This causes turbid water to enter the intake. Intake #1 may be impacted by significant runoff resulting from a high precipitation event. The high runoff causes sediment laden storm flows in Shotwell Brook. This brook is a main tributary on the north end of the lake that discharges approximately 1200 feet south of Intake #1. When the wind speeds are high enough and the wind direction is southerly, this plume of highly turbid water discharged into the lake can be transported over the intake. The majority of intake closures are to Intake #2.

Intake #2 was closed on 13 occasions in order to prevent a TTV or a Turbidity Event. There were no Intake #1 closures in 2022 related to turbidity concerns (Table No. 10).

Table 10 Raw Water Intake Closures

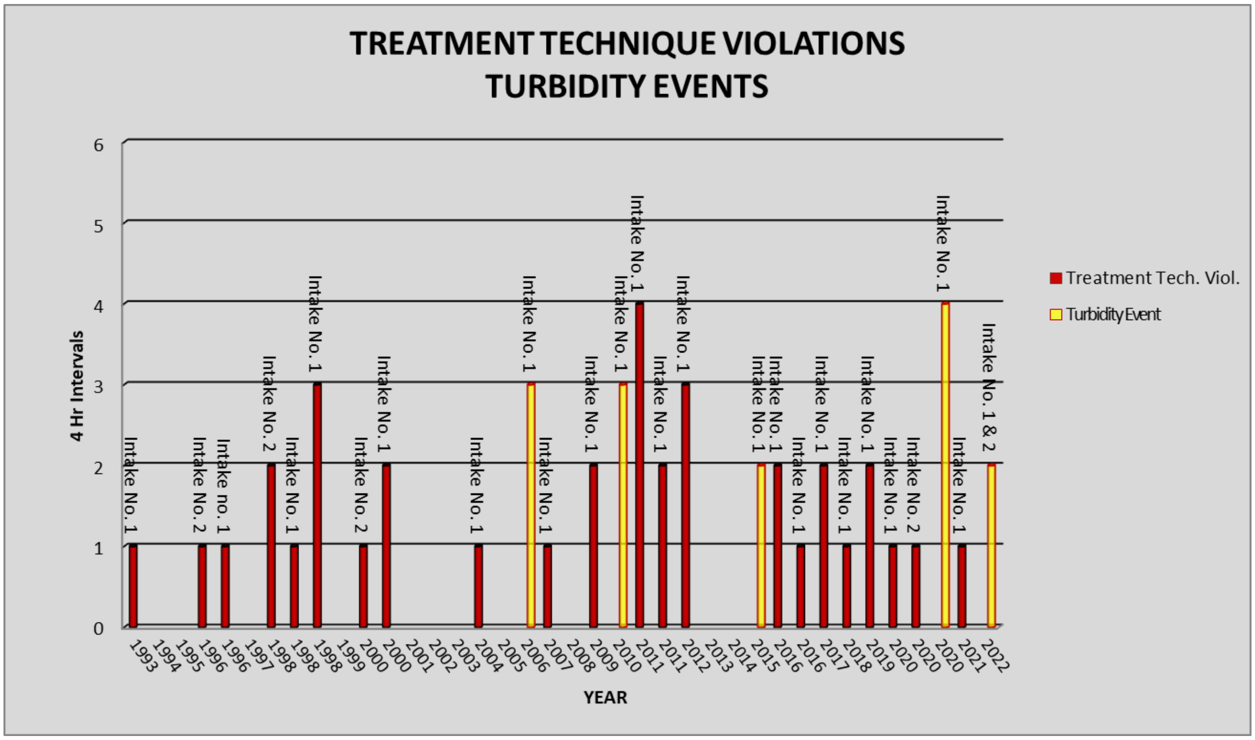
Date Intake Closed	Date Intake Opened	Intake Affected	Violation (Yes/No)
2/16/2022	2/17/2022	2	No
2/19/2022	2/21/2022	2	No
2/22/2022	2/23/2022	2	No
3/6/2022	3/7/2022	2	No
3/24/2022	3/25/2022	2	No
3/30/2022	4/1/2022	2	No
4/7/2022	4/8/2022	2	No
4/21/2022	4/22/2022	2	No
10/13/2022	10/17/2022	2	No
11/5/2022	11/7/2022	2	No
11/30/2022	12/4/2022	2	No
12/6/2022	12/7/2022	2	No
12/22/2022	12/25/2022	1	Yes

No TTV's were recorded in 2022. One Turbidity Event occurred on December 1, 2022 (Intake #1). Sustained southerly winds resulted in an elevated turbidity recording of 8.48 NTU at 4:00 am on November 30 (Intake #2). On December 1, Intake #1 recorded 7.19 NTU at 12:00 am. Intake #2 was completely closed by 5:05 am on November 30 and re-opened on December 4 at 9:30 am.

Refer to Figure 5 for TTV and Turbidity Events recorded since 1993. The Graph also displays the frequency that 5.0 NTU was exceeded (on a four-hour interval) during the TTV or Turbidity Event.

Note that in 2015, a Turbidity Event consisted of only two 5.0 NTU exceedances at four-hour intervals, comparable to numerous TTV's illustrated in the graph. However, because the intervals were at 8:00 pm and 12:00 am, the conditions set forth by NYSDOH defining a Turbidity Event (a series of consecutive days during which at least one turbidity measurement each day exceeded 5.0 NTU) was attained. The 2022 Turbidity Event was unique in that a TTV was recorded on Intake #2 on November 30 (4:00 am) during the Intake shutdown procedure. On December 1, Intake #1 exceeded 5.0 NTU at 12:00 pm resulting in two consecutive days with turbidity measurements exceeding 5.0 NTU.

Figure 5 1993-2022 Treatment Technique Violations vs Turbidity Events



2.3 Turbidity Analysis at City Reservoirs

Additional turbidity analyses were done Monday-Friday at the Woodland Reservoir and Westcott Reservoir effluent conduits, and four locations within the distribution system. These additional analyses were conducted by Department of Water, Maintenance and Operations Section personnel. Hach 2100N turbidimeters are also located at the Woodland and Westcott Reservoir Gatehouses. The turbidimeters are also calibrated monthly by Water Plant personnel. During 2022 no monthly average turbidity in the distribution system exceeded 5.0 NTU. The results of this monitoring routine are included in the monthly reports sent to the NYSDOH.

2.4 Total and Fecal Coliform Sampling and Analyses

Total coliform and fecal coliform samples were collected at the Water Plant (raw water) five times/week/intake as directed by Title 10, Part 5 of the Official Compilation of Codes, Rules and Regulations of New York (10 NYCRR Part 5). The samples were analyzed by a NYSDOH certified commercial laboratory using the membrane filter (MF) technique. Of the 535 samples collected for total coliform analyses, there were two samples that exceeded 100 coliform forming units (cfu). Note that only the fecal coliform results are used to determine compliance with the City's filtration avoidance. Of the 535 samples collected for fecal coliform analyses, there were no samples that exceeded 20 cfu. No six-month threshold for fecal coliform density was exceeded. Table Nos. 11 and 12 summarize the monthly analyses for total and fecal coliform, for each intake, respectively.

In addition to the sampling conducted at the Water Treatment Plant, samples were routinely collected within the distribution system in Syracuse to ensure water quality. Samples were collected at 51 locations within the City. Approximately 191-271 samples were collected per month or 2,645 samples for the year.

Table 11 Skaneateles Lake Raw Water Total Coliform Analyses Rolling Six-month 10% Threshold for Part 5 Violation Criteria

For 6-Month Period Ending	Number of Samples Analyzed	Number of Samples Analyzed	Number of Samples >100 Colonies	Number of Samples >100 Colonies	Percent >100 Colonies	Percent >100 Colonies
Intake:	Number 1	Number 2	Number 1	Number 2	Number 1	Number 2
January	140	140	2	0	1.43%	0.00%
February	136	136	0	0	0.00%	0.00%
March	134	134	0	0	0.00%	0.00%
April	134	134	0	0	0.00%	0.00%
May	134	134	0	0	0.00%	0.00%
June	132	132	0	0	0.00%	0.00%
July	133	133	0	0	0.00%	0.00%
August	134	134	0	0	0.00%	0.00%
September	133	133	1	1	0.75%	0.75%
October	133	133	1	1	0.75%	0.75%
November	135	134	1	1	0.74%	0.75%
December	136	135	1	1	0.74%	0.74%

Table 12 Skaneateles Lake Raw Water Fecal Coliform Analyses Rolling Six-month 10% Threshold for Part 5 Violation Criteria

For 6-Month Period Ending	Number of Samples Analyzed	Number of Samples Analyzed	Number of Samples >20 Colonies	Number of Samples >20 Colonies	Percent >20 Colonies	Percent >20 Colonies
Intake:	Number 1	Number 2	Number 1	Number 2	Number 1	Number 2
January	140	140	2	0	1.43%	0.00%
February	136	136	0	0	0.00%	0.00%
March	134	134	0	0	0.00%	0.00%
April	134	134	0	0	0.00%	0.00%
May	134	134	0	0	0.00%	0.00%
June	132	132	0	0	0.00%	0.00%
July	133	133	0	0	0.00%	0.00%
August	134	134	0	0	0.00%	0.00%

September	133	133	0	0	0.00%	0.00%
October	133	133	0	0	0.00%	0.00%
November	135	134	0	0	0.00%	0.00%
December	143	142	2	0	1.40%	0.00%

2.5 Giardia and Cryptosporidium Sampling and Analyses

Analyses for the presence of Giardia cysts and Cryptosporidium oocysts began in 1985 and 1988, respectively. During 2022, samples were collected monthly from the raw water intakes (Intake #1 and Intake #2). A total of 24 samples were collected for Giardia and Cryptosporidium in 2022. Environmental Protection Agency (EPA) Method 1623 was the analysis utilized.

There were no confirmed Giardia cysts or Cryptosporidium oocysts detected in 2022. Since 1986, there have been 1,277 samples analyzed for Giardia and 1,265 samples for Cryptosporidium. Confirmed Giardia cysts have been observed in ten samples. Of these, eight were samples collected from tributaries within the watershed, one was a sample collected from Raw Water Intake #2 and one was collected from the Water Shop in 2003 (Table No. 13). Cryptosporidium oocysts have been observed on nine occasions since 1988. Of these, three sample locations were tributaries and three were from Raw Water Intake samples (Table No. 14).

Table 13 Skaneateles and Watershed *Giardia* Detection: Incidents of Confirmed Cysts

Incident Number	Date	Location	Cysts Detected	Calculated as Cysts/100 Liters
1	December 11, 1990	Grout Brook	2	2.6
2	March 14, 1991	Intake 2	1	0.1
3	March 14, 1991	Grout Brook	3	1.6
4	June 22, 1992	Shotwell Brook	2	6.6
5	June 22, 1992	One Mile Brook	4	4.2
6	August 28, 1992	Shotwell Brook	1	5.3
7	November 23, 1992	Willow Brook	1	0.3
8	November 23, 1992	Harrold Brook	2	2.1
9	March 24, 1993	Harrold Brook	1	1.1
10	May 13, 2003 *;**	Water Shop	1	2.0

* As of 2000, results are listed as cysts/liter

** As of August 2000, Method 1623 used for analyses

Table 14 Skaneateles and Watershed *Cryptosporidium* Detection: Incidents of Confirmed Oocysts

Incident Number	Date	Location	Oocysts Detected	Calculated as Oocysts/100 Liters
1	July 26, 1988	Intake 1	1	2.1
2	March 15. 1989	Intake 1	1	0.1
3	December 11, 1990	Grout Brook	2	2.6
4	November 23, 1992	Willow Brook	1	0.3

5	November 23, 1992	Harrold Brook	1	1.1
6	September 15, 2004 *;**	Intake 2 ***	2	4.0
7	September 21, 2011	Water Shop	5	0.1
8	October 3, 2011	Water Shop	1	0.02
9	October 3, 2011	Woodland Reservoir	2	0.01

* As of 2000, results are listed as cysts/liter ** As of August 2000, Method 1623 is used for analyses

*** Previous reports list Intake 1 as the affected intake. That was incorrect. The oocysts were in a sample from Intake 2

2.6 Skaneateles Lake Limnological Sampling and Analyses

2.6.1 Algal Analyses

The sampling regime included station samples and depth profile samples. The station sampling consists of collecting one-liter samples at eight locations on the lake at a depth of 20’. The sites are approximately two miles apart. Sampling was conducted on ten dates with 80 one-liter samples being collected and analyzed for algal content.

It is noted that the Secchi disk readings effected during the station sampling can be somewhat skewed. Since stations I and VIII are shallow, the readings are consistently at the bottom, which is usually about six meters (as a result, samples are collected at about 15 feet). It is not unusual for the readings at the other Stations to vary considerably throughout the spring, summer and fall seasons, ranging from four to 16 meters (Figure 6). Figures 7 and 8 illustrate Secchi disk depth variations between early summer and fall. References to Secchi disk readings in the narrative below are adjusted, i.e., only Stations II – VII were used to determine averages.

Depth profile samples were collected at a location approximately four miles from the northern shore in the center of the lake. On each of the six sampling dates, 21 one-liter samples were collected at 10-foot intervals from the surface to a depth of 200 feet. Each was analyzed for temperature and turbidity. Algal content was determined on those samples representing the different layers of stratification: six of the 21 samples collected on each date were analyzed for algal content. Thirty-six one-liter samples were analyzed for algal concentration during the season.

Sampling was conducted from May through October 2022. The majority of genera observed were blue-green algae of the Phylum Cyanophyta (genus, Cyclotella and Polycystis) (Table No. 15). For Station Samples, two genera accounted for 75.18% of the total cell count - Polycystis (52.07%) and Cyclotella (23.11%). For Depth Profile samples, three genera accounted for 78.07% of the total cell count. Polycystis was the dominant form at 38.91%. Achnanthes accounted for 25.88% and Cyclotella accounted for 13.28%.

The station and depth profile sample collection and analyses are discussed in greater detail below. Table No. 16 lists the dates and results of the Station analyses. Table No. 17 is a summary of the Depth Profile analyses.

Note: There have been changes to the identification (or naming) of the various genera over the past several years. For the most part, the changes apply to growth in the city reservoirs. A complete summary can be found in the draft document: City of Syracuse Water Department: Woodland Reservoir Treatment Procedures for Algal Control.

