Part II

Table 5 **New York State Water Resources Information**	
State Population, 2000 (estimate)	18,196,600 persons
State Surface Area	49,576 square miles
Surface Water Information[1]	
Rivers and Streams, total miles	88,020 miles
Lakes/Reservoirs/Ponds, total number	7,849
Lakes/Reservoirs/Ponds, acres	687,672 acres
Bays/Estuaries/Harbors, square miles	1,530 square miles
Great Lakes Shoreline, shore miles	577 miles
Ocean Coastline, shore miles	120 miles
Freshwater Wetlands, acres	2,400,000 acres
Tidal Wetlands, acres	25,000 acres
Groundwater Resources Information	
Long Island Aquifers - underlie about 3% of New York State land area and serve more than 3 million people.	
Primary Aquifers (Upstate) - eighteen (18) aquifers underlie about 4% of the state and serve 800,000 people.	
Principal Aquifers - highly productive aquifers, but not presently intensively used, underlie 11.2% of the state.	
Precipitation	
Average Annual Precipitation	40 inches (90 bgd)
Amount lost to evapotranspiration	~45 bgd
Runoff into surface waters	27-31 bgd
Amount into groundwater supply	14-18 bgd

[1]Derived from National Hydrography Dataset, 1:24,000 (USGS, 2007)

Nearly 17 billion gallons each day are withdrawn from the surface and groundwaters of New York State for various uses. More than 60% of that total is fresh water. (Almost all of the 6.5 billion gallons of saline water are used primarily for thermoelectric power generation.) Surface water withdrawals account for nearly 90% of all freshwater withdrawals in New York State, the remaining 10% being groundwater withdrawals.

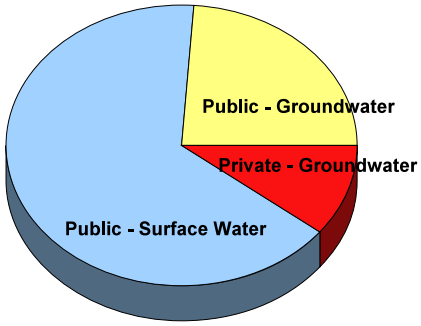
Domestic water uses (including normal household uses such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets and watering lawns and gardens) represent about 20% of all freshwater withdrawals in the state. Seventy-eight percent of the domestic water supply in the state is taken from surface waters, while groundwater provides the rest.

Community supply systems throughout the state withdraw, treat and distribute water for domestic, municipal, commercial and some industrial uses. In New York, more than 3,200 community water supply systems serve almost 90% of the state population. The largest 10% of these systems supply water to more than 95% of New York State residents in the larger urban and suburban areas. This includes the majority of New York City residents, whose 1.5 billion gallon per day water supply is drawn from a series of reservoirs upstate in Delaware, Sullivan, Schoharie, Greene and Ulster counties. The vast majority of the community systems in the state, however, are rather small with each serving on average only a few hundred people. People not served by community systems are self-supplied; virtually all withdraw water from their own wells. In all, approximately one third of New York State's population depends on groundwater, including much of the population of Long Island.

Public Water Supplies

State Population (1995):	18,136,000
Public Water Supply Systems:	> 3,200
People Served by Systems:	16,200,000
New York State Population Supplied by:	
Surface Water:	11,900,000
Groundwater:	4,350,000

NYS Population Served by



In addition to these consumptive uses, the water resources of New York State also support numerous and exceptional recreational activities for state residents and tourists alike. Swimming, fishing and boating opportunities abound throughout the state. More than 100 state parks and forests – including the six-million acre Adirondack Park and 650,000 acre Catskill Park and Forest Preserves – feature some form of water recreation. The state offers a variety of public beaches, from the sandy shores of the Atlantic Ocean and Long Island Sound, to the clear, cool lakes of the Adirondacks, scenic beauty of the Finger Lakes area, or majesty of the Great Lakes. Boating on the extensive Erie Barge Canal System, and canoeing or rafting outings through forested wilderness areas are also popular outdoor pastimes.

Part III

Water Quality Monitoring and Assessment

Chapter 1 - Water Quality Monitoring

Statewide Waters Monitoring Program

The NYSDEC Statewide Ambient Water Quality Monitoring program (SWMP), which includes monitoring of surface waters and groundwater, uses a rotating strategy in which all major drainage basins in the state are monitored over a five year period. Component programs include the Rotating Integrated Basin Studies program (RIBS) for rivers and streams, the Lake Classification and Inventory (LCI), the Citizens' Statewide Lake Assessment Program (CSLAP), and the statewide groundwater monitoring program, which is conducted in cooperation with the US Geological Survey. The Stream Biomonitoring and Toxicity Testing Programs, in addition to providing biological components to the surface water program, conduct other monitoring that is reported separately as well as being incorporated into basin assessments. SWMP represents the continuation of the state water quality monitoring program that was established in the 1960s.

