

## 2.7 Surface Water Resources

Cayuga Lake is the second largest Finger Lake in volume and has the largest watershed while serving as the principal water resource for the watershed. The lake is 38.2 miles long with a maximum width of 3.5 miles and 95.3 miles of shoreline. The drainage basin or watershed is 785 square miles. Cayuga Lake drains through the Oswego River system to Lake Ontario. The primary users of surface water in the watershed are located at the southern end of the lake and include the City of Ithaca, Cornell University, and the Bolton Point Water System which serves the towns of Dryden, Ithaca, and Lansing, and the villages of Cayuga Heights and Lansing.



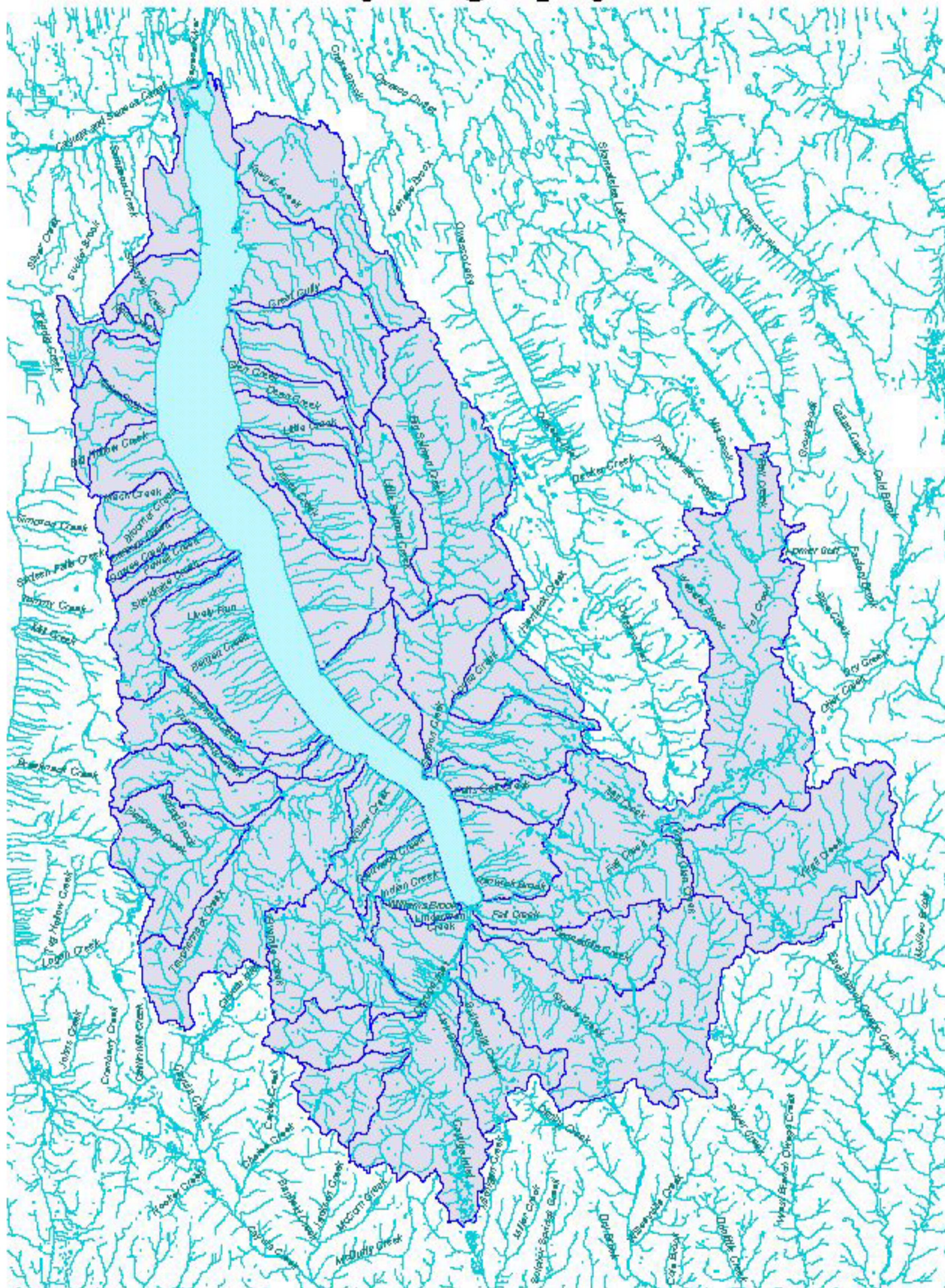
Figure 2.7.1. Mudlock

The control structure at Mud Lock, located at the north end of the lake, regulates the water level of Cayuga Lake. As part of the New York State Barge Canal System, the NYS Thruway Authority controls Mud Lock. According to Oglesby, “The general strategy is to draw the lake down in mid-December to minimize ice damage to shoreline structures and for maximizing storage during the period of heavy spring runoff” (Oglesby).

The quantity and quality of water in Cayuga Lake depends on the quality of water that drains into it from tributaries and runoff within the watershed. The watershed acts as a funnel for water from these inlets and overland runoff to the lake. For this report, the Cayuga Lake Watershed is made up of 46 subwatersheds that drain into the lake through streams. Map 2.7.1, Cayuga Lake Watershed Hydrography, displays the subwatersheds and their streams.

According to a report issued by the US Army Corps of Engineers, the largest tributary of Cayuga Lake “is Fall Creek with a drainage area of 128 square miles” (US ACE). Other principal tributaries of Cayuga Lake (and their drainage areas at mouth of stream) include Salmon Creek (89.2 square miles), Cayuga Inlet (86.7 square miles), Taughannock Creek (67 square miles), Sixmile Creek (49.6 square miles), Yawger Creek (24.9 square miles), Paines Creek (15.4 square miles – not taken at mouth), and Great Gully Creek (15 square miles). Cayuga Lake is an “open” system and is therefore subject to contamination from point and non-point sources that enter the lake via runoff into tributaries or directly into the lake itself. These contaminants can result in waterborne diseases that afflict humans and the entire ecological system when exposed to contaminated surface water. The NYS Department of Health (NYSDOH) regulates municipal water systems, businesses, and other systems that serve five or more residences or 25 or more individuals. Regulation and enforcement of water quality standards by the NYSDOH is provided for under the NYS Sanitary Code Subpart 5-1. The NYSDEC also plays a prominent role through the permitting of

# Cayuga Lake Watershed Hydrography



This map was prepared for the New York State Department of State with funding from the Environmental Protection Act. Additional funding was provided through the Empire State Development Corporation.

Source: New York State Department of Environmental Conservation, 1988.  
Genesee/Finger Lakes Regional Planning Council, 1988.

Base Map: New York State Department of Transportation, February 1986.

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Prepared by Genesee/Finger Lakes Regional Planning Council, 1988.

Table 2.7.1 Public Surface Water Systems in the Cayuga Lake Watershed			
System Location	Communities Served	Retail Population	Production (gallons/day)
<i>Cayuga County</i>			
Village of Cayuga	Village of Cayuga and portions of the Town of Aurelius north of the village along Rt. 90	600	1,710
Wells College	Village of Aurora	950	3,980
<i>Cortland County</i>			
No Public Surface Water Systems			
<i>Schuyler County</i>			
No Public Surface Water Systems			
<i>Seneca County</i>			
Seneca Falls	Town and Village of Seneca Falls	7,400	3,500,000
<i>Tioga County</i>			
No Public Surface Water Systems			
<i>Tompkins County</i>			
Bolton Point Water System	Towns of Dryden, Ithaca, and Lansing and Villages of Cayuga Heights and Lansing	25,000	9,000,000
Cornell University	Cornell University and City of Ithaca	25,000	3,600,000
City of Ithaca	City of Ithaca	28,000	7,000,000

Sources: Cayuga County Health and Human Services Dept. - Environmental Health, Cortland County Health Dept. - Division of Environmental Health, Schuyler County Public Health Agency, Seneca County Public Health Dept., Tioga County Dept. of Environmental Health, Tompkins County Dept. of Health - Division of Environmental Health, 1999.