Figure 6 Average Secchi Disk Depths 1987-2022

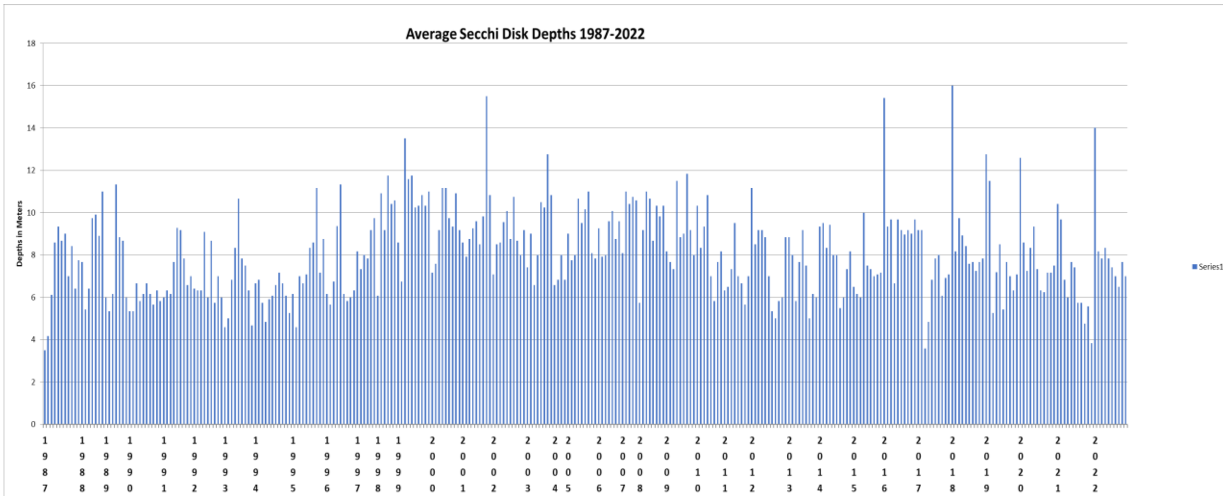


Figure 7 Average Secchi Disk Depths (June) 1987-2022

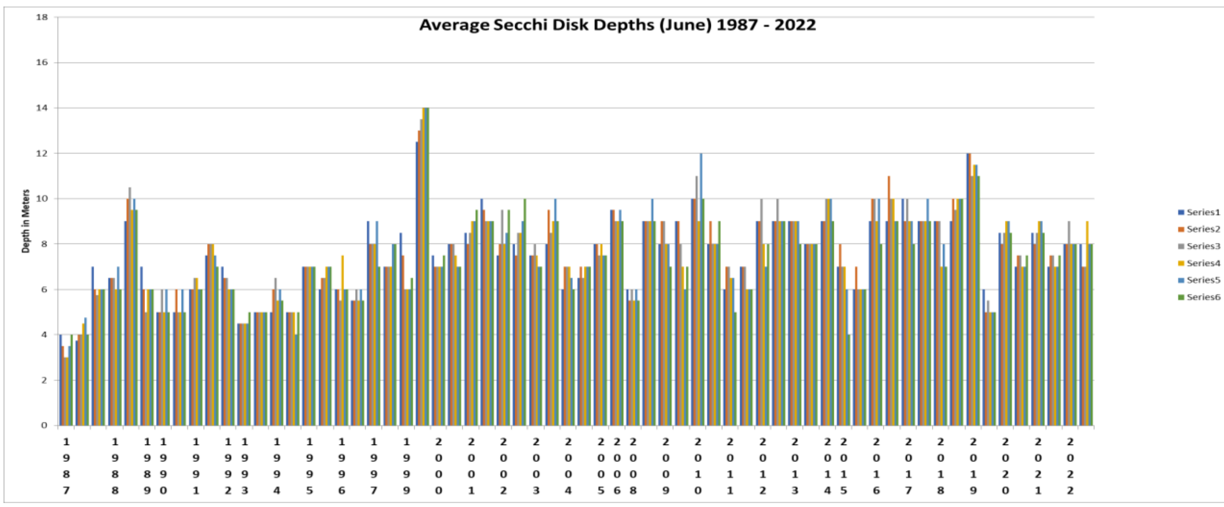


Figure 8 Average Secchi Disk Depths (September) 1987-2022

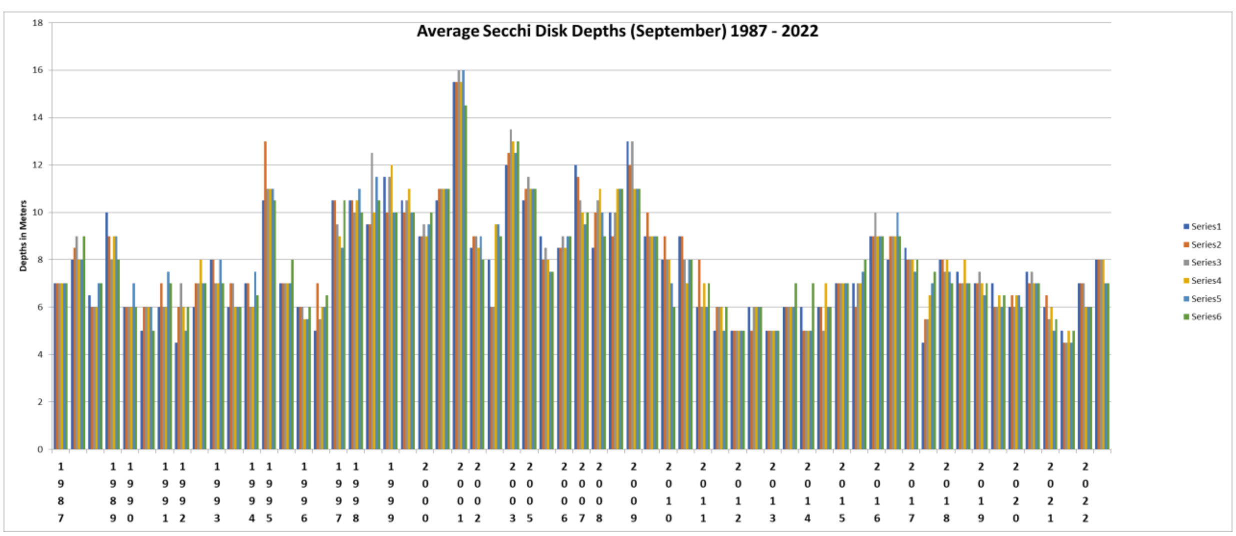


Table 15 Genera of Phytoplankton Typically Found in Skaneateles Lake

Phylum: Chrysophyta (Diatoms)

Achnanthes	Coscinodiscus	Diatoma	Meridion	Pinnularia	Surirella
Asterionella	Cyclotella	Fragellaria	Navicula	Stauroneis	Synedra
Cocconeis	Cymbella	Gomphonema	Nitzschia	Stephanodiscus	Tabellaria

Phylum: Chrysophyta (Golden-Brown)

Centritractus	Tribonema
Dinobryon	Mallomonas

Phylum: Chlorophyta (Green)

Botyrococcus	Cosmarium	Palmella	Straurastrum
Chlorcoccum	Hydrodictyon	Pediastrum	Tetraedron
Chlorella	Nitella	Phytoconis	Ulothrix
Coelastrum	Oocystis	Scenedesmus	Volvox

Phylum: Cyanophyta (Blue-Green)

Anabaena	Cyanarcus	Merismopdia
Aphanothece	Gomphosphaeria	Rivularia
Polycystis	Lyngbya	Oscillatoria
Chroococcus	Cyanobium	

Phylum: Euglenophyta (Flagellates)

Euglena	Trachelomonas

Phylum: Pyrrophyta (Dinoflagellates)

Ceratium	Peridinium

Table 16 Station Sampling Analyses Skaneateles Lake Algal Content 2022

Date	Average Total Cell Count	Dominant Form	Percent of Total	Average Secchi Disk Meters	Average Water Temperature ^{0}F
May 24	533	Polycystis 84.7% Cyanobium 6.2%	90.9%	14.0	51.5
June 8	748	Polycystis 72.8% Cyclotella 18.2%	91.0%	8.2	58.4
June 27	662	Cyclotella 48.0% Polycystis 31.4% Cyanobium 15.5%	94.9%	7.9	63.0
July 14	355	Polycystis 59.0% Cyanobium 19.3% Synedra 8.4% Cyclotella 6.4%	93.1%	8.3	70.8
July 27	436	Polycystis 44.0% Synedra 14.3% Cyanobium 14.1% Cyclotella 13.1% Dinobryon 10.7%	96.2%	7.6	70.8
August 11	1592	Polycystis 40.3% Cyclotella 20.4% Dinobryon 20.1%	88.8%	7.4	74.6
August 24	1114	Cyclotella 43.5% Polycystis 42.3% Synedra 3.8%	89.6%	6.9	73.3
September 8	1022	Polycystis 44.4% Achnanthes 23.4% Cyclotella 22.4%	90.2%	6.5	72.0
September 30	238	Polycystis 91.2% Cyclotella 1.9% Cyanobium 1.8%	94.9%	7.4	63.8
October 6	271	Polycystis 86.4% Cyanobium 4.1% Cyclotella 3.6%	94.1%	7.0	62.5
Average				8.1	66.1

Table 17 Depth Profile Sampling Analyses Skaneateles Lake Algal Content 2022

Date	Average Total Cell Count	Dominant Form	Percent of Total	Average Turbidity	Average Water Temperature ^{0}F
May 18	302	Polycystis 73.4% Cyclotella 10.6% Cyanobium 8.7%	92.7%	0.37	44.8
June 15	298	Polycystis 69.9% Cyclotella 14.7% Cyanobium 5.1%	89.7%	0.44	50.3
July 20	432	Cyclotella 43.6% Polycystis 19.5% Synedra 17.9% Chroococcus type I 10.4%	91.4%	0.30	58.1
August 17	2369	Achnanthes 41.1% Polycystis 27.7% Tabellaria 8.8% Cyclotella 8.7%	86.3%	0.44	55.6
September 16	452	Polycystis 52.2% Cyanobium 15.3% Cyclotella 13.3% Achnanthes 11.6%	92.4%	0.41	54.3
October 24	279	Polycystis 72.1% Cyanobium 8.6% Cyclotella 6.8% Achnanthes 6.1%	93.6%	0.60	49.4
Average	689			0.43	52.08

2.6.2 Station Sample Analysis

Total cell counts for station samples collected on May 24 averaged 533 cells/mL. Polycystis was the dominant form accounting for 84.7% of the total, Cyanobium and Cyclotella accounted for 6.2% and 4.6% respectively. Secchi disc readings averaged 14.0 meters. The water temperature averaged 51.50 degrees Fahrenheit.

The total monthly cell count for June averaged 705 cells/mL. On June 8 the total average cell count was 748 cells/mL. Polycystis and Cyclotella accounted for 72.8% and 18.2% of the total respectively. The June 27 total cell count averaged 705 cells/mL. Cyclotella, Polycystis and Cyanobium were dominant, accounting for 48.0%, 31.4% and 15.5% of the total respectively. Secchi disk readings averaged 8.2 meters on June 8, decreasing marginally to 7.9 meters on June 27. The average water temperature recordings increased between sample events; from 58.40 degrees Fahrenheit (June 8) to 63.0 degrees Fahrenheit (June 27).

The July monthly average total cell count of 396 cells/mL. was exceptionally low. On July 14, the total average cell count was 355 cells/mL. Polycystis and Cyanobium were the dominant forms accounting for 59.0% and 19.3% respectively. Water temperatures averaged 70.80 degrees Fahrenheit. The average Secchi disk reading was consistent with June averages at 8.3 meters. On July 27, the average total cell count remained low at 436 cells/mL. Polycystis was the dominant form totaling 44.0% of the total cell count. Synedra, Cyanobium, Cyclotella and Dinobryon accounted for 14.3%, 14.1%, 13.1% and 10.7% of the cell count respectively. Average water temperature increased to 73.50 degrees Fahrenheit. Secchi disk readings averaged 7.6 meters.

The total average cell count on August 11 increased significantly from July sample events, averaging 1,592 cells/mL. The dominant forms were Polycystis (40.3%), Cyclotella (20.4%) and Dinobryon (20.1%). On August 24, the average total cell count decreased to 1,114 cells/mL. Cyclotella and Polycystis were dominant, accounting for 43.5% and 42.3% respectively. For the month of August, water temperatures averaged 73.90 degrees Fahrenheit and Secchi disk readings averaged 7.1 meters.

Total cell counts for September 8 and September 29 averaged 1,022 cells/mL. and 630 cells/mL. respectively. For the September 8 sample event, dominant forms included Polycystis (44.4%), Achnanthes (23.4%) and Cyclotella (22.4%). Polycystis accounted for 91.2% of the September 30 sample event. Water temperatures for the month of September averaged 67.90 degrees Fahrenheit. Secchi disk readings averaged 6.9 meters.

Total cell counts for October 6 averaged 271 cells/mL. Polycystis was the dominant form totaling 86.4%. Cyanobium and Cyclotella accounted for 4.1% and 3.6% of the total cell count respectively. Water temperatures averaged 62.50 degrees Fahrenheit and Secchi disc readings averaged 7.0 meters.

2.6.3 Depth Profile Sample Analysis

The total cell count for the May 18 depth profile averaged 302 cells/mL. (Replicating the May 20, 2021, Depth Profile sample). Polycystis was the dominant form throughout the water column, accounting for 73.4% of the total cell count. Cyclotella and Cyanobium accounted for 10.6% and 8.7% respectively. Water temperatures averaged 44.80 degrees Fahrenheit, ranging from 51.00 degrees Fahrenheit at the surface, declining to 42.00 degrees Fahrenheit (110' – 200'). The lake was still exhibiting spring turnover, with weak thermal stratification.

The total cell count for the June 15 depth profile averaged 298 cells/mL. Dominant algal forms included Polycystis (69.9%) and Cyclotella (14.7%). The surface temperature was 67.00 degrees Fahrenheit. Vertical mixing was still evident throughout the upper water column with no defined epilimnion or metalimnion.

The total cell count for the July 20 depth profile remained remarkably low, averaging 432 cells/mL. (July 19, 2021, count was 2,209 cells/mL). The dominant forms were Cyclotella, Polycystis and Synedra at 43.6%, 19.5% and 17.9% respectively. The water surface temperature increased to 76.00 degrees Fahrenheit. Thermal layers were still not established.

On August 17 the depth profile average total cell count increased significantly from July's count, averaging 2,369 cells/mL. Achnanthes was the dominant form, increasing from 6 cells/mL. in July to 5,848 cells/mL. (41.1% of the total cell count). 93.7% of the Achnanthes cell count was observed at the 20-foot sample depth. Cyclotella accounted for 27.7% of the total. The surface water temperature decreased to 73.00 degrees Fahrenheit. Thermal stratification was evident; the epilimnion extended to 40', the thermocline extended to 110' and the hypolimnion from 110' downward.

The September 16 depth profile average total cell count was exceptionally low at 452 cells/mL. Polycystis was the dominant form comprising 52.2% of the total cell count. Cyanobium, Cyclotella and Achnanthes accounted for 15.3%, 13.3% and 11.6% of the sample respectively. The epilimnion remained shallow, extending to a depth of 40 feet. The metalimnion and hypolimnion were uncharacteristically not well defined for mid-September. Water temperatures ranged from 70 degrees Fahrenheit at the surface to 45 degrees Fahrenheit at 190'.

The surface water temperature decreased to 56.00 degrees Fahrenheit for the October 24 depth profile sample event. The average total cell count was 279 cells/mL. Polycystis was the dominant form at 72.1%. The epilimnetic depth increased to 70', the metalimnion extended to 90 feet and hypolimnion from 90' downward.

