Quality Assurance Project Plan

Rotating Integrated Basin Studies
Rivers and Streams

New York State
Department of Environmental Conservation
Division of Water

April 1st, 2021 – March 31, 2022

Approval Signatures

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_____ Date 3/30/2021
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_____ Date 3/31/2021
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DISTRIBUTION LIST

These individuals must receive a copy of the approved QAPP in order to complete their role in the project.

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RIBS QAPP Update Log

Prepared/Revised By:	**Date:**	**Revision No:**	**Summary of Changes:**
Gavin Lemley, Brian Duffy, Nikki Wright, Rebecca Gorney	April 2020	1.0	Added: update log, COVID-19 information, instructions on assigning tributary numbers to site IDs, clarification on HABs sampling procedures, note on use of lab duplicates for precision analysis in leu of field duplicates. Updated: staff assignments and regional personnel list, 2020 sampling basins, Microtox information, sampling cycle map, ammonia standard method, turbidity QL, sampling and QA schedule, email address for submitting Routine field sheets, indicated sites not sampled during COVID-19. Removed: chlorophyll from screening analyte list, mention of field duplicate samples.
Gavin Lemley	June 2020	1.1	Added sequential duplicate sampling information. Updated sample collection time instructions (rounding to 15 mins). Updated Table 10 for clarity. Fixed header and page numbering issues.
Gavin Lemley	February 2021	1.0	Added information on CEC pilot component in Routine network. Updated Routine regional staff listings. Updated 2021 sampling basins and dates. Updated RIBS field sheet. Various clarification, typographical, and formatting updates. Updated sites table in Appendix B (added site IDs and toxicity sampling schedule, general cleanup). Added a summary of data outputs. Updated Table 3 and 4 MDLs, QLs and hardness standard method.

No substantive changes include updating references, correcting typographical errors, and clarifying certain language to make the document more useful and effective.

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INTRODUCTION

This document has been prepared to meet the Quality Assurance/Quality Control (QA/QC) requirements for the New York State Department of Environmental Conservation's (NYSDEC) River and Stream Rotating Integrated Basin Studies (RIBS) program, which is a component of the Statewide Waters Monitoring Strategy of the NYSDEC. All component programs of this strategy are covered under the Quality Assurance Management Plan for the New York State Water Monitoring Strategy (NYSDEC, 2016). While the Management Plan covers goals, objectives, and procedures common to all component programs, this quality assurance plan (QAPP) documents program goals and objectives, standard operating procedures, data review and evaluation procedures, and quality control methods specifically for implementation of the RIBS Program.

Special health and safety considerations for COVID-19 are to be followed. Modifications to outlined procedures are to be in accordance with Division of Water Guidance for Field Work During COVID-19 Pandemic (SOP #603-20).

The RIBS Program produces a statewide picture of river and stream water quality conditions and trends on a 5-year rotating cycle. Each year, 3 major watersheds are surveyed according to an established rotation among watersheds (Figure 2). The goal is to establish a statistical representation of the state's water quality in flowing waters, while also providing useable information specific to other programs requiring water quality information.

To address varied needs for water quality data (overall statewide assessment, listing of impaired waters, establishment of baseline conditions, targeted monitoring for improvement projects, and others), sampling locations are stratified among different objective categories within two major survey networks (screening and routine) (Table 1). These categories include regional reference condition, long term trend, unassessed waters, random probabilistic, and department interest. Between 50 and 75 sampling locations are selected within each watershed and stratified among the objective categories resulting in 150-225 sampling locations per year as part of a "screening network". In addition to assessing long term changes in statewide water quality conditions, trend data is supplemented with continued, annual sampling at 40 permanent locations as part of a "routine network" of sites.

The screening network includes the use of macroinvertebrate community analysis as the primary means of assessing water quality conditions, as it is cost effective, and organisms show the effects of water conditions existing for at least several months prior to their collection, whereas a water chemistry sample provides only a snapshot of the time of the sample collection. Water chemistry sampling is also collected at screening network locations. However, this information is meant only to enhance macroinvertebrate assessments of water quality by providing some indication of possible sources of impact. Water column constituent data from the screening network is not meant to provide an exhaustive representation of in-stream condition over any length of time. In addition to biological and water chemical monitoring, collection of sediment for toxicity screening is also conducted but is dependent upon outcomes of field water quality conditions assessment. Water quality monitoring is used to provide information on prioritization of screening network sampling locations. Separate HABs samples (raw water and rock scrape samples) were piloted as a component to the RIBS screening network in 2017-2018 and will be collected for the following 3-5 years.

The network of permanent ("routine") sites provides information on an annual basis for a large range of waterbodies statewide. 40 routine sites exist statewide with water column chemistry samples collected four times, annually, regardless of screening network basin rotation, by DEC regional staff. These sites are co-located with United States Geological Survey (USGS) gage stations to facilitate loading calculations for TMDL development and other watershed planning initiatives. Water quality condition estimates at these sites are provided primarily through the documentation of long-term trends in water column chemical constituents. Biological monitoring of macroinvertebrate communities may occur but is considered supplemental in this network.

In 2021, the watersheds to be sampled are the Allegheny River, Seneca-Oswego-Oneida Rivers, and Upper Hudson River basins (screening), and the 40 permanent routine network sites statewide. In addition to the screening and routine networks, special surveys may be conducted. Special surveys are typically undertaken at the request of other NYSDEC programs and may involve any number of different water quality monitoring activities. These special surveys require their own QAPP and are typically treated independently from this document. This is determined on a case-by-case basis through communication between the RIBS Program Manager, the DOW Quality Assurance Officer, and the RIBS Project Quality Assurance Officer. However, in some instances monitoring activities may fall within the limits of this RIBS QAPP and not require further quality assurance and quality control documentation. In these cases, the RIBS Program Manager may determine that increasing the number of "Department Interest" sites to allocate for additional sample collection is warranted.

In 2019 and 2021, a pilot project for sampling Contaminants of Emerging Concern (CECs) was added as a component to the RIBS Routine network. A subset of sites was sampled for CECs in October 2019 for phase 1 of the project in order to assess effectiveness of sampling design. The full set of 40 Routine sites will be sampled in April and August of 2021. Details of this project and sampling design are managed in a separate QAPP, "Rotating Integrated Basin Studies (RIBS): Contaminants of Emerging Concern (CECs) Screening Monitoring Pilot 2019-2021 Quality Assurance Project Plan" (NYSDEC, 2021).

This QAPP is to be effective on April 1st, 2021. The work outlined within will not begin until the QAPP has been fully approved.

Table 1. Sampling location strategy for the RIBS Program.

Objective Site Selection Category	**Percent of Total Sites**
Regional Reference (highest water quality or best attainable condition in a basin)	10%
Long Term Trends (historical knowledge base of water quality trends)	20%
Unassessed Waters (no data or no data within the last 10 years)	20%
Department Interest	20%
Random Probabilistic (for statewide or basin-wide determinations about water quality)	30%

I. PROJECT MANAGEMENT

1. Organization/Responsibilities

RIBS Program Coordinators and Responsibilities

The following outline describes the staff involved with the monitoring program and their respective roles.

New York State Department of Environmental Conservation

Division of Water, Bureau of Water Assessment & Management

Stream Monitoring and Assessment Section

I. Program Coordination

Meredith Streeter, Section Chief, 518-402-8213

Responsibilities

1. Overall Management of RIBS Program
   a. Determine sampling strategy and overall monitoring network design, including sampling site location, parameter selection, sampling frequency, etc.
   b. Produce periodic assessments of monitoring results.
   c. Conduct appropriate program reviews and implement modifications to enhance monitoring effort as necessary.
   d. Coordinate with Regional Office staff the purchase of equipment, supplies and/or training.
   e. Respond to all inquiries concerning the RIBS program

II. Project QA Officer

Keleigh Reynolds, Project Quality Assurance Officer, 518-402-8236

Responsibilities

1. Oversight of the RIBS Quality Assurance Project Plan.
2. Communicate QA concerns and updates to management.

III. Water Column Sampling

Gavin Lemley, Sampling and Equipment Coordinator, 518-402-8202
Jeff Lojpersberger, Sampling and Equipment Coordinator, 518-285-5683
Charles Stoll, Data Management Coordinator, 518-285-5699

Responsibilities

1. Coordination of Sampling Operations
   a. Produce schedules outlining the collection of samples.
   b. Develop collection procedures for the sampling program and maintain them in Standard Operating Procedures (SOPs) documents.
   c. Provide sample collection technical support and training to Regional Office staff, as needed.
   d. Coordinate sampling logistics (including paperwork) between Regional Office staff and the analytical laboratory and NYSDEC Central Office staff.
2. Sample Collection

a. Collect water column samples in assigned geographic areas as scheduled, following the procedures and quality assurance methods outlined in the program sample collection manual.
b. Purchase and maintain sampling program sampling equipment.

3. Implementation of Quality Control Measures
   a. Develop Quality Assurance/Quality Control plan for the RIBS program.
   b. Conduct as needed observations and field training of Regional Office staff to ensure proper sample collection methods and discuss problems and/or needs.
   c. Review water quality and quality control data results for adherence to appropriate specifications.
4. Management of Analytical Results
   a. Enter all data from sample collection field sheets into the Stream Monitoring and Assessment Section Database.
   b. Review, edit (if necessary), and store to the Stream Monitoring and Assessment Section Database the water column analytical data results generated by the sampling program.
   c. Provide water quality assessment and expertise in data evaluation.