Two major pathogens that have been associated with animal waste are cryptosporidium parvum, and giardia lamblia. No safe and effective form of specific treatment for cryptosporidiosis has been identified to date. The parasite is transmitted by ingestion of oocysts excreted in the feces of infected humans or animals. The infection can therefore be transmitted from person-to-person, through ingestion of contaminated water (drinking water and water used for recreational purposes) or food, from animal to person, or by contact with fecally contaminated environmental surfaces. Giardiasis is an illness caused Giardia lamblia, a one-celled, microscopic parasite that lives in the intestines of people and animals. During the past 15 years, Giardia lamblia has become recognized as one of the most common causes of waterborne disease in humans.

The largest public surface water systems in the watershed are located at the southern end of the lake. The City of Ithaca's water system has the largest retail population at 28,000 and produces nine million gallons per day on average. The Bolton Point Water System, which serves five municipalities, and Cornell University also use large amounts of surface water in the basin and are located at the southern end of the lake. The Village and Town of Seneca Falls have a public water system that uses water directly from Cayuga Lake to supply a retail population of 7,400. The villages of Cayuga and Aurora are the only other two public water supply systems in the watershed that use surface water. There are no public surface water systems in the Cortland, Schuyler, or Tioga county portions of the watershed. Table 2.7.1 displays the location of public systems that use surface water from Cayuga Lake along with the communities served, retail population, and production in gallons per day.

Scattered throughout the Cayuga Lake Watershed are state regulated freshwater wetlands. Over time, many have been drained, filled, and fragmented leaving those that remain in small isolated pockets. The most significant concentrations are in the northern tip as part of the Montezuma National Wildlife Refuge, the Red Creek Subwatershed in the Town of Varick, and at the southern end in the Town of Danby. The locations of regulatory freshwater wetlands within the watershed are presented in Map 2.12.11.

## 2.8 Groundwater Resources

Ground water is water which moves from the land surface, infiltrates the soil, and fills pore spaces in unconsolidated materials (gravel, sand, silt, or clay) and/or fractures in bedrock. An aquifer is a locally or regionally connected zone of unconsolidated deposits and/or bedrock fractures which easily yields water to springs or wells.

Many residents, businesses, and others within the watershed access groundwater supplies through wells. There are five primary types of wells: dug, drilled, bored, jetted, and driven. Drilled wells are the deepest reaching depths of 750 to 300 feet. The majority of systems using groundwater have a retail population of less than 1,000. The only groundwater systems with a retail population over 1,000 are municipal systems located in Union Springs, the Village of Dryden, and Trumansburg. Table 2.8.1 presents public groundwater systems in the watershed and their corresponding retail populations where applicable.

**Table 2.8.1. Public Groundwater Systems in the Cayuga Lake Watershed**

Name (Town)	Retail Population (persons unless otherwise noted)
<i>Cayuga County</i>	
Town of Genoa/King Ferry (Genoa)	800
Village of Union Springs (Springport)	2,000
<i>Cortland County</i>	
Elm Tree Golf Course (Virgil)	100
Trails End Campground (Virgil)	75
Virgil Elementary School (Virgil)	150
<i>Schuyler County</i>	
Blueberry Campground - seasonal (Hector)	25
Butternut Mobile Home Park (Hector)	21
Country Home Manor (Hector)	50
Potomac Campground - seasonal (Hector)	25
<i>Seneca County</i>	
Village of Interlaken (Covert)	644
<i>Tioga County</i>	
No Public Groundwater Systems	
<i>Tompkins County</i>	
17 Railroad (Dryden)	3 Businesses
A-1 Pizza (Dryden)	N/A
Annee T. Apartments (Dryden)	8 Apartments
Arrowbrook Farm (Dryden)	8 Apartments
B & B Mobile Home Park (Dryden)	7 Sites
Bailey Mobile Home Park (Danby)	14 Double Sites
Barangus Restaurant (Ulysses)	N/A
Beaconview Mobile Home Parks (Dryden)	44 Sites
Big Al's Get-N-Go (Dryden)	N/A
Boxwood Apartments (Newfield)	8 Apartments
Brook Woods Mobile Manor (Lansing)	20 Sites
Brookside Apartments (Ulysses)	8 Apartments
Brookside Mobile Home Park (Dryden)	4 Sites
Brookview Apartments (Dryden)	24 Apartments (50)
Buttermilk Apartments (Danby)	9 Apartments
Caroline Elementary School (Caroline)	N/A
Cayuga Nature Center (Ulysses)	100
Cecil's Restaurant (Lansing)	N/A
Cedar View Golf Course (Lansing)	49
Central NY Spiritualist Camp (Dryden)	20
Chef Yeppi Presents (Ithaca)	N/A
Clover Land Mobile Home Park (Newfield)	28 sites
CNG Transmission (Dryden)	4 Homes, 2 Community Buildings
Collegeview North (Enfield)	38 Sites
Common Ground Restaurant (Danby)	N/A
Congers Mobile Home Park (Dryden)	114 Sites
Corning Apartments (Dryden)	46 Apartments
Country Acres Mobile Home Park (Dryden)	102 Sites
Country Garden Apartments (Dryden)	20 Apartments
Country Garden Tea Room (Lansing)	N/A
Country Manor Estates Trailer Park (Dryden)	14 Sites (24)
Country Meadows Apartments (Dryden)	6 Apartments
Covenant Love Community School (Dryden)	N/A
Crooked Board Restaurant (Caroline)	N/A
Dalebrook Apartments (Caroline)	4 Apartments, 1 Post Office
Deerfield Apartments (Dryden)	6 Apartments