2.7 Skaneateles Lake Algal Blooms

Algal blooms observed by Skaneateles Lake Watershed Protection staff in 2022 were small, localized and limited to near-shore areas Microcystin was detected in a raw water sample collected from Intake #1 on September 22, 2022. On September 19, 22, and October 3, 2022, microcystin was detected in raw water samples collected from Intake #2. Results ranged from 0.33 ug/L to 0.60 ug/L (Table 18).

Monitoring, identifying, sampling, and reporting algae blooms involved a collaborative effort between the NYSDEC Finger Lakes HAB Volunteer Surveillance, NYSDEC Finger Lakes Water Hub, the Skaneateles Lake Association (SLA) Shoreline HABs Program, CSLAP and the City of Syracuse Water Department. The SLA Shoreline HABs Program comprising of select volunteers continued to monitor 25 zones around the perimeter of Skaneateles Lake in 2022. Suspicious algal blooms were reported to the NYSDEC Division of Water website HABsInfo@dec.ny.gov. Syracuse Water Department personnel routinely collected surface water skim samples following reports of suspicious blooms. Algal forms were identified, and cell counts performed on one-liter centrifuged samples under light microscopy to determine dominant algal forms.

As a result of the numerous volunteers and professional staff monitoring Skaneateles Lake and the heightened awareness of lakefront property owners and watercraft operators, the lake was intensely monitored, and lake conditions assessed in a timely manner. The frequent monitoring and the lake-wide surveillance program were instrumental in the early detection of algal blooms.

2.8 HAB Action Plan for Managing Microcystin in Skaneateles Lake

In coordination with the NYSDOH, a HAB Action Plan was developed in 2018 to ensure that the City's drinking water remained of high quality and microcystin was not detected in treated water above 0.3 µg/L. The Action Plan included short-term and long-term measures and is updated annually.

2.8.1 Short Term Measures

The short-term measures provided for an aggressive monitoring program. Microcystin sampling at the City's drinking water intakes was initiated on July 5 and extended through October 10 of 2022. Raw water was analyzed weekly unless blooms were identified within the North basin or microcystin was detected in either raw or treated samples, triggering a more frequent sampling schedule. Samples were collected and transported to an ELAP certified lab on 17 occasions for analysis in 2022. Four raw water samples were reported with microcystin levels above the limit of quantitation (LOQ) of 0.3 µg/L (Table No. 18).

Table 18 Skaneateles Lake Microcystin Levels (ug/L) July 5 – October 10, 2022

SKANETELES LAKE MICROCYSTIN LEVELS (ug/L)
July 5 - October 10, 2022

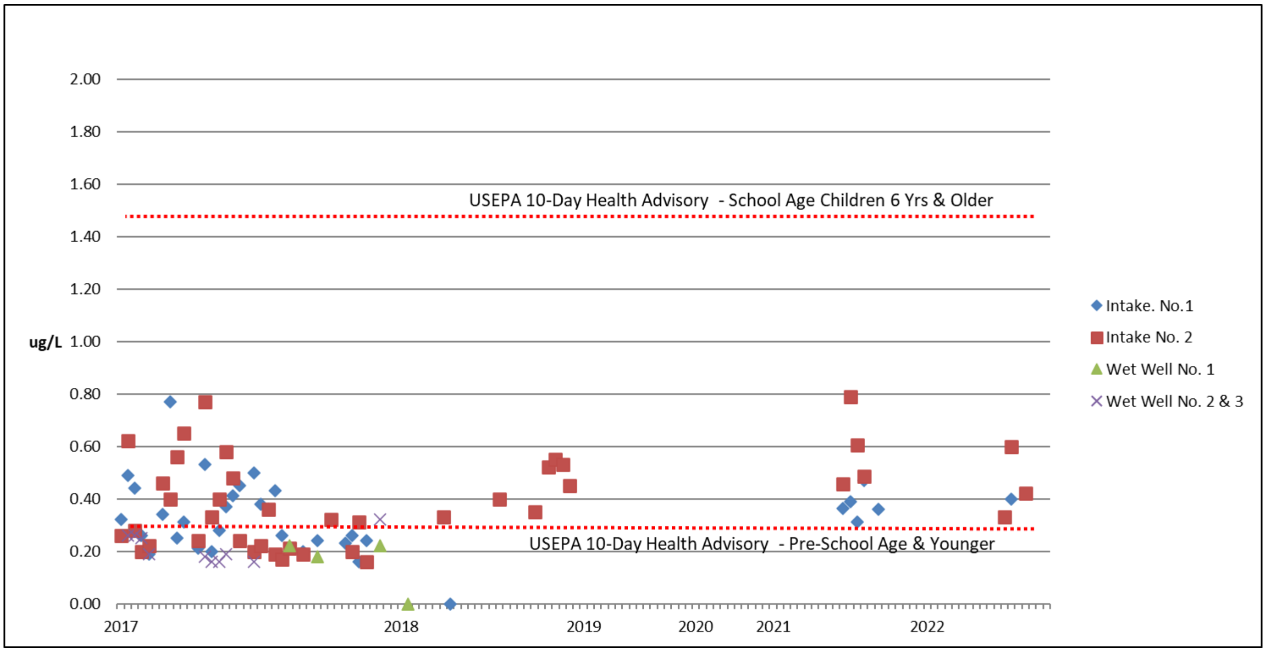
Date Sampled	7/5	7/11	7/19	7/18	7/25	8/1	8/8	8/15	8/22	8/29	9/6
Intake 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Intake 2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Clear Well 1 & 2	-	-	-	-	-	-	-	-	-	-	-
Clear Well 3	-	-	-	-	-	-	-	-	-	-	-
Skaneateles UV plant	-	-	-	-	-	-	-	-	-	-	-
Elbridge UV plant	-	-	-	-	-	-	-	-	-	-	-
Westcott incoming	-	-	-	-	-	-	-	-	-	-	-
Westcott outgoing	-	-	-	-	-	-	-	-	-	-	-
Woodland incoming	-	-	-	-	-	-	-	-	-	-	-
Wooland outgoing	-	-	-	-	-	-	-	-	-	-	-
Skaneateles HS	-	-	-	-	-	-	-	-	-	-	-
Byrne Dairy	-	-	-	-	-	-	-	-	-	-	-
Elbridge North	-	-	-	-	-	-	-	-	-	-	-
Jordan Town Hall	-	-	-	-	-	-	-	-	-	-	-
Syracuse Burnet Ave	-	-	-	-	-	-	-	-	-	-	-

Date Sampled	9/19	9/22	9/26	10/3	10/7	10/10
Intake 1	ND	* 0.40	ND	ND	ND	ND
Intake 2	0.33	* 0.60	ND	0.42	ND	ND
Clear Well 1 & 2	-	-	ND	-	ND	-
Clear Well 3	-	-	ND	-	ND	-
Skaneateles UV plant	-	-	-	-	-	-
Elbridge UV plant	-	-	-	-	-	-
Westcott incoming	-	-	-	-	-	-
Westcott outgoing	-	-	-	-	-	-
Woodland incoming	-	-	-	-	-	-
Wooland outgoing	-	-	-	-	-	-
Skaneateles HS	-	-	-	-	-	-
Byrne Dairy	-	-	-	-	-	-
Elbridge North	-	-	-	-	-	-
Jordan Town Hall	-	-	-	-	-	-
Syracuse Burnet Ave	-	-	-	-	-	-

* 9/22/2022 sample results - 4th attempt due to a kit (calibration standards) issue, not a instrument issue

Throughout periods of microcystin detections in raw water intakes (2017, 2018, 2021 & 2022), the City has demonstrated that by boosting chlorine levels at the water intake cribs and wet wells and maintaining an elevated chlorine concentration in finished water, microcystin detection within the water distribution system could be avoided. Figure No. 9 shows the number of microcystin detections for both raw and treated water samples and the range of detections for the previous four years. Note that microcystin was not detected in 2019 or 2020.

Figure 9 Skaneateles Lake Microcystin Levels 2017-2022



Short term measures also addressed the City's response to finished water microcystin levels above the 0.3 µg/L. in regard to public messaging and agency coordination. These measures included identifying specific agencies and principal contacts involved in decision making and communications and resources immediately available, such as alternate potable water.

2.8.2 Long Term Measures

Long term measures include extending the City's shallow water intake. In September 2019, the City's Engineering Consultant submitted a report titled; Conceptual Design of the Extension of Intake No. 2 for review. The document updated key elements of the 2004 Conceptual Design which comprised of extending Intake #2 (3,400 feet in length) to a depth of approximately 60 feet. The report included cost estimations, a preliminary schedule, water quality assessment, hydraulic analysis, pipe design and construction and permitting strategy. In August of 2022, the City announced a request for proposal (RFP) for engineering services relative to the design phase of the Intake #2 extension project.

Additional measures include developing and/or enhancing interconnections between neighboring public water systems and continued and advanced source water protection activities. Source water protection activities are also part of the HAB Action Plan that the New York State Department of Environmental Conservation (NYSDEC) is developing in collaboration with steering committees.

3. CHEMICAL SAMPLING AND ANALYSIS

3.1 Organic and Inorganic Sampling Results

Skaneateles Lake water was sampled and analyzed for several chemicals and/or compounds during 2022. The analyses included: trihalomethanes (THM), haloacetic acids (HAA5), volatile organic compounds (VOC) with methyl-tertiary butyl ether (MTBE), synthetic organic compounds (SOC), inorganic chemicals and physical characteristics.

The monitoring results are listed in Tables Nos. 19-27, respectively. The frequency of sampling and methods of analyses were in accordance with 10 NYCRR Part 5-1 and/or Environmental Protection Agency (EPA) regulations. The results of the chemical analyses show that all concentrations were below the New York State Department of Health (NYS DOH) or EPA Maximum Contaminant Levels (MCLs).

Table 19 Total Trihalomethane Analyses of Chlorinated Skaneateles Lake Water for 2022

Results in ug/L	400 East Genesee St.	Serpicos Diner	Functional Comm. Corp.	McChesney Center	Quarterly Average (All Sites)
February 10	20.50	18.50	22.90	18.30	20.05
May 10	31.70	24.10	27.40	23.00	26.55
August 18	56.50	74.60	47.80	53.30	58.05
November 15	29.50	36.10	30.30	29.70	31.40
Locational Annual Average	34.55	38.33	32.10	31.08	

40/30 Certification Exemption per Disinfection Byproducts Rules: <40 ug/L

Table 20 Haloacetic Acids (5) Analyses of Skaneateles Lake Water for 2022

Results in ug/L	400 East Genesee St.	Serpicos Diner	Functional Comm. Corp.	McChesney Center	Quarterly Average (All Sites)
February 10	17.30	17.60	22.60	17.90	18.85
May 10	25.70	19.80	21.80	19.90	21.80
August 18	14.30	18.80	20.00	20.70	18.45
November 15	9.40	18.40	20.80	19.10	16.93
Locational Annual Average	16.68	18.65	21.30	19.40	

Table 21 Volatile Organic Compounds, Vinyl Chloride and MTBE: February 10, 2022, Skaneateles Lake Water

Volatile Organic Compound	ug/L	Volatile Organic Compound	ug/L
Benzene	<0.5	Cis-1,3-Dichloropropene	<0.5
Bromobenzene	<0.5	trans-1,3-Dichloropropene	<0.5
Bromochloromethane	<0.5	Ethylbenzene	<0.5
Bromomethane	<0.5	Hexachlorobutadiene	<0.5
N-Butylbenzene	<0.5	Isopropylbenzene	<0.5
sec-Butylbenzene	<0.5	4-Isopropyltoluene	<0.5
tert-Butylbenzene	<0.5	Methylene Chloride	<0.5
Carbon Tetrachloride	<0.5	n-Propylbenzene	<0.5
Chlorobenzene	<0.5	Styrene	<0.5
Chloroethane	<0.5	1,1,1,2-Tetrachloroethane	<0.5
Chloromethane	<0.5	1,1,2,2-Tetrachloroethane	<0.5
2-Chlorotoluene	<0.5	Tetrachloroethene	<0.5
4-Chlorotoluene	<0.5	Toluene	<0.5
Dibromomethane	<0.5	1,2,3-Trichlorobenzene	<0.5
1,2-Dichlorobenzene	<0.5	1,2,4-Trichlorobenzene	<0.5
1,3-Dichlorobenzene	<0.5	1,1,1-Trichloroethane	<0.5
1,4-Dichlorobenzene	<0.5	1,1,2-Trichloroethane	<0.5
Dichlorodifluoromethane	<0.5	Trichloroethene	<0.5
1,1-Dichloroethane	<0.5	Trichlorofluoromethane	<0.5
1,2-Dichloroethane	<0.5	1,2,3-Trichloropropane	<0.5
1,1-Dichloroethene	<0.5	1,2,4-Trimethylbenzene	<0.5
cis-1,2-Dichloroethene	<0.5	1,3,5-Trimethylbenzene	<0.5
trans-1,2-Dichloroethene	<0.5	m-Xylene	<0.5
1,2-Dichloropropane	<0.5	o-Xylene	<0.5
1,3-Dichloropropane	<0.5	p-Xylene	<0.5
2,2-Dichloropropane	<0.5	Vinyl Chloride	<0.5
1,1-Dichloropropene	<0.5	MTBE	<0.5

Table 22 Volatile Organic Compounds, Vinyl Chloride and MTBE: May 10, 2022, Skaneateles Lake Water

Volatile Organic Compound	ug/L	Volatile Organic Compound	ug/L
Benzene	<0.5	Cis-1,3-Dichloropropene	<0.5
Bromobenzene	<0.5	trans-1,3-Dichloropropene	<0.5
Bromochloromethane	<0.5	Ethylbenzene	<0.5
Bromomethane	<0.5	Hexachlorobutadiene	<0.5
N-Butylbenzene	<0.5	Isopropylbenzene	<0.5
sec-Butylbenzene	<0.5	4-Isopropyltoluene	<0.5
tert-Butylbenzene	<0.5	Methylene Chloride	<0.5
Carbon Tetrachloride	<0.5	n-Propylbenzene	<0.5
Chlorobenzene	<0.5	Styrene	<0.5
Chloroethane	<0.5	1,1,1,2-Tetrachloroethane	<0.5
Chloromethane	<0.5	1,1,2,2-Tetrachloroethane	<0.5
2-Chlorotoluene	<0.5	Tetrachloroethene	<0.5
4-Chlorotoluene	<0.5	Toluene	<0.5
Dibromomethane	<0.5	1,2,3-Trichlorobenzene	<0.5
1,2-Dichlorobenzene	<0.5	1,2,4-Trichlorobenzene	<0.5
1,3-Dichlorobenzene	<0.5	1,1,1-Trichloroethane	<0.5
1,4-Dichlorobenzene	<0.5	1,1,2-Trichloroethane	<0.5
Dichlorodifluoromethane	<0.5	Trichloroethene	<0.5
1,1-Dichloroethane	<0.5	Trichlorofluoromethane	<0.5
1,2-Dichloroethane	<0.5	1,2,3-Trichloropropane	<0.5
1,1-Dichloroethene	<0.5	1,2,4-Trimethylbenzene	<0.5
cis-1,2-Dichloroethene	<0.5	1,3,5-Trimethylbenzene	<0.5
trans-1,2-Dichloroethene	<0.5	m-Xylene	<0.5
1,2-Dichloropropane	<0.5	o-Xylene	<0.5
1,3-Dichloropropane	<0.5	p-Xylene	<0.5
2,2-Dichloropropane	<0.5	Vinyl Chloride	<0.5
1,1-Dichloropropene	<0.5	MTBE	<0.5

