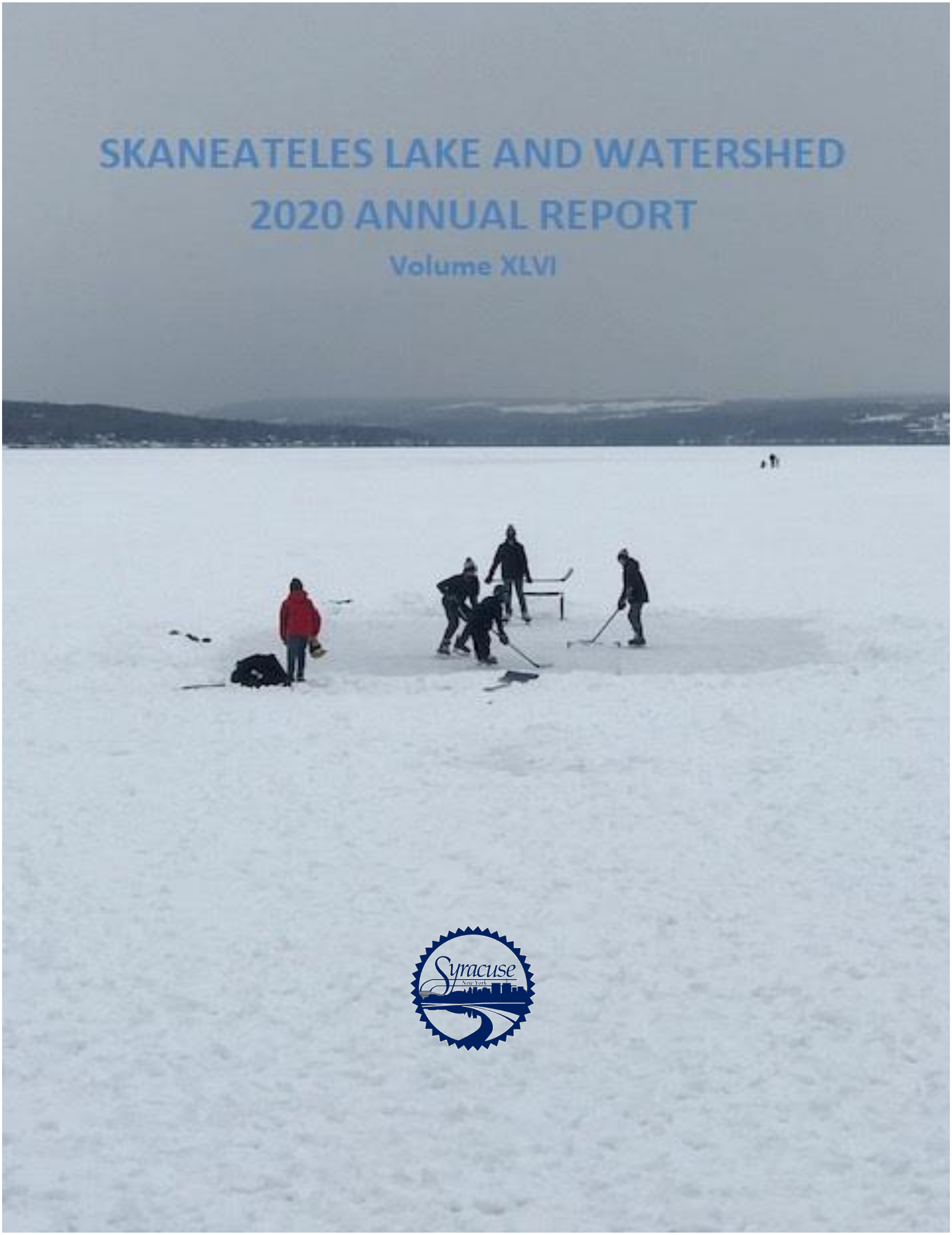
SKANEATELES LAKE AND WATERSHED 2020 ANNUAL REPORT

Volume XLVI



DEPARTMENT OF WATER

CITY OF SYRACUSE, MAYOR BEN WALSH

Joseph Awald, PE
Commissioner

John Walsh
Deputy Commissioner

Howard A. Zucker, M.D., J.D.
Commissioner of Health
New York State Department of Health
Flanigan Square
547 River Street
Troy, New York 12180

Re: 2020 Skaneateles Lake and Watershed Annual Report XLVI

Dear Commissioner Zucker,

This 2020 Skaneateles Lake and Watershed Annual Report was prepared by the City of Syracuse Department of Water. The Annual Report illustrates and discusses various programs performed by the City according to 10 NYCRR Part 5 and 10 NYCRR Part 131. Discussed within the report are the City's filtration avoidance status, land use and demography within the watershed, and a summary of the City's water quality monitoring and watershed inspection programs.

The 2020 sampling, inspection and survey programs demonstrate the continued excellent quality of Skaneateles Lake water and watershed environment. This Department continues its efforts to maintain the quality of this valuable resource.

Sincerely,

Rich Abbott

Rich Abbott, Watershed Quality Coordinator

attachment

Department Of Water
Skaneateles Lake
Watershed Protection
Program

20 W. Genesee Street
Skaneateles, NY 13152

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cc:

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Kevin Court, Sempronius Town Supervisor
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CITY OF SYRACUSE
DEPARTMENT OF WATER
WATER QUALITY MANAGEMENT

SKANEATELES LAKE AND WATERSHED
2020 ANNUAL REPORT

VOLUME XLVI

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Water Quality Management
Department of Water
City of Syracuse, New York
April 2021

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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]

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

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

1.3 Demographics, Land Use and Land Ownership

The watershed population totals approximately 4,487 people residing in 2,941 dwelling units (Table Nos. 3 and 4) [3]. Of the total number of dwelling units, approximately 1065 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 706 or 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	1,414	2,406	53.6%	26.0%
Spafford	734	908	20.2%	25.0%
Niles	389	388	8.7%	17.0%
Sempronius	88	79	1.8%	17.0%
Scott	316	706	15.7%	15.0%
Totals	2,941	4,487	100%	100%

Data supplied by the Syracuse-Onondaga County Planning Agency, October 2011

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	3,314	73.9%	51%	110.1
Cayuga	477	467	10.4%	34%	23.4
Cortland	316	706	15.7%	15%	79.9
Totals	2,941	4,487	100%	100%	71.1*

* 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%

* Revised 2004

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 42.83" 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 elevation was 861.47, marginally below the Monthly Low Drawdown Guideline Desired Range of 861.50. Snowfall for the month totaled 14.75" (av. 23.34"). Dam discharges were consistent throughout the month, averaging 70.60 MGD, above the monthly average of 42.54 MGD.

There was very limited fluctuation in lake elevation through January and February, resulting in .07' decline over the two-month period to 861.40 on February 29. Snowfall total for February was consistent with the monthly average at 20.50” (av. 21.58”). Dam discharges were reduced to 36 MGD on February 25. March precipitation and snowfall totals; 2.88” (av. 3.23”) and 3.75” (av. 15.10”) respectively, were both below the monthly average. Dam discharges were increased to 53 MGD on March 14, as the lake elevation exceeded the March Monthly High Drawdown Guideline Desired Range of 862.00. The lake elevation increased .98’ in March.

The lake level on April 1 was 862.40, within the April Monthly Drawdown Guideline Desired Range. April’s precipitation total was above average at 4.11” (av. 3.55”), however, dam discharges were reduced on April 24 from 54 MGD to 38 MGD. Discharges for the month averaged 51 MGD (av. 50 MGD). The monthly increase in lake elevation was .50’.

From April 30 to May 2 the lake elevation increased an additional .50’, to 862.95, resulting from the 2.06” two-day rain event. Precipitation for the remainder of the month was nominal, resulting in a 2.43” monthly total (av. 3.69”). Dam discharges averaged 69 MGD for the month.

For the January-May period, precipitation totaled 16.64” (av. 15.87”). The yield and yield coefficient were 126.75 MGD (av. 119.37 MGD) and .92 (av. 0.89) respectively.

Snowfall for the 2019-20 season totaled 41.00” (av. 88.89”), the second lowest seasonal total on record (documented snowfall totals commenced in 1980 at the Skaneateles Lake Gatehouse). Measurable snowpack was recorded on 15 (weekly) sample dates from November 2019 through March 2020.

The June precipitation total was significantly below the monthly average at 1.63” (av. 3.97”). There was no one-day precipitation event totaling .50” or greater for the month. Dam discharges were reduced to seven MGD on June 2. July precipitation events included four one-day events over .66”, including a 1.88” two-day event on July 10 and 11 and a 1.31” one-day event on July 16. Recorded precipitation for July was 4.99” (av. 4.00”). Despite the above average monthly rainfall, the lake elevation decreased .29’ in July. Precipitation total for August was below average at 2.82” (av. 3.85”). Dam discharges remained at a minimum, averaging 6.74 MGD for the month (av. 13 MGD).

Precipitation for the June-August period totaled 9.44” (av. 11.82”). The yield and yield coefficient were below average at 8.60 MGD (av. 35.04 MGD) and .07 (av. 0.19) respectively.

The lake elevation recorded on September 1 was precisely the 69 year average of 861.47. Rainfall total was below the monthly average at 2.21” (av. 3.98”). The lake elevation declined 0.69’ for the month, resulting in a September 30 elevation of 860.80. September dam discharges averaged 6.41 MGD (av. 11.26 MGD).

Monthly precipitation totals for October and November were below average totaling 3.68” (av. 4.04”) and 2.58” (av. 3.78) respectively. Although precipitation was recorded on 21 days in October and 17 days in November, the lake elevation declined .90’ over the two-month period.

December’s precipitation total was 2.44” (av. 3.42”). After seven consecutive months of declining lake levels, the lake increased marginally in December by .12’ to 860.05 on December 31.

Precipitation for the September-December period totaled 11.00” (av. 15.14”). Yield for the period was 10.05 MGD (av. 47.97 MGD) and the yield coefficient was 0.09 (av. 0.28). Dam discharges for the period averaged 5.46 MGD.

The Skaneateles Watershed received 37.08” of precipitation for the year (av. 42.83”). The average annual yield to the lake was 58.31 MGD (av. 74.49 MGD) with a yield coefficient of 0.45 (av. 0.49). Total discharge through the lake outlet for 2020 was 10,396 MG or 3.67’ of elevation (av. 10,318 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	
	69 Year Average	2020	69 Year Average	2020	69 Year Average	2020	69 Year Average	2020
January	2.76	3.75	83.49	114.16	860.75	861.47	42.54	70.60
February	2.64	3.36	102.40	103.63	860.70	861.47	38.16	64.11
March	3.23	2.99	153.73	179.04	860.88	861.47	37.58	46.52
April	3.55	4.11	165.66	137.56	861.65	861.47	50.23	50.50
May	3.69	2.43	91.57	99.38	862.38	861.47	36.95	69.07
June	3.97	1.63	61.93	13.65	862.48	861.47	21.39	7.45
July	4.00	4.99	31.96	22.85	862.41	861.47	20.78	6.94
August	3.85	2.82	11.24	-10.71	862.01	861.47	12.94	6.74
September	3.98	2.31	12.34	-19.68	861.47	861.47	11.26	6.41
October	4.04	3.68	28.28	-4.86	860.99	861.47	12.17	6.07
November	3.70	2.58	62.19	10.08	860.67	861.47	21.81	5.21
December	3.42	2.44	89.09	54.67	860.63	861.47	34.08	4.17
Annual	**42.83**	**37.09**	**74.49**	**58.31**			**28.32**	**28.65**

* 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 2100N 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 2100N 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 2020 average turbidity readings for Intakes #1 and #2 were 0.46 NTU and 0.51 NTU, respectively.

Figure 1 illustrates relatively stable annual turbidity averages at Intake #1 and #2 through 2020. 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. Spikes in 2017 and 2018 September turbidity averages did not reach averages recorded from 2012 – 2014, however, both years were above the long term averages.

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 2020, daily maximum turbidity levels exceeded 10 NTU on three occasions.