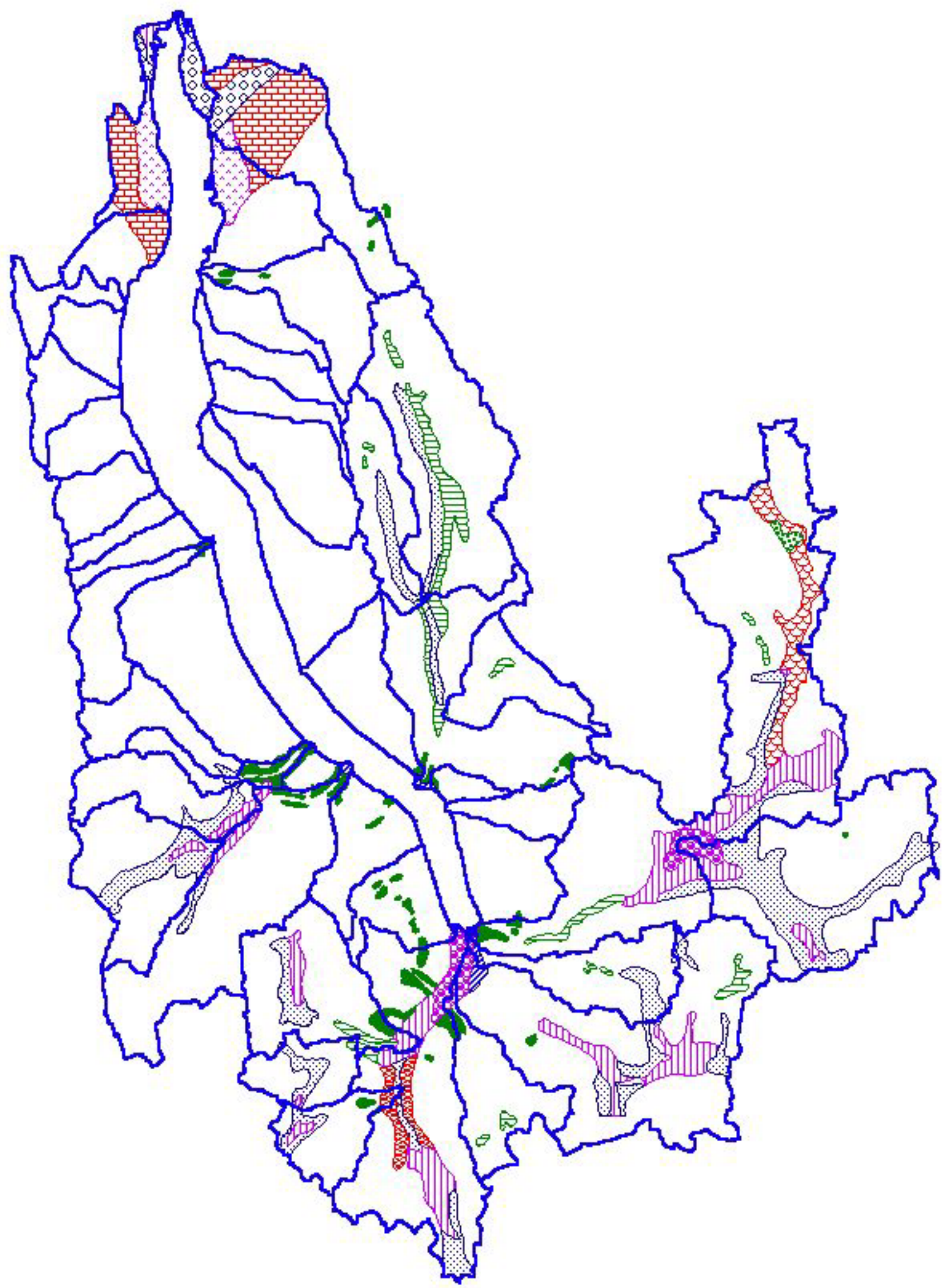
Deibler Apartments (Dryden)	8 Buildings
Depot Apartments (Caroline)	5 Apartments
Enfield Elementary School (Enfield)	N/A
Etna Mills Apartments (Dryden)	15 Apartments
Fall Creek Parke Mobile Home Park (Dryden)	38 Sites
Fallbrook Apartments (Groton)	8 Apartments
Fenner Apartments Mobile Home Park (Lansing)	8 Sites
Fountain Glow Apartments (Dryden)	8 Apartments
Fountain Manor Apartments (Caroline)	24 Apartments
Frazoni Apartments (Dryden)	6 Apartments
Freeville Elementary School (Dryden)	N/A
Garden Trailer Park (Enfield)	6 Sites
George Jr. Republic (Dryden)	N/A
German Cross Road Apartments (Dryden)	9 Apartments
Glenwood Apartments (Ulysses)	8 Apartments
Gray Haven Motel (Ithaca)	49
Green Acres Mobile Home Park (Caroline)	12 Sites
Groton Golf & Recreation (Groton)	N/A
H & E Machine (Danby)	80
Hayts Trailer Park (Enfield)	6 Sites
Hickory Stick Apartments (Ulysses)	7 Apartments
Hill and Dale Apartments (Dryden)	8 Apartments
Hillendale Golf Course (Enfield)	N/A
Hillside Apartments (Dryden)	12 Buildings
Hillview Terrace Mobile Home Park (Danby)	57 Sites
Holland Apartments (Dryden)	14 Apartments
Hovlan Apartments (Lansing)	14 Apartments
Iacovelli Apartments (Dryden)	14 Apartments
ISA Breeders (Ulysses)	30
Island Grove Apartments (Dryden)	11 Apartments
J & S Midline Mobile Home Park (Dryden)	7 Sites
Jacksonville Apartments (Ulysses)	8-9 Apartments (18)
J-A-M Mobile Home Park (Lansing)	5 Sites
Jeslen Court Mobile Home Park (Groton)	22 Sites (49)
Jewell Properties (Dryden)	6 Apartments
Jim's Mobile Home Park (Newfield)	16 Sites
Jim's Place (Caroline)	Convenience Store
Keith Lane (Dryden)	8 Apartments
Knapp Apartments (Caroline)	8 Apartments, 1 Single-family home
Kuma Restaurant (Enfield)	N/A
Lake Country Community Mobile Home Park (Dryden)	149 Sites
Lake Ridge Point (Lansing)	N/A
Lake Road Apartments (Dryden)	8 Apartments
Lakeview Golf Club (Dryden)	N/A
Lakeview Village Mobile Home Park (Lansing)	30 Sites
Lansing Shore Apartments (Lansing)	23 Apartments
Lansing Town Park (Lansing)	N/A
Lansingville Mobile Home Park (Lansing)	10 Sites
Lehigh Crossing Apartments (Dryden)	24 Apartments
Linda's Corner Diner (Lansing)	N/A
Little Creek Mobile Home Park (Dryden)	100 Sites
LIU Apartments (Dryden)	12 Apartments
Livery Restaurant (Caroline)	N/A
Longhouse Co-op (Ithaca)	10 Units
Mandeville Apartments (Dryden)	5 Apartments, 2 Cabins
Marion Apartments (Caroline)	8 Apartments
Marquis Apartments (Dryden)	17 Apartments
Matychak Apartments (Caroline)	6 Apartments
McLean Elementary School (Dryden)	N/A
Meadowbrook Park (Newfield)	240 Sites, 18 Apts.
Mott Road Mobile Home Park (Dryden)	24 Sites (45)
Mountain View Manor Mobile Home Park (Caroline)	17 Sites
Newfield Sunny's (Newfield)	4 Businesses
Norman Apartments (Enfield)	6 Apartments

Old 76 Club (Caroline)	N/A
Paradise Café (Ulysses)	N/A
Plantation Inn (Dryden)	N/A
Pleasant View Mobile Home Park (Dryden)	49 Sites
Ponderosa Apartments (Enfield)	5 Apartments
R. H. Treman Stae Park (Ithaca)	N/A
Rascal's Restaurant (Ulysses)	N/A
Red Barn Apartments (Caroline)	6 Apartments
Rendano Apartments (Lansing)	6 Apartments
Roman Village Restaurant (Groton)	N/A
Rose Inn (Lansing)	34
Sandy Creek Mobile Home Park (Enfield)	85 Sites
Seabring Inn (Newfield)	N/A
Shady Grove Mobile Home Park (Dryden)	18 Sites
Shagbark Apartments (Newfield)	8 Apartments
Shelter Valley Mobile Home Park (Dryden)	70 Sites
Siren's Restaurant (Groton)	N/A
Skyhook Apartments (Newfield)	24 Apartments
Special Childrens' Center (Ulysses)	N/A
Spruce Row Campsite (Ulysses)	N/A
Stoney Brook Apartments (Enfield)	14 Apartments
Sunrise Barn Apartments (Caroline)	5 Apartments
Sunset Townhouses (Enfield)	12 Apartments
Taughannock Falls State Park (Ulysses)	N/A
Teeter Trailer Park (Enfield)	6 Sites
Thorpe Apartments (Dryden)	5 Buildings
Town of Newfield	900
Tru Haven Apartments (Ulysses)	15 Apartments
Ulysses Square (Ulysses)	N/A
Unity House (Dryden)	10 Apartments
Upper Buttermilk Falls (Ithaca)	N/A
Valley Manor Mobile Home Park (Newfield)	186 Sites
Village of Dryden (Dryden)	2000
Village of Trumansburg (Ulysses)	2300
Ward's Trailer Park (Newfield)	70 Sites
Washington Heights Manufactured Home Park (Ulysses)	13 Sites
Werninck Apartments (Dryden)	10 Apartments
Werninck Subdivision (Dryden)	48
West Danby Water District (Danby)	264
White Apartments (Enfield)	8 Apartments
White Tail Crossing Cottages (Lansing)	4 Cottages
Willow Hill Mobile Court (Enfield)	16 Sites
Willowood Campground (Newfield)	N/A
Wonderland Motel (Ithaca)	80
Xtra Mart (Dryden)	N/A
	N/A = not applicable

Sources: Cayuga County Health and Human Services  
Dept. - Environmental Health, Cortland County Health  
Dept. - Division of Environmental Health, Schuyler County  
Public Health Agency, Seneca County Public Health  
Dept., Tioga County Dept. of Environmental Health,  
Tompkins County Dept. of Health - Division of  
Environmental Health, 1999.