Table 23 Volatile Organic Compounds, Vinyl Chloride and MTBE: August 18, 2022, Skaneateles Lake Water

Volatile Organic Compound	ug/L	Volatile Organic Compound	ug/L
Benzene	<0.5	Cis-1,3-Dichloropropene	<0.5
Bromobenzene	<0.5	trans-1,3-Dichloropropene	<0.5
Bromochloromethane	<0.5	Ethylbenzene	<0.5
Bromomethane	<0.5	Hexachlorobutadiene	<0.5
N-Butylbenzene	<0.5	Isopropylbenzene	<0.5
sec-Butylbenzene	<0.5	4-Isopropyltoluene	<0.5
tert-Butylbenzene	<0.5	Methylene Chloride	<0.5
Carbon Tetrachloride	<0.5	n-Propylbenzene	<0.5
Chlorobenzene	<0.5	Styrene	<0.5
Chloroethane	<0.5	1,1,1,2-Tetrachloroethane	<0.5
Chloromethane	<0.5	1,1,2,2-Tetrachloroethane	<0.5
2-Chlorotoluene	<0.5	Tetrachloroethene	<0.5
4-Chlorotoluene	<0.5	Toluene	<0.5
Dibromomethane	<0.5	1,2,3-Trichlorobenzene	<0.5
1,2-Dichlorobenzene	<0.5	1,2,4-Trichlorobenzene	<0.5
1,3-Dichlorobenzene	<0.5	1,1,1-Trichloroethane	<0.5
1,4-Dichlorobenzene	<0.5	1,1,2-Trichloroethane	<0.5
Dichlorodifluoromethane	<0.5	Trichloroethene	<0.5
1,1-Dichloroethane	<0.5	Trichlorofluoromethane	<0.5
1,2-Dichloroethane	<0.5	1,2,3-Trichloropropane	<0.5
1,1-Dichloroethene	<0.5	1,2,4-Trimethylbenzene	<0.5
cis-1,2-Dichloroethene	<0.5	1,3,5-Trimethylbenzene	<0.5
trans-1,2-Dichloroethene	<0.5	m-Xylene	<0.5
1,2-Dichloropropane	<0.5	o-Xylene	<0.5
1,3-Dichloropropane	<0.5	p-Xylene	<0.5
2,2-Dichloropropane	<0.5	Vinyl Chloride	<0.5
1,1-Dichloropropene	<0.5	MTBE	<0.5

Table 23 Volatile Organic Compounds, Vinyl Chloride and MTBE: November 15, 2022, Skaneateles Lake Water

Volatile Organic Compound	ug/L	Volatile Organic Compound	ug/L
Benzene	<0.5	Cis-1,3-Dichloropropene	<0.5
Bromobenzene	<0.5	trans-1,3-Dichloropropene	<0.5
Bromochloromethane	<0.5	Ethylbenzene	<0.5
Bromomethane	<0.5	Hexachlorobutadiene	<0.5
N-Butylbenzene	<0.5	Isopropylbenzene	<0.5
sec-Butylbenzene	<0.5	4-Isopropyltoluene	<0.5
tert-Butylbenzene	<0.5	Methylene Chloride	<0.5
Carbon Tetrachloride	<0.5	n-Propylbenzene	<0.5
Chlorobenzene	<0.5	Styrene	<0.5
Chloroethane	<0.5	1,1,1,2-Tetrachloroethane	<0.5
Chloromethane	<0.5	1,1,2,2-Tetrachloroethane	<0.5
2-Chlorotoluene	<0.5	Tetrachloroethene	<0.5
4-Chlorotoluene	<0.5	Toluene	<0.5
Dibromomethane	<0.5	1,2,3-Trichlorobenzene	<0.5
1,2-Dichlorobenzene	<0.5	1,2,4-Trichlorobenzene	<0.5
1,3-Dichlorobenzene	<0.5	1,1,1-Trichloroethane	<0.5
1,4-Dichlorobenzene	<0.5	1,1,2-Trichloroethane	<0.5
Dichlorodifluoromethane	<0.5	Trichloroethene	<0.5
1,1-Dichloroethane	<0.5	Trichlorofluoromethane	<0.5
1,2-Dichloroethane	<0.5	1,2,3-Trichloropropane	<0.5
1,1-Dichloroethene	<0.5	1,2,4-Trimethylbenzene	<0.5
cis-1,2-Dichloroethene	<0.5	1,3,5-Trimethylbenzene	<0.5
trans-1,2-Dichloroethene	<0.5	m-Xylene	<0.5
1,2-Dichloropropane	<0.5	o-Xylene	<0.5
1,3-Dichloropropane	<0.5	p-Xylene	<0.5
2,2-Dichloropropane	<0.5	Vinyl Chloride	<0.5
1,1-Dichloropropene	<0.5	MTBE	<0.5

Table 24 Synthetic Organic Compound Analyses of Skaneateles Lake Water May 12 & November 15, 2022

Part 5 Group Number	Parameter	EPA Standard in ug/L	Results in ug/L
1	Alachlor	0.2	Not Detected
1	Aldicarb	3	Not Detected
1	Aldicarb sulfone	2	Not Detected
1	Aldicarb sulfoxide	4	Not Detected
1	Atrazine	3	Not Detected
2	Benzo(a)pyrene	0.2	Not Detected
1	Carbofuran	40	Not Detected
1	Chlordane, Total	2	Not Detected
2	Bis(2-ethylhexyl)pthalate	6	Not Detected
1	1,2-dibromo-3-chlorpropane	0.2	Not Detected
1	2,4-D	50	Not Detected
2	Dinoseb	7	Not Detected
1	Endrin	2	Not Detected
1	1,2-dibromoethane (EDB)	0.05	Not Detected
1	Heptachlor	0.4	Not Detected
1	Heptachlor expoxide	0.2	Not Detected
2	Hexachlorobenzene	1	Not Detected
1	Gamma-BHC (Lindane)	0.2	Not Detected
+1	Methoxychlor	40	Not Detected
1	Pentachlorophenol	1	Not Detected
1	PCB, Total	0.5	Not Detected
2	Simazine	4	Not Detected
1	Toxaphene	3	Not Detected
1	2,4,5-TP Silvex	10	Not Detected
2	3-Hydroxy Carbofuran	5	Not Detected
2	Aldrin	5	Not Detected
2	Butachlor	50	Not Detected
2	Carbaryl	5	Not Detected
2	Dalapon	50	Not Detected
2	Dicamba	50	Not Detected
2	Dieldrin	5	Not Detected
2	Glyphosate	50	Not Detected
2	Hexachlorocyclopentadiene	5	Not Detected
2	Methomyl	5	Not Detected
2	Metolachlor	50	Not Detected
2	Metribuzin	50	Not Detected
2	Oxamyl	5	Not Detected
2	Propachlor	50	Not Detected

Table 25 Inorganic Chemicals and Physical Characteristics Analysis of Skaneateles Lake Water May 10, November 15 & 29, 2022

Parameter	EPA Standard in mg/L	Results in mg/L
Antimony	0.006	Not Detected
Arsenic	0.010	Not Detected
Barium	2.0	0.0227
Berylium	0.004	Not Detected
Cadmium	0.005	Not Detected
Chromium	0.10	Not Detected
Cyanide	0.02	Not Detected
Mercury	0.002	Not Detected
Nickel	None	Not Detected
Selenium	0.05	Not Detected
Thallium	0.002	Not Detected
Fluoride	2.2	0.79
Chloride	250	21.9
Iron	0.30	Not Detected
Magnesium	None	7.73
Manganese	0.30	Not Detected
Silver	0.10	Not Detected
Sodium	None	11.7
Sulfate	250	12.0
Color	15 units	<5
Odor	3 units	Not Detected
Nitrate	10.0	0.45
Nitrite	1.0	Not Detected

Table 26 Radionuclide Analyses of Skaneateles Lake Water for 2017 May 10, 2017

Parameter	EPA Standard in picocuries/liter (pCi/l)	Results in pCi/l
Gross Alpha Particle	15	Undetected
Radium 226	5	Undetected
Radium 228	5	Undetected

Table 27 Emerging Contaminants – PFAS / 1-4 Dioxane Analysis of Skaneateles Lake Water for November 15, 2022

Contaminant	Unit	Regulatory Limit (MCL)	MCLG	Level Detected	Sample Date	Violation
Perflurobutanesulfonic acid (PFBS)	ng/L	50,000	2,000	Undetected	11/15/2022	No
Perfluorohexanoic acid (PFHxA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluorohexanesulfonic acid (PFHxS)	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluoroheptanoic acid (PFHpA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluorooctanoic acid (PFOA) (1)	ng/L	10	N/A	0.96 (2)	11/15/2022	No
Perfluorooctanesulfonic acid (PFOS)	ng/L	10	N/A	Undetected	11/15/2022	No
Perfluoronanoic acid (PFNA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluorodecanoic acid (PFDA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
N-etFOSAA	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluoroundecanoic acid (PFUnA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
N-MeFOSAA	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluorododecanoic acid (PFDoA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluorotetradecanoic acid (PFTrDA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
Perfluorotetradecanoic acid (PFTA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ng/L	50,000	10	Undetected	11/15/2022	No
11CL-PF3OUdS(F53B Major)	ng/L	50,000	N/A	Undetected	11/15/2022	No
9Cl-PF3ONS(F53B Minor)	ng/L	50,000	N/A	Undetected	11/15/2022	No
4,8-dioxa-3H-perfluornonanoic acid (ADONA)	ng/L	50,000	N/A	Undetected	11/15/2022	No
1,4 Dioxane	ug/L	1 ug/L	N/A	Undetected	11/15/2022	No

Notes:

1: Released into the environment from widespread use in commercial and industrial applications

2: Level detected below reporting limit of 1.8 ng/L

4. SKANEATELES LAKE WATERSHED PROTECTION PROGRAM

4.1 Watershed Inspection Program Overview

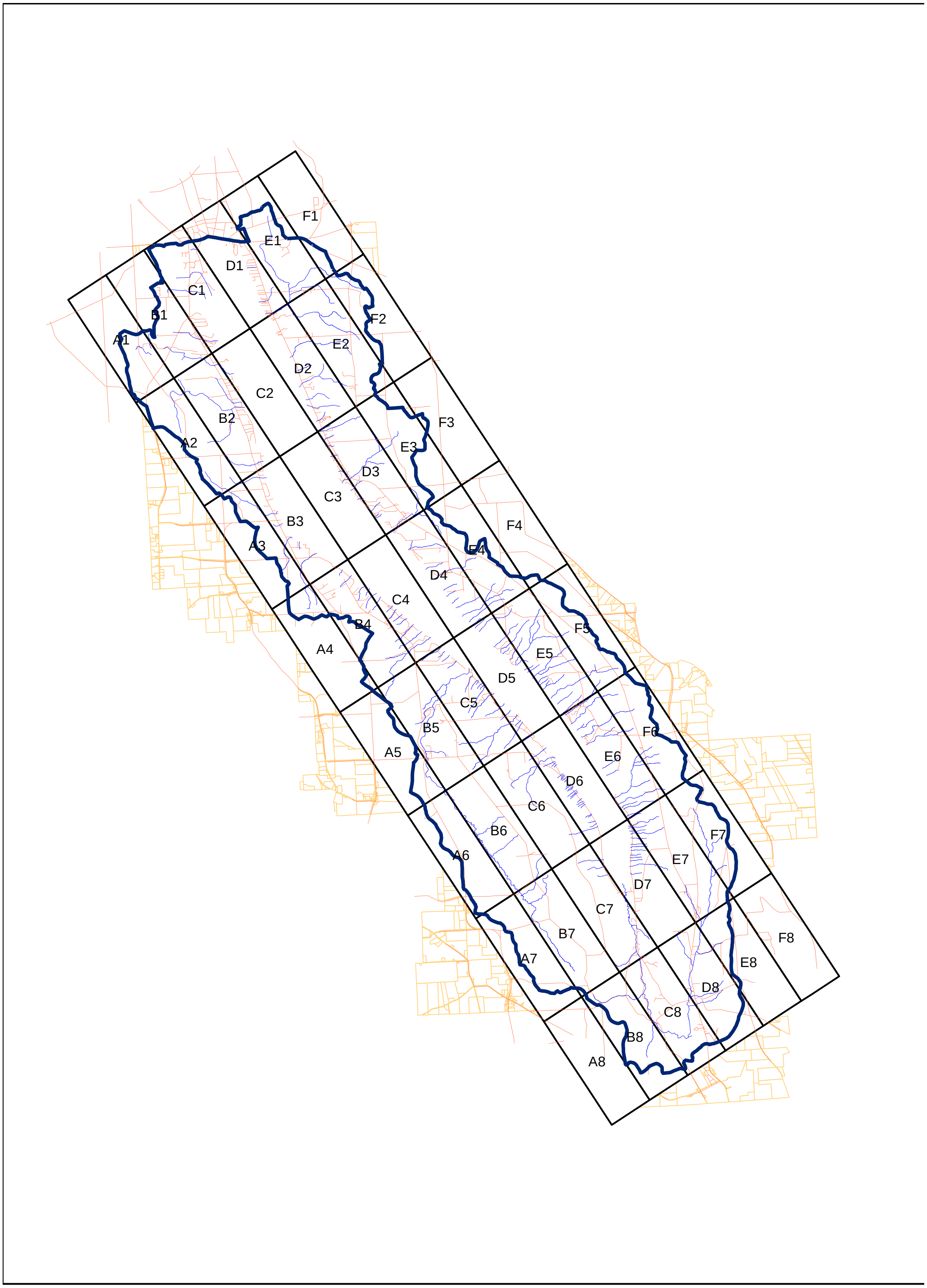
The Watershed Protection Program operated by the City of Syracuse consisted of (a) an Inspection Program to detect violations of the Watershed Rules and Regulations, NYSDOH and county Sanitary Codes, NYS Department of Environmental Conservation (DEC) Environmental Conservation Law (ECL), Navigation Law and local rules and regulations, (b) direct involvement in the procedures for installation of new and repair of existing OWTS, (c) reviewing all design and site plans for proposed building and land disturbing activity and (d) the OWTS Inspection and Dye Testing Program.