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 – 2020. Daily maximum turbidity above 1 NTU was recorded on 39 days in 2020 at Intake #1. Thirty of the 39 occurrences were between October and December in 2020 (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 2020.

Figure 1 2000-2020 Annual Turbidity Average

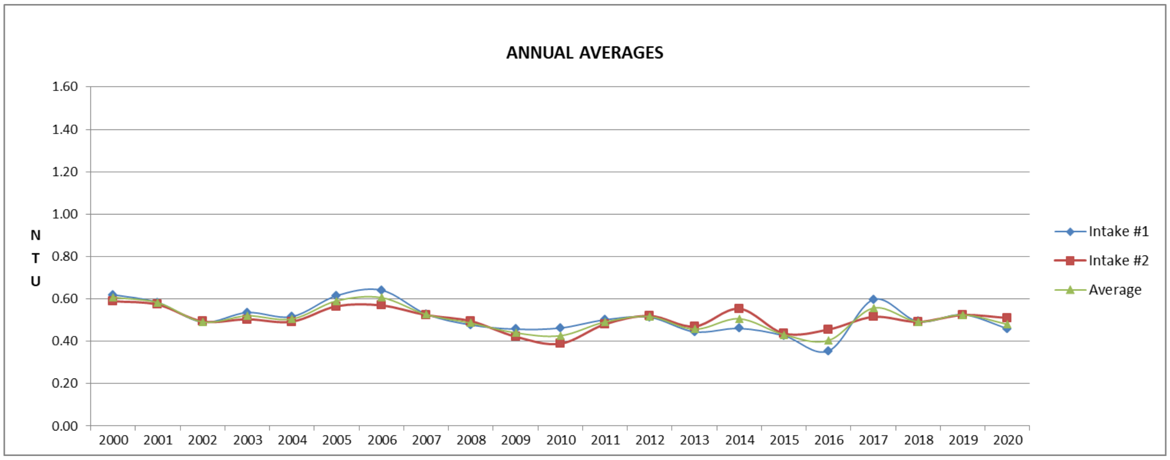


Figure 2 2000-2020 September Annual Turbidity Average

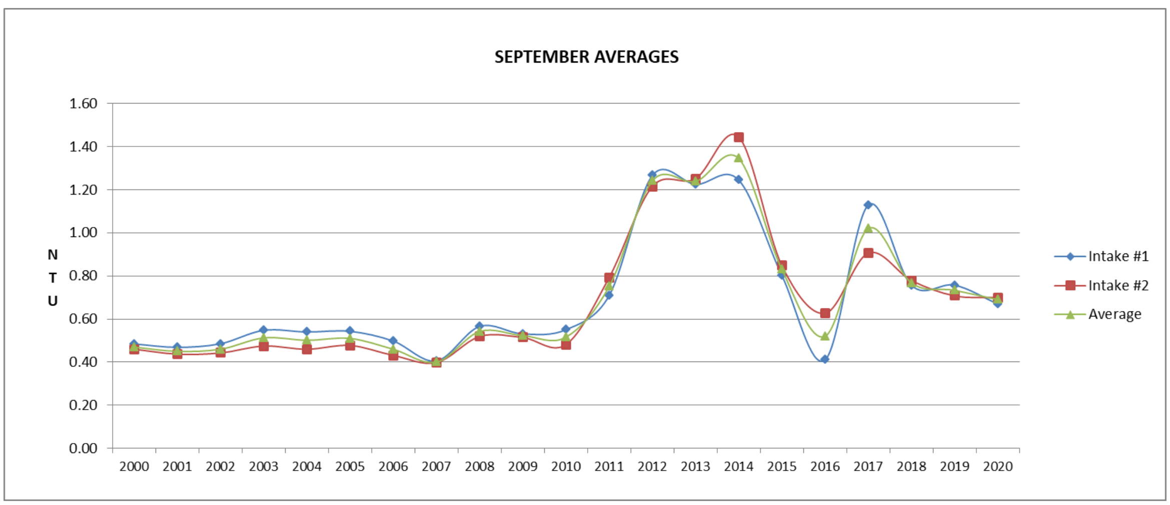


Figure 3 2004-2020 Daily Maximum Turbidity (NTU) Intake #1

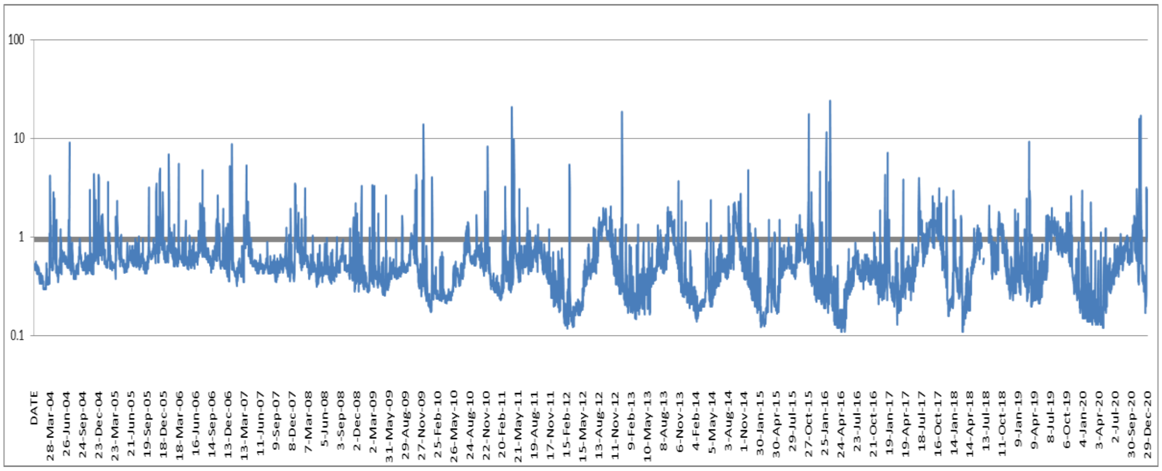


Figure 4 Monthly Counts of Turbidity >1 NTU at Intake 1, 2004-2020

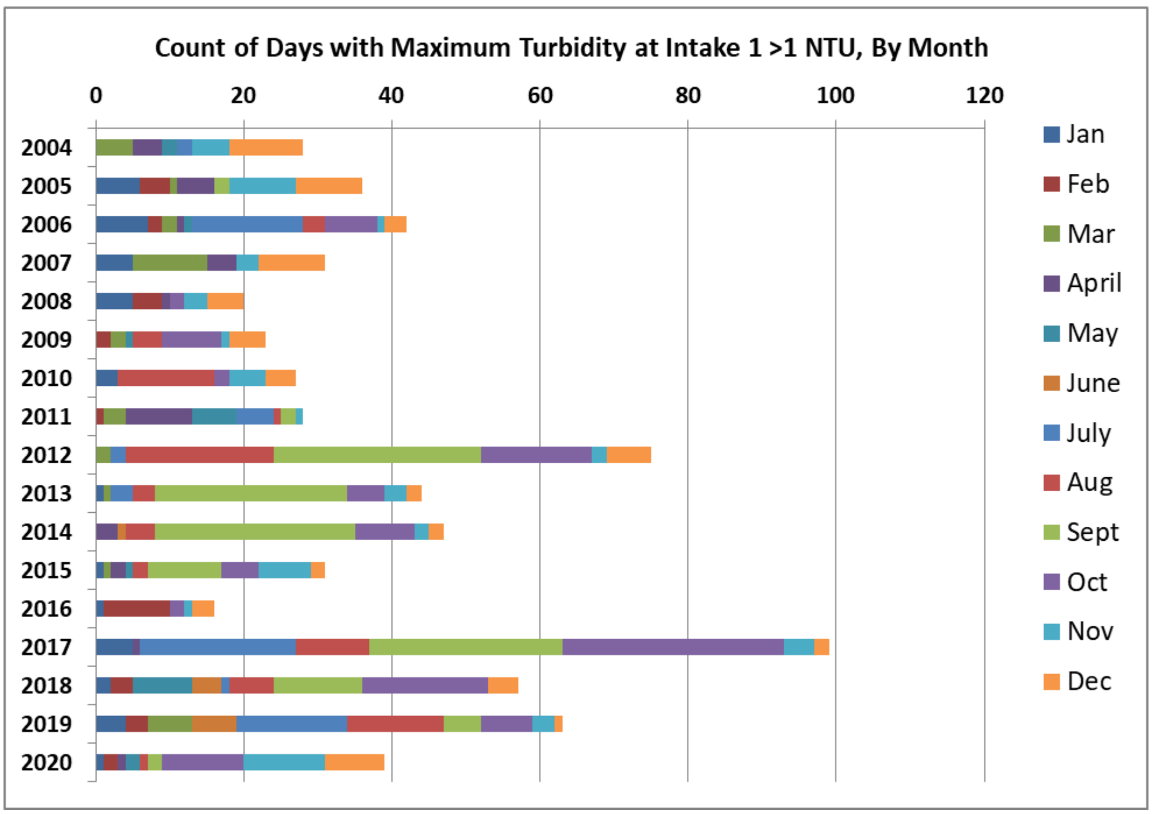


Table 8 Syracuse Water Plant Raw Water Maximum, Minimum, and Average Monthly Turbidity in NTU for 2020 (Both Intake 1 & 2)

Month	Intake 1 Maximum	Intake 1 Minimum	Intake 2 Maximum	Intake 2 Minimum	Intake 1 Average	Intake 2 Average
January	1.39	0.13	1.46	0.14	0.20	0.27
February	2.24	0.12	1.22	0.11	0.24	0.31
March	0.72	0.10	2.74	0.11	0.17	0.28
April	1.11	0.11	1.45	0.14	0.19	0.23
May	1.20	0.15	1.44	0.20	0.27	0.41
June	0.84	0.19	1.07	0.31	0.33	0.43
July	0.89	0.27	0.65	0.34	0.44	0.47
August	1.06	0.36	0.97	0.38	0.57	0.54
September	1.03	0.46	1.84	0.45	0.67	0.70
October	1.61	0.37	2.03	0.40	0.79	0.86
November	16.76	0.26	9.62	0.40	1.13	1.10
December	3.15	0.12	9.81	0.23	0.50	0.56
				Cumulative Average	0.46	0.51

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	Summed by Month
Jan	0	6	7	5	5	0	3	0	0	1	0	1	1	5	2	4	1	41
Feb	0	4	2	0	4	2	0	1	0	0	0	0	9	0	3	3	2	30
Mar	5	1	2	10	0	2	0	3	2	1	0	1	0	0		6	0	33
April	4	5	1	4	1	0	0	9	0	0	3	2	0	1		0	1	31
May	2	0	1	0	0	1	0	6	0	0	0	1	0	0	8	0	2	21
June	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	6	0	11
July	2	0	15	0	0	0	0	5	2	3	0	0	0	21	1	15	0	64
Aug	0	0	3	0	0	4	13	1	20	3	4	2	0	10	6	13	1	80
Sept	0	2	0	0	0	0	0	2	28	26	27	10	0	26	12	5	2	140
Oct	0	0	7	0	2	8	2	0	15	5	8	5	2	30	17	7	11	119
Nov	5	9	1	3	3	1	5	1	2	3	2	7	1	4		3	11	61
Dec	10	9	3	9	5	5	4	0	6	2	2	2	3	2	4	1	8	75
Summed by Year	28	36	42	31	20	23	27	28	75	44	47	31	16	99	57	63	39	

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 NTU) or Turbidity Event (a series of consecutive days during which at least one turbidity measurement each day exceeds 5 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 15 occasions in order to prevent a TTV or a Turbidity Event. There were no Intake #1 closures in 2020 related to turbidity concerns (Table No. 10).