Objectives of the Statewide Ambient Water Quality Monitoring Program are:

- Monitoring of all the State's waters to provide data for the Waterbody Inventory, and as required by EPA for the 305(b) report, including identification of reference condition (documentation of good quality waters)
- Identification and analysis of temporal and spatial water quality trends
- Characterization of naturally occurring or background conditions
- Establishment of baseline conditions and overall resource condition for measuring the effectiveness of site-specific restoration and protection activities
- Identification of waters in need of restoration; evaluation of causes and sources of impairments to designated uses (drinking water supply, shellfishing, public bathing, recreation, fish consumption, aquatic life, habitat/hydrology)
- Collection of data useful for prediction of future conditions, for TMDL and model development

Program data are used in the compilation and development of the Division Waterbody Inventory/Priority Waterbodies List, the database of water quality assessments and impairments across the state; the New York State 305(b) Water Quality Report, a report to Congress on the quality of water resources in the state; intensive water quality surveys and reports; Total Maximum Daily Loads (TMDL) and water quality-based SPDES permit limits; and data and information delivered to the public, academia, local and county authorities, other state agencies, and watershed basin commissions.

Monitoring Design

The lake, river/stream, and groundwater programs operate on a rotating basin schedule (Figure 3; Table 2). Each year, monitoring is initiated in 2-3 of the state's 17 major drainage basins, resulting in one cycle of monitoring and assessment in each of the major basins of the state over a period of 5 years. Monitoring is conducted over a two year period and activities differ in each of the two years, in order to meet the different

program objectives identified above. Prior to the first year of sampling, a meeting is held in each basin, in order to gather information about general water quality issues in the watershed, and to receive comment on the draft site list of rivers, streams, lakes, ponds, and reservoirs that has been developed by DEC. These kick-off meetings are attended by DEC regional Water and Fisheries staff and the interested public, including Soil and Water Conservation District and Water Quality Coordinating Committee personnel.

Year One: Screening Sampling in Surface Waters

Sampling in the first year of a basin rotation is a qualitative assessment of as many basin surface waters–streams, rivers, lakes, ponds–as possible. The groundwater program does not have a screening component. The goal of screening is to evaluate a site in each segment of the Waterbody Inventory in a basin over two sampling cycles (10 years).

In the RIBS screening program, macroinvertebrate community analysis is the primary method for assessment of water quality in wadeable streams. Field parameters are measured, and a Microtox® bioassay for determination of sediment and porewater toxicity is used if faunal condition is assessed in the field as poor or very poor. Non-wadeable rivers are sampled using three artificial substrate samples collected between June and September.

Detailed information on sampling and analytical methods used in the Statewide Waters Monitoring Program (SWMP) can be found in the Division of Water Quality Assurance Management Plan, individual Quality Assurance Project Plans and Standard Operating Procedures.

Sites are selected based on several criteria. Approximately 60% of screening sites are targeted and 40% are randomly selected. Targeted sites may be reference (representative of the highest water quality or best attainable condition in the basin); temporal trend (historical sites from locations that have been monitored for many years); sites of departmental, regional, or public interest; or unassessed waters from New York's Waterbody Inventory/Priority Waterbodies List. A random dataset provides the ability to project aquatic life use attainment in an un-biased, statistically sound manner. In addition random sampling provides comparability between basin datasets. Random sites are selected using GIS with the most up-to-date statewide hydrography dataset and a random selection tool. The statewide hydrography dataset is clipped to the individual basin and stream segments equaling the number of sites available are randomly selected. A dataset of historical sampling locations is overlaid on the hydrography and selected segments. If a selected segment has a historical sampling location on it then the historical location is selected. Otherwise a detailed street layer is overlaid and the most downstream road crossing on the selected segment is chosen as the sampling location.

Macroinvertebrate samples are sorted and subsampled in the laboratory, and depending on sorting results, may be identified only to family level or to species. Four metrics are calculated from these data: species richness, EPT richness, biotic index, and percent model affinity. Values from the four metrics are converted to a common 0-10 scale and the mean value forms the Biological Assessment Profile (BAP), representing an overall assessment. The resulting profile uses a four-tiered system of classification, ranging from non-impacted to severely impacted.