Two full-time City of Syracuse personnel routinely patrol the lake and watershed: a Watershed Inspector and a Water Department Sanitarian. Typically, there is an increase in regulated activities within the watershed during the summer months (May-September). This is due, in large part, to the influx of seasonal residents and non-resident recreational users (boaters, anglers, hikers, etc.). The activities include construction and/or repair of dwellings, OWTS and shoreline structures and recreation.

In order to address this increased seasonal activity, Inspectors conduct intensive morning investigations of lakeshore properties. This includes walking properties, looking under structures, inspecting for OWTS failures, and investigating construction activities of any kind. When required, a boat detail is implemented for those areas that are difficult to access by truck or foot. In an effort to more effectively survey the entire land area within the watershed annually, watershed zones were digitally overlaid and labeled on a GIS map in 2012 (Figure 10). The zones appear on the Skaneateles Lake Watershed Map as 48 rectangular grids, each representing approximately 870 acres of land. Inspectors are assigned to individual zones based on the time of year. Zones comprising of lakefront seasonal cottages are inspected during the summer months and remote areas located off seasonal roads are typically inspected in the spring and fall.

The afternoon schedule allows for flexibility, and no specific areas are selected for inspection. This affords the Inspectors the latitude to conduct general inspections, pursue compliance of outstanding violations, conduct site surveys for OWTS proposals and meet with property owners, Environmental Conservation Officers (ECOs), Building Inspectors, or County Public Health Technicians/Sanitarians.

Figure 10 Skaneateles Lake Watershed Inspection Zones



4.2 Onsite Wastewater Treatment System Review and Inspection

Soil tests were witnessed by the Inspectors on 43 occasions in 2022. All soil tests were done in accordance with 10 NYCRR Part 75 (Appendix 75-A) and witnessed by the inspection team. All proposed systems for new dwellings require a plan designed by a licensed Design Professional. Typically, property owners hire a private consultant. However, Cortland County Department of Health personnel are responsible for conventional system design in their county. Sites requiring non-conventional systems require designs by a private consultant. Plans are submitted to the Department of Water for review and comment, and to the respective county health department for approval or rejection based on 10 NYCRR Part 75 guidelines. A total of 28 OWTS design proposals for new construction or alternative engineering design were recommended for approval. No proposals were reviewed for repair of existing septic system components. Watershed personnel also conducted backfill inspections on repairs, as well as assisted county Sanitarians and design engineers with final inspections for new construction.

4.3 Housing Starts in the Watershed

A total of 21 building permits were issued for new dwellings during 2022 (Table No. 27 & Fig. 11). Eighteen of the permits were in Onondaga County. Four were in the town of Skaneateles (one lakefront), three in the Village of Skaneateles (all lakefront) and eleven were issued in the town of Spafford (seven lakefront). One permit was issued in Cayuga County, in the town of Niles (lakefront). Two permits were issued in Cortland County, both in the town of Scott, (no lakefront).

Table 28 Construction Activity in the Skaneateles Watershed for 2022

Township	New Construction	Lakefront*	Additions & Renovations	Lakefront**
Village of Skaneateles	3	3	1	1
Town of Skaneateles	4	1	13	7
Spafford	11	7	3	1
Niles	1	1	0	0
Sempronius	0	0	0	0
Scott	2	0	0	0
Total	21	12	17	9

* Included in new construction figures

** Included in additions & renovations figures

4.4 Building Permit Application Review

The Watershed Protection Program reviewed a total of 82 Building and Zoning Permit Applications in 2022. As discussed above, 21 were new construction. Seventeen applications were additions or renovations to existing dwellings and the remaining 44 applications included shoreline structures, accessory structures, landscape features or proposed subdivisions and lot line relocations. Figures 11 through 14 illustrate new construction and renovation proposals reviewed by the City of Syracuse and monitored throughout project duration in the Skaneateles Lake Watershed since 1993.

Figure 11 New Construction Activity within the Skaneateles Lake Watershed 1993-2022

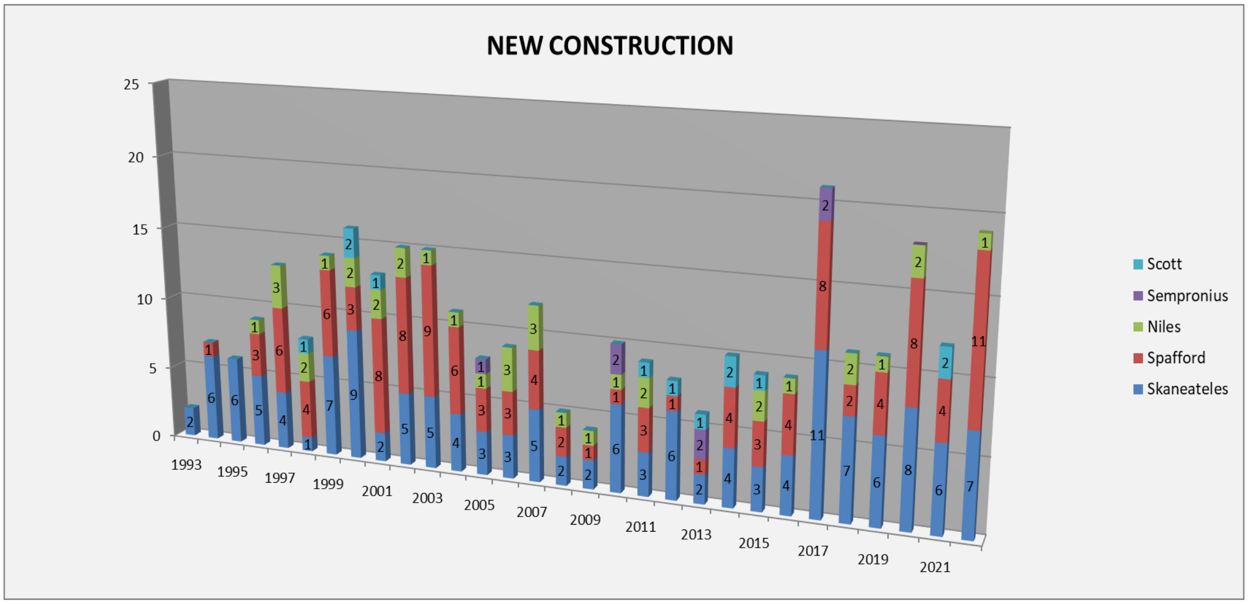


Figure 12 Renovation Activity within the Skaneateles Lake Watershed 1993-2022

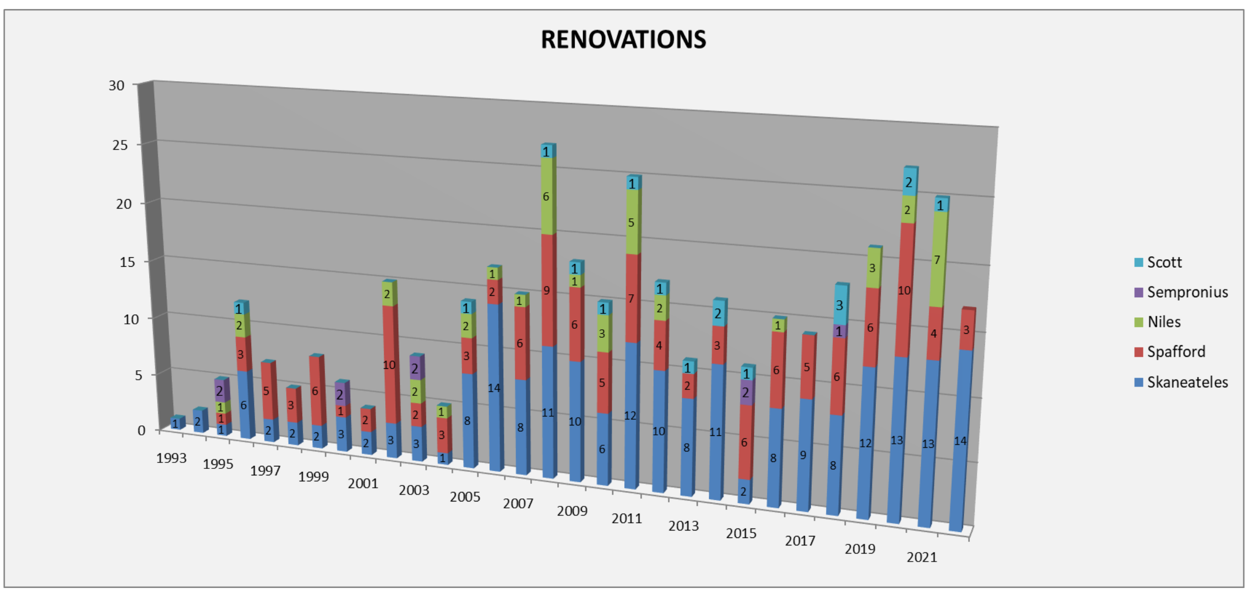


Figure 13 Map of New Construction Activity within the Skaneateles Lake Watershed 1993-2022

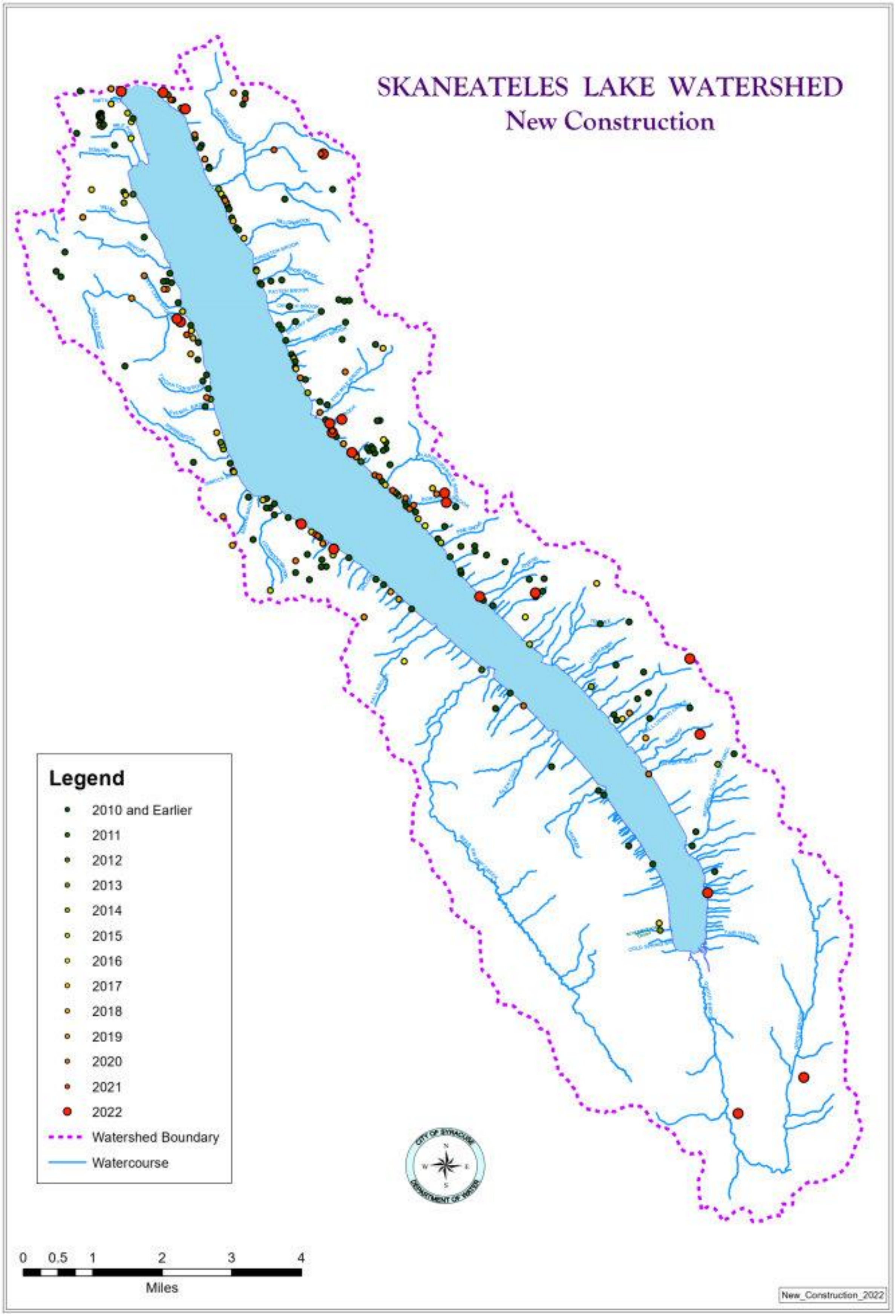
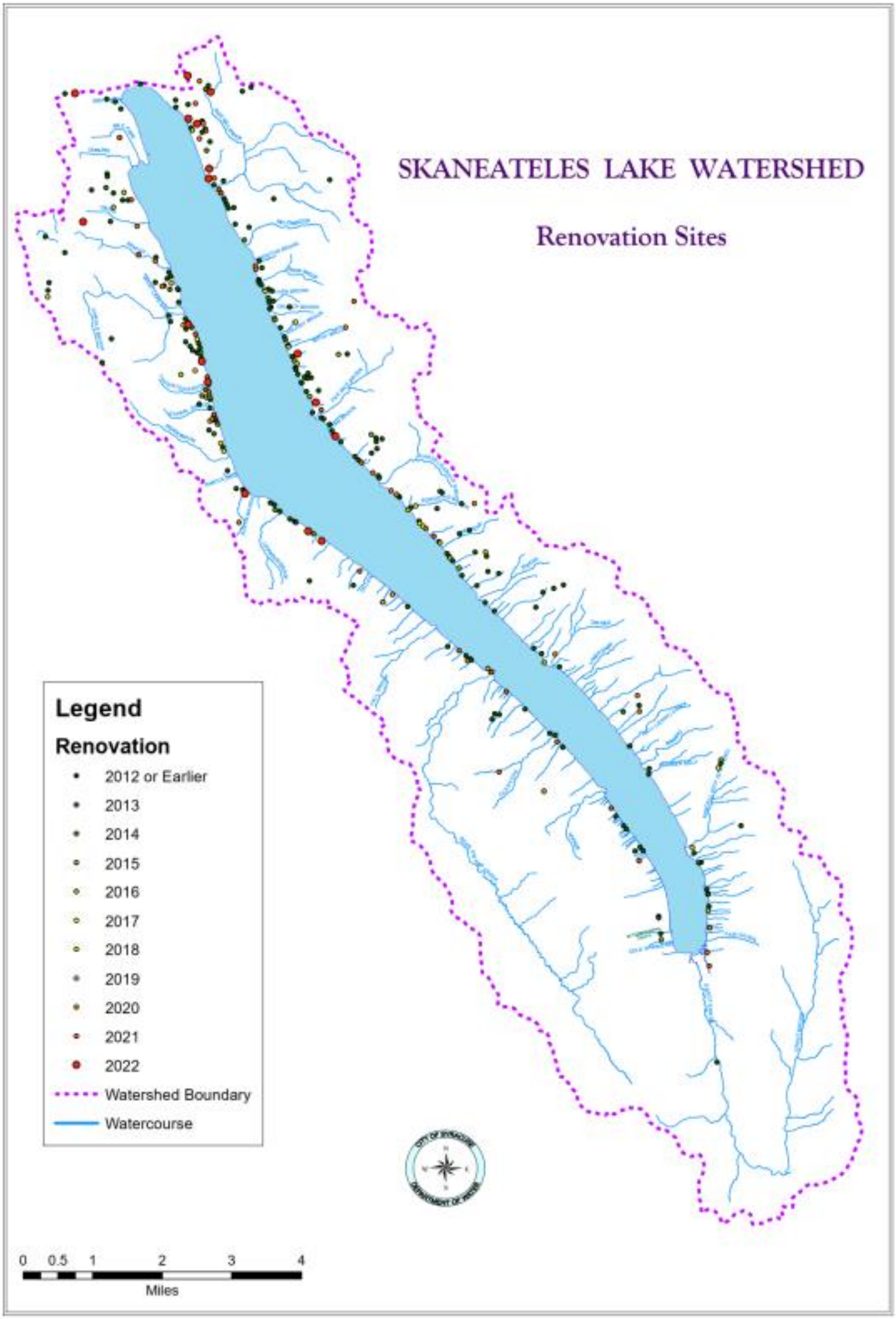