# Cayuga Lake Watershed

## Maximum Yields to Individual Wells and Geologic Situations of Individual Aquifers



This map was prepared for the New York State Department of State with funding from the Environmental Protection Act. Additional funding was provided through the Empire State Development Corporation.

Source: United States Department of the Interior Geological Survey, 1974.  
Genesee/Finger Lakes Regional Planning Council, 1988.

Base Map: New York State Department of Transportation, February 1986.

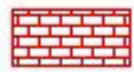
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Prepared by Genesee/Finger Lakes Regional Planning Council, 1988

# Cayuga Lake Watershed

## Maximum Yields to Individual Wells and Geologic Situations of Individual Aquifers



**<1 to 100**

Bedrock of moderate permeability overlain by till of low permeability



**1 to 10**

Bedrock of low permeability overlain by sand and gravel. Best yields are obtained by wells drilled into rock but draining the thin saturated zone in sand and gravel at top of rock



**1 to 150**

Bedrock of moderate permeability overlain by till or silt and clay



**100 to 500**

Bedrock of high permeability with thick saturated zone overlain by till, sand and gravel, or silt and clay



**<1 to 100**

Sand or sand and gravel interbedded with silt and clay or till. Thin, saturated layers of moderately permeable material occurring at random



**1 to 150**

Sand and gravel under water-table conditions but with thin saturated zone. May be necessary to drill into underlying bedrock to obtain adequate supply



**5 to 250**

Sand and gravel of moderate transmissibility under water-table conditions



**5 to 250**

Sand and gravel of moderate transmissibility under confined conditions, overlain by silt and clay



**100 to 500**

Sand and gravel of high transmissibility under water-table conditions



**100 to 500**

Sand and gravel of high transmissibility under confined conditions, overlain by silt and clay



**250 to >1,000**

Sand and gravel of high transmissibility under water-table conditions



**250 to >1,000**

Sand and gravel of very high transmissibility under confined conditions, overlain by silt and clay

*Prepared for the New York State Department of State with funding from the Environmental Protection Act. Additional funding was provided through the Empire State Development Corporation.*

*Source: United States Department of the Interior Geological Survey, 1974.*

*Prepared by Genesee/Finger Lakes Regional Planning Council, 1999.*

According to USGS (Miller) the unconsolidated aquifers in the Cayuga Lake watershed with the greatest potential yield are located in the Cayuga Inlet Valley and the Fall Creek Valley. These are confined sand and gravel aquifers overlain by less permeable materials -- silt, clay, or glacial till. Wells in these aquifers have the potential to yield from 5, to greater than 500 gallons per minute. A smaller, confined, valley-fill aquifer of lower yield potential lies southwest of the village of Trumansburg and is the back-up supply for the village.

Several small unconfined aquifers are found at the mouths of larger streams which enter Cayuga Lake and in the upper Salmon Creek valley. These aquifers have a potential yield of more than 100 gallons per minute. A few small unconfined aquifers lie northeast of Dryden and can yield between 10 and 100 gallons per minute. There are also several small kame terrace, outwash, or alluvial deposit unconfined aquifers adjacent to the large valley-fill aquifers and in the lower Salmon Creek valley. These aquifers yield generally less water than those described above, but can be enhanced if the aquifer is connected to surface water streams.

Elsewhere in the watershed, individual water supplies are generally from small unconsolidated deposits of varying yields or from bedrock. Bedrock aquifers in shale generally yield between 0.5 to 5 gallons per minute. Where limestone aquifers exist, these aquifers can yield from 10 to over 100 gallons per minute depending on whether karst development (natural widening of fractures) is present.

Natural water quality in the unconsolidated and bedrock aquifers vary by the aquifer source material, time of residence in the aquifer, and depth of the aquifer. Shallow aquifers generally yield softer water, but can be easily contaminated by land surface activities. Deeper aquifers generally have harder water, and can contain mineral salts and natural gas (methane and hydrogen sulfide). The potential for surface contamination in these aquifer is much less.

As with surface water, pollution from both point and non-point sources can contaminate groundwater making it unsafe for use by humans and animals. Because groundwater is stored in aquifers, water from precipitation and runoff can transmit pollutants into aquifers as it percolates through the pores of soils and sand and the cracks of bedrock eventually contaminating groundwater supplies. The chemical quality of groundwater is dependent on identifying and mitigating the effects of pollution, both from point and non-point surfaces. Those using groundwater from wells in agricultural areas need to be especially concerned with pesticide contamination through either accidental spills or improper disposal that allows pesticides to seep through soils or bedrock into drinking water supplies (USGS 1995).

According to a report published by the USGS (1975), calcium and sulfate concentrations were highest in the northern portion of the Oswego River Basin. In the southern portion of the watershed, high chloride concentrations were a problem, but only in deeper wells. High chloride concentrations in the northern end of the watershed were limited to the Seneca River and Barge Canal area near Mud lock. However, it should be noted that these characteristics may have changed given the age of the data.

## **2.9 Terrestrial Vegetation**

The Cayuga Lake watershed falls completely within the regional forest formation designated as the Allegheny Section of the Northern Appalachian Highland Division of the Hemlock-White Pine Northern Hardwood Region (Braun 1950). This Allegheny Section is a broad forest type that begins at the northern edge of the Finger Lakes and continues south, covering most of the northern half of Pennsylvania and the southern half of New York. The U.S. Forest Service maps this area as the White Pine-Hemlock-Hardwood Forest Section (Lull 1968).

The watershed is located at the interface between the northern hardwoods (north of the Cayuga Lake to Lake Ontario) and the Yellow poplar- Tulip tree assemblage extending to the south (Lull 1968). As a result of local variation in microclimate, the Cayuga Lake watershed contains tree species common to both forest types. For example, northern red oak (*Quercus borealis*) is the most widely distributed hardwood, but other oaks (*Quercus alba*), hickory (*Carya glabra*), and tulip trees (*Liriodendron tulipifera*) are present as well. In the northern or higher elevation areas, hardwoods typical of the beech-birch-maple region are common.

	% of County in	White/Red	Spruce/Fir	Loblolly / Shortleaf	Oak/Pine	Oak/Hickory	Oak/Gum/Cypress	Elm/Ash / Red Maple	Northern Hardwoods	Aspen/Birch	Total Acres	Adjusted
Cayuga & Seneca	33.0%	0	5	0	0	34.3	0	62.4	103.6	10.2	215.5	71.1
Cortland	3.0%	0	5.1	0	5	0	0	21.5	135.4	0	167	5.0
Schuyler	4.5%	5.4	5.1	0	5.1	21.6	0	0	69.9	11.4	118.5	5.3
Tioga	0.5%	32	4.9	0	0	20.9	0	0	121	5.3	184.1	0.9
Tompkins	59.0%	10.4	4.9	0	15.8	20.5	0	18.5	87	0	157.1	92.7

Source: Forest Statistics for New York: 1980-1993, USDA Forest Service, 1993

	% of County in			Sapling & Seedling	Non-Stocked	Total	Adjusted
	Watershed	Sawtimber	Poletimber				Total Acres
Cayuga & Seneca	33.0%	123.0	48.1	44.4	0.0	215.5	71.1
Cortland	3.0%	84.8	30.1	52.0	0.0	166.9	5.0
Schuyler	4.5%	59.4	42.4	16.8	0.0	118.6	5.3
Tioga	0.5%	90.9	66.7	26.6	0.0	184.2	0.9
Tompkins	59.0%	80.1	48.0	29.1	0.0	157.2	92.7

Source: Forest Statistics for New York: 1980-1993, USDA Forest Service, 1993.

Other vegetation maps of the area consider the lower elevation segments of the watershed, which tend to be found in the northern portion, as part of the Lake Ontario lake plain forest (dominant species include chestnut (*Castanea dentata*), oaks, hickories and tulip tree). In contrast, the higher elevation areas (which tend to be found in the southern region of the watershed) are considered part of a more southern assemblage (sugar maples (*Acer saccharum*), beech (*Fagus grandifolia*), yellow birch (*Betula lutea*), hemlock (*Tsuga canadensis*) and white pine (*Pinus Strobus*) (Bray, 1930). Stand composition varies greatly with site and land-use history. On cool slopes, particularly after the selective cutting of conifers, northern hardwoods prevail.