IV. Stream Biomonitoring

Brian Duffy, Stream Biomonitoring Program Coordinator, 518-285-5682
Gavin Lemley, Stream Biomonitoring Staff, 518-402-8202
Jeff Lojpersberger, Stream Biomonitoring Staff, 518-285-5683
Charles Stoll, Stream Biomonitoring staff, 518-285-5699
Keleigh Reynolds, Stream Biomonitoring staff, 518-402-8236

Responsibilities

1. Coordinate the macroinvertebrate, fish, and diatom sampling components of the RIBS program
   a. Conduct macroinvertebrate collections (including preparation of tissue samples) and community assessments at all Screening Network and special survey sites where appropriate.
   b. Conduct fish and diatom collections at selected special survey sites
   c. Conduct macroinvertebrate community assessments at designated screening network sites.
   d. Provide data to the Assessment Unit
   e. Provide expertise and interpretation of biological sampling results as requested.
2. Coordinate the Habitat Assessment Component of the RIBS Program
   a. Conduct habitat assessments at all Screening Network sites and at special survey sites where appropriate.
   b. Provide written assessment of habitat assessment results for RIBS program.
   c. Provide expertise and interpretation of habitat assessments as requested.
3. Coordinate the User Perception Component of the RIBS program
   a. Conduct user perception surveys at all Screening Network sites and at other special survey sites where appropriate.
   b. Provide written assessment of user perception results for RIBS program.
   c. Provide expertise and interpretation of user perception results as requested.

V. Toxicity Testing

Nicole Wright, Toxicity Testing Coordinator, 518-402-8206

Responsibilities

1. Coordinate the *Ceriodaphnia dubia* Toxicity Testing Component of the RIBS program.
   a. Establish and administer the laboratory contract for chronic toxicity testing of water column samples 4x annually capturing seasonality (i.e. spring, summer & fall) using *C. dubia* at approximately 10 Permanent Network sites per basin upon rotation into the applicable basins consistent with the established monitoring and assessment cycle, or at other special survey sites where appropriate.
   b. Coordinate sampling logistics between the commercial toxicity testing laboratory and the Regions in which testing is scheduled.
   c. Provide electronic assessment of *C. dubia* survival and reproductive results for sampling program.
   d. Provide expertise and interpretation of chronic toxicity testing results as requested.

2. Coordinate the Microtox® Toxicity Testing Component of the RIBS program.
   a. Conduct acute toxicity testing of bottom sediment 1x during the growing season (i.e. July-September) using *Vibrio fischeri* at approximately 15 Screening Network sites per basin consistent with the established monitoring and assessment basin cycle. Samples are collected only for those sites identified as unassessed waters or department interest and/or with a biological field assessment condition of poor or very poor, or at other special survey sites where appropriate.
   b. Provide electronic assessment of *V. fischeri* bioluminescence results for sampling program.
   c. Provide expertise and interpretation of acute toxicity testing results as requested.

VI. Harmful Algal Blooms Sampling

Rebecca Gorney, DOW HABs Sampling Coordinator, 518-402-8258

Responsibilities

1. Coordinate the HABs Sampling Component of the RIBS program.
2. Coordinate communication among the HABs analytical laboratories and RIBS program.
3. Provide feedback regarding problems and/or needs concerning sample collection encountered by field sampling staff.

VII. Water Quality Standards & Analytical Support Section

RoseAnn Garry, DOW Quality Assurance Officer, 518-402-8159
Jason Fagel, DOW, Contract Laboratory Coordinator, 518-402-8156

Quality Assurance Officer Responsibilities

1. Conduct as-needed audits of Analytical Laboratories which perform analysis of parameters that NYSDOH ELAP does not certify for.
2. Conduct field audits of RIBS program activities
2. Provide expertise regarding analytical and QA/QC Issues.
3. Review the QA project plan to verify that those elements outlined in the *EPA Requirements for QA Project Plans (QA/R-5)* are addressed in this document.
4. Approve QAPP.

Contract Laboratory Coordinator Responsibilities

1. Tracks the fiscal budget for analytical services and costs
2. Ensures laboratory contracts meet the requirements of the NYSDEC's "*Prescribed Analytical Protocols*, October, 2016.
3. Receives laboratory data packages from analytical contract laboratories.

VIII. Division of Water, Regional RIBS Sampling Personnel

	Anthony Leung, Water		
R1: Stony Brook	Engineer	(631)444-0415	anthony.leung@dec.ny.gov
	Cathy Haas	(631)444-0427	cathy.haas@dec.ny.gov
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	David Lengyel	(631)444-0416	david.lengyel@dec.ny.gov
R2: Long Island City	Selvin Southwell	(718)482-4933	selvin.southwell@dec.ny.gov
R3: White Plains	[vacant], Water Engineer	(xxx) xxx-xxxx	[vacant]@dec.ny.gov
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	Manoara Begum	(914)803-8134	manoara.begum@dec.ny.gov
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	Derek Thorsland, Water		
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	Rebecca Mitchell	(518)357-2378	rebecca.mitchell@dec.ny.gov
	Bonnie Starr	(518)357-2377	bonnie.starr@dec.ny.gov
	Robert Streeter, Water		
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	Tom Vigneault, Water		
R7: Syracuse	Engineer	(315)426-7485	thomas.vigneault@dec.ny.gov
	Tatsuhiko Murakami	(315)426-7503	tatsuhiko.murakami@dec.ny.gov
	Tony Prestigiacomo	(518)402-8165	Anthony.Prestigiacomo@dec.ny.gov
	Tara Blum, Water		
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	Hayden Chan	(607)622-8266	hayden.chan@dec.ny.gov

R9: Buffalo	Jeffrey Konsella, Water Engineer	(716)851-7220	jeffrey.konsella@dec.ny.gov
	Stephany Tatarevich	(716)851-7145	Stephany.Tatarevich@dec.ny.gov
	James Lehnen	(716)851-7130	james.lehnen@dec.ny.gov

Responsibilities

1. Routine Sample Collection
   a. Collect water column samples at specific assigned locations, as scheduled, at routine network sites, following the procedures and quality assurance methods outlined in the QAPP and standard operating procedures (SOP-AMB-210_V21-1).
   b. Maintain assigned sampling program equipment.
   c. Communicate problems and/or needs concerning sample collection to CO staff.

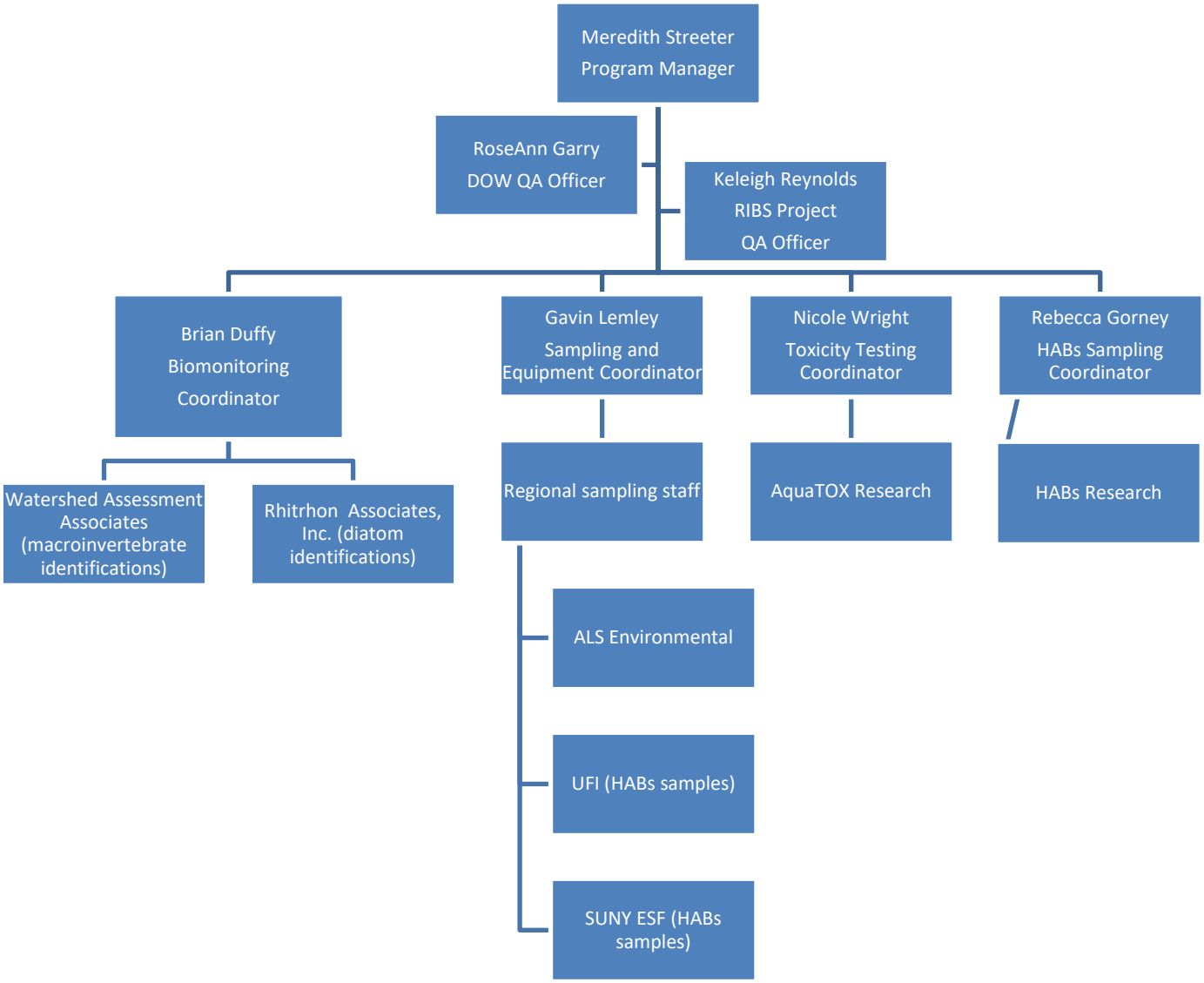
IX. Analytical Laboratories

The complete list of laboratories used in the project appears in Section II, Data Generation and Acquisition.

Responsibilities

1. Provide Sample Containers, paperwork, and water for field blanks, as needed.
2. Provide Expertise in Sample Collection Protocols.
3. Provide Expertise in Analytical Methods.
4. Analyze Water Quality Samples and Report Results.
   a. Provide analysis of specified parameters for water column, bottom sediment and biological tissue samples.
   b. Transmit analytical data to NYSDEC via agreed upon media/format.
5. Implement Internal Quality Assurance/Quality Control Procedures.