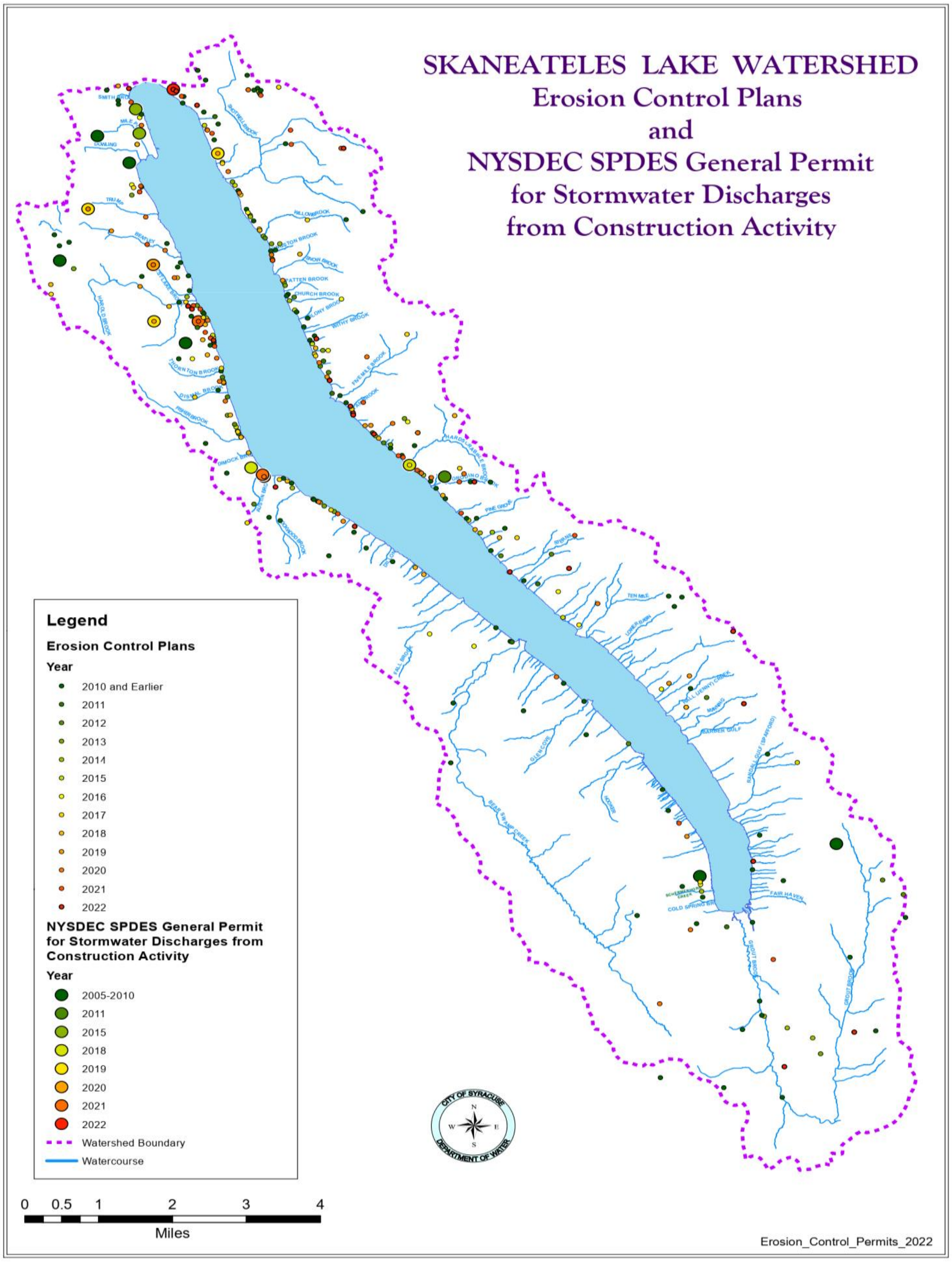
Figure 14 Map of Renovation Activity within the Skaneateles Lake Watershed 1993-2022



4.5 Erosion and Sediment Control Plan Review

As of 2004, the Skaneateles Watershed Rules and Regulations require property owners proposing to disturb 5,000 square feet or greater of land in defined environmentally sensitive areas to submit a Sediment and Erosion Control Plan (SECP) to the City of Syracuse for review. In 2022, 22 SECPs were reviewed. A NYSDEC SPDES General Permit for Storm water Discharges (GP-0-20-001) is required in New York State for all construction activity over one acre. One permit was issued for construction activity in the Watershed in 2022 under GP-0-20-001. Figure 15 illustrates SECP's reviewed and SPDES General Permits issued within the Skaneateles Lake Watershed since 2004.

Figure 15 Erosion Control Plans/NYSDEC SPDES Permits



4.6 Skaneateles Lake Watershed Rules and Regulations Violations

A total of 33 violations of the Skaneateles Lake Watershed Rules and Regulations were recorded in 2022. The violations are discussed in detail below.

4.6.1 County Sanitary Code Violations

Twenty violations of County Sanitary Code were reported in 2022. Eighteen violations were the result of failing OWTS. Two property owners were cited for failure to renew operation and maintenance contracts for Enhanced Treatment Units (ETU's). (Table No. 28 at end of next section).

- All Sanitary Code violations were abated in 2022 or in the process of abatement. Corrective actions included performing scheduled maintenance, replacement of failing septic system components and contract renewals.

The enforcement of Sanitary Code violations is the responsibility of the respective county health departments. Alleged violators are issued a Violation Notice from the City of Syracuse and given five working days to reply and declare their intent to affect the necessary repairs. If there is no response, or if the property owner refuses to abate the problem, the violation is forwarded to the respective county health department for enforcement. Sanitary Code violations identified by Watershed Inspectors since 1994 are shown in Figure 16.

Figure 16 Skaneateles Lake Watershed Sanitary Code Violations 1994-2022

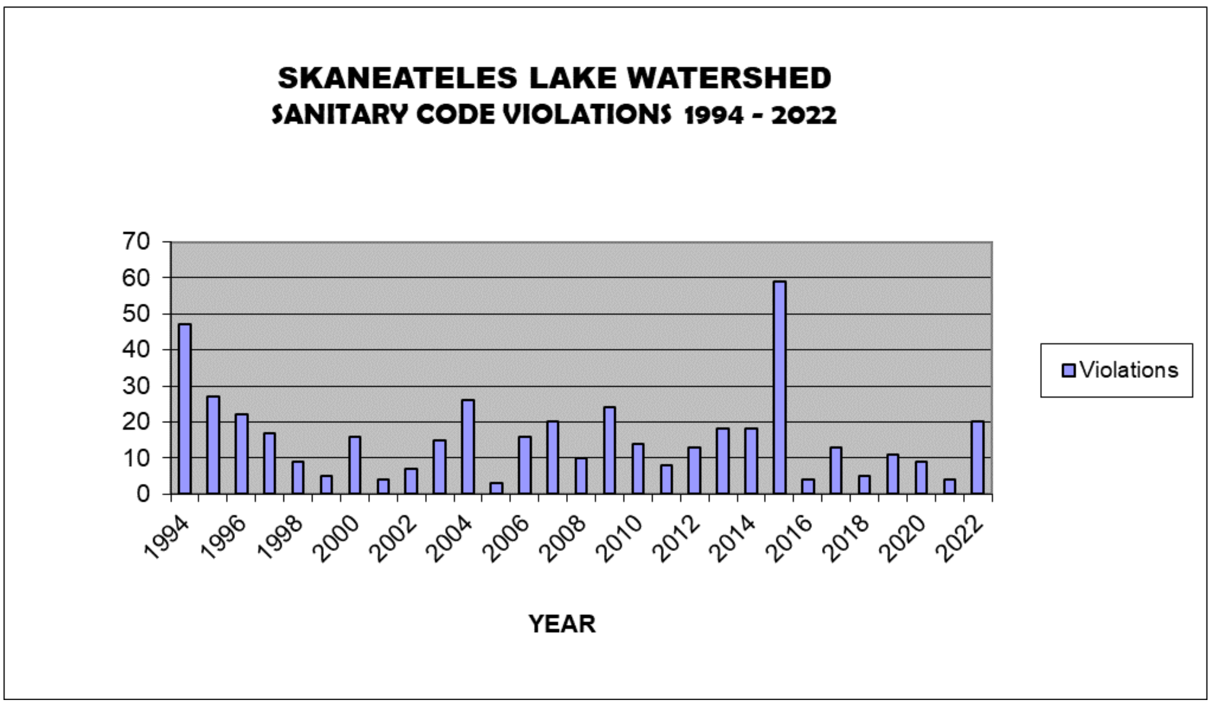
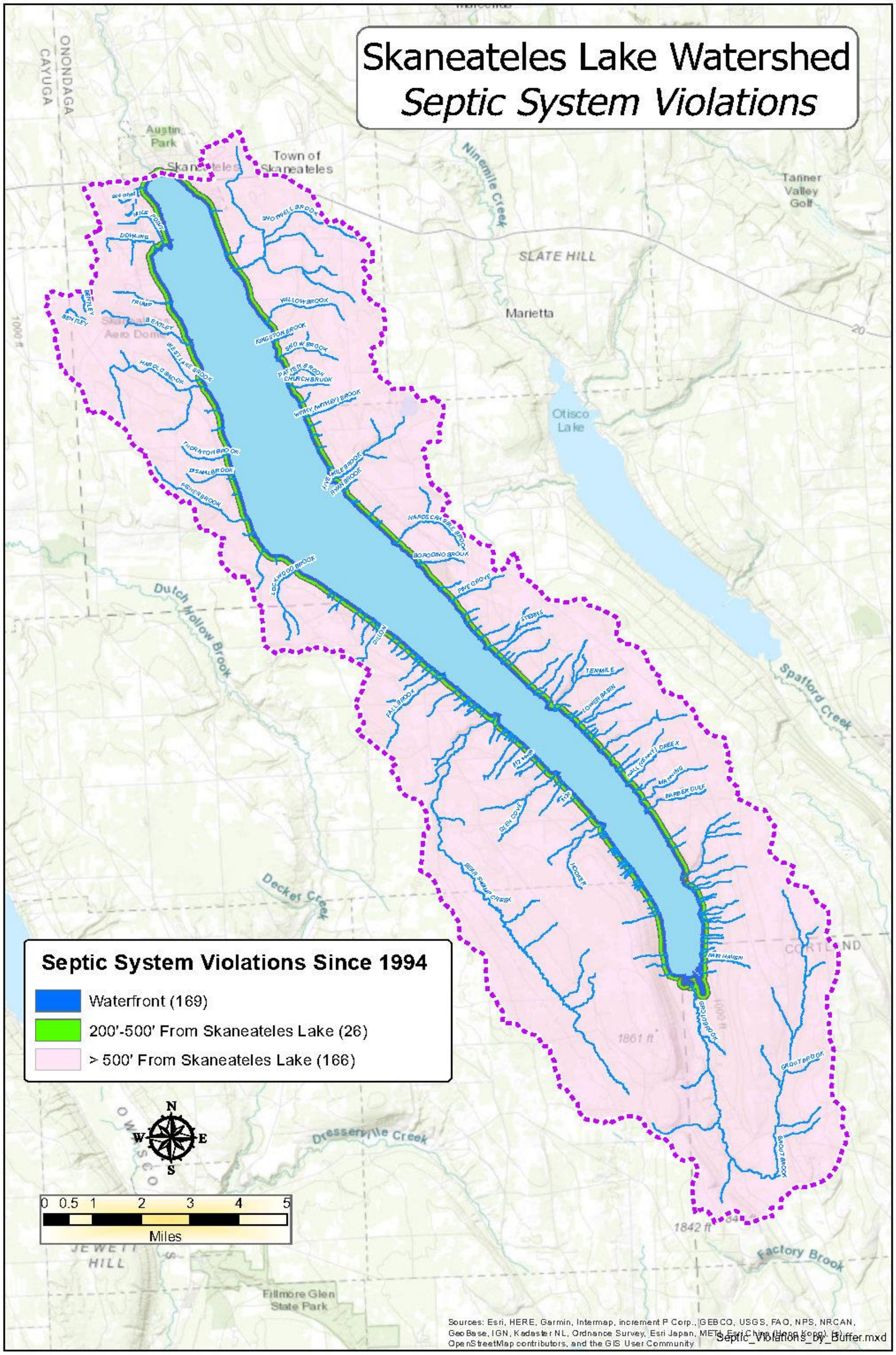


Figure 17 Sanitary Code Violation – Proximity To Skaneateles Lake 1994-2022



4.6.2 Erosion and Sediment Control Violations

Thirteen violations were issued for non-compliance of sediment and erosion control practices in 2022. All violations were abated in 2022 (Table No. 28).

Table 29 Violations for the Past Five Years: NYSDOH and Local DOH Sanitary Code Erosion and Sediment Control

Year	Number or Violations DOH/Sanitary Code	Number or Violations Erosion and Sediment	Abated or Pending Action by City	Reported to DOH or NYSDEC
2018	5	14	19	1
2019	11	13	24	1
2020	10	12	22	0
2021	4	9	13	0
2022	20	13	33	1

* New regulations became effective in 2004

4.6.3 Petroleum/Hazardous Material Spills

There were no hazardous material releases identified by City personnel or reported by NYSDEC Division of Environmental Remediation in 2022.