Historically, terrestrial vegetation was quite different particularly in the amount of forested land. Original survey records provide a description of the character of the regional forest in the 1790s: "More than 97 percent of the landscape [of the Central Finger Lakes Region] was forested. Beech/maple/basswood was the predominant forest type throughout the region" (Marks, Gardescu, and Seischab 1992: 1).

The 1790 survey documented disturbance by wind, fire, beavers, and people on less than one percent of the land area. Western portions of the Cayuga Lake watershed were recorded as dominated by linden (*Tilia americana*), maple (*Acer saccharum*), oak (*Quercus rubra*), and ash (*Fraxinus americana*). Closer to Cayuga Lake the oaks and hickories became more prevalent. On the eastern side of the watershed, an oak-hickory association was common. Progressing south, pine (*Pinus strobus*) and oak groups increased, and a few areas of hemlock (*Tsuga canadensis*) and beech (*Fagus americana*) were recorded.

The present vegetation of the watershed bears little resemblance to the original cover. The forest vegetation of the upland areas has been profoundly modified by lumbering and fire in the earlier periods, and by urbanization in more recent times. Remnants of original forest cover remain in only a few places, preserved in state and local parks and wildlife refuges. These remnants indicate that the forest of the 1940's and 1950's was a hemlock-hardwood woodland in which hemlock (*Tsuga canadensis*), American beech (*Fagus grandifolia*), and sugar maple (*Acer saccharum*) (in that order) were the most abundant in the canopy. American beech far

(in thousands of acres)									
	% of County in	Stand-Volume-Class (cubic feet per acre)							Adjusted total
	Watershed	0-499	500-999	1000-1499	1500-1599	2000-2499	2500+	Total	cubic feet/acre
Cayuga & Seneca	33.0%	60.20	16.90	41.20	50.00	10.40	36.90	215.60	71.1
Cortland	3.0%	56.20	22.80	12.20	18.00	43.60	14.10	166.90	5.0
Schuyler	4.5%	32.60	22.00	21.10	10.20	16.30	16.30	118.50	5.3
Tioga	0.5%	32.00	37.80	30.30	38.10	35.90	10.10	184.20	0.9
Tompkins	59.0%	29.10	22.90	44.10	15.20	25.90	20.10	157.30	92.8
Source: Forest Statistics for New York: 1980-1993, USDA Forest Service, 1993.									

outnumbered other species in the subdominant layer and was well represented in all size classes (Braun 1950). Other prevalent species were black cherry (*Prunus serotina*), black birch (*Betula lenta*), yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*) and white ash (*Fraxinus americana*). Tulip tree (*Liriodendron tulipifera*), cucumber magnolia (*Magnolia acuminata*), and basswood (*Tilia americana*) were also present. Herbaceous plants included spinulose wood fern (*Dryopteris spinulosa*), shining clubmoss (*Lycopodium lucidulum*), white wood sorrel (*Oxalis montana*), partridge berry (*Mitchella repens*), and Canada mayflower (*Maianthemum canadense*).

Presently, northward extensions of oak and oak-chestnut forests reach into New York State and are mainly established on gravelly soils in the valley head moraine belt south of the lake.

Diversity in topography and soils and the admixture of southern species give the watershed vegetation more variety than other areas typically mapped as this Hemlock-White Pine-Northern hardwoods region. The hemlock-beech and its variant, hemlock-beech red maple assemblages occupy the most mesic (average moisture conditions) habitat, while a more mixed type seems to be transitional between this and the hemlock-white oak (*Quercus alba*) white pine type of the warmer (southeast and southwest) slopes. The white pine-hemlock and hemlock-white pine-red maple (*Acer rubrum*) communities are developmental steps in which the large amount of white pine (which reproduces best in the open) is related to some site disturbance such as drought and fire (Braun, 1950).

The composition of the forest today can also be gauged through the countywide forest inventories by the US Forest Service. Forests of the northeastern and northwestern ends of the watershed in Cayuga and Seneca counties are made up of northern hardwoods including maple, beech and birch trees. The southern end of the lake, now mostly developed, was once filled with dense forests of northern hardwoods as well.

From the table it is apparent that Cayuga, Seneca, and Tompkins have the highest number of acres in forest. The total acres adjusted for the percentage of the county in the watershed is 175,000 acres. Based on the stand-size class of trees by county, the forests in the watershed are maturing and moving out of the early stages of succession. This has an impact on wildlife, particularly birds that inhabit the trees. The stand-size class for trees in counties in the watershed is provided above (Table 2.9.2)

While not an optimal measure of density, cubic-foot-stand-volume class can be used to compare the stocking or manner in which trees grow in an area against other areas. The areas of the watershed with the largest stand-volume class by county are located in the southern end of the watershed. A table of cubic-foot-stand-volume class is shown above (Table 2.9.3).

The highest average annual removals of growing stock trees in the watershed between 1979-1992 occurred in Tompkins County. During the same period, the highest number of removals as measured by board feet

occurred in Cortland County. Schuyler County had the lowest number of removals as determined by both measures. While Cayuga and Seneca Counties had the largest quantity of trees in the watershed, these counties combined had the lowest number of removals. Displayed below (Table 2.9.4) are the average annual removals as measured by cubic feet growing stock and board feet of sawtimber. Total adjusted board feet of lumber removed in 6,448.

**Table 2.9.4 Average Annual Removals of Growing-Stock and Sawtimber Volume on Timberland by County, Geographic Unit, and Species Group, 1993**

		(in thousands of feet)						Adjusted
		Growing-Stock			Sawtimber			
	% of County in	(cubic feet)		(board feet)		Adjusted		
	Watershed	Softwoods	Hardwoods	All Groups	Softwoods	Hardwoods	All Groups	Board feet
Cayuga & Seneca	33.0%	37	651	688	189	2943	3132	1033.6
Cortland	3.0%	74	2452	2526	205	9616	9821	294.6
Schuyler	4.5%	0	261	261	0	1028	1028	46.3
Tioga	0.5%	147	2147	2294	360	6285	6645	33.2
Tompkins	59.0%	175	2396	2571	113	8431	8544	5041.0

Source: Forest Statistics for New York: 1980-1993, USDA Forest Service, 1993.

Large cattail (*Typha latifolia*) and iris (*Iris* sp.) marshes, and elm-silver maple swamps have developed in northern portions of the glacially filled valleys, notably in Montezuma Wildlife Refuge which is owned by the U.S. Fish and Wildlife Service. These vegetative communities are extensions of the vegetation association of the adjacent lake plain. Large wetland areas on the southern end of the lake existed in the past but have been filled for urban uses or parks.

Bogs occur frequently on the glaciated Allegheny Plateau. Black spruce (*Picea mariana*), tamarack (*Larix laricina*), and balsam fir (*Abies balsamea*) are constituents of the forest in this area. White pine, hemlock, red maple and sour gum (*Nyssa sylvatica*) may occupy the bog borders. *Chamaedaphne*, *Ledum*, and *Nemophanthus* are common bog shrubs. Species of *Vaccinium*, *Viburnum*, *Spiraea* are often present in the bog border.

A unique quaking bog, Junius Bog, is located near Mays Point in the Montezuma National Wildlife Refuge (NWR). This quaking bog, approximately 25 to 35 acres in size, is intermediate between a bog and a fen, with a number of plants representative of both. The bog waters have thick marl deposits (Johnson, 1985). Another example of a unique wetland within the Cayuga Lake watershed is Ringwood Bog near Freeville. The small 20-acre acidic bog (which is owned by Cornell University) is unusual since regional bog waters are typically neutral to basic pH, reflecting the underlying calcareous bedrock. Ringwood Bog has typical northern bog plants, such as sphagnum mosses, leatherleaf, black spruce, and some highbush blueberry (*Vaccinium corymbosum*).