Table 10 Raw Water Intake Closures

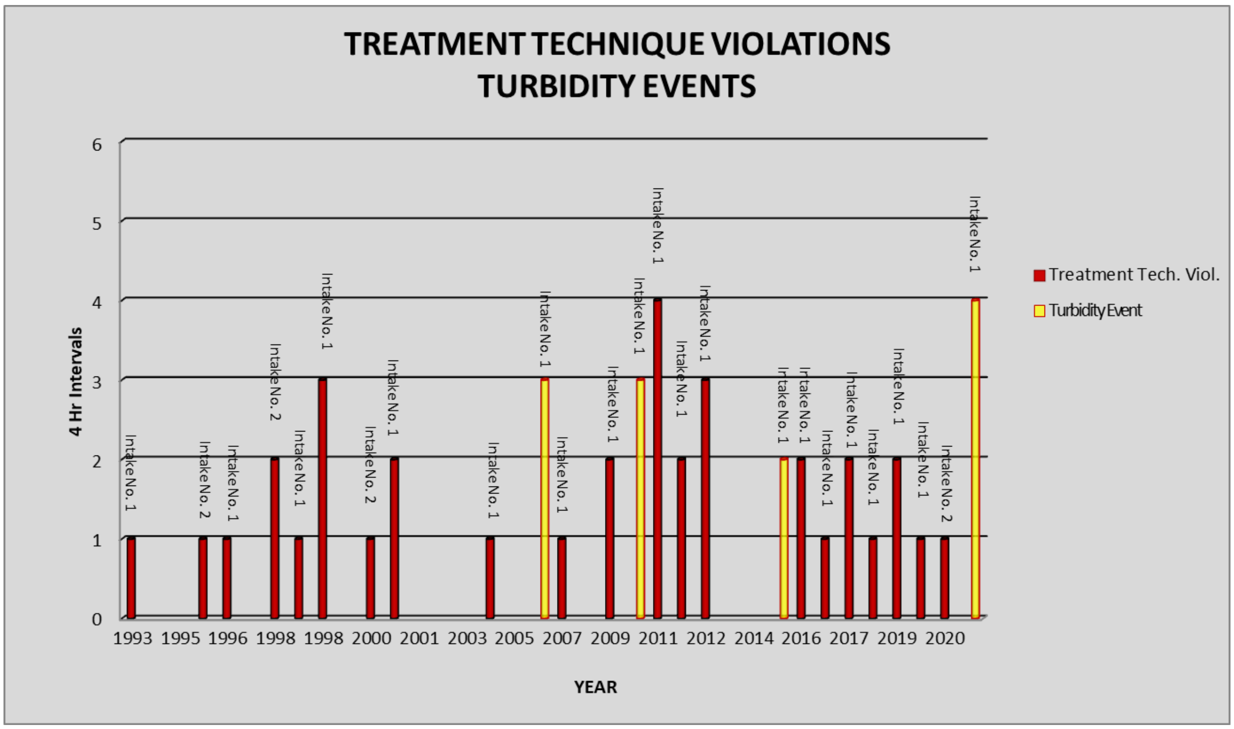
Date Intake Closed	Date Intake Opened	Intake Affected	Violation (Yes/No)
1/9/2020	1/11/2020	2	No
1/15/2020	1/20/2020	2	No
2/18/2020	2/20/2020	2	No
3/13/2020	3/14/2020	2	No
3/29/2020	3/30/2020	2	No
4/12/2020	4/15/2020	2	No
4/29/2020	3/1/2020	2	No
11/1/2020	11/3/2020	2	No
11/15/2020	11/18/2020	2	Yes: 2 days >5 NTU Intake 2 already closed
11/22/2020	11/24/2020	2	Yes: Treatment Technique Violation
11/25/2020	11/26/2020	2	No
12/20/2020	12/21/2020	2	No
12/23/2020	12/25/2020	2	Yes: Treatment Technique Violation
12/27/2020	12/28/2020	2	No
12/30/2020	1/1/2020	2	No

Two TTV's were recorded in 2020. The first violation occurred on November 22, on Intake #1. Sustained southerly winds resulted in an elevated turbidity recording of 16.76 NTU at 8:00 pm. Intake #2 was completely closed by 8:00 pm on November 22 and re-opened on November 24. The second TTV occurred on December 23 on Intake #2. Strong winds resulted in a turbidity recording of 9.81 NTU at 8:00 pm. Intake #2 was closed by 10:30 pm on December 23 and re-opened on December 25.

There was one Turbidity Event in 2020. This occurred for Intake #1 over November 15 and 16. The high turbidity reading on November 15 was 15.68 NTU at 8:00 pm. On November 16, a high of 11.01 NTU was recorded at 4:00 am. Intake #2 was closed on November 15 at 10:30 am. Re-opening was initiated at 8:05 am on November 18. Intake #1 was impacted from a combination of sustained high winds over several days and a low lake level (Nov. 15 elevation 860.00).

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 NTU) was attained.

Figure 5 1993-2020 Treatment Technique Violations vs Turbidity Events



2.2 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 2020 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.

2.3 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 531 samples collected for total coliform analyses, there were no 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 531 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 insure water quality. Samples were collected at 51 locations within the City. Approximately 185-255 samples were collected per month or 2,577 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	132	130	0	0	0.00%	0.00%
February	130	128	0	0	0.00%	0.00%
March	131	129	0	0	0.00%	0.00%
April	130	128	0	0	0.00%	0.00%
May	130	128	0	0	0.00%	0.00%
June	130	130	0	0	0.00%	0.00%
July	130	130	0	0	0.00%	0.00%
August	131	131	0	0	0.00%	0.00%
September	131	131	0	0	0.00%	0.00%
October	131	130	0	0	0.00%	0.00%
November	133	132	0	0	0.00%	0.00%
December	136	135	0	0	0.00%	0.00%

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	132	130	0	0	0.00%	0.00%
February	130	128	0	0	0.00%	0.00%
March	131	129	0	0	0.00%	0.00%
April	130	128	0	0	0.00%	0.00%
May	130	128	0	0	0.00%	0.00%
June	130	130	0	0	0.00%	0.00%
July	130	130	0	0	0.00%	0.00%
August	131	131	0	0	0.00%	0.00%
September	131	131	0	0	0.00%	0.00%
October	131	130	0	0	0.00%	0.00%
November	133	132	0	0	0.00%	0.00%
December	136	135	0	0	0.00%	0.00%

2.4 Giardia and Cryptosporidium Sampling and Analyses

Analyses for the presence of Giardia cysts and Cryptosporidium oocysts began in 1985 and 1988, respectively. During 2020, 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 2020. Environmental Protection Agency (EPA) Method 1623 was the analysis utilized.

There were no confirmed Giardia cysts or Cryptosporidium oocysts detected in 2020. Since 1986, there have been 1,229 samples analyzed for Giardia and 1,217 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

2.5 Skaneateles Lake Limnological Sampling and Analyses

2.5.1 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 11 dates with 88 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 2020. The majority of genera observed were blue-green algae of the Phylum Cyanophyta (genus, Polycystis and Cyanobium) and diatoms of the Phylum Chrysophyta (genus, Synedra) (Table No. 15). For Station Samples, four genera accounted for 93.25% of the total cell count; Polycystis (58.53%), Cyanobium (20.95%), Synedra (7.22%) and Achnanthes (6.55%). For Depth Profile samples, three genera accounted for 87.39% of the total cell count. Polycystis was dominant at 63.93%. Cyanobium and Synedra accounted for 12.66% and 10.80% of the total respectively.