In addition, a procedure of Impact Source Determination (ISD) is used to identify types of impacts in streams based on macroinvertebrate communities. ISD uses community models to ascertain the primary factor influencing the faunal composition. Sixty-two model communities are grouped into the following general categories: nonpoint nutrient additions, toxics, sewage effluent or animal wastes, municipal/industrial, siltation, impoundment, and natural. The model exhibiting the highest similarity to the test data denotes

the55 likely impact source type, or may indicate that the species are similar to those of an undisturbed community, and the no impacts can be discerned.

In the LCI screening ("mass attack") program, candidate lakes are visited once or twice during the period from April to October, during which time a limited number of critical lake eutrophication indicators (dissolved oxygen, water clarity, and total phosphorus) are measured to evaluate limiting lake conditions. Thermally stratified lakes are sampled during the spring after ice melt when nutrient concentrations are greatest, and once during the late summer, when hypolimnetic oxygen depletion is greatest; non-stratified lakes are sampled during the spring only. A single location, corresponding to the deep hole in the lake, is sampled. This site is chosen to maximize the water transparency measurement, to minimize sediment disturbance from the boat, anchor, or sampling equipment, to assure that thermal stratification and resulting oxygen deficits, if present, are detected, and to maximize representativeness and reproducibility of results. The number of lakes sampled each year is dictated by analytical and sampling resources, the number of lakes meeting the site selection criteria, and the number of lakes sampled in the other networks, but generally ranges from 30-45 per year.

Lakes are selected for screening to verify water quality conditions, to evaluate unassessed waters; to maintain information on lakes with water use value, to determine background conditions, and to identify temporal trends.

Beginning in 2008, biological screening will also be conducted on lakes, ponds, and reservoirs sampled as part of the LCI. Benthic samples will be collected using a combination of sweep net and kick net sampling techniques. Samples will be analyzed to start building the database needed to develop lake assessment tools. In addition, short sediment cores will be collected, with the top and bottom analyzed for sediment diatoms. These data will be used to construct a paleolimnological record for each sampled lake, in part to identify trophic-based historical records and in part to identify reference waterbodies for several nutrient ecoregions within the state. Periphyton coverage will be estimated using assessment tools developed for recent large river studies. The presence of invasive plant species will be evaluated in locations (boat launch sites, inlets and outlets, etc.) most likely to serve as the site for pioneering introductions into these ponded waters. This surveillance will focus on both exotic macrophytes and invasive diatoms such as "didymo" (*Didymosphenia geminata*).

Year Two: Intensive Sampling in Rivers and Streams

Results of the year one screening and other sources of information are used to identify sites for intensive monitoring. Criteria for selection of intensive sites are: verification of water quality conditions and suspected impairment, from information contained in the Waterbody Inventory; monitoring of major tributaries near their confluence with major rivers allow for characterization of watershed conditions; water use value - sampling of public water supplies, recreational areas, significant wildlife habitats, or other waters of special importance; background condition - characterization of water quality in "unimpacted" areas; trends - monitoring at sites with long-term sampling records is useful in assessing temporal trends in water quality; and response to regional concerns and regional water quality issues.

At sites selected for intensive monitoring, water column, sediment, and macroinvertebrate tissue chemistry, macroinvertebrate community analysis, habitat assessment,, and toxicity testing of water and sediment are undertaken. Water column samples are collected and analyzed 10 times during the period from April to November. Toxicity samples are collected three times; sediment and invertebrates are collected once in the period from June through September.

The Rotating Integrated Basin Studies (RIBS) Program applies parameter-specific criteria and surrogate water quality indicators in its assessment methodology. Assessment criteria for each of the media, i.e., water chemistry, tissue, and sediment, are based on evaluation and comparison of statewide sampling data, analytical minimum reporting levels, parameter characteristics, and consensus of potential environmental impact. RIBS assessment criteria were developed to evaluate the ability of the state's waters to support designated uses. Exceeding a RIBS assessment criterion does not necessarily represent a water quality standards violation, but indicates a location that should be investigated for sources of the parameter of concern, and as such, is protective of the waterbody's designated uses .

For water column chemistry, parameters that exceed assessment criteria are identified as "parameters of concern." Maximum and median values for the parameter, the ratio of the median value to the assessment criterion, and the frequency of exceedance are reported.