The NYSDEC, Division of Fish, Wildlife and Marine Resources, Wildlife Resources Center, New York Natural Heritage Program has two listings for rare and endangered species in the watershed. They are existing occurrences and species known only from historical records. For terrestrial vegetation in the watershed 23 species are listed as rare, 3 species is listed as exploitably vulnerable, 12 species are listed as threatened, and 10 species are listed as endangered (NYSDEC, 1999). Based on the Users Guide to NY Natural Heritage Data, the data provided in the report (NYSDEC, 1999) is ecologically sensitive and should be treated in a sensitive manner. The report should not be released, distributed or incorporated in a public document. For additional information on rare and endangered species in the Cayuga Lake Watershed contact the NYSDEC, Division of Fish, Wildlife and Marine Resources, Wildlife Resources Center, New York Natural Heritage Program.

Table 2.10.1 1997 Deer Take by Town and City for Municipalities in the Cayuga Lake Watershed, 1997.					
		Buck Take	Total Take		
		Buck Take	Total Take		
<i>Cayuga County</i>			<i>Seneca County</i>		
Town of Aurelius	46	95	Town of Covert	110	162
Town of Fleming	35	70	Town of Fayette	94	186
Town of Genoa	100	204	Town of Lodi	129	224
Towne of Ledyard	111	268	Town of Ovid	94	176
Town of Locke	74	162	Town of Romulus	113	268
Town of Scipio	76	135	Town of Seneca Falls	66	116
Town of Sempronious	56	98	Town of Varick	32	80
Town of Springport	73	124	Seneca County Total	638	1212
Town of Summerhill	48	111	<i>Tioga County</i>		
Town of Venice	74	140	Town of Spencer	245	458
Cayuga County Total	693	1407	Tioga County Total	245	458
<i>Cortland County</i>			<i>Tompkins County</i>		
Town of Cortlandville	139	196	Town of Caroline	244	483
Town of Harford	60	78	Town of Danby	285	540
Town of Homer	145	227	Town of dryden	336	643
Town of Scott	54	110	Town of Enfield	161	272
Town of Virgil	135	142	Town of Groton	119	340
Cortland County Total	533	753	City of Ithaca	178	303
<i>Schuyler County</i>			Town of Ithaca	1	1
Town of Catharine	158	292	Town of Lansing	180	408
Town of Hector	415	711	Town of Newfield	349	598
Schuyler County Total	573	1003	Town of Ulysses	142	228
			Tompkins County Total	1995	3816

Source: NYSDEC, Division of Fish, Wildlife, & Marine Resources, March 1998.

## 2.10 Wildlife

The Cayuga Lake Watershed contains a number of diverse habitats that support a wide array of wildlife. Forests and wetlands throughout the watershed, as well as agricultural lands and transitional areas, provide dwelling and feeding areas for various species of mammals, birds, reptiles and amphibians.

Based on the division of New York State into ecozones, nearly the entire Cayuga Lake Watershed is within the Erie-Ontario Plain. The ecozones are determined by major physiographic differences to provide a breakdown for the proper management of wildlife habitats by area. The land forms and local relief as they affect soils, climate, and vegetation determine the habitats contained in the ecozone and thus determine the species of wildlife that will reside in that ecozone.

The Montezuma National Wildlife Refuge at the northern end of the watershed encompassed approximately 36,000 acres and provides habitats for a number of species. The refuge's primary purpose is to provide habitats for waterfowl, migratory birds, and endangered species. In addition, nearly 75% of the refuge is classified as wetland, adding to the diversity of wildlife already present in the watershed.

The NYSDEC, Division of Fish, Wildlife and Marine Resources, Wildlife Resources Center, New York Natural Heritage Program has two listings for rare and endangered species in the watershed. They are existing occurrences and species known only from historical records. For wildlife in the watershed 2 species are listed as threatened, and 1 species is listed as endangered, and 5 species are listed as protected (NYSDEC, 1999). Based on the Users Guide to NY Natural Heritage Data, the data provided in the report (NYSDEC, 1999) is ecologically sensitive and should be treated in a sensitive manner. The report should not be released, distributed or incorporated in a public document. For additional information on rare and endangered species in the Cayuga Lake Watershed contact the NYSDEC, Division of Fish, Wildlife and Marine Resources, Wildlife Resources Center, New York Natural Heritage Program.

Table 2.10.2

<b>Mammals that Inhabit the Cayuga Lake Watershed</b>	
Virginia Opossum	Red Fox
Masked Shrew	Gray Fox
Smoky Shrew	Bobcat
Pygmy Shrew	Woodchuck
Least Shrew	Eastern Chipmunk
Shorttail Shrew	Gray Squirrel
Star-nosed Mole	Red Squirrel
Hairytail Mole	Southern Flying Squirrel
Little Brown Myotis	Northern Flying Squirrel
Keen Myotis	Beaver
Indiana Myotis	Deer Mouse
Small-footed Myotis	White-footed Mouse
Silver-haired Bat	Southern Bog Lemming
Eastern Pipistrelle	Boreal Red-backed Vole
Big Brown Bat	Meadow Vole
Red Bat	Pine Vole
Hoary Bat	Muskrat
Raccoon	Meadow Jumping Mouse
Shorttail Weasel	Woodland Jumping Mouse
Longtail Weasel	Porcupine
Mink	Snowshoe Hare
River Otter	Eastern Cottontail
Striped Skunk	White-tailed Deer
Coyote	Water Shrew
Redback Vole	Norway Rat
Ermine	Least Weasel

Source: *Integrating Forest Management Wildlife*, R.E. Chambers, School of Environmental Science & Forestry, Syracuse, NY.

Small game species present in the watershed include deer, coyote, opossum, rabbit, squirrel, hare, raccoon, red and gray fox, grouse, pheasant, woodcock, ducks, and geese. The reported deer takes in towns in the watershed and the City of Ithaca in 1997 are provided in Table 4.10.1.

An inventory of the mammals, breeding birds, reptiles and amphibians that inhabit the forested riparian habitats of the Erie-Ontario Plain and the wetlands of the Montezuma NWR are provided in the Tables 4.10.2-5.

Table 2.10.3

<b>Reptiles that Inhabit the Cayuga Lake Watershed</b>	
Common Snapping Turtle	Northern Brown Snake
Stinkpot	Northern Redbelly Snake
Spotted Turtle	Eastern Garter Snake
Bog Turtle	Eastern Ribbon Snake
Wood Turtle	Northern Ringneck Snake
Map Turtle	Eastern Smooth Green Snake
Eastern Painted Turtle	Black Rat Snake
Eastern Spiny Softshell	Eastern Milk Snake
Coal Slink	Eastern Massasauga
Northern Water Snake	Timber Rattlesnake
Snapping Turtle	Northern Black Racer
Red-Bellied Racer	Smooth Green Snake

Source: *Integrating Forest Management Wildlife*, R.E. Chambers, School of Environmental Science & Forestry, Syracuse, NY.

Table 2.10.4

<b>Amphibians that Inhabit the Cayuga Lake Watershed</b>	
Mudpuppy	Northern Spring Salamander
Jefferson Salamander	Northern Two-lined Salamander
Blue-Spotted Salamander	American Toad
Spotted Salamander	Northern Spring Peeper
Red-Spotted Newt	Gray Treefrog
Northern Dusky Salamander	Western Chorus Frog
Mountain Dusky Salamander	Bullfrog
Redback Salamander	Green Frog
Slimy Salamander	Wood Frog
Four-toed Salamander	Northern Leopard Frog
Pickerel Frog	Red-Backed Salamander
Spring Salamander	Spring Peeper

Source: *Integrating Forest Management Wildlife*, R.E. Chambers, School of Environmental Science & Forestry, Syracuse, NY.