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 1987-2020

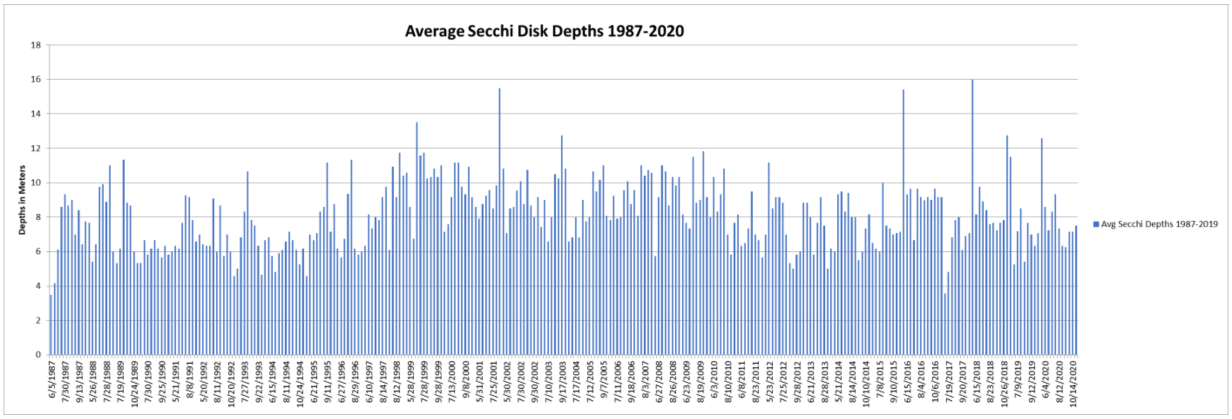


Figure 7 Average Secchi Disk Depths (June) 1987-2020

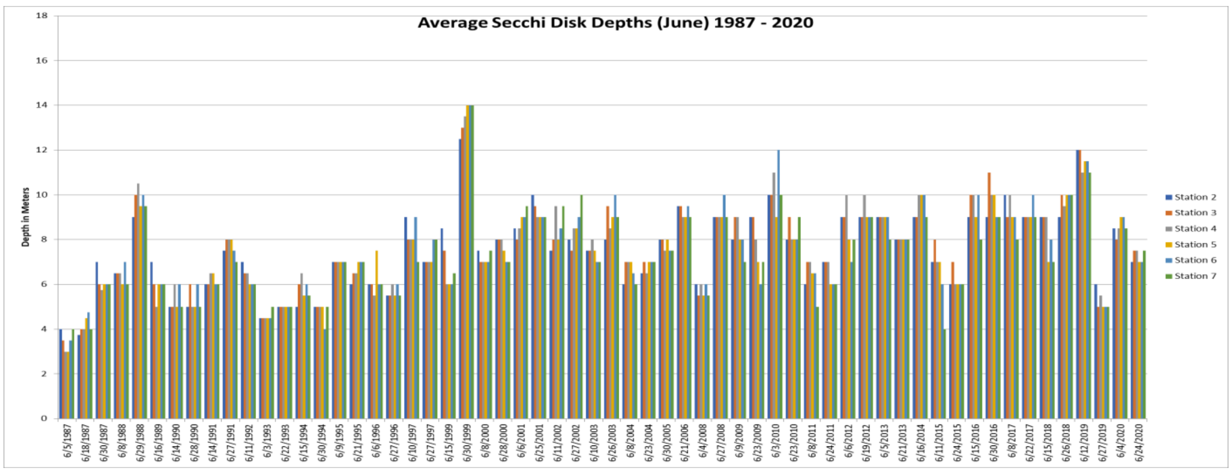


Figure 8 Average Secchi Disk Depths (September) 1987-2020

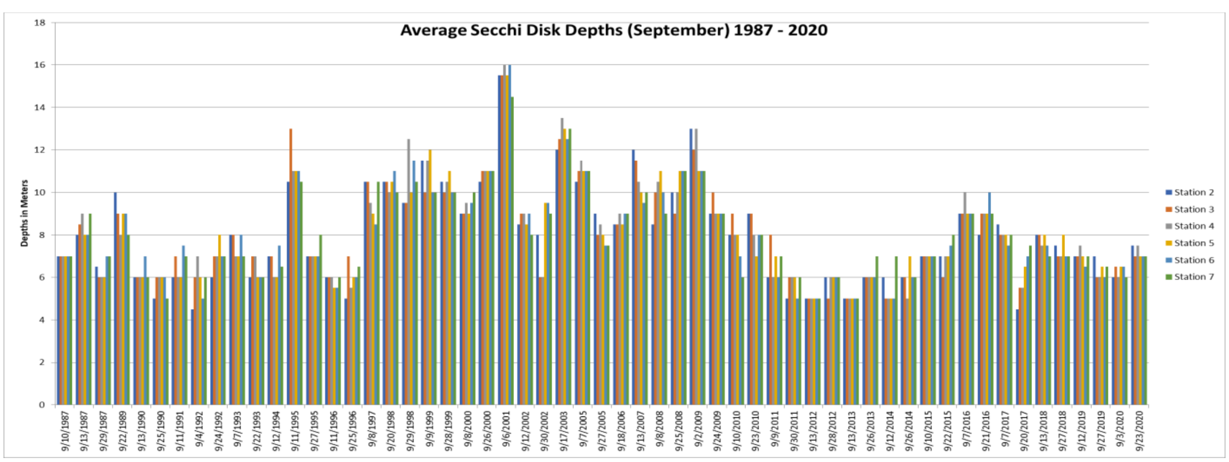


Table 15 Genera of Phytoplankton Typically Found in Skaneateles Lake

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 2020

Date	Average Total Cell Count	Dominant Form	Percent of Total	Average Secchi Disk Meters	Average Water Temperature ^{0}F
May 13	260	Polycystis 66.4% Cyanobium 21.8%	88.2%	12.6	50.5
June 4	1404	Polycystis 66.9% Cyanobium 26.5%	93.4%	8.6	59.1
June 24	1202	Polycystis 62.4% Cyanobium 21.2% Synedra 7.8%	91.4%	7.2	70.1
July 15	990	Polycystis 56.5% Synedra 28.0%	84.5%	8.3	75.0
July 30	782	Polycystis 49.5% Cyanobium 17.5% Synedra 14.6% Achnanthes 10.0%	91.6%	9.3	77.3
August 12	896	Polycystis 68.9% Cyanobium 16.9% Achnanthes 6.3%	92.1%	7.3	79.1
August 26	1228	Polycystis 61.0% Cyanobium 16.3% Achnanthes 11.6%	88.9%	6.5	75.0
September 3	927	Polycystis 63.1% Cyanobium 26.0%	89.1%	6.3	72.0
September 23	447	Polycystis 46.6% Achnanthes 27.8% Cyanobium 17.6%	92.0%	6.9	63.8
October 14	564	Cyanobium 50.4% Polycystis 20.5% Achnanthes 14.7% Chroococcus Type I 7.4%	93.0%	7.2	60.5
October 28	378	Polycystis 67.0% Cyanobium 27.8%	94.8%	7.4	53.6
Average			90.8%	8.0	66.9

Table 17 Depth Profile Sampling Analyses Skaneateles Lake Algal Content 2020

D ate	Average Total Cell Count	Dominant Form	Percent of Total	Average Turbidity	Average Water Temperature ^{0}F
May 21	374	Polycystis 78.0% Cyanobium15.0%	93.0%	0.65	47.6
June 17	1038	Polycystis 66.2% Synedra 13.0% Cyanobium 10.0%	89.2%	0.38	55.5
July 21	922	Polycystis 55.4% Synedra 21.9% Achnanthes 7.9% Dinobryon 6.2%	91.4%	0.31	60.7
August 19	607	Polycystis 61.3% Achnanthes 14.7% Cyanobium 13.7%	89.7%	0.35	64.7
September 17	491	Polycystis 68.5% Cyanobium 21.4%	89.9%	0.42	58.7
October 22	396	Polycystis 63.1% Cyanobium 28.8%	91.9%	0.39	53.0
Average	638		91.0%	0.42	56.7

2.5.2 Station Sample Analysis

Total cell counts for station samples collected on May 13 averaged 260 cells/mL. Polycystis was the dominant form accounting for 66.4%, Cyanobium accounted for 21.8%. Secchi disc readings averaged 12.6 meters. Water temperature averaged 50.50 degrees Fahrenheit.

The total monthly cell count for June averaged 1,303 cells/mL., a significant year-over-year decrease from the June 2019 monthly average (2,626 cells/mL.). Polycystis was the dominant form at all eight sample stations for both June sample events. The June 4 total average cell count was 1,404 cells/mL. Polycystis and Cyanobium accounted for 66.9% and 26.5% of the total respectively. The June 24 total cell count was consistent with June 4 count, averaging 1,202 cells/mL. Polycystis and Cyanobium remained dominant at 62.4% and 21.2% of the total respectively. Secchi disk readings averaged 8.6 meters on June 4, decreasing to an average of 7.2 meters on June 24. The average water temperature recordings increased significantly between sample events; from 59.10 degrees Fahrenheit (June 4) to 70.10 degrees Fahrenheit (June 24).

The July monthly average total cell count of 866 cells/mL. was surprisingly lower than the June average. On July 15, the total average cell count was 990 cells/mL. Polycystis and Synedra were the dominant forms accounting for 56.4% and 28.0% respectively. Water temperatures increased significantly from the June recordings to 75.00 degrees Fahrenheit. The average Secchi disk reading was 8.3 meters. On July 30, the average total cell count remained remarkably low at 782 cells/mL. Polycystis was the dominant form at all eight stations totaling 49.5% of the total cell count. Cyanobium and Synedra accounted for 17.5% and 14.6% of the cell count respectively. Water temperature increased to 77.30 degrees Fahrenheit. Secchi disk readings averaged 9.3 meters.

The total average cell count increased marginally on August 12 from the July sample events to 896 cells/mL. (August 9, 2019 average total cell count was 4,432 cells/mL.). The dominant forms were

Polycystis (68.9%), and Cyanobium (16.9%). On August 26, the average total cell count increased to 1,228 cells/mL. Polycystis, counts totaled 5,993 cells/mL. (61.0%). Cyanobium and Cyclotella totaled 1,602 cells/mL. (16.3%) and 1,140 cells/mL. (11.6%) respectively. For the month of August, water temperatures averaged 77.10 degrees Fahrenheit and Secchi disk readings averaged 6.9 meters.

Total cell counts for September 3 and September 23 averaged 927 cells/mL. and 447 cells/mL. respectively. For the September 3 sample event, Polycystis, comprised 63.1% and Cyanobium accounted for 26.0% of the total cell count. Polycystis accounted for 44.6% of the September 23 sample event. Achnanthes and Cyanobium accounted for 27.8% and 17.6% respectively. Water temperatures for the month of September averaged 67.90 degrees Fahrenheit. Secchi disk readings averaged 6.6 meters.

The dominant forms for the October 14 sample event included Cyanobium, Polycystis and Achnanthes, accounting for 50.4%, 20.5% and 14.7% of the total cell count respectively. Chroococcus Type I cell count, which accounted for less than 2% of the total cell count throughout the season, totaled 7.4%. Water temperatures averaged 60.50 degrees Fahrenheit and Secchi disc readings averaged 7.2 meters.

2.5.3 Depth Profile Sample Analysis

The total cell count for the May 21 depth profile averaged 374 cells/mL. Polycystis was the dominant form throughout the water column, accounting for 78.0% of the total cell count. Cyanobium accounted for 15.0%. Water temperatures averaged 47.60 degrees Fahrenheit, ranging from 55.00 degrees Fahrenheit at the surface and declining to 46.00 degrees Fahrenheit at 90 feet. The lake was still exhibiting spring turnover, with weak thermal stratification.

The total cell count for the June 17 depth profile averaged 1,038 cells/mL. Dominant algal forms included Polycystis (66.2%) Synedra (13.0%) and Cyanobium (10.0%). Species richness increased from 10 forms (May 21 sample) to 26 forms. The surface temperature was 68.00 degrees Fahrenheit. The epiliminion and metalimnion were not well established. The hypoliminion extended from 110 feet downward.

The total cell count for the July 21 depth profile averaged 922 cells/mL. Dominant forms were Polycystis, and Synedra at 55.4% and 21.9% respectively. The water surface temperature was exceptionally warm at 79.00 degrees Fahrenheit. The epiliminion was still not established, however, the metalimnion extended between 20 feet and 80 feet and the hypolimnion from 80 feet downward.

On August 19, 2019 the depth profile average total cell count was 607 cells/mL. (compared to 3,886 cells/mL. on August 14, 2019). The dominant form was Polycystis (61.3% of the total cell count). Achnanthes and Cyanobium accounted for 14.7%, and 13.7% of the total cell count respectively. The epilimion was shallow, extending to 20 feet. The thermocline extended to 110 feet and the hypolimnion from 120 feet downward. The water temperature ranged from 76.00 degrees Fahrenheit (epilimnic zone) to 48.00 degrees Fahrenheit at 200 feet.

The September 17 depth profile average total cell count was exceptionally low at 491 cells/mL. Polycystis was the dominant form comprising 68.5% of the total cell count. Cyanobium accounted for 21.4%. The epilimnion was a consistent 67.00 degrees Fahrenheit, extending to a depth of 70 feet. The metalimnion extended to 90 feet, and the hypolimnion from 90 feet downward.

The surface water temperature decreased to 58.00 degrees Fahrenheit for the October 22 depth profile sample event, resulting in a very low average total cell count of 396 cells/mL. Dominant forms were Polycystis and Cyanobium at 63.1% and 28.8% respectively. The epilimnion extended to a depth of 80 feet, the metalimnion was evident from 80 feet to 120 feet and hypolimnion extended from 120 feet downward.

3. SKANEATELES LAKE ALGAE BLOOMS

Blooms observed by Skaneateles Lake Watershed Protection staff were exceptional small, localized and limited to near-shore areas in 2020. 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 2020. Suspicious algal blooms were reported to the NYSDEC Division of Water HABsInfo@dec.ny.gov. Syracuse Water Department personnel collected several surface water skim samples in late summer/early fall, 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. Microcystis colonies were not identified in the majority of prepared samples following numerous scans of fields. When colonies were identified, counts were limited to a significantly small percentage of the sample.

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.

3.1 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.

3.1.1 Short Term Measures

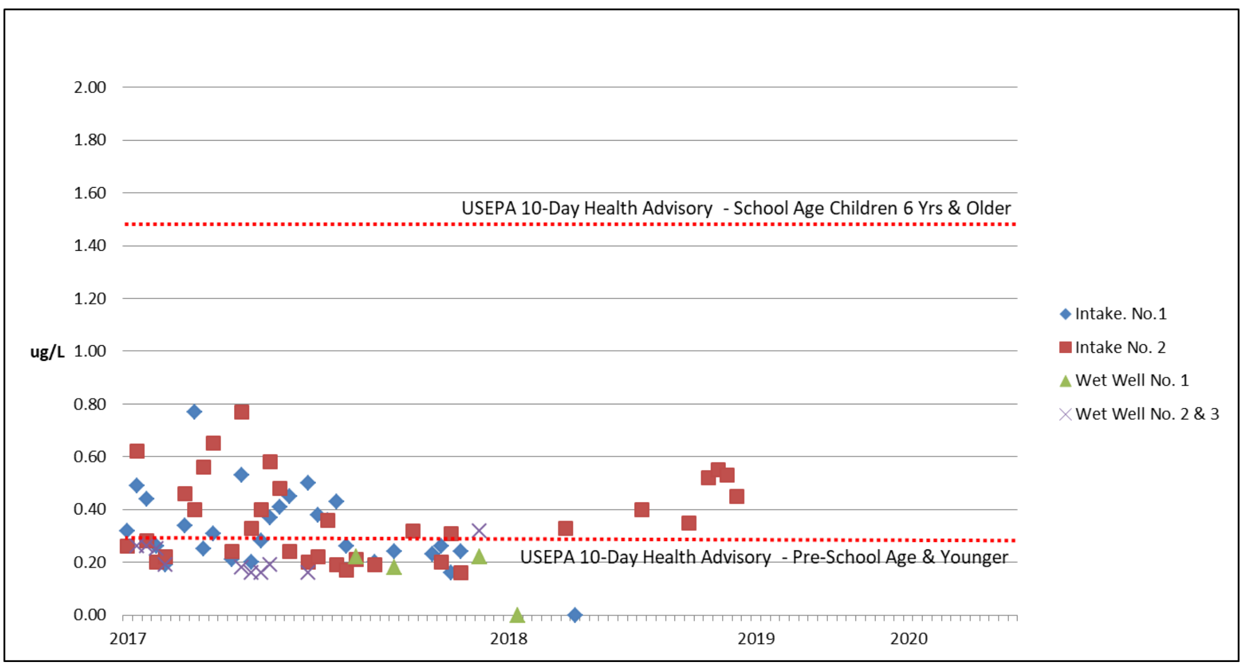
The short-term measures provided for an aggressive monitoring program. Microcystin sampling at the City's drinking water intakes were initiated on July 6 and extended through September 28. Raw water from both of the City's Intakes was sampled weekly. Samples were collected and transported to an ELAP certified lab on 11 occasions for analysis in 2020. No 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 6 – September 28, 2020

Date Sampled	7/6	7/20	7/27	8/3	8/10	8/17	8/24	8/31	9/14	9/21	9/28
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	-	-	-	-	-	-	-	-	-	-	-

Throughout periods of microcystin detections in raw water intakes (2017 & 2018), 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 2017-2020



Short term measures also addressed the City's response to finished water microcystin levels above the 0.3 µg/L. in regards 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.