Consensus-based sediment quality guidelines (SQG) for freshwater ecosystems, are used to assess bottom sediment quality of RIBS intensive monitoring network sites. The two SQGs for each contaminant are: the threshold effect concentration (TEC), below which adverse effects on sediment-dwelling organisms are not expected to occur, and the probable effect concentration (PEC), above which adverse effects to sediment-dwelling organisms are expected to occur a majority of the time. Mean PEC quotients (PEC-Q) are used to determine whether the sediment at RIBS intensive monitoring network sites is likely to cause chronic toxicity in sediment-dwelling organisms.
Assessment of overall stream water quality based on macroinvertebrate community metrics uses a four-tiered system of classification, ranging from non-impacted to severely impacted. Level of impact is assessed for each metric, and then combined for all metrics to form the Biological Assessment Profile, representing an overall assessment. Four metrics are used to evaluate kick samples from riffles: species richness, EPT value, biotic index, and percent model affinity. Values from the four metrics are converted to a common 0-10 scale and the mean value of these determines the overall assessment.

Levels of concern (LOC) for substances in invertebrate tissues have been developed for metals, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), and some pesticides. LOCs are determined by examining frequency distributions of contaminant concentrations in tissues compiled from samples collected statewide, representing a wide range of water quality. Provisional LOCs are initially set at the level of the mean plus 2.57 standard deviations from the mean, representing the 99th percentile. LOCs are compared to assessed impacts to determine correlations with adverse effects. LOCs are reviewed approximately every 5 years for possible adjustment as new data are obtained

When available, the RIBS program uses information from the Division of Fish, Wildlife and Marine Resources for fish community assessments and fish tissue contaminant levels. Assessment characterizations are developed with regard to diversity and health of the fish community. Fish community assessments are based on methods developed by NYSDEC Division of Fish, Wildlife, and Marine Resources, and summarized in the Quality Assurance Plan for Biological Stream Monitoring in New York State. The metrics used to interpret fish community composition as it relates to water quality are species richness, percent non-tolerant individuals, percent non-tolerant species, and percent model affinity.

Toxicity testing measures toxicity of ambient water to the test organism, *Ceriodaphnia dubia,* by determining if survival and reproductive rates of the test organisms differ from a control group of organisms.

The Microtox® rapid bioassay is used to screen ambient sediment and porewater samples for acute toxicity, using the naturally occurring, bioluminescent marine bacteria *Vibrio fischeri*. This species produces light as a natural by-product of its cellular respiration, and is sensitive to a broad range of chemicals. Any inhibition of cellular activity, and corresponding decrease in luminescence, is used as a direct measure of toxicity.

WATER COLUMN PARAMETERS	
Field - (Temp, pH, DO, Conductivity.)	to provide general characterization of stream
Conventional - (Nutrients, Solids)	to indicate sewage/agricultural pollution; determine sediment load
Bacteriological - Total & Fecal Coliform Only at Intensive Network sites where required holding times can be met	to indicate possible human/animal waste; evaluate contact recreational uses
Common Minerals, Hardness	to determine geologic contribution
Metals	frequently detected priority toxics (naturally occurring/industrial use)
Volatile Halogenated Organics (VHOs) Only at Permanent Network sites	indicative of municipal/industrial point discharges
Phenolic Compounds Only at Permanent Network sites and Class A waters	indicative of industrial discharges; responsible for fish tainting

BOTTOM SEDIMENT/MACROINVERTEBRATE TISSUE PARAMETERS	
Metals	frequently detected toxic priority pollutants (naturally occurring/industrial use)
Polychlorinated Biphenyls (PCBs)	persistent toxic bioaccumulative compound (wide use historically, known problem)
Organochlorine Pesticides	selected persistent agricultural pesticides (currently limited use or out of use)
Polynuclear Aromatic Hydrocarbons (PAHs)	indicators of petroleum distillation and/or chemical manufacturing or incomplete combustion

BIOLOGICAL INDICATORS OF WATER QUALITY	
Macroinvertebrate Community Assessment	evaluation of overall (integrated) water quality and stream health as reflected by relatively sensitive biological community
Toxicity (Bioassay) Testing	direct measure of acute (mortality) and chronic (reproductive) toxicity effects
Fishery Evaluation*	assessment of the ability of stream to support a larger biological community

* Fisheries work is conducted when resources permit

Year Two: Intensive Sampling in Lakes, Ponds, and Reservoirs

Results of the year one screening and other sources of information are used to identify sites for intensive monitoring. At sites selected for intensive monitoring, water column samples are collected monthly from May to October. Both surface and depth sampling is conducted in thermally stratified lakes. Parameters are as indicated in the following tables.