Figure 1. Project Organizational Chart



2. Background – Description of Problem

In the mid-1960s, the New York State Health Department Environmental Health Laboratories initiated a statewide water quality monitoring program for conventional (solids, nutrients, BOD, etc.) pollutants. This program was transferred to the newly established Department of Environmental Conservation in 1972. An independent biological monitoring program was also established in 1972 to evaluate the biological condition of the state's rivers and streams. In the early 1980s, monitoring activities were expanded to include sampling for toxic pollutants (heavy metals, PCBs, organics, pesticides, etc.) and to include sampling of bottom sediment, biological tissue and toxicity testing.

In 1987, a statewide multi-media monitoring program was established in the NYSDEC's Division of Water. From 1987 through 1996, the program was designed to have both biological and chemical sampling in each of two years in a basin. In 1996, because of reduced funding and an EPA directive to "assess all waters", the design changed to incorporate separate screening and intensive sampling, as a means of monitoring more of the state's rivers and streams.

In 2003, EPA presented a document to the states, entitled, "Elements of a State Water Monitoring Strategy". States were required to develop and/or document the approach and basis for the monitoring programs conducted in their state, how all available data were used to make water quality assessments and how the state would move toward this overall strategy for a comprehensive set of monitoring programs for the state. New York's monitoring strategy was completed in 2005. These plans were for ten years, with a new or revised strategy to be completed after this time period. New York's Monitoring Strategy expired in 2015; EPA then asked all states to produce a new strategy for the next ten years. Although water quality issues, technology, and resources had changed significantly since prior monitoring strategies had been developed it had been 20 years since a thorough review of the program was done.

Therefore, in 2016 a workgroup of staff from the Stream Monitoring and Assessment Section reviewed the current sampling approach and practices, including numbers of locations sampled, types of samples collected (biological, chemical—water column, sediment, tissue—toxicological, physical), methods used for sampling, and how data are used, either by the section, the bureau, or the division. Previously staff had met with members of the Permits, Compliance and TMDL/Clean Water Initiative staff to discuss needs for data for their projects. The workgroup also evaluated the importance of the parameters analyzed for in water column samples. Thus, the RIBS program in 2017 became a more cohesive program with its biological, sediment toxicity, and water column chemistry elements. In 2017 and 2018, riverine HABs sampling was piloted in collaboration between the Lakes and Streams sections as an added component to the RIBS screening network. The ultimate goal of this would be to assess statewide occurrences of HABs in the streams and rivers of New York State. This sampling will continue for a period of at least 3-5 years to cover most or all of the 5-year RIBS sampling cycle.

The primary objective of New York State's RIBS program is to:

- Provide a comprehensive assessment of water quality conditions, based on the collection of sufficient data and information, to produce an Integrated Water Quality Assessment Report (incorporating 305(b) and 303(d) reports), in support of the State's Program Partnership Grant (PPG) from EPA as well as NYSDEC's obligations to comprehensive monitoring of New York State's flowing waters.

Secondary Objectives and Program Benefits are:

- Identification and analysis of temporal and spatial water quality trends
- Characterization of naturally occurring or background conditions
- Collection and reporting of water quality data in support of other department programs

The concentrations of chemical and physical constituents in the water column, sediment toxicity, and biological communities are compared to assessment criteria to determine if designated uses of a waterbody are supported by its water quality. Water column sampling provides a snapshot of conditions at the time of sample collection, while sediment toxicity provides a view of conditions over a longer period. The viability of aquatic communities and an ecosystem's overall health are determined by assessing the condition of the aquatic and riparian habitat, the composition of resident benthic macroinvertebrate communities, and by laboratory bioassays to identify toxicity.

The RIBS program produces a statewide picture of river and stream water quality conditions and trends on a 5-year rotating cycle. Each year 3 major watersheds are surveyed per an established rotation among watersheds (Figure 1). The goal of monitoring program is to establish a statistical representation of the state's water quality in flowing waters, while also providing useable information specific to other programs requiring water quality information.

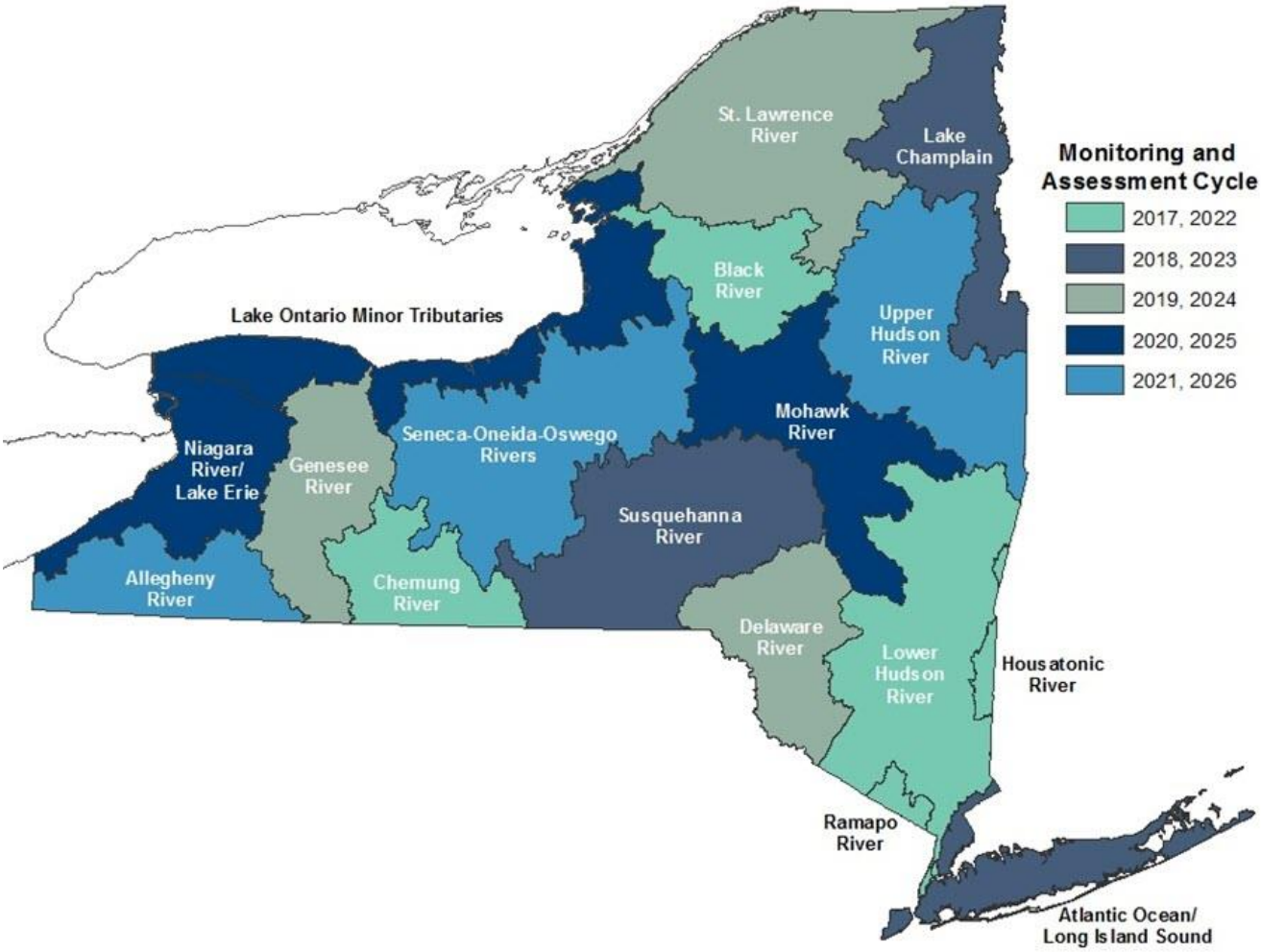


Figure 2. RIBS program sampling rotation. Three basins are sampled each year as part of the survey. This rotation ensures complete and equal statewide coverage every 5 years.

3. Project/Task Description

The RIBS Program, as part of the NYSDEC Statewide Ambient Water Quality Monitoring strategy (SWMP), includes monitoring of the surface waters of the state using a rotating approach in which all major drainage basins in the state are sampled over a five-year period as detailed in the SWMP Quality Assurance Management Plan (NYSDEC, March 2016) (Figure 1). Between 50 and 75 sampling locations are selected within each watershed and stratified among the objective categories (Table 1) resulting in 150-225 sampling locations per year. In addition to assessing long term changes in statewide water quality conditions, trend data are supplemented with continued, annual sampling at permanent network sites.

The following activities are conducted for this program:

1. Single visits to 2021 screening network sites selected for collection of macroinvertebrate samples, acute toxicity testing, habitat parameters, water column chemistry, HABs samples, and field water quality parameters during the period from July through September, in the Allegheny River, Seneca-

Oswego-Oneida Rivers, and Upper Hudson River watersheds. Locations of these sites for 2021 are contained in Appendix A.

2. Collection of water column samples, field water quality parameters and field observations conducted quarterly (1x each in April, June, August, and October), at routine network sites statewide. Chronic and acute toxicity samples are collected at routine network sites which correspond with RIBS basin rotation schedule. Locations of water column sampling sites and a schedule for toxicity sampling are contained in Appendix B.

Program schedules are listed in Table 7. Coordinates of the sampling locations can be found in Appendix A and B. Parameter groups collected as part of each of the three networks and for the different sampling media are listed in Table 2.

Table 2. Parameter Groups for Sampling Media in the RIBS Program.

Parameter Group	Water	Sediment	Rock Scrape	Organisms
Field - (Temp, pH, DO, Conductivity.)	●			●
Conventional - (Nutrients, Solids)	●			
Common Minerals, Hardness	●			
Metals	●^			
Low Level Mercury	●			
Stream Discharge (Routine Network)	●			
Community Composition Analysis				●
Physical (habitat) assessment	●			●
User Perception				●
Chronic Toxicity	●			
Acute Toxicity	●	●		
HABs parameters	●		●	

^ Total metals are collected at screening network sampling locations, total and dissolved metals are collected at routine network sampling locations. Special surveys may require project specific decisions on which fraction (total or dissolved) is analyzed for.