3.1.2 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 No. 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. 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.

3.2 Chemical Sampling and Analyses

Skaneateles Lake water was sampled and analyzed for several chemicals and/or compounds during 2020. 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. 19-26, 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 2020

Results in ug/L	400 East Genesee St.	Serpicos Diner	Functional Comm. Corp.	McChesney Center	Quarterly Average (All Sites)
February 12	16.90	14.20	20.50	11.90	15.88
May 19	16.65	21.70	24.81	19.29	20.61
August 14	39.80	50.50	37.19	37.50	41.25
November 13	27.00	39.00	29.10	26.90	30.50
Locational Annual Average	25.09	31.35	27.90	23.90	

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

Table 20 Haloacetic Acids (5) Analyses of Skaneateles Lake Water for 2020

Results in ug/L	400 East Genesee St.	Serpicos Diner	Functional Comm. Corp.	McChesney Center	Quarterly Average (All Sites)
February 12	15.80	16.00	25.10	14.70	17.90
May 19	14.40	18.90	22.40	18.90	18.65
August 14	16.60	20.00	20.40	20.00	19.25
November 13	12.40	18.90	17.30	16.40	16.25
Locational Annual Average	14.80	18.45	21.30	17.50	

Table 21 Volatile Organic Compounds, Vinyl Chloride and MTBE: February 12, 2020 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: August 13, 2020 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 12, 2020 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 19 & June 8, 2020

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

Table 25 Inorganic Chemicals and Physical Characteristics Analysis of Skaneateles Lake Water June 8, 2020

Parameter	EPA Standard in mg/L	Results in mg/L
Antimony	0.006	Not Detected
Arsenic	0.010	Not Detected
Barium	2.0	0.024
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	0.52
Chloride	250	26.7
Iron	0.30	Not Detected *
Manganese	0.30	.0008
Silver	0.10	Not Detected
Sodium	None	10.9 *
Sulfate	250	11.8
Color	15 units	<5
Odor	3 units	1
Nitrate	10.0	0.99
Nitrite	1.0	Not Detected

* Sample collected on 11/12/2020

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

4. SKANEATELES LAKE WATERSHED PROTECTION PROGRAM

4.1 Watershed Inspection Program Overview

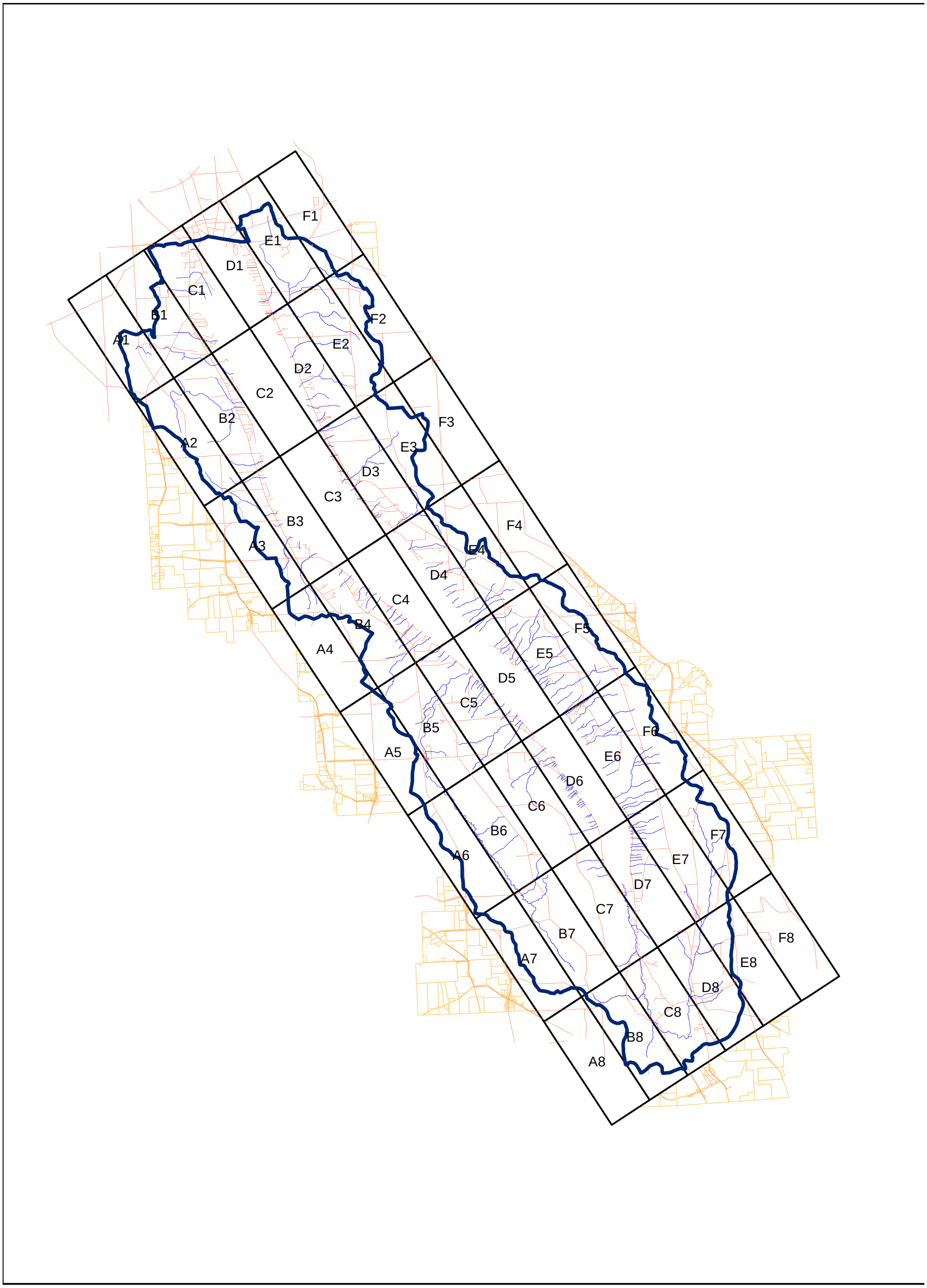
The Watershed Protection Program operated by the City of Syracuse consisted of (a) an Inspection Program to detect violations of the Watershed Rules and Regulations, NYSDOH and county Sanitary Codes, NYS Department of Environmental Conservation (DEC) Environmental Conservation Law (ECL), Navigation Law 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.

Three full-time City of Syracuse personnel routinely patrol the lake and watershed: two Watershed Inspectors 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 47 occasions in 2020. 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 36 OWTS design proposals for new construction or alternative engineering design were recommended for approval. Three proposal 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 18 building permits were issued for new dwellings during 2020 (Table No. 27 & Fig. 11). Sixteen of the permits were in Onondaga County. Eight were in the town of Skaneateles (three lakefront), and eight were issued in the town of Spafford (five lakefront). Two permits were issued in the town of Niles, Cayuga County (one lakefront). No permits were issued in the town of Sempronius (Cayuga County) or Scott, (Cortland County).

Table 27 Construction Activity in the Skaneateles Watershed for 2020

Township	New Construction	Lakefront*	Additions & Renovations	Lakefront**
Village of Skaneateles	0	0	0	0
Town of Skaneateles	8	3	13	5
Spafford	8	5	10	6
Niles	2	1	2	1
Sempronius	0	0	0	0
Scott	0	0	2	0
Total	18	9	27	12

* Included in new construction figures

** Included in additions & renovations figures

4.4 Building Permit Application Review

The Watershed Protection Program reviewed a total 73 Building and Zoning Permit Applications in 2020. As discussed above, 18 were new housing starts. Twenty Seven applications were additions or renovations to existing dwellings and the remaining 28 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 1993-2020

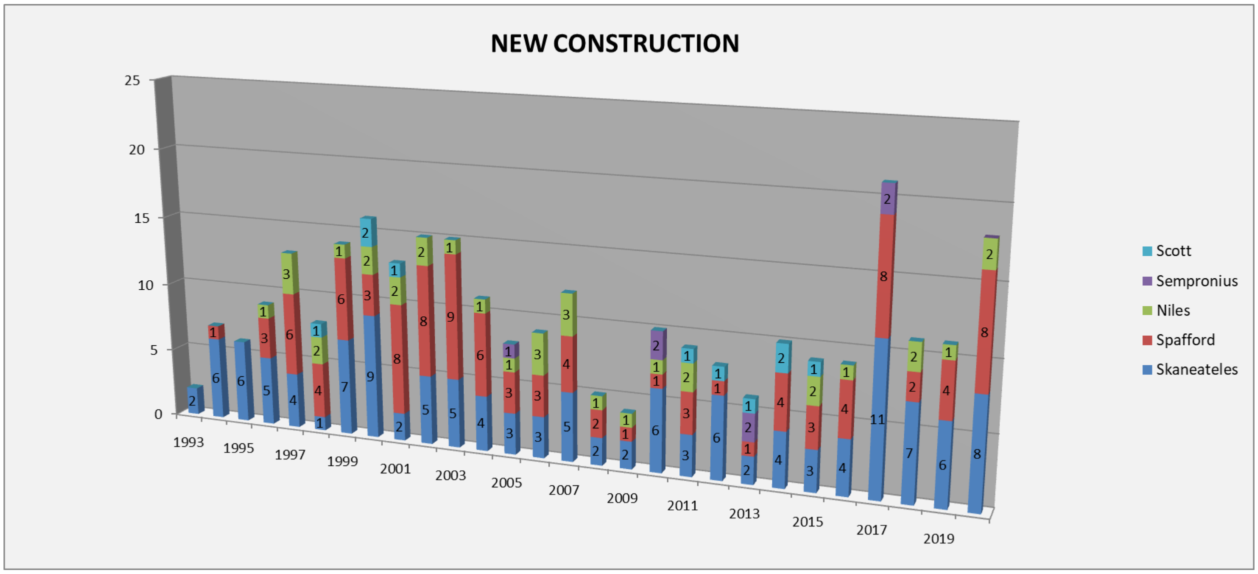


Figure 12 Renovation Activity within the Skaneateles Lake Watershed 1993-2020

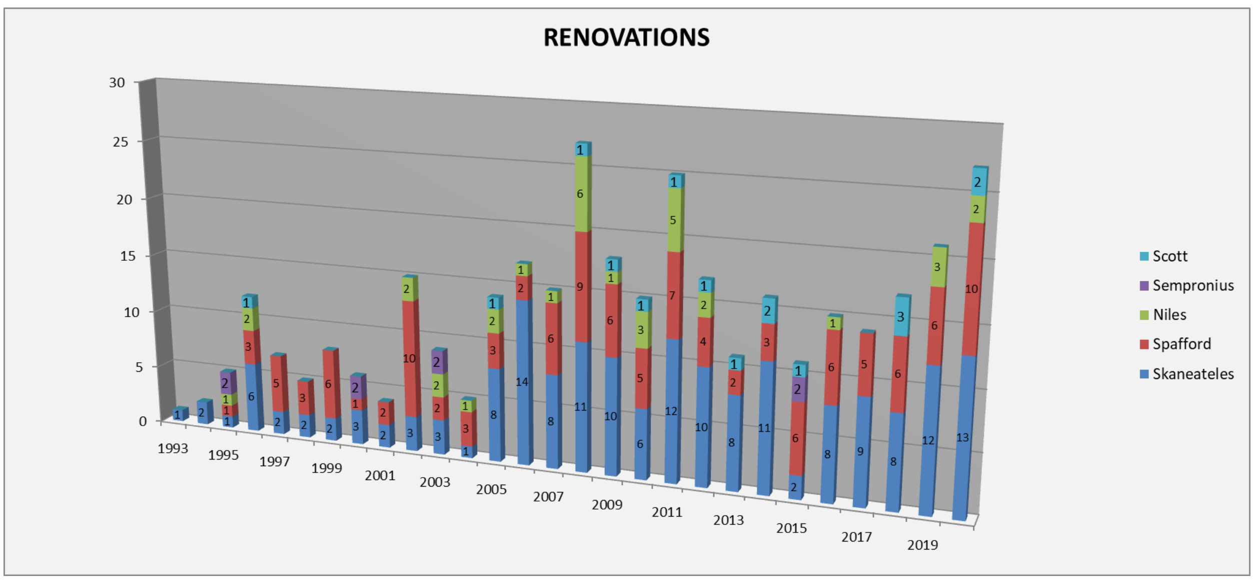


Figure 13 Map of New Construction Activity within the Skaneateles Lake Watershed 1993-2020