4.7 Composing Toilet Operation

Currently 35 property owners utilize composting toilets provided by the City of Syracuse. Compost toilet users are responsible for removing finished compost from their units and emptying the compost in clean 5-gallon buckets provided by the City. Finished compost is collected in the spring by City Water Department personnel and placed in 4-foot (w) x 4-foot (l) x 4 foot (d) wooden containers, allowing for additional composting on the City's Glen Haven property. The storage containers have been constructed to allow thermophilic composting (internal temperature exceeding 105 degrees Fahrenheit) to take place, further reducing or eliminating any pathogens remaining from the collected compost. The compost piles are monitored to ensure the required temperatures are attained. Carbon based materials such as grass clippings, mulch and wood chips are added to the piles periodically to maintain a balanced carbon/nitrogen ratio. A balanced ratio allows for optimum digestion of compost by microorganisms, resulting in accelerated temperatures in the pile. Sampling for fecal coliform coincides with monitoring for thermophilic conditions within the compost pile to ensure pathogen reduction. Compost is typically stored for a minimum of three years allowing for a significant reduction in volume and pathogens. Provided that fecal coliform results are below water quality indicator levels specified by New York State Department of Health for bathing beaches, the remaining organic material is mixed within the leaf litter.

5. FILTRATION AVOIDANCE WAIVER

5.1 Filtration Avoidance Waiver Conditions

The City of Syracuse applied for and received a filtration avoidance waiver extension on June 28, 2004. The waiver has no termination date and will remain in effect for as long as the City complies with the conditions of that filtration avoidance waiver.

Progress continues to be made on the programs implemented by the City in order to enhance the Skaneateles Lake Watershed Management Program. The programs are: The Data Gathering and Management Program, Conservation Easement Acquisition Program (now complete), the Skaneateles Lake Watershed Agricultural Program (SLWAP), and the Water Quality Public Education Program.

For a detailed discussion of these programs, refer to the Skaneateles Lake Watershed Program Annual Report 2022-2023.

6. PESTICIDE AND FERTILIZER INVENTORY

6.1 Agricultural Pesticide and Fertilizer Use Survey

The annual Agricultural Survey was conducted by the Skaneateles Lake Watershed Agricultural Program staff. A total of 37 farms were involved in the survey. These farms are actively participating in the Skaneateles Lake Watershed Agricultural Program (SLWAP) with the majority of these farms located entirely in the watershed. A total of 29,897 acres were found to have been worked by the 37 farms with active Whole Farms Plans.

A total of 1,046 tons of granular fertilizer and 19,744 gallons of liquid fertilizer were applied to cropland. A total of 711 tons of lime were applied to cropland. A total of 3,045 tons of manure, and 19,525,335 gallons were utilized for nutrient value and soil organic matter enhancement. This manure was produced by approximately 2,046 animals (1,565 dairy animals, 73 horses, 158 sheep, 67 beef, 160 bison, 20 alpacas, 1 goat, 2 pigs).

A total of 2,003 gallons of liquid pesticide and 2,641 pounds of granular pesticide were applied to cropland. These numbers represent totals for all pesticides (herbicides, insecticides, and fungicides) that were applied at the rate specified by the label.

A total of 128,802 gallons of diesel and 18,443 gallons of gasoline were used by the 37 farms.

Watershed Inspectors conducted an annual survey of agricultural operations focusing on petroleum and chemical storage, disposal practices and solid and hazardous waste. There was no evidence of petroleum spills or leakage from bulk storage tanks, dispensers, or hoses during the inspections.

6.2 Pesticide Use by State and Local Departments of Transportation

Herbicides were not used by New York State Department of Transportation (NYSDOT) Region 3, Cayuga Residence of the NYSDOT or the Cayuga and Cortland County DOTs in 2022. The NYSDOT Cortland Residency applied Roundup Pro Concentrate & Oust XP around guiderails and signposts on Route 41 from the Onondaga County line south to the watershed boundary. The NYSDOT Onondaga Residency applied Accord XRT2, Arsenal Powerline, Escort XP, Garlon 4 Ultra and Roundup Pro Concentrate around guiderails and signposts on Route 41 and Route 41A. Onondaga County DOT applied Roundup Pro Concentrate and SFM 75 (Oust equivalent) for guide rail vegetation control on several road rights-of-way in the towns of Skaneateles and Spafford. Roundup Pro Concentrate and Whetstone was applied for shoulder vegetation encroachment control in the towns of Skaneateles and Spafford. This information was based on personal communication and/or information provided by Regional Engineers for the respective NYS Residences, the Environmental Specialist with the Onondaga County DOT, General Foreman of the Cayuga County DOT and the Superintendent of Highways for the Cortland County DOT.

7. PETROLEUM AND HAZARDOUS MATERIALS INVENTORY

7.1 Inventory

Petroleum products were the most abundant and potentially hazardous materials stored on the watershed. In addition to the petroleum products stored on farms (see above), 19 commercial enterprises and seven municipal facilities stored a total of 50,755 gallons of petroleum products as of January 1, 2023. Gasoline accounted for 35,350 gallons of the total. Other products stored were propane (46,120 gallons), diesel (11,225 gallons), heating oil (1,275 gallons) and used oil (2,905 gallons).

Road salts are used by the local highway departments and the NYSDOT for vehicle safety. There is one covered storage facility in the Town of Scott. The average rate of application of salt or salt/sand mixtures on watershed roads by each agency was unchanged from previous years.

7.2 Road Ditch Survey

All road ditches within the watershed are inspected routinely for contamination sources. Watershed Inspectors document evidence of sewage discharge, agricultural runoff, petroleum spills, etc., on Survey Sheets and take necessary steps to identify the source of contamination through sampling point source discharges and investigating property records.

8. WATERSHED MANAGEMENT PROJECTS

8.1 Watershed Management Approach to Controlling Hemlock Woolly Adelgid (HWA)

HWA was identified in the Skaneateles Lake Watershed in 2014. Once infested with HWA, mature hemlock trees die within four to 20 years. The hemlock loss and replacement with hardwood species has the potential to impact water quality by altering nutrient cycling in the watershed and changing water temperature and water quantity going into the lake over the course of the year. Hemlocks' deep shade and often streamside habitat helps keep streams cool, and their evergreen shade keeps snow on the ground into the spring, providing cold runoff into groundwater farther into the growing season. Because hemlocks draw the most water during spring and fall, and relatively little in the summer, they also help stabilize stream flows.

HWA has been found along the lakeshore from the south end of the lake to the area of Fire Lane 22A on the western shore, and to Ten Mile Point on the eastern shore. It is also in the ravines that drain to the lake in the infested area. This winter it was also found northeast of the lake, at several locations between Skaneateles and Marcellus. (For the most up to date information, please visit the NY iMapInvasives map at nyimapinvasives.org/data-and-maps).

In May 2015, 100 Eastern Hemlock trees were planted within this region of the watershed to grow populations of biological controls to resist the spread of HWA. Three insects that feed on HWA (biocontrols) have been released in the Skaneateles Watershed in 2014, 2015 and 2016. These are a beetle referred to as 'Little Larry', Laricobius nigrinus, and two species of silver fly, Leucopis piniperda and L. argenticollis. All three species are imported from their native range in the

Northwestern US where they are natural predators of HWA. Establishment has not been verified in the Skaneateles watershed for any of the three species, but establishment can take many years to be detected.

To minimize the spread of HWA, the City has collaborated with the Onondaga County Soil and Water District, Cornell University, CCE of Onondaga County and several volunteers residing within the watershed. In 2021, Onondaga County SWCD received $50,000 from the Great Lakes Restoration Initiative for targeted treatment of high-priority hemlocks in the Skaneateles and Otisco Lake watersheds. Onondaga County Soil and Water Conservation District staff treated 405 trees in 2021 and 868 trees in 2022.Treatments have occurred at Bahar, High Vista, High Hickory, and Bacher/Albanese Nature Preserves as well as Hemlock Hollow and Basin Brook lake-front subdivisions.

While no HWA educational programs were held in 2022, there is programming currently scheduled in 2023.

8.2 Watershed Data Scanning Project

Records of septic system designs dating back to the 1930's are archived in numerous file cabinets at the Skaneateles Gatehouse. As the Watershed Protection Program evolves and Watershed Rules and Regulations were updated, documentation collected on individual properties expanded to include all regulated activity involving local health departments, townships and the New York State Department of Conservation. A database which records all activity in the watershed is maintained by City personnel and includes over 150 categories. The database is linked to a GIS database, which allows for tracking of watershed activity such as new housing starts, violations of watershed rules and regulations, OWTS design approvals, etc.

In January 2010 the City initiated the scanning of all file folder documents. The electronic images will allow for indexing of data on individual tax parcels according to regulatory agencies, increase storage space, provide a back-up in the event of a permanent loss and allow for prompt retrieval through a GIS hyperlink. Scanning is conducted by City personnel and is typically scheduled for afternoons during the winter months when there is limited activity and access to property on the watershed. Due to the intermittent scanning schedule and extensive file folders, the project has taken numerous years, however, completion is anticipated in 2023.

8.3 Shotwell Brook Pathogen, Nutrient and Sediment Loading Reduction Initiative

Shotwell Brook is located along the northeast section of the Watershed and enters the Lake within close proximity to one of the City's drinking water intakes. Agriculture accounts for approximately 70% of the land use in the 3.3 square mile Shotwell Brook Watershed. The Land Protection Plan for the Skaneateles Lake Watershed dated June 20, 1995, prioritizes critical management zones and divides the Skaneateles Lake Watershed into six Watershed Protection Zones. The Shotwell Brook tributaries and sub-watershed comprise the three highest levels of protection priority designated in the Report.

High intensity storm events frequently result in substantial sediment loading to Skaneateles Lake from Shotwell Brook. Storm events combined with strong southerly winds often result in sediment plumes which are transported from the Shotwell Brook outlet in the direction of Intake #1, causing elevated turbidity through the intake.

In 2018 the SLWAP was awarded a $181,000 grant for storm water attenuation on the NE branch of Shotwell Brook. The project completed in September 2020, involved the establishment of a constructed wetland and an extensive floodplain on one acre of fallow agricultural land. An unexpected budget surplus allowed for a portion of the grant to be redirected to a floodplain restoration project located on the main branch of Shotwell Brook, east of the NYS Rt. 41 bridge. The restoration project involved the creation of four shallow pocket wetlands along 600 feet of Shotwell Brook. A rock cross vein was installed at the upstream section of the project to convey discharges above bank-full flow into the enhanced wetland, allowing for temporary storage and attenuation of peak flows. The project was completed in October 2021.

In August of 2022 the SLWAP contracted with a private drone operator to initiate the use of large aerial drone technology for planting seed on Central NY farmland. Ninety-seven acres of standing corn silage fields located in the Shotwell Brook watershed were seeded with an annual ryegrass cover crop. The seed was applied at 25 lbs./acre allowing for satisfactory fall establishment on all but one field. Ryegrass was selected as a cover crop for its shade tolerance, allowing for germination and establishment under the canopy of corn leaves. Aerial seeding ensures a timely application that is often delayed with conventional farm equipment when extended wet weather patterns saturate fields, delaying corn harvesting and cover crop planting.

Focusing on a comprehensive multi-agency approach to reducing the amount of sediment discharging to Skaneateles Lake through Shotwell Brook has been and will continue to be a watershed protection priority.

8.4 Subsurface Agricultural Drain Tile Outlet Survey

In 2016 the Watershed Protection Program initiated a program to identify and record GPS coordinates of agricultural subsurface drain tile outlets throughout the Watershed. Watershed Inspectors are surveying every watercourse, road ditch, swale, grassed waterway, etc., that border agricultural fields. Outlet locations and observations noted within drainage ways such as erosion of embankments, excessive algae growth and foam which may be a result of subsurface discharges will be conveyed to the SLWAP for further analysis and possible modifications of Whole Farm Plans. Due to the limited time that can be allocated to the inventory, and the significant amount of land area to be covered (approximately 28 square miles of land use coverage in the watershed is agricultural) surveying all conveyances bordering farmland has extended over several years. In 2022, Watershed Inspectors completed the survey, logging a total of 227 drain tile outlet locations.

9. WATERSHED PERSONNEL TRAINING, CERTIFICATIONS AND PRESENTATIONS

NYS Conservation District Employees' Association, Inc. 2022 Water Quality Symposium – March 18 & 24, 2022

The Symposium was attended by the City's Watershed Quality Coordinator. Certificates of Completion were awarded for the successful completion of the *Hydroseeding Forum* and *Afforestation in New York State.*

Sediment Control & stormwater Advancements via Proactive Solutions – May 3, 2022

This webcast focused on innovative new technologies related to stormwater management. Products and systems featured during the presentations included products that improve stormwater quality by filtering out sediment. The webcast was attended by the Watershed Quality Coordinator.

Stream Training with Dave Derrick – August 15, 2022

The Watershed Quality Coordinator attended the workshop sponsored by the Onondaga County Soil and Water Conservation District. Classroom instruction focused on river and stream stabilization concepts promoting environmentally responsible and economically cost-effective methods of stream bank restoration.

Estimating Nutrient Loads Due to Streambank Erosion with Michael Coryat, Delaware County SWCD – September 21, 2022

The Watershed Quality Coordinator attended the webinar sponsored by the Upper Susquehanna Coalition. The presenter discussed methods and results from the publication titled*: Estimating Nutrient Loads from Two Streambank Erosion Sites on the West Branch Delaware River*. The "Soil and Water Assessment Tool" (SWAT) computer model was discussed as an effective tool to estimate sediment and nutrient flux from the landscape.

Stormwater Construction Permit GP-0-20-001 Review and Construction Site Inspection – September 28, 2022

The Watershed Quality Coordinator and Sanitarian attended the presentation sponsored by the NYS Conservation District Employee's Association, USDA Natural Resource Conservation Service and the NYS Soil and Water Conservation Committee. Instruction focused on review of the Permit including permit coverage, SWPPP plans and inspection and maintenance requirements.

10. ACKNOWLEDGMENTS

The City of Syracuse continued in its efforts to control pollution within the Skaneateles Lake Watershed in 2022. It is with appreciation that the Water Department acknowledges the efforts, assistance and expertise of the Onondaga, Cayuga and Cortland County Health Departments and the NYS Department of Environmental Conservation Division of Law Enforcement and Division of Regulatory Affairs in the enforcement of the Watershed Rules and Regulations. In addition, the Water Department acknowledges the combined efforts of the City of Syracuse Department of Law, the New York State Department of Health, Natural Resources Conservation Service, Soil and Water Conservation Districts, and the Cornell Cooperative extension for their efforts in assisting the Water Department in its endeavors to enhance the watershed environment.

11. ENDNOTES/FOOTNOTES

1. Lake data excerpted from: Effler, S.W., et al. 1989. Limnological Analysis of Skaneateles Lake, 1988. Upstate Freshwater Institute, Inc. Syracuse, NY.

2. Historically, the City of Syracuse Department of Water has used 59.3 sq. miles or 37,952 acres as the watershed area when calculating the water budget. As of the current re-calculation of land use and cover, the GIS calculates the watershed area as 58.94 sq. miles or 37,720 acres with acreage for Onondaga, Cayuga and Cortland Counties at 19,310, 12,583 and 5,827 acres, respectively.