Table 2.10.5

Birds Known to Inhabit or Frequent the Cayuga Lake Watershed by Abundance and Seasonal Occurrence			
Acadian Flycatcher* (RS)	Black-crowned Night Heron* (FM,FS)	Common Black-headed Gull (Acl)	Forster's Tern (RM)
Alder Flycatcher* (FM,FS)	Black-legged Kittiwake (Acl)	Common Eider (Acl)	Fox Sparrow (FM,RW)
American Avocet (RM)	Blackpoll Warbler (FM)	Common Flicker	Franklin's Gull (Acl)
American Bittern* (UM,US)	Black-throated Blue Warbler* (FM,US)	Common Goldeneye (FM,FW)	Fulvous Whistling Duck (Acl)
American Black Duck* (AM,US)	Black-throated Gray Warbler (Acl)	Common Grackle* (AM,CS,UW)	Gadwall* (FM,US,RW)
American Coot* (AM,CP)	Black-throated Green Warbler* (FM,US)	Common Loon (CM,US,UW)	Glaucous Gull (UW)
American Crow* (AP)	Blue Grosbeak (Acl)	Common Merganser* (FM,RS,UW)	Glossy Ibis (RM)
American Goldfinch* (CM,CS,FW)	Blue Jay* (AP)	Common Moorhen* (US)	Golden Eagle (RM)
American Kestrel* (CP)	Blue-gray Gnatcatcher* (FM,FS)	Common Nighthawk* (UM,US)	Golden-crowned Kinglet* (FM,US,FW)
American Redstart* (CM,FS)	Blue-winged Teal* (FM,FS)	Common Raven (UP)	Golden-winged Warbler* (UM,RS)
American Robin* (AM,CS,UW)	Blue-winged Warbler* (FM,FS)	Common Redpoll (IW)	Grasshopper Sparrow* (UM,US)
American Swallow-tailed Kite (Acl)	Bobolink* (FM,FS)	Common Screech Owl	Gray Catbird* (CM,CS,RW)
American Tree Sparrow (FW)	Bohemian Waxwing (RW)	Common Snipe* (FM,US,RW)	Gray Jay (Acl)
American White Pelican (RM)	Bonaparte's Gull (FM)	Common Tern* (UM,US)	Gray Kingbird (Acl)
American Wigeon* (CM,RS,RW)	Boreal Chickadee (RW)	Common Yellowthroat* (CM,CS,RW)	Gray Partridge* (Introduced P)
American Woodcock* (FM,US,RW)	Brant (UM)	Connecticut Warbler (UM)	Gray-cheeked Thrush (UM)
Arctic Tern (Acl)	Broad-winged Hawk* (FM,US)	Cooper's Hawk (UM,UP)	Great Black-backed Gull (RS,UW)
Audubon's Warbler (Acl)	Brown Creeper* (FP)	Curlew Sandpiper (Acl)	Great Blue Heron* (CM,CS,RW)
Baird's Sandpiper (UM)	Brown Thrasher* (FM,FS)	Dark-eyed Junco* (CM,US,RW)	Great Crested Flycatcher* (FM,FS)
Bald Eagle* (UM,US,RW)	Brown-headed Cowbird* (AM,CS,UW)	Dickcissel (RM,RS,RW)	Great Egret (US)
Bank Swallow* (FM,US)	Buff-breasted Sandpiper (RM)	Double-crested Cormorant (FM,FS)	Great Horned Owl (CP)
Barn Swallow* (AM,CS)	Bufflehead (FM,FW)	Dovekie (Acl)	Greater Scaup (CM,CW)
Barred Owl* (UP)	Canada Goose* (AM,CP)	Downy Woodpecker* (CP)	Greater White-fronted Goose (RM)
Barrow's Goldeneye (RW)	Canada Warbler* (FM,US)	Dunlin (CM)	Greater Yellowlegs (FM)
Bay-breasted Warbler (FM)	Canvasback* (FM,RS,RW)	Eared Grebe (Acl)	Green-backed Heron* (CM,CS)
Belted Kingfisher* (CS,UW)	Cape May Warbler (FM)	Eastern Bluebird* (FM,FS,UW)	Green-tailed Towhee (Acl)
Black Rail (Acl)	Carolina Wren* (FP)	Eastern Kingbird* (CM,CS)	Green-winged Teal* (FM,RS)
Black Scoter (RM)	Caspian Tern (UM)	Eastern Meadowlark* (FM,FS)	Gyr Falcon (Acl)
Black Tern* (UM,RS)	Cattle Egret (UM,US)	Eastern Phoebe* (CM,CS,RW)	Hairy Woodpecker* (FP)
Black Vulture (Acl)	Cedar Waxwing* (CP)	Eastern Screech-Owl (UP)	Harlequin Duck (Acl)
Black-and-white Warbler* (FM,US)	Cerulean Warbler* (UM,US)	Eastern Wood-Pewee* (CM,CS)	Harris' Sparrow (RW)
Black-backed Woodpecker (RW)	Chestnut-sided Warbler* (FM,FS)	Eurasian Wigeon (RM)	Henslow's Sparrow* (UM,US)
Black-bellied Plover (FM)	Chimney Swift* (CM,CS)	European Starling* (AP)	Herald Petrel (Acl)
Black-billed Cuckoo* (US)	Chipping Sparrow* (CM,CS,RW)	European Goldfinch (Acl)	Hermit Thrush* (FM,US,RW)
Black-billed Magpie (Acl)	Cinnamon Teal (Acl)	Evening Grosbeak* (RS,IW)	Herring Gull (UW)
Blackburnian Warbler* (FM,US)	Clay-colored Sparrow (RS)	Field Sparrow* (CM,CS,RW)	Hoary Redpoll (Acl)
Black-capped Chickadee* (AP)	Cliff Swallow* (UM,US)	Fish Crow* (UP)	Hooded Merganser* (FM,US,UW)
Black-capped Petrel (Acl)	Common Barn-Owl* (RS)	Fork-tailed Flycatcher (Acl)	Hooded Warbler* (US)
Horned Grebe (CM,FW)	Mourning Dove* (FP)	Pine Grosbeak (IW)	Ruff (RM)
Horned Lark* (CM,US,FW)	Mourning Warbler* (UM,US)	Pine Siskin* (RS,IW)	Ruffed Grouse* (FP)
House Finch* (AP)	Mute Swan (Introduced P)	Pine Warbler* (UM,US)	Rufous-sided Towhee* (FM,FS,RW)
House Sparrow* (AP)	Myrtle Warbler* (CM,RS,RW)	Piping Plover (Acl)	Rusty Blackbird (FM,RW)
House Wren* (CS)	Nashville Warbler* (FM,US)	Prairie Warbler* (UM,US)	Sabine's Gull (Acl)
Hudsonian Godwit (RM)	Northern Goshawk* (UM,RS)	Prothonotary Warbler* (UM,US)	Sanderling (UM)
Iceland Gull (UW)	Northern Bobwhite* (RP)	Purple Finch* (FM,US,UW)	Sandhill Crane (RM)
Indigo Bunting* (FM,FS)	Northern Cardinal* (CP)	Purple Gallinule (Acl)	Savannah Sparrow* (FM,FS,RW)
Kentucky Warbler* (RM,RS)	Northern Flicker* (CM,CS,RW)	Purple Martin* (UM,US)	Saw-Whet Owl
Killdeer* (CM,CS,RW)	Northern Gannet (Acl)	Purple Sandpiper (Acl)	Say's Phoebe (Acl)
King Eider (RW)	Northern Goshawk	Razorbill (Acl)	Scarlet Tanager* (CM,CS)
King Rail* (RS,RW)	Northern Harrier* (FM,US,UW)	Red Crossbill* (RS,IW)	Sedge Wren* (US)
Lapland Longspur (UW)	Northern Hawk-Owl (Acl)	Red Knot (UM)	Semipalmated Plover (FM)
Lark Bunting (Acl)	Northern Mockingbird* (FP)	Red Phalarope (RM)	Semipalmated Sandpiper (CM)
Lark Sparrow (Acl)	Northern Oriole* (CM,CS,RW)	Red-bellied Woodpecker* (FP)	Sharp-skinned Hawk* (FM,FP)
Laughing Gull (Acl)	Northern Parula* (FM,US)	Red-breasted Merganser (FM,RW)	Sharp-tailed Sparrow (RM)
Least Bittern* (UM,US)	Northern Pintail* (FM,RS,RW)	Red-breasted Nuthatch* (UP)	Short-billed Dowitcher (FM)
Least Flycatcher* (FM,FS)	Northern Rough-winged Swallow* (FM,FS)	Red-eyed Vireo* (CM,CS)	Short-eared Owl* (IW)
Least Sandpiper (CM)	Northern Saw-whet Owl* (UP)	Redhead* (CM,US,RW)	Slate-colored Junco* (FM,US,CW)
Least Tern (Acl)	Northern Shoveler* (CM,US)	Red-headed Woodpecker* (US,RW)	Snow Bunting (IW)
LeConte's Sparrow (Acl)	Northern Shrike (UW)	Red-necked Grebe (UM,UW)	Snow Goose (AM)
Lesser Black-backed Gull (RS,UW)	Northern Waterthrush* (FM,FS)	Red-necked Phalarope (UM)	Snowy Egret (US)
Lesser Golden-Plover (UM)	Northern Wheater (Acl)	Red-shouldered Hawk* (UM,US,RW)	Snowy Owl (IW)
Lesser Scaup (FM,RW)	Oldsquaw (UM,UW)	Red-tailed Hawk (CM,CS,FW)	Solitary Sandpiper (UM)
Lesser Yellowlegs (FM)	Olive-sided Flycatcher (UM)	Red-throated Loon (UM)	Solitary Vireo* (UM,US)
Lincoln's Sparrow (UM)	Orange-crowned Warbler (UM)	Red-winged Blackbird* (AM,AS,RW)	Song Sparrow* (CM,CS,UW)
Little Blue Heron (RS)	Orchard Oriole* (US)	Ring-billed Gull* (AM,AP)	Sora* (FM,FS)
Little Gull (Acl)	Oregon Junco (Acl)	Ring-necked Duck (FM,RW)	Spotted Sandpiper* (CM,FS)
Loggerhead Shrike* (RS)	Osprey* (FM,US)	Ring-necked Pheasant* (CP)	Stilt Sandpiper (UM)
Long-billed Dowitcher (UM)	Ovenbird* (CM,CS)	Rock Dove* (AP)	Summer Tanager (Acl)
Long-eared Owl* (UP)	Palm Warbler (FM)	Rose-breasted Grosbeak* (FM,CS,RW)	Surf Scoter (UM)
Long-tailed Jaeger (Acl)	Parasitic Jaeger (Acl)	Ross' Goose (Acl)	Swainson's Thrush* (UM)
Louisiana Waterthrush* (UM,CS)	Passenger Pigeon* (Extinct)	Rough-legged Hawk (TW)	Swamp Sparrow* (FM,FS,RW)
Magnolia Warbler* (FM,US)	Pectoral Sandpiper (CM)	Rough-winged Swallow	Tennessee Warbler (FM)
Mallard* (AM, AP)	Peregrine Falcon* (UM)	Ruby-crowned Kinglet (FM,RW)	Thick-billed Murre (Acl)
Marbled Godwit (Acl)	Philadelphia Vireo (UM)	Ruby-throated Hummingbird* (FM,US)	Three-toed Woodpecker (Acl)
Marsh Wren* (UM,FS)	Pied-billed Grebe* (FM,CS,UW)	Ruddy Duck* (UM,RS,RW)	Tree Swallow* (AM,CS,RW)
Merlin (UM)	Pileated Woodpecker* (FP)	Ruddy Turnstone (UM)	Tricolored Heron (US)
Tufted Titmouse* (CP)	Western Kingbird (Acl)	White-winged Crossbill (RS,IW)	Worm-eating Warbler (RS)
Tundra Swan (UM,RW)	Western Meadowlark (Acl)	White-winged Scoter (UM)	Yellow Rail (Acl)
Turkey Vulture* (UM,US)	Western Sandpiper (UM)	Wild Turkey* (FP)	Yellow Warbler* (CM,CS)
Upland Sandpiper* (RM,US)	Western Tanager (Acl)	Willet (RM)	Yellow-bellied Flycatcher (UM)
Varied Thrush (Acl)	Whimbrel (RM)	Willow Flycatcher* (FM,FS)	Yellow-bellied Sapsucker* (FM,US,RW)
Veery* (CM,FS)	Whip-poor-will (UM,RS)	Wilson's Phalarope (UM)	Yellow-billed Cuckoo* (US)
Vesper Sparrow* (FM,US)	White-breasted Nuthatch* (CP)	Wilson's Warbler (FM)	Yellow-breasted Chat* (RS)
Virginia Rail* (FM,FS,UW)	White-crowned Sparrow (CM,RW)	Winter Wren* (UM,US,RW)	Yellow-crowned Night Heron (RM)
Warbling Vireo* (FM,FS)	White-eyed Vireo (RM,RS,Acl,W)	Wood Duck* (FM,FS,RW)	Yellow-headed Blackbird (Acl)
Water Pipit (UM)	White-rumped Sandpiper (UM)	Wood Stork (Acl)	Yellow-rumped Warbler* (UM,US,RW)
Western Grebe (Acl)	White-throated Sparrow* (CM,RS,UW)	Wood Thrush* (CM,CS)	Yellow-throated Vireo* (UM,US)
			Yellow-throated Warbler (RS,Acl,W)