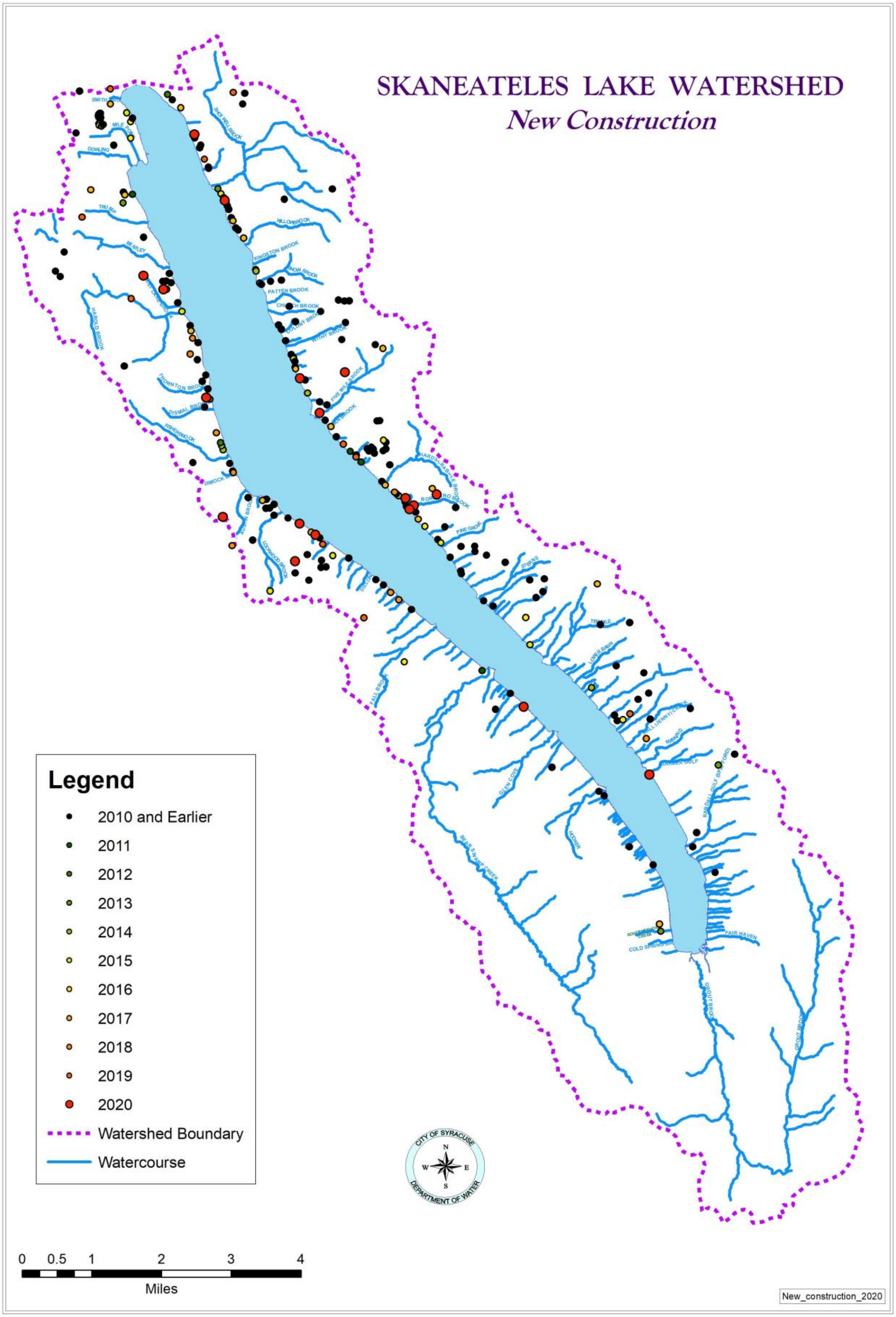
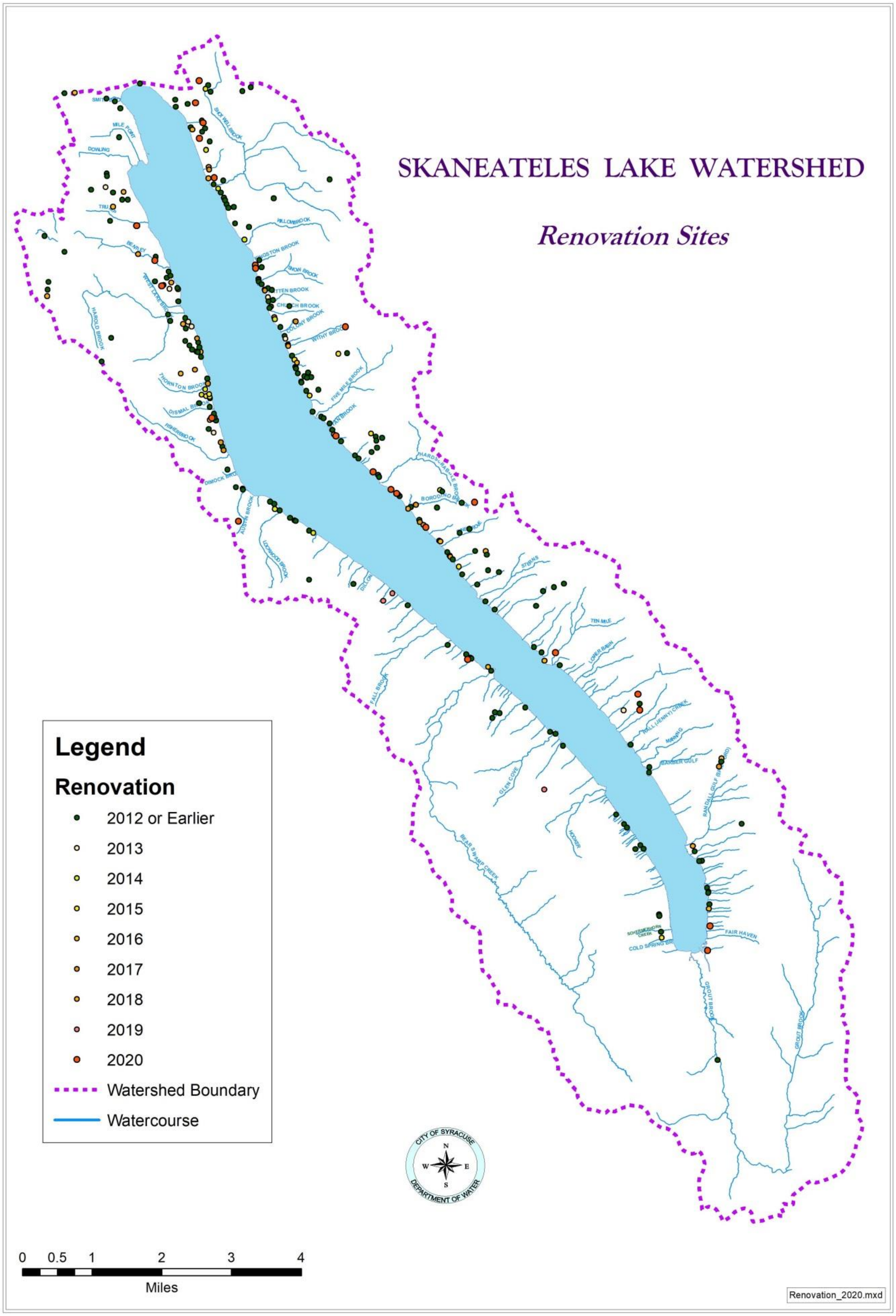


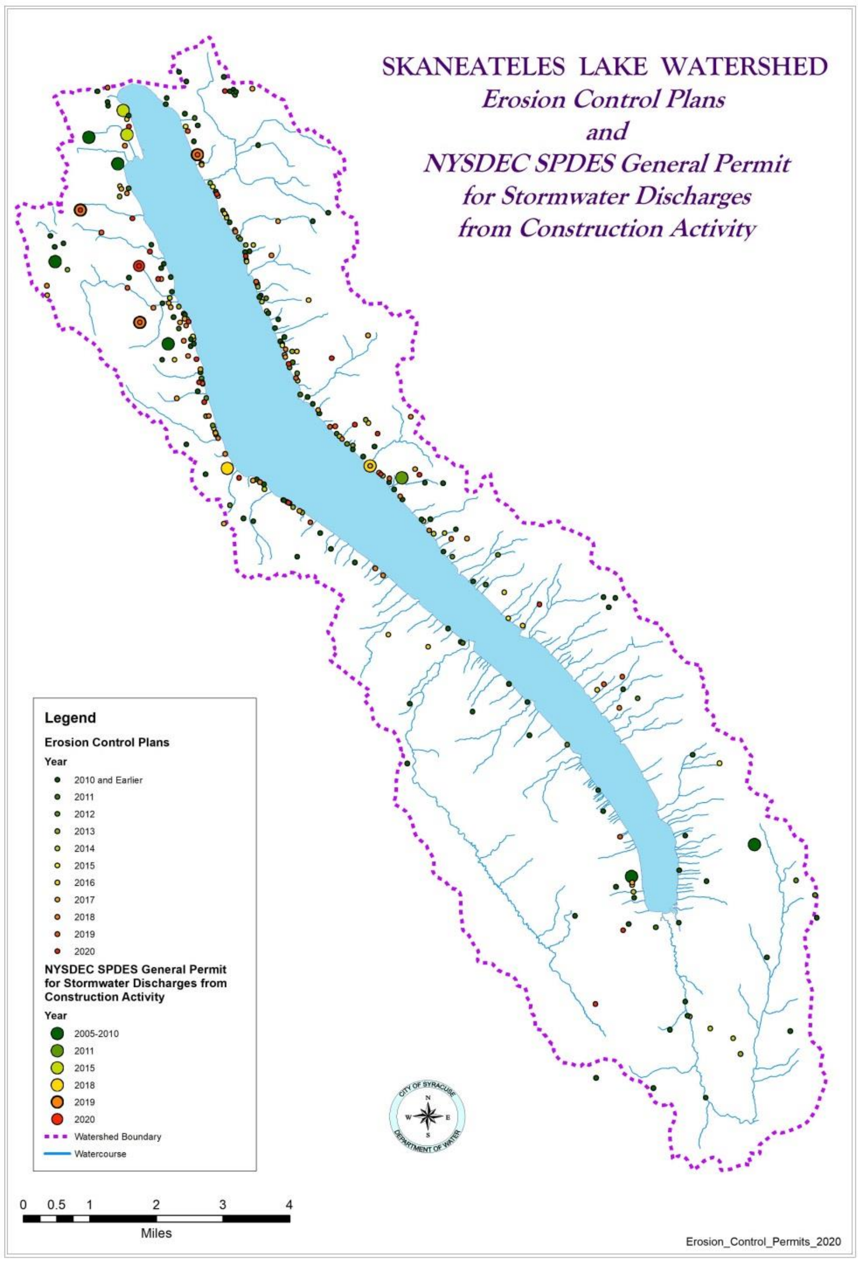
Figure 14 Map of Renovation Activity within the Skaneateles Lake Watershed 1993-2020



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 2020, 29 SECPs were reviewed. A NYSDEC SPDES General Permit for Storm water Discharges (GP-0-15-002) is required in New York State for all construction activity over one acre. One permit weas issued for construction activity in the Watershed in 2020 under GP-0-15-002. 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 23 violations of the Skaneateles Lake Watershed Rules and Regulations were recorded in 2020. The violations are discussed in detail below.