4. Quality Objectives and Criteria

Data quality requirements for this program are as follows:

1. Criteria for detection limits, precision, and accuracy for water column chemistry parameters are listed in Tables 3 and 4 of this document.
2. For levels of taxonomic effort for identification of benthic macroinvertebrate samples for community analysis see Section 17.10 of NYSDEC SOP-208_V21-1.
3. Table 5 contains assessment criteria for water column chemistry constituents.
4. Table 6 contains water column chemistry hardness dependent assessment criteria (µg/l)
5. For assessment criteria of benthic macroinvertebrate samples see Section 9.0 of NYSDEC SOP-208_V21-1.

Table 3. Water chemistry analytical specifications for samples collected from screening network locations.

Parameter	Analytical Lab	Standard Method	Precision	Accuracy	Calibration	Blanks	Method Detection Limit	Quantitation Limit
Temperature	In Situ	2550 B	± 1ºC	± 1.5ºC	Factory Set	~	(Range: -5 to 70˚C)	
Dissolved Oxygen	In Situ	4500-O G	± 1%	± 2%	Daily	~	(Range: 0 to 50 mg/L or 0 to 500%)	
pH	In Situ	4500-H+B	± .05 SU	± .2 SU	Weekly	~	(Range: 0 to 14 SU)	
Specific Conductance	In Situ	2510 B	± 1µs/cm	± 1%	Weekly	~	(Range: 0 to 200 mS/cm)	
Salinity	In Situ	2510 B	0.1 ppt	±0.1 ppt	Weekly	~	Range: 0 to 80 ppt	
Chlorophyll-*a*, phycocyanin	In Situ	10200 H	0 to 100 RFU	N/A	Weekly	~	(Range: 0 to 100 RFU or 0 to 100 µg/L)	
Ammonia	ALS	350.1	^	± 25%	~	Every 10	0.0025 mg/L	0.01 mg/L
TKN	ALS	EPA 351.2	^	± 25%	~	Every 10	0.098 mg/L	0.1 mg/L
Nitrate	ALS	EPA 353.2	^	± 25%	~	Every 10	0.007 mg/L	0.01 mg/L
Nitrite	ALS	E353.2	^	± 25%	~	Every 10	0.007 mg/l	0.01 mg/L
Total Nitrogen	ALS	calculated	^	N/A	~	~	~	~
Total Phosphorus*	ALS	EPA 365.1	^	± 25%	~	Every 10	0.004 mg/L	0.005 mg/L
Turbidity	ALS	EPA 180.1	^	± 20%	~	Every 10	0.06 NTU	1.0 NTU
Alkalinity	ALS	SM 2320B	^	N/A	~	Every 10	1.8 mg/L	2.0 mg/L
Hardness	ALS	SM 2340B	^	± 25%	~	Every 10	NA	6.62 mg/L
Chloride	ALS	EPA 300.0	^	± 25%	~	Every 10	0.041 mg/L	0.2 mg/L
Magnesium	ALS	EPA 200.7	^	± 25%	~	Every 10	0.068 mg/L	1 mg/L
Total Iron	ALS	EPA 200.7	^	± 25%	~	Every 10	20 µg/L	100 µg/L
Total Arsenic	ALS	EPA 200.8	^	± 25%	~	Every 10	0.32 µg/L	1 µg/L
Total Silver	ALS	EPA 200.8	^	± 25%	~	Every 10	0.15 µg/L	1 µg/L

Parameter	Analytical Lab	Standard Method	Precision	Accuracy	Calibration	Blanks	Method Detection Limit	Quantitation Limit
Total Aluminum	ALS	EPA 200.8	^	± 25%	~	Every 10	7.6 µg/L	10 µg/L
Total Cadmium	ALS	EPA 200.8	^	± 25%	~	Every 10	0.38 µg/L	1 µg/L
Total Copper	ALS	EPA 200.8	^	± 25%	~	Every 10	0.66 µg/L	1 µg/L
Total Lead	ALS	EPA 200.8	^	± 25%	~	Every 10	0.19 µg/L	1 µg/L
Total Nickel	ALS	EPA 200.8	^	± 25%	~	Every 10	0.26 µg/L	1 µg/L
Total Zinc	ALS	EPA 200.8	^	± 25%	~	Every 10	2.5 µg/L	5 µg/L
Total Microcystins**	UFI	EPA 546	N/A	N/A	~	Every 10	0.3 µg/l	0.3 µg/l
Chlorophyll a, unextracted**	UFI, ESF	Bbe Moldaenke, 2014	± 0.01 µg/L	± 20%	~	Every 10	0.05 µg/L	0.02 µg/l
Microcystin congeners, anatoxin-a, additional cyanotoxins**	ESF	**	N/A	N/A	~	**	**	N/A

* Under certain circumstances, such as participation in NYSDEC's Professional External Evaluations of Rivers and Streams (PEERS) program, Total Phosphorus may be analyzed using standard methods SM 18-20 4500-P. Precision, accuracy, calibration, detection and reporting limits apply as stated in Table 3.
**HABs parameters are only run on HABs samples. Standard methods will differ among laboratories. ESF has specific methods for LC-MSMS analysis of cyanotoxins^ Precision is calculated using the following equation: %RPD > (0.9465x^-0.344)100 +5, where: x = sample / detection limit %RPD = [diff(lab duplicate pair)/av(lab duplicate pair)]*100. See SOP-GEN-110_V21-1: Data Validation and Verification for more details.

Table 4. Water chemistry analytical specifications for samples collected from routine network locations.

Parameter	Analytical Lab	Standard Method	Precision	Accuracy	Calibration	Blanks	Method Detection Limit	Quantitation Limit
Temperature	In Situ	2550 B	± 1ºC	± 1.5ºC	Factory Set	~	(Range: -5 to 70˚C)	
Dissolved Oxygen	In Situ	4500-O G	± 1%	± 2%	Daily	~	(Range: 0 to 50 mg/L or 0 to 500%)	
pH	In Situ	4500-H+B	± .05 SU	± .2 SU	Weekly	~	(Range: 0 to 14 SU)	
Specific Conductance	In Situ	2510 B	± 1µs/cm	± 1%	Weekly	~	(Range: 0 to 200 mS/cm)	
Ammonia	ALS	350.1	^	± 25%	~	Every 10	0.0025 mg/L	0.01 mg/L
TKN	ALS	EPA 351.2	^	± 25%	~	Every 10	0.098 mg/L	0.1 mg/L
Nitrate	ALS	EPA 353.2	^	± 25%	~	Every 10	0.007 mg/L	0.01 mg/L
Nitrite	ALS	EPA 353.2	^	± 25%	~	Every 10	0.007 mg/l	0.01 mg/L
Total Nitrogen	ALS	calculated	^	~	~	~	~	~
Total Phosphorus	ALS	EPA 365.1	^	± 25%	~	Every 10	0.004 mg/L	0.005 mg/L
Orthophosphate	ALS	EPA 365.1	^	± 25%	~	Every 10	0.0049 mg/L	0.005 mg/L
Total Dissolved Solids	ALS	SM 2540C	^	N/A	~	Every 20	9.0 mg/L	10 mg/L
Turbidity	ALS	EPA 180.1	^	± 20%	~	Every 20	0.06 NTU	1.0 NTU
Dissolved Organic Carbon	ALS	5310C	^	± 25%	~	Every 10	0.45 mg/L	1.0 mg/L
Alkalinity	ALS	SM 2320B	^	N/A	~	Every 10	1.8 mg/L	2.0 mg/L
Hardness	ALS	SM 2340B	^	± 25%	~	Every 10	NA	6.62 mg/L
Calcium	ALS	EPA 200.7	^	± 25%	~	Every 10	0.11 mg/L	1.0 mg/L
Magnesium	ALS	EPA 200.7	^	± 25%	~	Every 10	0.068 mg/L	1 mg/L
Potassium	ALS	EPA 200.7	^	± 25%	~	Every 10	0.180 mg/L	2.0 mg/L
Sodium	ALS	EPA 200.7	^	± 25%	~	Every 10	0.100 mg/L	1.0 mg/L
Chloride	ALS	EPA 300.0	^	± 25%	~	Every 10	0.041 mg/L	0.2 mg/L
Fluoride	ALS	EPA 300.0	^	± 25%	~	Every 10	0.027 mg/L	0.1 mg/L
Sulfate	ALS	EPA 300.0	^	± 25%	~	Every 10	0.039 mg/L	0.2 mg/L
Iron	ALS	EPA 200.7	^	± 25%	~	Every 10	20 µg/L	100 µg/L
Manganese	ALS	EPA 200.7	^	± 25%	~	Every 10	1.7 µg/L	10 µg/L
Arsenic	ALS	EPA 200.8	^	± 25%	~	Every 10	0.32 µg/L	1 µg/L
Silver	ALS	EPA 200.8	^	± 25%	~	Every 10	0.042 µg/L	1 µg/L
Mercury	ALS	EPA 1631	^	± 25%	~	Every 10	0.24 ng/L	1 ng/L
Soluble Aluminum	ALS	EPA 200.8	^	± 25%	~	Every 10	7.6 µg/L	10 µg/L
Soluble Cadmium	ALS	EPA 200.8	^	± 25%	~	Every 10	0.38 µg/L	1 µg/L
Soluble Copper	ALS	EPA 200.8	^	± 25%	~	Every 10	0.66 µg/L	1 µg/L
Soluble Lead	ALS	EPA 200.8	^	± 25%	~	Every 10	0.19 µg/L	1 µg/L
Soluble Nickel	ALS	EPA 200.8	^	± 25%	~	Every 10	0.46 µg/L	1 µg/L
Soluble Zinc	ALS	EPA 200.8	^	± 25%	~	Every 10	2.5 µg/L	5 µg/L
Chlorophyll a	ALS	SM 10200 H	^	± 20%	~	Every 20	NA	0.4 ug/L

^ Precision is calculated using the following equation: %RPD > (0.9465x^-0.344)100 +5, where: x = sample / detection limit %RPD = [diff(lab duplicate pair)/av(lab duplicate pair)]*100. See SOP-GEN-110_V21-1: Data Validation and Verification for more details.