WATER COLUMN PARAMETERS	
Field Parameters (Temp, pH, DO, Conductivity, Clarity, ORP)	to provide general characterization of lake
Conventional Parameters (Nutrients, Solids, Color)	to indicate cultural eutrophication; determine sediment and nutrient load as impacting phytoplankton or macrophyte growth
Bacteriological Parameters (Coliform)	to indicate possible human/animal waste; evaluate contact recreational uses
Common Minerals, Metals	to determine geologic contribution
Heavy Metals	frequently detected priority toxics (naturally occurring/industrial use)

BIOLOGICAL INDICATORS OF WATER QUALITY	
Phytoplankton standing crop (chlorophyll *a*)	to estimate density of algal communities
Plankton identification	to assess phytoplankton and/or zooplankton community composition
Macrophyte identification	to identify the presence of nuisance macrophyte species (primarily of exotic submergent macrophytes) and/or endangered aquatic plant species

Year Two: Intensive Sampling in Groundwater

The groundwater monitoring program is conducted in cooperation with the US Geological Survey Water Resources Division, which is responsible for the field work. The program, operating for 6 years, is establishing a statewide foundation of ambient groundwater quality data to produce a comprehensive statewide water quality assessment and to fulfill section 305b reporting requirements of the Clean Water Act.

Groundwater monitoring follows the basin rotation used by the surface waters programs; however, since there is no screening component, the sampling is conducted entirely in year two of the rotation. After a review of basin geology and hydrology, possible existing contamination concerns or other areas of interest, letters are sent to water officials requesting information and seeking involvement in the program during the development of sampling locations. The input is used to determine if or how much sampling will be directed to an area of concern, particularly if these areas are believed to be locations of greatest ground water use or vulnerability. Areas of documented ground water concerns (e.g. listed contamination sites) are not included.

A total of approximately 60 wells per year are sampled, divided among the basins. The distribution of well types is divided equally between public and private wells. For the public supply wells, preference is given to those that are not regularly or intensively sampled to fulfill New York State Department of Health (NYSDOH) or other regulatory requirements. Domestic wells are identified through the NYSDEC Water Well Reporting Program. Sampling is also divided between bedrock and overburden aquifers, and an attempt is made to have even geographic distribution throughout the basin.

Parameters collected are water temperature dissolved oxygen, pH, an conductivity (collected in the field), samples for bacteria include heterotrophic plate count (HPC), and total and fecal coliform, nutrients, total organic carbon (TOC), phenols, inorganics, organics (including VOCs and pesticides), and radiochemicals (Radon-222 & Uranium).

Groundwater data are maintained in USGS NWIS database, but is not incorporated into the Waterbody Inventory. Groundwater aquifers have not been defined as segments in the Inventory database.

Annually: Permanent Network Monitoring of Large Rivers
A permanent network of 19 large river sites is monitored 6 times per year, irrespective of the basins in which intensive sampling is being conducted. These are integrative sites, used primarily to evaluate long-term trends in water quality. No such network exists for ponded waters, although certain Finger Lakes monitoring, as well as the CSLAP lakes can be considered as a type of permanent network.

Annually: Targeted biological monitoring
Independent of the rotating basin calendar, the Stream Biomonitoring Unit and the Toxicity Testing Unit conduct targeted biological assessment surveys and facility toxicity testing, in response to requests from within or outside the Department, related to known or suspected water quality problems. These surveys are conducted according to established sampling protocols and laboratory procedures, and are designed specifically to collect data related to the identified or potential problem.

Year Three: Water Quality Evaluation and Assessment
The Statewide Waters Monitoring Program applies parameter-specific criteria and surrogate water quality indicators in its assessment methodology. Assessment criteria for each of the media are based on evaluation and comparison of statewide sampling data, analytical minimum reporting levels, parameter characteristics, and consensus of potential environmental impact. Assessment criteria have been developed to evaluate the ability of the state's waters to support designated uses. Exceeding an assessment criterion does not necessarily represent a water quality standards violation, but indicates a location that should be investigated for sources of the parameter of concern, and as such, is protective of the waterbody's designated uses.

Water quality data results are reviewed by staff prior to release to the public. This review includes the comparison of results with historic and/or expected values, the possible qualification of data values where necessary, and the evaluation of Quality Control samples taken in conjunction with the water quality samples. For chemistry data, each result is compared with a range of expected values for each parameter. The review criteria range for each parameter has been calculated to reflect a range of values within existing water quality standards or appropriate guidance values or criteria for New York State. Where no such values exist, professional judgment has been used to define the appropriate ranges.