Key: \* = Indicates at least one breeding record since 1890

Abundance: A = Abundant (seen every year), C = Common (seen every time), F = Fairly Common (usually seen), U = Uncommon (not seen every time, few individuals)

R = Rare (not seen every year, usually one individual), I = Invasion or Irruptive Species (wide yearly variation), Acl = Accidental (fewer than five records since 1950)

Seasonal Occurrence: P = Present all year, M = Migrant (spring and fall), S = Summer, W = Winter,

Introduced = Status uncertain or requiring periodic releases to maintain the population

Source: *Birds of the Cayuga Lake Basin, New York Annotated Check-List*, Dorothy W. Mellroy & Charles R. Smith, January 1992. Courtesy of Tompkins County Department of Planning and Integrating Forest Management Wildlife, R.E. Chambers, School of Environmental Science & Forestry, Syracuse, NY.

## 2.11 Fish Community

The Cayuga Lake food web includes two interrelated assemblages of species, one in the shallow (littoral) zone and the second in the deep water (pelagic and profundal) zone. The littoral zone is limited to the northern and southern lake basins and a narrow fringe along the lake margins where light reaches the bottom. Approximately 25% of the lake surface area overlies depths of 20 ft. or less.

Most of the littoral zone is located in the northern basin, which is home to a warmwater fish community dominated by smallmouth bass. Other important predator fish in the littoral community include largemouth bass and northern pike. These species prey on yellow perch, pumpkinseeds, bluegills, rock bass, and minnows. Southern Cayuga Lake supports a spawning population of white suckers.

The deep water community is dominated by lake trout, rainbow trout, brown trout, and landlocked salmon as the top predators. Of these salmonids, only the lake trout is native to Cayuga Lake. Populations of the salmonids are maintained (or, in the case of rainbows, supplemented) by stocking. Juvenile salmonids prey on zooplankton, including *Mysis relicta*. Chiotti (1980) considers the quantity of this zooplankton to be the limiting factor for the growth and survival of stocked juvenile lake trout, Cayuga Lake's most important sport fishery. Older fish prey mainly on other fish; the alewife is the predominant forage species. Other prey species include rainbow smelt, troutperch, and slimy sculpin.

Youngs and Ogelsby (1972) reported that the food web supporting the deep water community is relatively short: phytoplankton, zooplankton, alewife, and fish. A second energy pathway culminating with smelt begins with organic detritus, which is consumed by *Mysis relicta*, then by smelt. These generalized food webs do not reflect changes in food preferences with life stage and size.

Distribution of fish reflects thermal preferences, predator-prey relationships, and predictable migrations for spawning. Similar to feeding relationships, distribution is variable with life stage and season. The fish community is discussed in greater detail in Chapter 4. Limnology.