Table 5. Assessment criteria for water column chemistry.

Parameter	Type of Standard	Stream Class	Assessment Criterion
Total Metals			
Iron	Aquatic Life	A, AS, AA, AAS, B, C	> 1000 µg/L
Manganese	Aesthetics	A, AS, AA, AAS	> 300 µg/L
Arsenic	Water Supply	A, AS, AA, AAS	> 50 µg/L
Silver	Water Supply	A, AS, AA, AAS	> 50 µg/L
Dissolved Metals			
Aluminum	Aquatic Life	A, AS, AA, AAS, B, C	> 100 µg/L
Cadmium	Aquatic Life	A, AS, AA, AAS, B, C, D	Hardness Dependent (see Table 6)
Copper	Aquatic Life	A, AS, AA, AAS, B, C, D	Hardness Dependent (see Table 6)
Lead	Aquatic Life	A, AS, AA, AAS, B, C, D	Hardness Dependent (see Table 6)
Nickel	Aquatic Life	A, AS, AA, AAS, B, C, D	Hardness Dependent (see Table 6)
Zinc	Aquatic Life	A, AS, AA, AAS, B, C, D	Hardness Dependent (see Table 6)
Total Dissolved Solids		AS	> 200 mg/L
		A, AA, AAS, B, C	> 500 mg/L
Turbidity		A, AA, B, C, D	No visible contrast to natural conditions based on field notes
Field Parameters			
Water Temperature	Aquatic Life	A, AS, AA, AAS, B, C, D	> 25˚C
pH		A, AS, AA, AAS, B, C	< 6.5 - > 8.5
		D	< 6.0 - > 9.5
Dissolved Oxygen	Aquatic Life	A, AA, AAS, B, C	
		Trout Spawning	< 7.0 mg/L
		Trout Waters	< 5.0 mg/L
		No trout Waters	< 4.0 mg/L
		AS	< 6.0 mg/L
		D	< 3.0 mg/L
Specific Conductance	Aquatic Life	A, AS, AA, AAS, B, C, D	> 800 µS/cm
Minerals			
Magnesium	Water Supply	A, AS, AA, AAS	> 35,000 µg/L
Chloride	Water Supply	A, AS, AA, AAS	> 250,000 µg/L
Fluoride	Water Source	A, AS, AA, AAS	> 1,500 µg/L
Sulfate	Water Source	A, AS, AA, AAS	> 250,000 µg/L

Parameter	Type of Standard	Stream Class	Assessment Criterion
	Aquatic Life	A, AS, AA, AAS, B, C, D	Hardness Dependent
Nutrients			
Ammonia, un-ionized	Aquatic Life	A, AS, AA, AAS, B, C, D	pH/water temperature dependent based on standards
		(Trout and Non trout Streams)	> 10,000 µg/L
Nitrate	Water Supply	A, AS, AA, AAS	> 10,000 µg/L
Phosphorous		A, AS, AA, B, C, D	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages

Table 6. Hardness dependent parameters (chronic) assessment criteria (µg/l)

Parameter	Hardness Value (µg/L)					
	0 - 50	50 - 80	80 - 110	110 - 140	140 - 180	> 180
Fluoride	≥ 1100	> 1100	> 1700	> 2300	> 2900	> 3600
Cadmium	≥ 1.2	> 1.2	> 1.8	> 2.3	> 2.7	> 3.3
Copper	≥ 5.0	> 5.0	> 7.4	> 9.7	> 12	> 15
Lead	≥ 1.8	> 1.8	> 3.0	> 4.2	> 5.4	> 7.1
Nickel	≥ 29	> 29	> 43	> 56	> 69	> 86
Zinc	≥ 46	> 46	> 68	> 90	> 110	> 140

5. Training Requirements/Certifications

The RIBS program has components that are conducted by Regional DEC offices (Routine network water chemistry sampling) and components that are conducted entirely by Central Office staff (Screening network biological and water chemistry sampling). This separation of responsibilities requires different training procedures. However, all NYSDEC Regional and Central Office sampling staff must attend comprehensive DOW sampling training if offered.

Central Office personnel meet with Regional sampling staff before the start of the sampling season in regions where personnel are new to the program. Sample collection procedures and paperwork issues are explained and demonstrated in the field. When a region with experienced samplers is involved with collecting water column samples, Central Office staff will meet or telephone conference with these samplers to review procedures. A memo is sent to all sampling personnel at the start of the sampling year to review sampling procedures and note any changes; the schedule that shows the weeks each region is to collect their samples and when they are scheduled to collect field blanks and/or QC samples. If there are significant changes to any sampling procedures, a workshop or video conference will be set up.

Effective communication with regional personnel during the sampling season is critical, to discuss any problems that arise with sampling procedures or equipment. In order to solve problems during the sampling season, samplers can contact the Sampling and Equipment Coordinator (see section I.II. for contact information). Communication will be conducted as needed, to make sure equipment is performing properly and to discuss any other issues.

For staff involved in biological or toxicity testing sampling, yearly training is conducted by means of a two-day session conducted in the office and at a local stream, to learn and/or review field procedures for sample collection, field sheet completion, and multi-probe meter calibration procedures. For the Routine network, biennial refresher trainings are conducted. Additional as-needed trainings for the Routine network are also utilized for network changes and new staff additions.

Staff processing macroinvertebrate samples in the laboratory and new to the process of subsampling, undergo a certification process by which their processed subsamples are compared to each other for precision and to a subsample processed by an experienced sample processor for accuracy.

The Program Manager will ensure that all individuals involved with the project receive and are familiar with this quality assurance document and to the relevant standard operating procedures, to ensure proper adherence to sampling procedures. DEC staff are required to sign a document certifying that they have read and understand the Quality Assurance Project Plan and the relevant Standard Operating Procedures.

Staff will follow all safety procedures outlined in program-specific SOPs (SOP-208_V21-1, SOP-AMB-210_V21-1) and shall be familiar with the Division of Water Health and Safety Plan (NYSDEC, 2019) prior to sampling. This document is accessible from the DOW SharePoint Health & Safety page.

6. Documentation and Records

Site Locations
Sampling location information and coordinates will be maintained in the Statewide Waters Monitoring Program coverage on the NYSDEC GIS, which is accessed via ArcMap 10, ArcGIS Pro, and ArcGIS Online, and uses coverages contained on the secure Department server.

Analytical Laboratory Results for Water
Complete data packages are required for the RIBS program in order to provide data validation capability. Data packages will be delivered to the Contract Laboratory Coordinator accordance with the requirements of the Prescribed Analytical Protocols (NYSDEC October 2016), and to the RIBS program Data Management Coordinator, or the Biomonitoring Sampling Coordinator (according to sampling medium). A QAQC summary of 5% of the data will be prepared by the Contract Laboratory Coordinator (for DEC-collected day) and provided to the program.

Data Outputs
Data outputs are designed to achieve the needs of the RIBS program objectives as outlined in section I.2. Although concrete data output formats are currently under development under the DOW Data Modernization project, interim solutions are established to accomplish the program objectives:

- Outputs for Primary Objective, section I.2.:
    - Data are delivered to the NYSDEC Division of Water's Water Assessment and Implementation Section for assessments and for evaluation against water quality standards according to the CALM, using the "stayCALM" R package developed by the DOW Standards and Analytical Support Section.
- Outputs for Secondary Objectives, section I.2.:
    - Long-term datasets collected by the RIBS program are utilized to assess long-term spatial and temporal trends in statewide water quality, which are presented in 10-year trend reports (Smith et al., 2018).
    - Naturally occurring background conditions are characterized for the use of sampling methodology development and evaluation of least impacted and reference conditions.
    - Other departmental programs are supported with RIBS data in special studies resulting in water quality summary reports.

Forms
Field and laboratory records for NYSDEC-collected samples are maintained according to standard operating procedures for each of the sampling media. Copies of field and laboratory sheets are contained in the SOPs as follows:
SOP-AMB-210_V21-1, Standard Operating Procedure: Collection of Water Column Samples for the Rotating Integrated Basin Studies (RIBS) Program
SOP-207_V21-1, Collection of Sediment Samples
SOP-208_V21-1, Biological Monitoring of Surface Waters in New York
SOP-AMB-212_V21-1 Harmful Algal Bloom (HAB) Sampling and Analysis
SOP-402_V21-1, *Ceriodaphnia dubia* Seven-day Chronic Screening Test for Toxicity of Ambient Water Samples or Effluents
SOP-403_V21-1, Microtox® Acute Toxicity Test for Sediments, Porewaters and Effluents

Records Retention
Legally, all records from the RIBS program fall under Records Disposition Authorization Number 17099, and are to be retained for at least 10 years as specified by the Department's Records Retention policy found at http://internal.dec.state.ny.us/docs/policydocs/cp50.PDF . In practice, records of documentation must be retained until the data are no longer being used, 10 years for RIBS program samples.

Laboratory Identification Numbers
Case numbers and sample delivery group numbers are assigned for water samples for tracking through the analytical laboratories. **305b.yr** is the case number for water samples, where yr is the two-digit sampling year,

The sample delivery group (**SDG**) number is made up of 6 numeric characters, a 2 character region code, and a 1 alpha character matrix code (W for water). The first 2 numbers indicate the month of sampling, the next 2 numbers indicate the Monday date of the week the sample is collected, and the last 2 indicate the year of sampling. The 2 character region code include R for region and the respective region number for staff conducting the sampling. Possible region codes include R1, R2, R3, R4, R5, R6, R7, R8, and R9. Regions with multiple teams performing sampling are designated with an added letter, with the main regional office as "A" and the suboffice as "B" (e.g., R8 Watertown = "R6A", R6 Utica = "R6B"). CO is used for Central Office sampling staff along with sampling team number 1-4. W (for water sample) will follow the numbers.

Example: The SDG number for a water column sample collected on Wednesday, May 31, 2017 by Region 1 sampling staff would be 052917R1W. Or for the same week collected by Team 1 of Central Office sampling staff would be 052917CO1W.