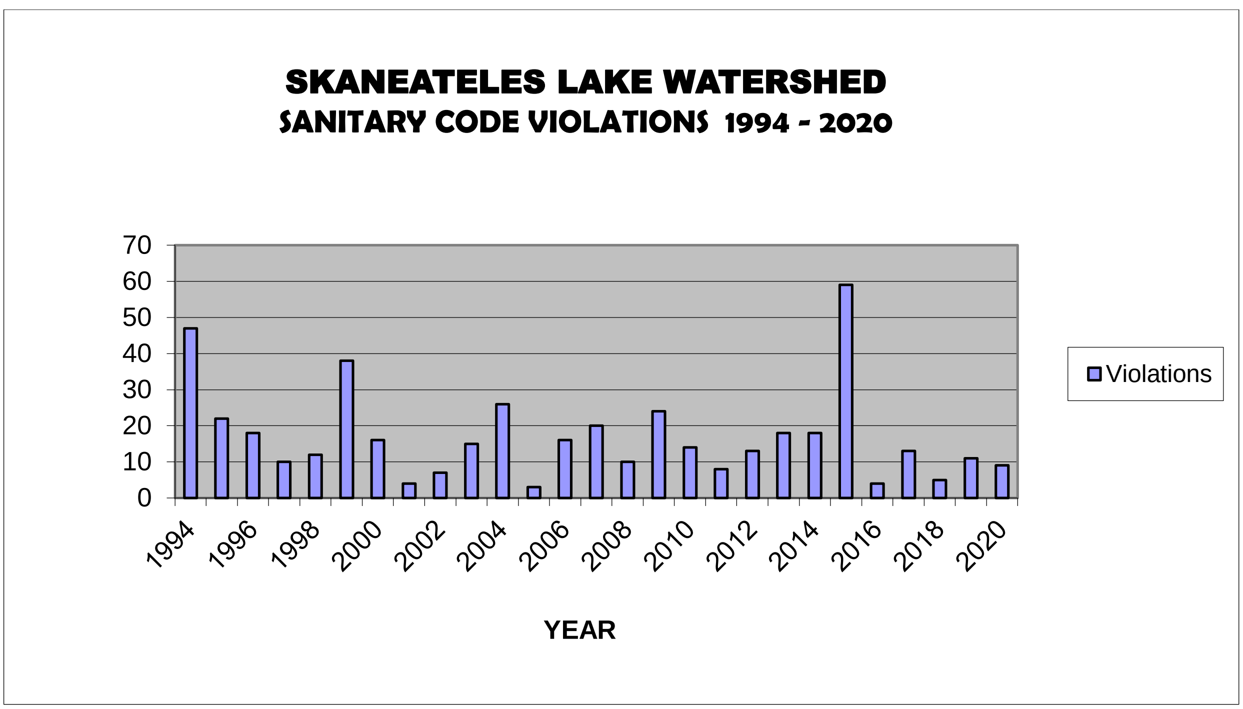
4.6.1 County Sanitary Code Violations

Ten violations of County Sanitary Code were reported in 2020. Nine violations were the result of failing OWTS. One property owner was cited for failure to renew an operation and maintenance contract for an Enhanced Treatment Unit (ETU). (Table No. 28 at end of next section).

- Eight Sanitary Code violations were abated in 2020. Abatement was the result of scheduled maintenance, replacement of failing septic system components or complete OWTS replacement.
- One violation is pending abatement.
- A renewal of an expired O&M contract will be activated with a certified ETU service provider in 2021. The contract was not extended through the 2020 summer season due to limited occupancy.

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 1993 are shown in Figure 16.

Figure 16 Skaneateles Lake Watershed Sanitary Code Violations 1994-2020



4.6.2 Erosion and Sediment Control Violations

Twelve violations were issued for non-compliance of sediment and erosion control practices in 2020. Eleven of the violations were abated in 2020. One violation is pending. (Table No. 28).

Table 28 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
2016	4	6	9	1
2017	13	17	30	0
2018	5	14	18	1
2019	11	13	23	1
2020	10	12	1	

* New regulations became effective in 2004

4.6.3 Petroleum/Hazardous Material Spills

There was one potentially hazardous material release identified by City personnel or reported by NYSDEC Division of Environmental Remediation in 2020.

- **October 9, 2020** – A motor vehicle travelling north on Rt. 41A in the town of Skaneateles overturned down a steep embankment, landing in a vegetated swale. An unknown quantity of fuel was released. Following removal of the vehicle, contaminated soil was scraped, collected and removed offsite. NYSDEC Environmental Remediation Division coordinated the contaminated soil clean-up effort.

4.7 Composing Toilet Operation

Currently 50 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 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 2020-2021.

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 39 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 29,374 acres were found to have been worked by the 39 farms with active Whole Farms Plans.

A total of 1,032 tons of granular fertilizer and 13,530 gallons of liquid fertilizer were applied to cropland. A total of 616 tons of lime were applied to cropland. A total of 6,030 tons of manure, and 17,821,865 gallons were utilized for nutrient value and soil organic matter enhancement. This manure was produced by approximately 2,215 animals (1,860 dairy animals, 66 horses, 86 sheep, 47 beef, 125 bison, 24 alpacas, 5 goats, 2 pigs).

A total of 2,451 gallons of liquid pesticide and 1,591 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 110,868 gallons of diesel and 20,867 gallons of gasoline were used by the 39 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, Onondaga and Cayuga Residences of the NYSDOT or the Cayuga and Cortland County DOT's in 2020. The NYSDOT Cortland Residency applied Roundup ProMax, and Escort around guide rails on Route 41 from the Onondaga County line south to the watershed boundary. Onondaga County DOT applied Roundup Pro Concentrate and Oust XP for guide rail vegetation control on several road right-of-ways 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), 16 commercial enterprises and seven municipal facilities stored a total of 48,280 gallons of petroleum products as of January 1, 2021. Gasoline accounted for 33,000 gallons of the total. Other products stored were propane (44,950 gallons), diesel (10,200 gallons), heating oil (1,250 gallons) and used oil (3,830 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 on both shores of Skaneateles Lake on the southern portion of the lake. As of February 2020, HWA has been found as far north as Fire Lane 22A (Niles) on the western shore, and around Ten Mile Point (Spafford) on the eastern shore. (For the most up to date information, please visit the NY iMapInvasives map at nyimapinvasives.org/data-and-maps). 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 2020, the group received $50,000 from the Great Lakes Restoration Initiative for targeted treatment of high-priority hemlocks in the Skaneateles watershed. Treatments are planned starting in spring of 2021.

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. Once the trees are large and healthy enough to sustain low populations of HWA, predator insects will be introduced to feed on HWA, and rear a larger population of predator beetles for introduction throughout the Watershed.

Biological control is a long-term solution for HWA, but landowners with trees that are currently infested are strongly encouraged to consider treatment of their trees. Treatment is relatively inexpensive and lasts for three - seven years. HWA management options can be found at the NYS Hemlock Initiative (NYSHI) website, nyshemlockinitiative.info.

In 2020, CCE Onondaga provided a workshop on HWA and iMapInvasives training. iMapInvasives is an on-line, GIS-based data management system used to assist citizen scientists and natural resource professionals working to protect our natural resources from the threat of invasive species. Attendees learned how to identify and report HWA infestations and, of equal importance, the absence of infestations, around the watershed. The workshop also featured a field session where attendees practiced surveying hemlocks for the presence of HWA. Volunteers have logged over three dozen entries in the database project shared between CCE of Onondaga and the NYSHI, including first reports of known infestations in the watershed. This citizen science effort has largely contributed to our understanding of HWA's spread through the watershed. It is proving to be an efficient use of agency resources, and aids our partners at state Partnerships of Regional Invasive Species Management (PRISMs) in following early detection, rapid response protocol

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 2021.

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 may result in sediment plumes which are transported from the Shotwell Brook outlet in the direction of Intake #1, causing elevated turbidity through the intake.

The Skaneateles Lake Watershed Protection Program is coordinating with multiple agencies including the Finger Lakes Land Trust, SLWAP, NYSDEC, Syracuse University, US Fish & Wildlife Service, Onondaga County Water and Environment Protection, the Town of Skaneateles and Upstate Freshwater Institute, to monitor Shotwell Brook water quality and assess impacts of land use in the Watershed on erosion and sediment loads. The objective of the monitoring program is to establish a seasonal (April – October) baseline characterization of hydrology and water quality. The monitoring location was approximately 700 feet upstream from the Shotwell Brook outlet. 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 (currently in the planning phase) located on the main branch of Shotwell Brook, E. of the NYS Rt. 41 bridge. The restoration project is scheduled to be completed in 2021.

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 of the conveyances bordering farm land will extend over several years. As of 2020, Watershed Inspectors have located and logged coordinates for 197 drain tile outlets. Approximately 65% of the Watershed has been surveyed.

9. WATERSHED PERSONNEL TRAINING, CERTIFICATIONS AND PRESENTATIONS

Skaneateles Lake Data and Research Summit – January 22, 2020

The Summit was attended by the City's Watershed Quality Coordinator. Presentations included summaries of data collection and research by Syracuse University and Upstate Freshwater Institute. Several agencies and organizations provided an overview and update on modelling efforts for the Skaneateles Lake Watershed Nine Element Plan.

Skaneateles Lake Watershed Municipal Stakeholders Meeting – January 29, 2020

The guest speaker for the bi-annual meeting was a Forestry Specialist with Cornell Cooperative Extension of Onondaga County. The presentation focused on local timber ordinances, including the challenges to establishing effective municipal ordinances. Environmental benefits of timber management using best practices and consequences of poor timber harvesting were discussed.

Streams 101 – July 23, 2020

The Watershed Quality Coordinator attended the webinar training sponsored by the Hudson River Estuary Program. The training was part of a Conservation and Land Use 101 webinar series. Topics discussed included; stream classification, stream corridors and floodplains and disrupting/disconnecting watercourses.

Restoration, Engineering and Stormwater Management – August 19, 2020

The Watershed Quality Coordinator attended the webinar training sponsored by the Tinker's Creek Watershed Partners. The training discussed effective stormwater management practices.

Stream & Buffer Protection Webinar Series – September 9, September 16 & September 23, 2020

The Watershed Quality Coordinator attended the webinar series sponsored by the Hudson River Estuary Program. Individual webinars included; The Science of Stream Buffers (September 9), State Regulations and Resources (September 16) and Stream Buffer Protection in Action (September 23). The range of topics included; riparian buffers critical role in nutrient processing and improving water quality, protecting buffer zones and streams through land trusts and an overview of the NYS stream protection program.

Stewardship in Skaneateles Virtual Program – September 29, 2020

The Watershed Quality Coordinator attended the event presented by Cornell Cooperative Extension of Onondaga County. Featured presentations included conservation easements and updates on Finger Lakes Land Trust's Skaneateles Lake Watershed projects. CNY Land Trust provided an update of the organizations recent projects and the SUNY ESF Restoration Science Center discussed the Skaneateles lawn to meadow restoration program.

10. ACKNOWLEDGMENTS

The City of Syracuse continued in its efforts to control pollution within the Skaneateles Lake Watershed in 2020. 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 2010 Census and was supplied by the Syracuse-Onondaga County Planning Agency in October 2011. It is noted that the overall figures show a declining population and increasing number of dwelling units within the watershed as compared to

the 1990 census (noted in previous annual reports). This is due to the way in which the watershed population is estimated. Essentially, a watershed boundary map is drawn over a tax parcel map. There are obvious discrepancies that could occur as a result, but are unavoidable.