3. The data is based on the 2020 Census.

4. Average historical data is based upon City data for the 70 years between 1951 and 2021 inclusive, i.e., total inputs versus total withdrawals plus lake elevation changes.

5. There are two City operated rain gauges within the watershed. One is at the Water Plant in the Village of Skaneateles (Cooperating Observer for the national Weather Service) and the second is located at the southern end of the watershed in the Town of Sempronius on City owned property. Precipitation amounts referred to within this report are weighted values, i.e., 75% of the recorded amount at the Plant plus 25% of the amount recorded at Sempronius.

6. Volume is determined based upon a drainage area of 72.54 square miles.

7. Based upon a lake surface area of 13.6 square miles.

8. This is required by Decision 609B, 1958 between the New York State Conservation Department/Water Power and Control Commission and the City of Syracuse

Appendix

Appendix A – Exhibits

Skaneateles Lake Watershed

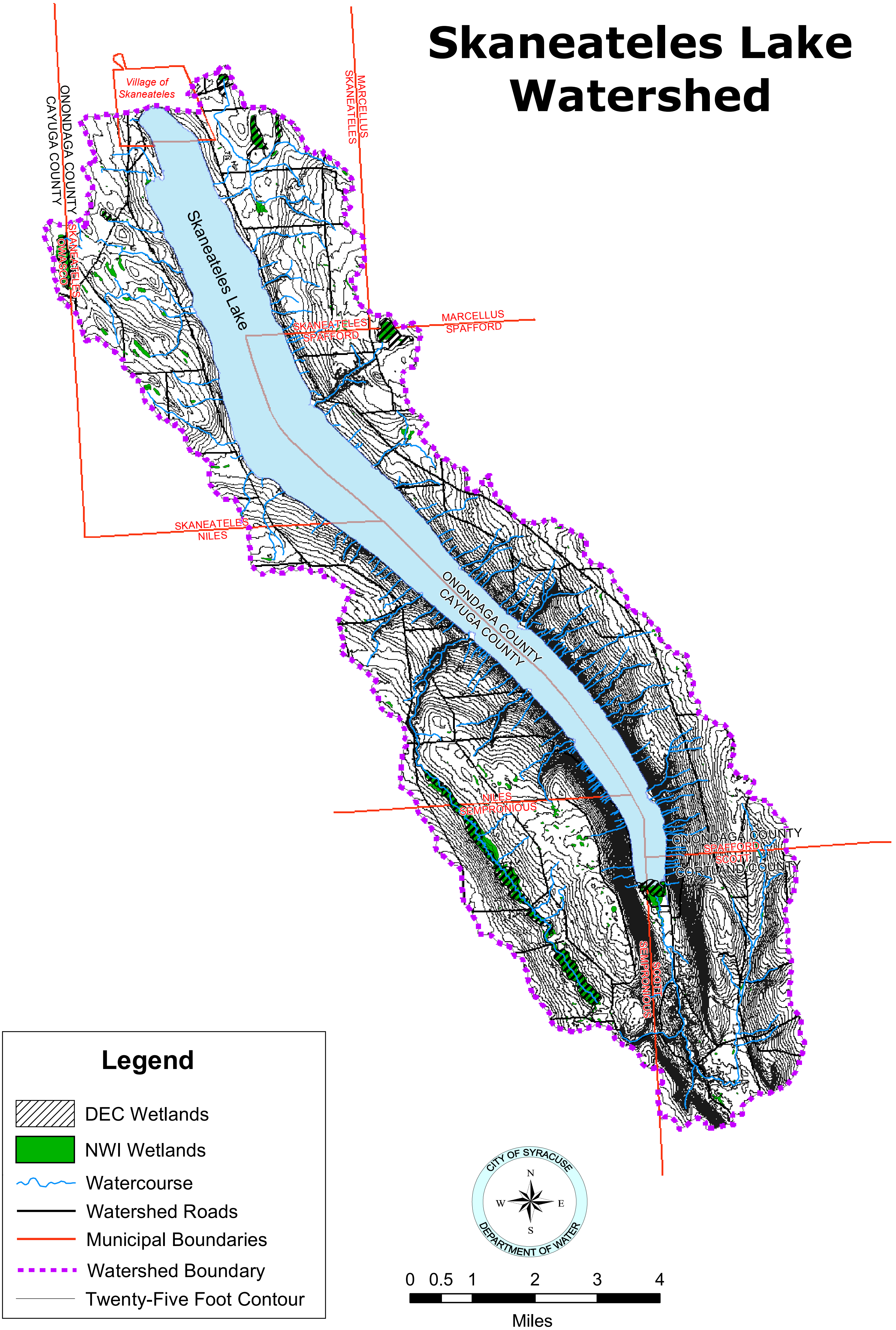


Exhibit A: General Watershed Map

Skaneateles Lake Watershed

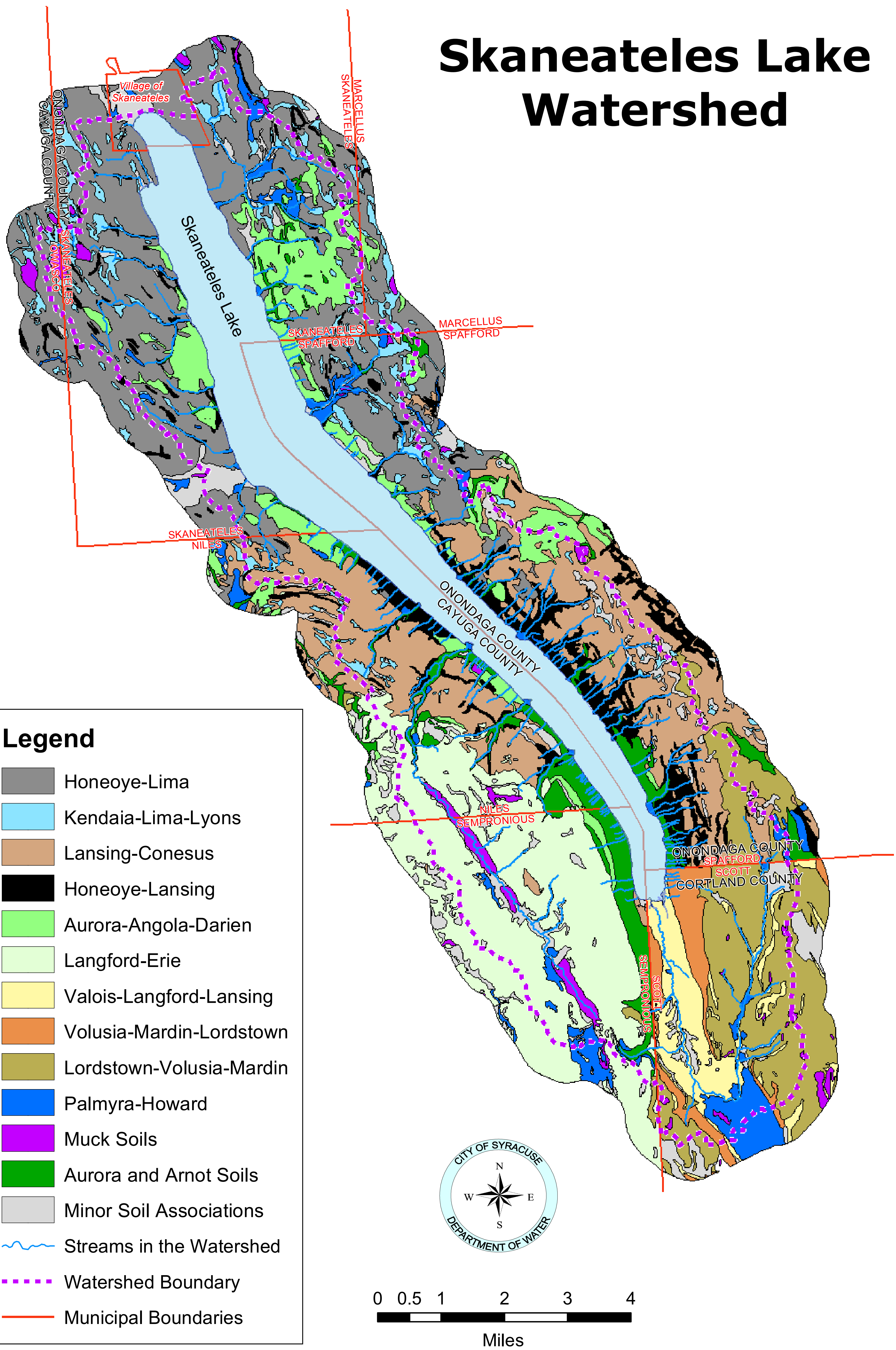
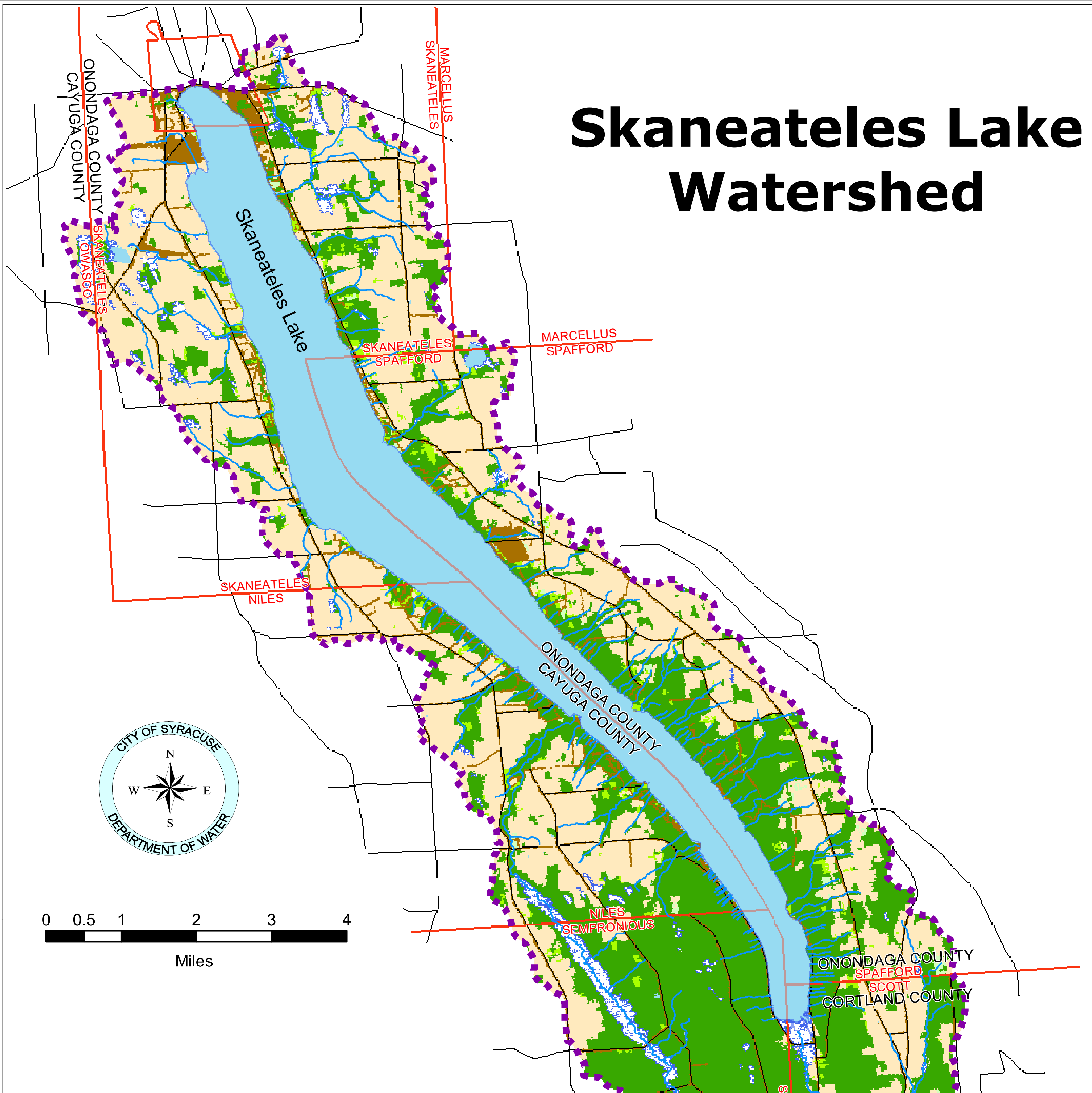


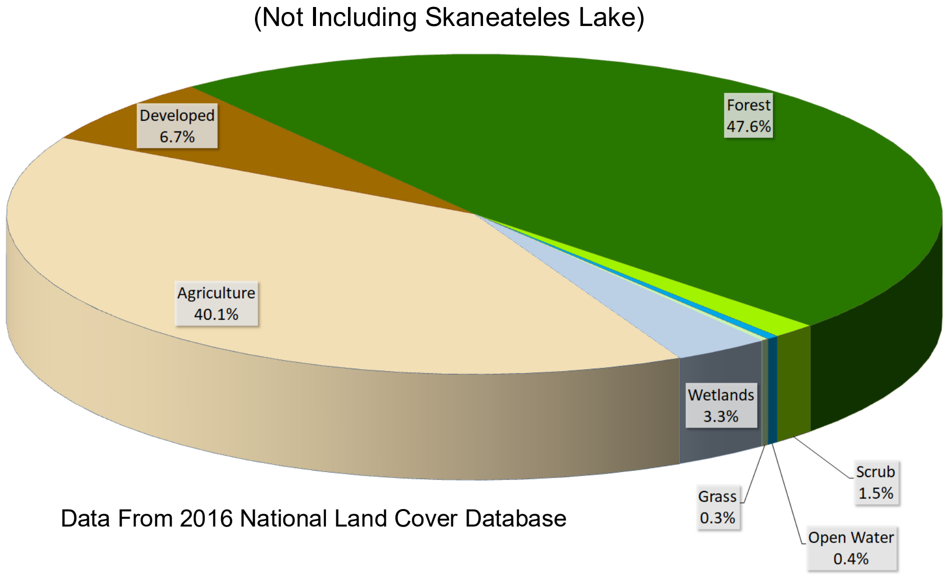
Exhibit B: Soil Associations Map

Skaneateles Lake Watershed



WATERSHED LAND USE PERCENTAGES

(Not Including Skaneateles Lake)



Data From 2016 National Land Cover Database

LAND USE BY COUNTY

	Cayuga County		Cortland County		Onondaga County	
	Acres	Percent	Acres	Percent	Acres	Percent
Agriculture	4318.7	31.6	2217.8	22.3	11487.7	54.0
Developed	831.8	6.1	387.1	3.9	1801.6	8.5
Forest	7494.0	54.8	7083.1	71.1	6817.0	32.0
Scrub	181.0	1.3	98.0	1.0	412.2	1.9
Grass	19.6	0.1	37.8	0.4	130.5	0.6
Open Water	31.1	0.2	1.3	0.0	83.6	0.4
Wetlands	797.0	5.8	133.2	1.3	547.4	2.6

Exhibit C: Land Use Map

Syracuse
New York