Any data value that falls outside the review criteria range is re-examined by review staff before being stored as final. In most cases, data values can be confirmed as reasonable based either upon historic, site-specific data, or due to particular field conditions at the time of sample collection as noted on the field sheet. If neither historic data or field conditions provide an explanation for an unusually high or low value, then

project coordinators confirm the data value against quality control data results and/or with the analytic lab directly.

Analysis of chemical and biological data collected in years 1 and 2 focuses on support of designated uses, evaluation of trends, and identification of areas where additional study may be needed. Data and information generated by the Statewide Waters Monitoring Program support other work conducted by the Division of Water. Results of the evaluation of the sampling data are used in compiling individual basin data report, the Waterbody Inventory/Priority Waterbody List (WI/PWL), New York State's Clean Water Act Section 305(b) Water Quality Report, and Section 303(d) Impaired Waters List. SWMP data are used to select locations for intensive surveys and special water quality monitoring projects, as described in the above section on targeted biological monitoring. Results and conclusions derived from the data are available in basin data reports, individual waterbody reports, such as CSLAP or Rapid Biological Assessment Survey reports, the Waterbody Inventory/Priority Waterbodies List (WI/PWL), and the 305(b) report.

Data Management

Groundwater data are maintained in the US Geological Survey NWIS system. Surface water monitoring results are reported electronically by analytical laboratories to Division of Water staff. Data are reviewed and compared against expected value ranges, assessment criteria, and quality control results. Outliers are verified with the analytical laboratory. Lakes, biological, and sediment data are maintained in Division of Water databases; after review and verification, data are available to the public by request. RIBS water column data are also available in STORET, EPA's national database. The Department is currently developing an Environmental Information Management System that when operational, will house all surface and groundwater data collected by the Division of Water.

NYSDEC currently has a National Environmental Information Exchange Network implementation grant that will use the department network node and the STORET XML schema currently under development. In the future this will be the means by which data are moved to the EPA data warehouse.

Volunteer Monitoring

Academic, citizen and local government groups across the state are involved in water quality monitoring for the protection of the State's water resources. Information obtained by the State from these sources is consistent with the EPA Code of Federal Regulations (CFR) Title 40 Section 130.7(b)(5), which states that "Each state shall assemble and evaluate all existing and readily available water quality related data and information..." for use in developing the state's list of impaired waters.

In the Division of Water, two models exist for the use of samples, data, and water quality assessments provided by groups outside the Department. In the Lakes monitoring program, there is direct oversight by the Division of Water in the collection of information. In the area of river and stream monitoring, outside groups work through county Water Quality Coordinating Committees and the DEC regional structure to provide their data for use in the development of the Waterbody Inventory/Priority Waterbodies List.

Lakes

The New York Citizens Statewide Lake Assessment Program (CSLAP) program is a cooperative effort between NYSDEC and the New York State Federation of Lake Associations (NYSFOLA).

Overall Goal of CSLAP

The goal of the New York Citizens Statewide Lake Assessment Program was to establish a volunteer lake monitoring program that would provide data for a variety of purposes, including establishment of a long-term database for New York State lakes, identification of water quality problems on individual lakes and

geographic and ecological groupings of lakes, and education for data collectors and users. The data collected in CSLAP are fully integrated into the state database for lakes and have been used to assist in local lake management and evaluation of trophic status, spread of invasive species, and other problems seen in the state's lakes. By these measures, it appears that the original goal for the program has been achieved.

Background of CSLAP Program

In recognition of the large number of New York State lakes with little or no recent sampling data, the success of volunteer lake monitoring programs in other states, and a strong network of lake associations within New York State, the NYSDEC Division of Water and the New York Federation of Lake Associations (NYSFOLA) founded the NY Citizens Statewide Lake Assessment Program (CSLAP) in 1986. The initial objectives of the program were three fold: collection of baseline water quality data to support a variety of local, state, and federal needs; identification of water quality problems in individual lakes and in similar geographical, ecological, or land and lake use settings, and education of both lakefront property owners and lake managers charged with monitoring or managing these waterbodies.

A pilot volunteer lake monitoring program was implemented on 25 lakes throughout the state, and utilized the services of about 100 lay volunteers. Initial on-site training and follow-up QA/QC sessions were conducted by the NYSDEC and trained NYSFOLA staff. After the initial training, NYSDEC left equipment, supplies, and pre-preserved sample bottles with the volunteers to begin biweekly sampling for a 15 week period between May and October. Water samples, field data and observation forms were transported to the New York State Department of Health (NYSDOH) for analysis.