4. Average historical data is based upon City data for the 69 years between 1951 and 2019 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

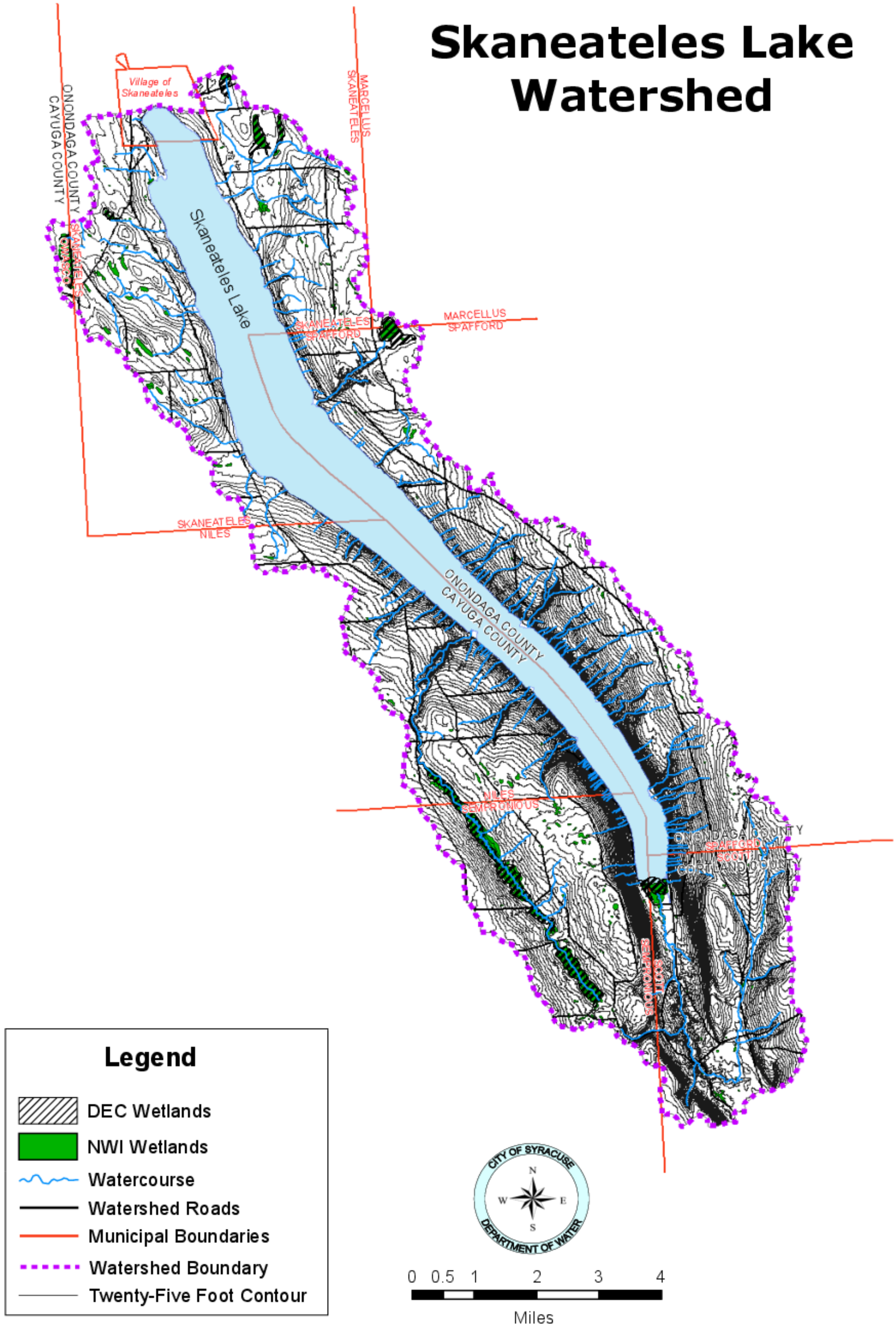


Exhibit A: General Watershed Map

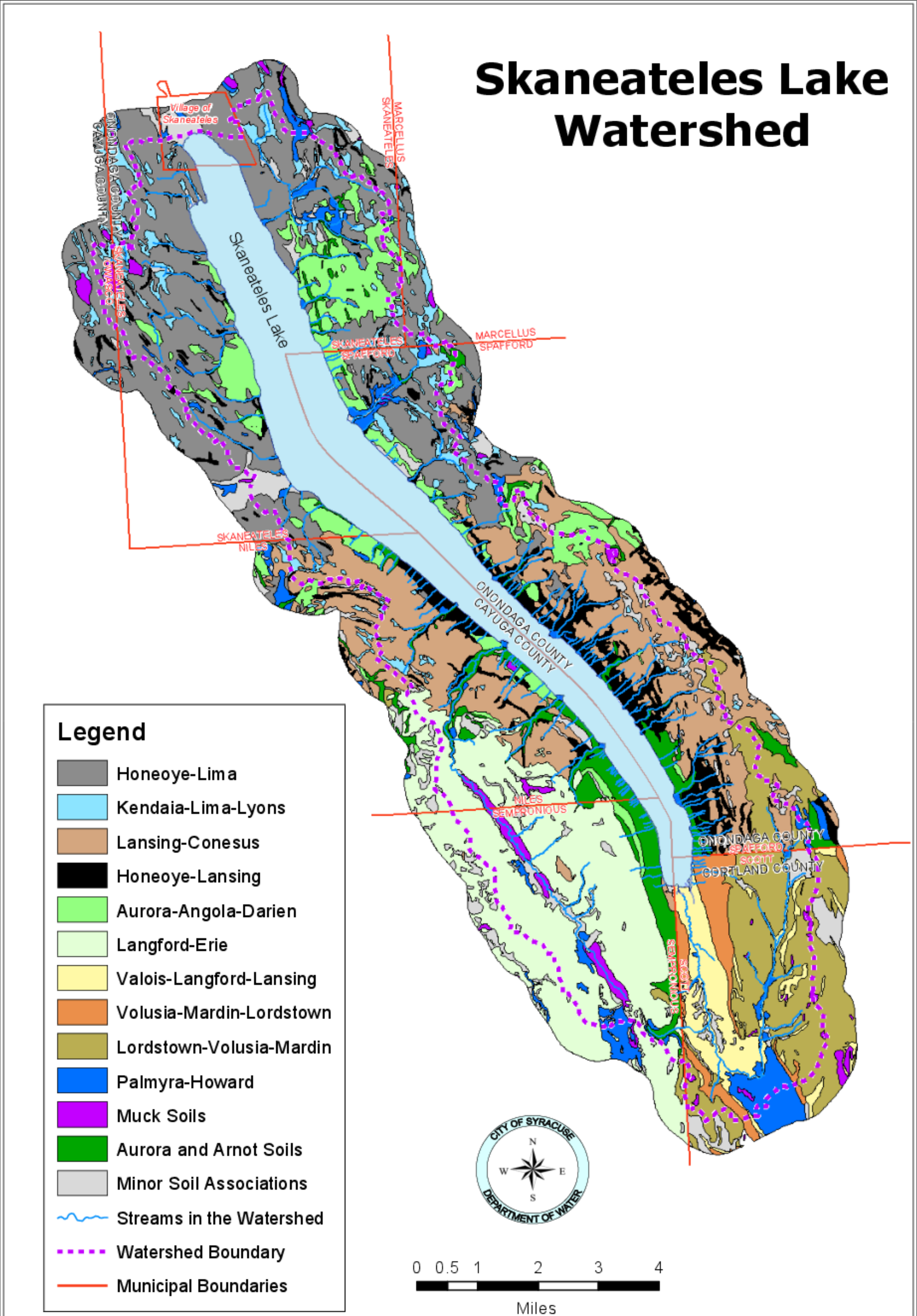
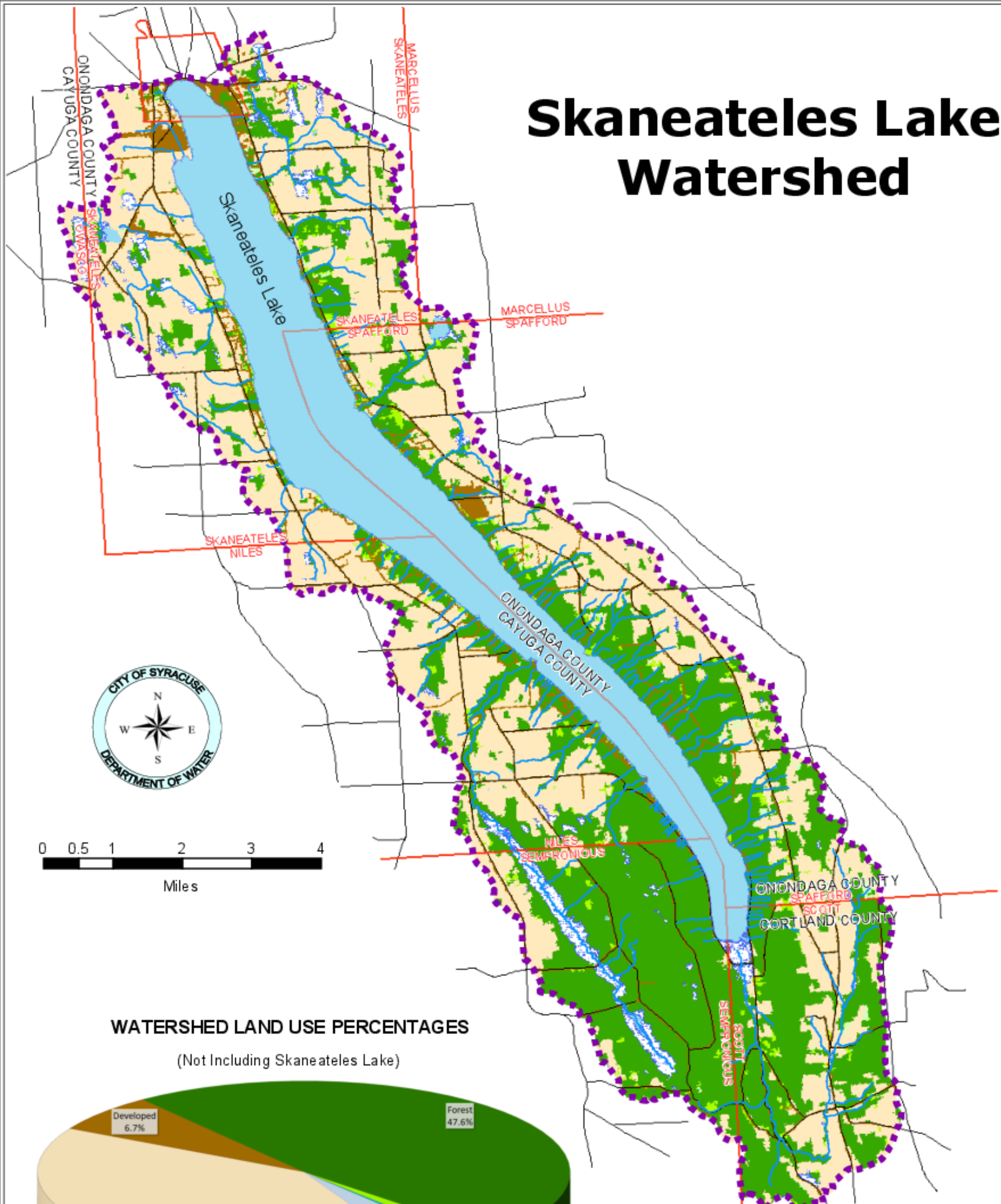


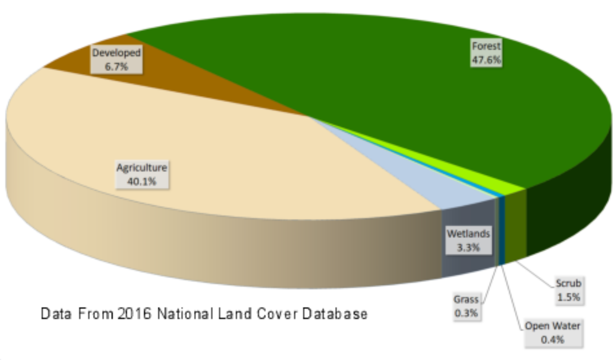
Exhibit B: Soil Associations Map

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