Water column sampling locations are assigned the same alpha-numeric "Station_ID" given to all biological sampling location consisting of: 1) the 2-digit basin code, retaining the leading zero (i.e. 01, 02, 03, etc…) 2) upper-case stream name code 3) river mile, retaining the trailing zero. Each "Station_ID" component is separated by an "-". For example 13-USOP-1.3 is the station identifier for the Lower Hudson, Upper Esopus Creek, river mile 1.3. If a site is located on an unnamed tributary, the site ID will use the stream code (#2 above) of the receiving waterbody followed by "_T[x]", with "x" being the assigned tributary based on the "Green Books" (6 CRR-NY X B 1-19). This can also be accessed at http://www.dec.ny.gov/regs/2485.html; see subchapter B, click the article series of the basin in question, and click quadrangle maps. If a tributary number is not assigned to the waterbody in the Green Book, the number of the adjacent tributary will be used followed by a lower-case letter beginning with "a" (e.g., "_T1a", "_T1b", "_T2a", etc.). If no numbers are assigned to the tributaries of a waterbody, only lower-case letters will be assigned (e.g., "_Ta", "_Tb", etc.)

The Stream Biomonitoring Unit maintains a statewide station location database for the RIBS Program. As naming conventions have changed over time and may do so in the future, previous site names are linked in the Stream Monitoring and Assessment Section Database to ensure consistency between samples at locations over time. Fields included in the database which create

long term connections between changes in site and sample naming conventions include: PWL_ID (priority water body list segment number), WIN (watershed identification number), RIBS_ID (current RIBS site ID), RIVMILE (river mile of the location from the mouth), LOCATION (four letter biomonitoring station ID), STATION (biomonitoring station number), PREVNAME (previous, historical ID number of the site).

Water column samples are assigned sample ID numbers that are a combination of three - four elements depending on the type of sample, i.e. water sample or QAQC water sample: Station_ID (NYSDEC assigned) + MMDDYYYY (date) +W (for "Water" matrix), for a water chemistry sample. For QAQC water samples, the following codes are added to the end of the sample ID: "SEQ" for sequential duplicate, "EB" for equipment blank, "FB" for field blank, . These groupings create a unique element for each station visit, required by the Stream Monitoring and Assessment Section Database. When matrix spike and matrix spike duplicate analyses are requested on the Chain of Custody, the laboratory adds "MS" or "SD" (respectively) to the "sample_type_code" field, and to end of the internal lab sample code ("sys_sample_code") in their data delivery files.

For example, the ID consists of the following components, in this exact order, and separated by a "-" for an equipment blank QAQC water sample from a tributary to the Lower Hudson River: 12-LHUD_T2-1.3-08132018-W-EB:

- Station_ID
  - Basin Number (ex: 12)
  - LOCATION ID (ex: LHUD_T2)
  - River mile (ex: 1.3)
- Date in MMDDYYYY format
- Matrix medium abbreviation (ex: W)
- Quality Control Identifiers (ex: EB)

HABs sample IDs are generated using the following format: Station ID (as noted above) + date (MMDDYYYY) + matrix type (R for raw water or S for rock scrape), followed by a three-digit number, which is generated consecutively. Examples: 15-RAMA-1.1-08222018-R001 (Raw Water) and 15-RAMA-1.1-08222018-S001 (rock scrape sample).

II. DATA GENERATION AND ACQUISITION

1. Rationale of Monitoring Design

A. Sample Distribution

Based on the objectives of the New York Statewide Waters Monitoring Strategy (SWMP), the RIBS program enlists a rotating approach in which rivers and streams in all major drainage basins in the state are monitored over a five-year cycle. In 2021, rotational monitoring of three of the seventeen major drainage basins in New York State will be conducted. These basins are the Allegheny River, Seneca-Oswego-Oneida Rivers, and Upper Hudson River basins (screening

network sampling). In 2021, there will be approximately 75 locations sampled in each of the 3 screening basins. In addition, the 40 permanent routine network river and stream sites will be sampled four times (1x each in Spring – April, Early Summer – June, Late Summer – August, and Fall – October), regardless of the basin rotation.

Sampling locations are selected per criteria that ensure samples collected will meet program objectives.

Screening Sampling

Screening sampling locations are selected based on the following criteria, with the target contribution of each site type. Target contributions are guidance and may change slightly with individual basin needs. In each screening basin, 50-100 sites are selected for sampling. Total number of sites depends on basin size and staff resources.

Regional Reference (highest water quality or best attainable condition in a basin)	10%
Long Term Trend (historical knowledge base on water quality trends)	20%
Unassessed Waters (no data or no data within the last 10 years)	20%
Department Interest	20%
Probabilistic (unbiased dataset for making statewide determinations about water quality)	30%

In addition to the site criteria noted above potential sampling locations are compared against the DOW water column historic site list and the biological historic site list to determine if a previous sampling location meets the siting requirements. Samples collected at screening sites consist of a macroinvertebrate sample for assessment of community composition, a water column grab sample, raw water and rock scrape HABs samples, field parameters (temperature, pH, conductivity, and dissolved oxygen), a habitat assessment, a recreation use assessment and for some sites, collection of sediment for toxicity screening. Sediment samples for use in the Microtox® sediment toxicity assay are collected at wadeable sites when field assessment of faunal condition is “poor” or “very poor”, and at up to 15 locations per basin at which suitable sediments can be collected, regardless of faunal condition. Macroinvertebrates are collected by various methods detailed in SOP-208_V21-1 once between June and September, and using multiple plate artificial substrate samplers (multiplates) deployed and retrieved 4 times during the same period (non-wadeable waterbodies). Multiplate samplers are deployed for five weeks at a time and are placed and retrieved three times from June through September. Details for all screening site sample collections are contained in SOP-208_V21-1 Biological Monitoring of Surface Waters in New York State.

Routine Network (Permanent Sites)

The routine monitoring network provides water column chemistry information for establishing basic water quality characteristics and baseline conditions, and for identifying long-term trends by sampling at 40 fixed sites across the state (Appendix B), conducted each year, regardless of where screening sampling is being conducted.

Table 7. Sampling schedule for all networks and sampling media for the 2021 water quality sampling year. These are target sampling dates and are subject to change based on current weather conditions, stream flow conditions, and staff/resource availability.

Network	Week of					
	April	June	July	August	September	October
Routine Surveys						
*Routine - Water Column	4/12/21	6/14/21		8/16/21		10/18/21
[1]Water Column Toxicity – Acute and Chronic	4/12/21	6/14/21		8/16/21		10/18/21
Screening Surveys						
Seneca-Oswego-Oneida Rivers basins Screening - Biology (Kicks), Water Column, Microtox®, HABs samples			*7/12/21			
Upper Hudson River basins Basin Screening - Biology (Kicks), Water Column, Microtox®, HABs samples				*8/2/21		
Allegheny River Basin Screening - Biology (Kicks), Water Column, Microtox®, HABs samples					*9/13/21	
Screening Multiplate Surveys						
Seneca-Oswego-Oneida Rivers multiplate survey			7/19/21 deployment	8/23/21 retrieval		
Upper Hudson River multiplate survey			7/26/21 deployment	8/30/21 retrieval		
Allegheny River multiplate surveys			N/A	N/A		

* These are target sampling dates and are subject to change based on current weather conditions, stream flow conditions, and staff/resource availability. However, every effort should be made to remain within a one-two week window of the targeted weeks.

[1]Water column toxicity sampling occurs at sites that coincide with 5-year RIBS basin rotations. See Appendix B for a 5-year schedule of toxicity sampling.

2. Sampling Methods and Field Sheet Documentation

Table 8 lists SOPs used in the RIBS program. SOPs are referenced below and are maintained on the NYSDEC internal website. When sampling procedures as described in SOPs are not followed exactly, modifications are recorded on the field sheets.

Field sheets for all media (water, sediments, organisms) must be completely filled out to document sample collection times, locations, dates and sampling personnel. Field sheets completed by regional staff must be scanned and emailed to StreamData@dec.ny.gov within 30 days of sample collection so that field data can be entered into the Stream Monitoring and Assessment Section database. Field sheets for each sampling medium are contained in Appendix D.

Preservation and holding time requirements for all project samples are detailed in SOP-AMB-210_V21-1, Table 1.

Table 8. SOPs followed during the RIBS Program

ID	Title	Project Component:	
		Routine	Screening
603-20	DOW Guidance for Fieldwork During COVID-19 Pandemic	X	X
SOP-GEN-101_V21-1	Sample Handling, Transport, and Chain-of-Custody	X	X
SOP-GEN-102_V21-1	Data Handling and Archival	X	X
SOP-GEN-103_V21-1	Equipment Cleaning	X	X
SOP-207_V21-1	Collection of Sediment Samples		
SOP-208_V21-1	Biological Monitoring of Surface Waters in New York State		X
SOP-AMB-210_V21-1	Ambient Water Quality Samples for RIBS program sampling	X	X
SOP-AMB-211-V21-1	Use, Calibration, Maintenance and Storage of multi-probe meters used to measure water quality parameters	X	X
SOP-AMB-212_V21-1	Harmful Algal Bloom Sampling and Analysis		X
SOP-AMB-222_V21-1	Sample Collection of Contaminants of Emerging Concern (CECs)	X	
SOP-402_V21-1	*Ceriodaphnia dubia* Seven-day Chronic Screening Test for Toxicity of Ambient Water Samples or Effluents	X	
SOP-403_V21-1	Microtox® Acute Toxicity Test for Porewater, Sediments and Effluents		X

3. Sample Custody Procedures

A. Water Chemistry Chain of Custody and Shipping

All sample handling, transport, and custody procedures are detailed in SOP-GEN-101_V21-1, Sample Handling, Transport, and Chain of Custody. Individual sample containers are marked to identify each station number, collection time, date, and location. A Chain of Custody Form will be completed by sampling personnel and submitted to the analytical laboratory with each cooler containing samples. The ALS Environmental Chain of Custody form also serves as a request for analysis (Figure 3). All sections of the Chain of Custody/Laboratory Analysis Request must be fully and legibly completed, including program name (RIBS), program contact, site ID, collection date and time, QAQC sample code (if applicable), the number of containers per sample being sent to the lab, and analyses requested. (see Section 6. Documentation and Records, Laboratory Identification Numbers).