Current CSLAP Program

In 2002, analytical services were shifted to a private (ELAP-certified) laboratory. Water samples are analyzed for standard lake water quality indicators, with a focus on evaluating eutrophication status, total phosphorus, nitrogen (nitrate, ammonia and total), chlorophyll *a*, pH, conductivity, color and calcium. Field measurements include water depth, water temperature, and Secchi disk transparency. Sampling volunteers also evaluate use impairments by completing field observation forms, using a methodology developed in Minnesota and Vermont. Data are sent from the analytical laboratory to the NYSDEC and annual interpretive summary reports are provided to the participating lake associations and other interested parties (county government, NYSDEC regional staff, etc.). Aquatic vegetation samples, deepwater samples, and occasional tributary samples are also collected by sampling volunteers at some lakes.

Each year, CSLAP is expanded to sample additional lakes, based on volunteers' interest, funding availability, and the ability of NYSDEC and NYSFOLA staff to adequately conduct the program. Prior to 2002, funding for the CSLAP lake associations was provided by the NYSDEC (with occasional assistance from EPA or local government) for a 5 year period. After 5 years of funding a particular lake association sampling program, lake sampling was deferred for a second 5 year period, after which the lake association was invited back into the program (although some lake associations continued with the program by assuming program costs). This process was referred to as the "5 Year On-5 Year Off " cycle. However, when CSLAP analytical services were shifted from the NYSDOH to a private laboratory in 2002, the NYSFOLA required participating lake associations to assume $200 of program costs. Since then, participants can remain in the program for as long as desired.

As of 2007, approximately 225 lakes and 1,500 volunteers have participated in CSLAP since its inception, with about 100 lakes and 400 volunteers actively participating in 2007. These volunteers have collected approximately 16,000 samples since 1986, which comprises the bulk of the lake water samples collected within New York State over this period of time.

In 1988, the NYS Environmental Conservation Law was amended to authorize a full-time NYSDEC staff coordinator to conduct CSLAP each year. Data collected through CSLAP are fully integrated in t he state lakes database, and are used extensively in the development of the state PWL list, the federal 305b report, the federal 303d list, the federal nutrient criteria database, and other state and federal reporting mechanisms.

Rivers and Streams

CSLAP for lakes is a defined and targeted program that uses trained volunteers to make observations and collect water samples for analysis by state-approved laboratories. No DEC-directed program such as CSLAP exists for river and stream monitoring. Numerous groups statewide engage in stream monitoring activities, ranging from individuals interested in a particular stream where they fish, to high schools, colleges and universities, county organizations, and large and small not-for-profit groups such as the Hudson Basin RiverWatch. Monitoring activities also vary, from basic stream walk techniques to characterize physical habitat and document discharges to chemical and biological sampling to assess water quality. Wide variations exist in the scope and sophistication of the work being conducted. HBRW has developed a comprehensive guidance manual containing recommended techniques for the design and conduct of water quality monitoring programs. Volunteer groups are encouraged to work with DEC Regional offices and Water Quality Coordinating Committees through the Waterbody Inventory/Priority Waterbodies List process. WI/PWL Assessment Workshops are conducted for NYSDEC regional staff and watershed partners within each river basin, and participants are encouraged to submit assessment worksheets for waterbodies for which they have information.