Quality assurance samples such as equipment blanks, field blanks, or sequential duplicates must be identified by indicating "**-EB", "-FB", or "-SEQ", respectively,** after the sample ID number. Samples times for quality assurance samples should be recorded as different from the parent/previous sample taken (e.g., at least 15 minutes before or after). Sample times for sequential duplicates should be recorded as the true time (rounded to the nearest 15 minutes) that the sequential duplicate sample was taken, which will be after the initial sample has been completely processed and equipment has been cleaned.

Chain of Custody forms contain station numbers, collection times (rounded to the nearest 15 minutes; in exception to SOP-GEN-101_V21-1), dates, and locations, a listing of the specific analyses to be performed, and the time and date of relinquishment to the laboratory/courier. If samples have been preserved or acidified, this is noted on the chain of custody form. Group all containers from the same site together in the same cooler. Make sure each cooler has a chain of custody exclusive to its contents. Upon arrival at the laboratory, containers will be re-grouped according to the types of analyses to be run.

Samples are delivered to the appropriate analytical laboratory for analysis within twenty-four hours of shipping, by courier service (UPS), pick up by the laboratory or delivery by sampling staff. Upon arrival at the laboratory, samples must be refrigerated at <6° C until all analyses are completed. Processing and analysis of samples will begin immediately upon receipt.

Upon receipt at the analytical laboratory, the time of sample receipt and start of analysis along with any problems encountered with equipment or samples will be recorded, and subsequently reported in the data package. Complete information on laboratory procedures is contained in the PAP (2016).

CHAIN OF CUSTODY

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Division of Water

Project Name: **SUSQUEHANNA SCREENING-RED**	Case Code: **RSC18**	NYSDEC SDG: **080618CO1W** (MMDDYYCO#Matrix)
Contract No.: **C010495**	Sampler Collector:	Sampler Phone No.:
Project Manager: Jeff Lojpersberger	☐ **Report to Project Manager** Report to: Alene Onion	☐ **Bill to Project Manager** Bill to: Jason Fagel
Address: 425 Jordan Rd, Troy, NY 12180	**Address:** 625 Broadway, 4th Floor Albany, NY 12233-3502	**Address:** 625 Broadway, 4th Fl Albany, NY 12233-3502
Phone: 518-285-5683	**Phone:** 518-402-8166	**Phone:** 518-402-8156
Email: jeff.lojpersberger@dec.ny.gov	**Email:** alene.onion@dec.ny.gov	**Email:** Jason.fagel@dec.ny.gov

Matrix Codes:
WW = Wastewater
GW = Groundwater
W = Ambient Water
SE = Sediment
SL = Sludge
T = Tissue
O = Other __DI WATER____

Preservative Codes:
(Please include in (_) on "Analyses Ordered" line):
1 = Cool to < 6°C
2 = 0.008% $Na_2S_2O_3$
3 = H_2SO_4 to pH < 2
4 = HNO_3 to pH < 2
5 = NaOH to pH > 12
6 = 5 mL/L 12N HCl
7 = 5 mL/L BrCl
8 = HCl to pH < 2
9 = H_3PO_4 to pH < 2
10 = Protect from light
11 = Freeze to < -10°C
12 = Other

SITE ID	Collection Date	Matrix Code	Equip. Blank (EB)	Duplicate (DUP)	Mercury Field Blank (FB)	Collection Time	No. of Containers	Analyses Ordered (list): RIBS SCREENING	Chlorophyll-*a*	Matrix Spike (MS)	Mercury	Location Info/ NYSDEC Notes	Lab Sample ID/ Lab Notes
06-NWIN-0.2	**08/ /2018**	**W**					9	X	X				
06-DILA_W_T6-1.8	**08/ /2018**	**W**					9	X	X				
06-NANG_W-0.3	**08/ /2018**	**W**					9	X	X				
06-SLEB-6.3	**08/ /2018**	**W**					9	X	X	X		Matrix spike	
06-NING_T-1.2	**08/ /2018**	**W**	EB				9	X	X			Equipment blank	
06-HAIT-0.1	**08/ /2018**	**W**		DUP			9	X	X			Duplicate	
06-FACT-3.2	**08/ /2018**	**W**			FB		1				X	Field blank	

Special Analysis Instructions:

Special Reporting Instructions:
Sample ID to be reported as: **"SITE ID-collection date (MMDDYYYY)-Matrix Code-[Equip Blank or Quality Control Code if noted]"** (dashes included)
EXAMPLES: "06-NWIN-0.2-08152018-W" (regular field sample)
"06-NWIN-0.2-08152018-W-DUP" (field duplicate sample)

Relinquished by Sampler:	Date:				Time:		Received by:	Date:	Time:	Laboratory Receipt Notes:
Relinquished by:	Date:				Time:		Received by:	Date:	Time:	Sample Temp.: _____°C Properly Preserved: Y / N Samples Intact: Y / N

Figure 3. NYSDEC Division of Water Chain of Custody Form

Water chemistry samples are to be shipped to the following location:

ALS Environmental
ATTN: Janice Jaeger
1565 Jefferson Rd # 360
Rochester, NY 14623
Telephone: (585) 288-5380

Samples must be shipped by Thursday of each full sampling week; samples are not to be collected or shipped on a Friday or when the following day is a holiday. Sample coolers are to be shipped by UPS. Drop coolers off at a UPS location or telephone for pick up. If problems arise with samples for ALS Environmental, call the program Sampling and Equipment Coordinator (see section I.II. for contact information), or the Stream Biomonitoring Program Coordinator (see section I. Project Management for contact info).

B. Water Toxicity Testing Chain of Custody and Shipping

Individual sample bottles will be marked to identify each station number, collection date, and location. The AquaTOX Research, Inc. Chain of Custody form (Figure 3a) must be completed by sampling personnel, and included in the cooler containing water samples for toxicity testing. Toxicity testing samples are to be shipped or delivered to the following location:

AquaTOX Research, Inc.
ATTN: Frank Doherty
1201 E. Fayette Street
Syracuse, NY 13210
Telephone: (315) 479-1499

Samples must be shipped in order to arrive by COB Thursday; samples are not to be collected or shipped on a Friday or when the following day is a holiday. Sample coolers are to be shipped by UPS Next Day Air. Drop coolers off at a UPS location or telephone for pick up. If problems arise with samples for AquaTOX Research, Inc., call the Toxicity Testing Coordinator Nicole Wright (518-402-8206). Samples can also be delivered in person to AquaTOX Research, Inc.

SURFACE WATERS CHAIN OF CUSTODY RECORD

Water Body Name:_____ NYSDEC SDG:_____

Sampling Location:_____

Type of Sample: Grab ___ If Grab, Volume of Sample Collected _____
Composite ___ If Composite, No. of Samples per Hour _____
or No. of Samples per Day _____
Volume of Sample Collected per Event _____

Start Time Sample Collection:_____ End Time Sample Collection:_____
Start Date Sample Collection:_____ End Date Sample Collection:_____
Sample Collected by:_____ Date:_____

Relinquished By	Date	Time	Received By
Relinquished By	Date	Time	Received By

Sample Temp on Arrival: _____ Recorded by: _____

Sample Disposition: Returned to Client _____ Trashed _____ Sewered _____

Disposed By: _____ Date: _____

NOTES:_____

AquaTOX Research, Inc., 1201 East Fayette Street, Syracuse, NY 13210
Ph: (315) 479-1498 Email: contactus@aquatoxresearch.com

Figure 4a. AquaTOX Research, Inc. Chain of Custody Form

C. Macroinvertebrate Samples Chain of Custody

Individual sample containers will be marked to identify each station number, collection date, collection method and location. Chain of custody of macroinvertebrate samples for community analysis is maintained on the field sheets and then with internal logging of samples at the Stream Biomonitoring Unit laboratory, as described in SOP-208_V21-1, Biological Monitoring of Surface Waters in New York State. Samples being sent to outside laboratories for species identification will be accompanied by a formal chain of custody.

D. Microtox® Sediment Chain of Custody and Shipping

Individual sample containers will be marked to identify each station number, collection date, and location. Chain of custody of toxicity testing sediment samples is maintained on the field sheets and with internal logging of samples at the NYSDEC Toxicity Testing laboratory space located at the USGS Technology Park.

E. HABs samples Chain of Custody and Shipping

Refer to SOP-AMB-212_V21-1: Collection of Harmful Algal Bloom Samples for the relevant Chain of Custody and sampling handling information.

HABs samples are to be shipped to the following locations:
Raw water in glass containers:
Upstate Freshwater Institute (UFI)
Attn: Gina Kehoe
224 Midler Park Drive
Syracuse, NY 13206
Telephone: (315) 431-4962 ext. 115
Raw water in plastic containers and rock scrapes:
SUNY ESF
Attn: Greg Boyer
307 Stadium Place
341 Jahn Lab
Syracuse, NY 13210

4. Analytical Methods

Analytical methods to be employed for this project are listed in Tables 3, 4, and 5, and listed in the references section. Table 9 lists the analytical laboratories to which samples will be sent for analysis in 2021. Benthic macroinvertebrates and toxicity testing samples will be shipped (water for toxicity testing) or delivered (sediment for Microtox® testing and macroinvertebrates will be delivered by the samplers to the appropriate DEC location for analysis).