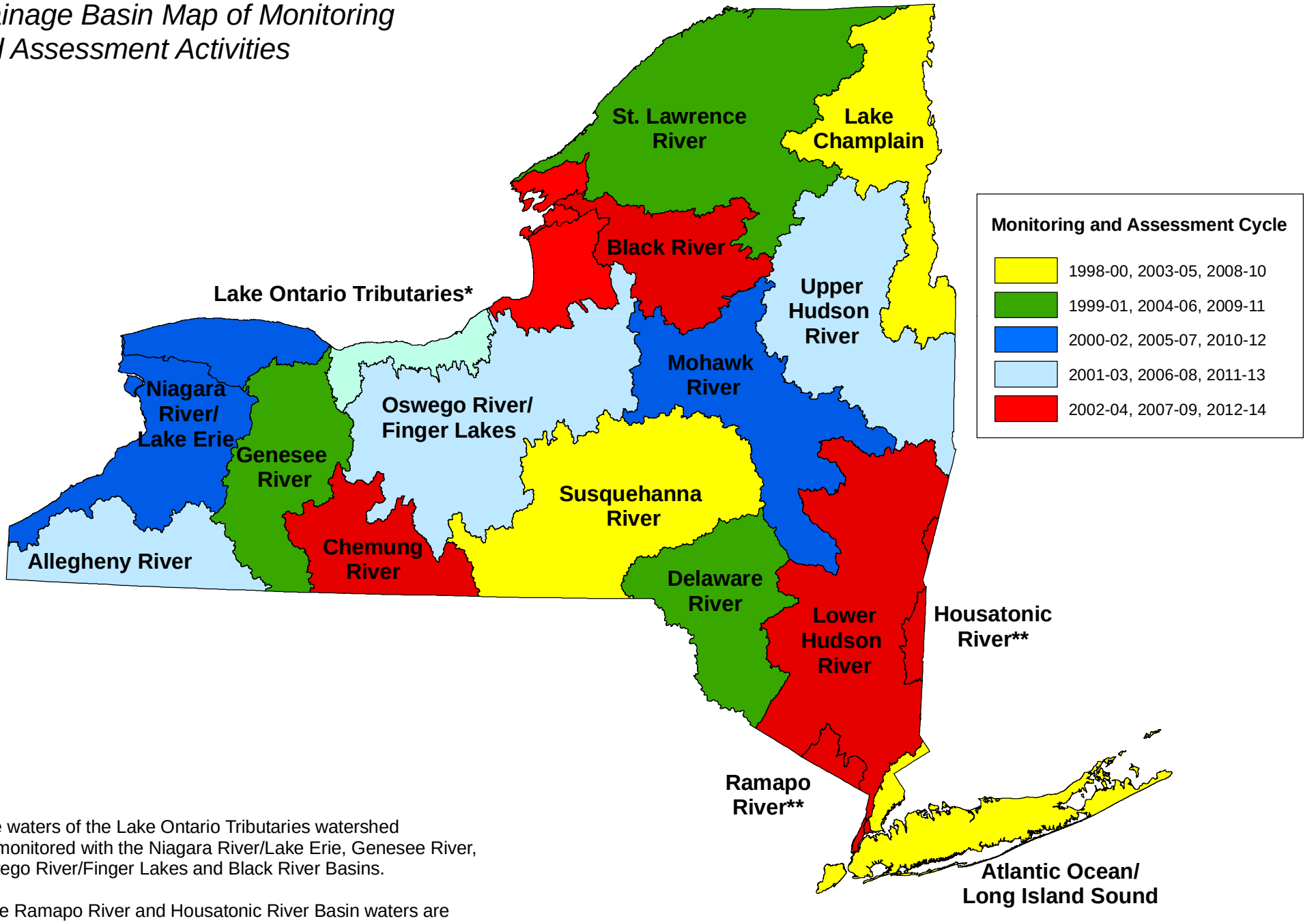
Table 6 Schedule of Statewide Waters Monitoring and Assessment

Drainage Basin	2004	2005	2006	2007	2008	2009	2010	2011
Allegheny River Seneca/Oswego (FingerLakes) Upper Hudson	Develop and Implement Management Strategies		**Screening**	**Intensive Monitoring**	Waterbody Inventory Update	Develop and Implement Management Strategies		**Screening**
Chemung River Black River Lower Hudson	Waterbody Inventory Update	Develop and Implement Management Strategies		**Screening**	**Intensive Monitoring**	Waterbody Inventory Update	Develop and Implement Management Strategies	
Susquehanna R. Lake Champlain Long Island	Monitoring	Waterbody Inventory Update	Develop and Implement Management Strategies		**Screening**	**Intensive Monitoring**	Waterbody Inventory Update	Develop and Implement Management Strategies
Genesee River St.Lawrence R. Delaware River	Screening	Monitoring	Waterbody Inventory Update	Develop and Implement Management Strategies		**Screening**	**Intensive Monitoring**	Waterbody Inventory Update
Niagara River Mohawk River		Screening	Monitoring	Waterbody Inventory Update	Develop and Implement Management Strategies		**Screening**	**Intensive Monitoring**

Figure 3

Comprehensive Assessment Strategy

Drainage Basin Map of Monitoring and Assessment Activities



*The waters of the Lake Ontario Tributaries watershed are monitored with the Niagara River/Lake Erie, Genesee River, Oswego River/Finger Lakes and Black River Basins.

**The Ramapo River and Housatonic River Basin waters are monitored with the Lower Hudson River basin.