Table 9. Analytical laboratories for 2021 RIBS program

LABORATORY NAME/CONTACT	LOCATION	LABORATORY SPECIALTY	TURNAROUND TIME
ALS Environmental Janice Jaeger (585) 288-5380	Rochester, New York	Water column chemistry parameters	30 days
NYSDEC Stream Biomonitoring Unit Laboratory (518) 285-5627	Troy, New York	Benthic macroinvertebrate community composition	April 30th following sample season
Watershed Assessment Associates Kelly Nolan (518)346-0225	Schenectady, New York	Benthic macroinvertebrate community composition	4 months
AquaTOX Research, Inc (315) 479-1498	Syracuse, New York	Water for *Ceriodaphnia* toxicity tests	30 days
NYSDEC Toxicity Testing Unit Laboratory (518)285-5682	Troy, New York	Sediment for Microtox® bioassay	30 days
Upstate Freshwater Institute (UFI)	Syracuse, New York	HABs sample analyses	60 days
SUNY ESF	Syracuse, New York	HABs sample analyses	60 days

5. Quality Control

RIBS program quality control is designed to establish and maintain standards that will ensure the validity of the data. An integral part of sample quality is the collection of representative samples, those that accurately describe the characteristics of the waterbody being studied. Collected samples must accurately represent the waterbody and be unaffected by collection procedures, sample preservation, or sample handling. All chemical analyses are performed at laboratories certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP). Each analytical laboratory is responsible for maintaining internal quality control as a part of their quality assurance plan and in accordance with the NYSDEC's Prescribed Analytical Protocols (PAP) (2016). Sample results comparability is maintained by use of established site selection, sampling, and analytical methods, detailed elsewhere in this document or in SOPs for individual sampling media.

40 CFR Part 136 EPA "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Wastewater and Sewage Sludge, Final Rule" was consulted to ensure adherence to established methodologies where applicable. Toxicity testing methods used have been adapted from the approved USEPA toxicity testing manuals (US EPA 2002 and SOP-402_V21-1) or those developed by NYSDEC for Microtox® acute sediment toxicity testing SOP-403_V21-1. For macroinvertebrate community analysis, methods are established and documented in SOP-208_V21-1, Biological Monitoring of Surface Waters in New York State.

A. Quality Control for Water Chemistry Samples

In order to ensure that sampling standards are being met, matrix spikes, matrix spike duplicates, sequential duplicates, field blanks (low-level mercury only), and equipment blanks are collected. Matrix spike duplicates are collected and used lieu of field duplicates to address precision of laboratory

analyses used in evaluation of data quality. In addition, mercury field blank samples are collected alongside mercury samples collected for the Routine monitoring network. Since samples are being collected by staff in different parts of the state in each sampling week (Table 7), a schedule is established before the sampling season begins that determines which office is responsible for quality control samples for each week (Table 10).

a. Accuracy (matrix spikes)

Matrix spike (MS) samples and matrix spike duplicate (MSD) samples are collected along with regular water quality samples and spiked in the analytic laboratory with a known concentration of analyte. The samples are then analyzed to determine the accuracy (percent recovery) of the analytic results for a given matrix.

For the screening network, matrix spike samples and matrix spike duplicate samples are collected one time per sampling week by each field crew, chosen at random by field crews, during each week of sampling. For routine network samples, matrix pike samples and matrix spike duplicate samples are collected one time per sampling week by each of three different regions at a pre-determined site. This frequency corresponds to between five percent (5%) and ten percent (10%) of the samples. Matrix spikes and matrix spike duplicates are analyzed for nutrients, metals, and minerals.

b. Precision (lab duplicates)

In addition to insight on matrix effects and laboratory performance, MS and MSD samples are used to provide an equivalent metric of precision to a laboratory duplicate. Parameters that are not amenable to spiking (e.g. Chlorophyll, Color, UV254) will still have laboratory duplicates performed and precision measured. The precision between the MS and MSD will be calculated and reported by the laboratory.

c. Precision (sequential field duplicates)

Screening network: For each week of sampling, sequential field duplicate samples are collected once per week by each field crew. The site for the sequential field duplicate is chosen at random by the field crew.

Routine network: Sequential duplicate samples are collected one time per sampling week by each of three regions on a rotational basis (see Table 10). Sequential duplicate sampling sites for the Routine network are pre-selected based on safety and ease of access (due to the extra time required on-site).

This frequency corresponds to between five percent (5%) and ten percent (10%) of the samples for each network.

d. Equipment Blanks

For the screening network, equipment blank samples are collected one time per sampling week by each field crew, chosen at random by field crews, during each week of sampling. For routine network samples, equipment blank samples are collected one time per sampling week by each of three different regions at a pre-determined site. This frequency corresponds to between five percent (5%) and ten percent (10%) of the samples. Equipment blanks are analyzed for nutrients, solids, turbidity, conductivity, hardness, metals, and minerals.

e. Field Blanks

For routine network samples, mercury field blanks are collected one time per sampling week by each of three different regions at a pre-determined site. This frequency corresponds to between five percent (5%) and ten percent (10%) of the samples.

f. Representativeness

Representativeness in water column samples is attained by selection of proper sampling equipment to obtain an integrated sample of water from a cross section of the waterbody, as well as from different depths. Representativeness in macroinvertebrate samples is attained by careful selection of sampling location, as described in SOP-208-V21-1, Biological Monitoring of Surface Water in New York State.

g. Completeness

Completeness is a measure of the number of samples intended to be collected and analyzed compared to the number of samples actually collected and analyzed, expressed as a percentage. For screening network sampling sites where only a single sample is collected at each site, the collection of eighty percent (80%) of samples from each screening basin set of sites will be the minimum acceptable level of completeness. For the routine network where water quality sampling is repeated at the same locations--incomplete data would result in a lower level of confidence in, but not necessarily invalid, conclusions drawn from the data. Generally, eighty percent (80%) of samples at a site will be the minimum acceptable level of completeness. However, because of the limited number of samples collected at each routine site per year every effort should be made to repeat sampling if prior attempts resulted in incomplete data.

h. Quality Control for Community Composition Samples

The quality control methodology for collection and analysis of macroinvertebrate samples collected for community composition analysis is documented in SOP-208-V21-1, Biological Monitoring of Surface Waters in New York State.

All QC calculation will be performed using procedures specified in SOP-GEN-110_V21-1.

Table 10. Distribution of QAQC sample collection and assignments for water chemistry sampling in 2021. Matrix Spike and Matrix Spike Duplicate samples are noted as "MS/MSD", Equipment Blank samples are noted as "EB", Mercury Field Blanks (only collected at Routine Network sites) are noted as "FB", and Sequential Duplicate samples are noted as "SEQ". Notations for number of sample collections and number of teams in the table below are *number* / team(s), read *number* per team(s), including a notation for total amount (n=*number total*).

Network	Week of					
	April	**June**	**July**	**August**	**September**	**October**
Routine Surveys						
Water Column	4/12/21	6/14/21		8/16/21		10/18/21
QAQC samples (MS/MSD, EB, FB, and SEQ)	1/regions 1, 3, and Central Office (n=3)	1/regions 4, 6A, and 6B (n=3)		1/regions 7, 8A, 8B, and 9 (n=4)		1/regions 1, 3, and Central Office (n=3)
Screening Surveys						
Seneca-Oswego-Oneida tribs Screening - Biology (Kicks), Water Column, Microtox, HABs samples			*7/12/21			
EB Bottle Sets			1/team (n=3)			
QC Bottle Sets			1/team (n=3)			
Upper Hudson River Basin Screening - Biology (Kicks), Water Column, Microtox, HABs samples				*8/02/21		
EB Bottle Sets				1/team (n=3)		
QC Bottle Sets (MS and MSD)				1/team (n=3)		
Allegheny River Basin Screening - Biology (Kicks), Water Column, Microtox, HABs samples					*9/13/21	
EB Bottle Sets					1/team (n=3)	
QC Bottle Sets					1/team (n=3)	

* These are target sampling dates and are subject to change based on current weather conditions, stream flow conditions, and staff/resource availability. However, every effort should be made to remain within a one-two week window of the targeted weeks.

6. Instrument/Equipment Testing, Maintenance, and Calibration Procedures

Equipment used in the program is maintained in a complete and current inventory, maintained by the RIBS program Sample Collection and Equipment Coordinator on a NYSDEC DOW server, L:\DOW\BWAM\Equipment. Major items are listed in Table 11.

Table 11. Equipment maintained by the RIBS Program

Item	Description	Number
Boats	10 ft. inflatable zodiac-type; 17 ft. skiff	3
Boat motors	15 hp, 70 hp	2
Multiprobe meters	Hydrolab	1
Multiprobe meters	YSI	14
Multiprobe meters	Eureka	1
Multiprobe meters	Hanna	1
Water Column Samplers	DH-81 handheld	7
Water Column Samplers	Kemmerer Bottle	9
Geo pumps	Peristaltic pump	9
Sediment Samplers	Petit Ponar	3
Water Sample Equipment	Churn Splitters	10
Biological Sampling equipment	Kick Net	12
Global Positioning System units	Garmin	6
Tablets	Apple iPads	5

Each sampling unit (Stream Biomonitoring, Toxicity Testing, Central Office and Regional Office water column samplers) is responsible for maintaining and calibrating equipment assigned to it. If a problem arises with equipment assigned to regional samplers, the program Equipment Coordinator (see section I.1.II. for contact information) should be contacted for assistance in repair or replacement. Some spare parts or spare units will be maintained in Central Office and will be sent or delivered to regional samplers if needed. If a piece of regional equipment breaks, is lost, or is not functioning properly, please contact the Equipment Coordinator as soon as possible so that it can be repaired, and complete sets of data can be collected at all sites. Calibration of multiprobe meters will be done at the beginning of each sampling week, and again if results indicate that re-calibration is necessary, except for dissolved oxygen, which must be calibrated each day. See SOP-AMB-211_V21-1 (Use, Calibration, Maintenance and Storage of Multi-Probe Meters used to Measure Water Quality Parameters).

7. Supplies and Consumables

Inspection of supplies and consumables must be made upon arrival of new materials and immediately before their use in the field or laboratory. For newly arrived supplies and consumables all materials must be in their original packaging and free of noticeable damages. For materials already obtained and about to be used no noticeable defects will be allowed. The Sampling and Equipment Coordinator and the sampling staff from each region are responsible for ensuring the quality of all supplies and consumables for their part of the

project. Supplies and consumables are listed in Table 13. Hand sanitizer (1 gallon), disinfectant wipes (box/160 wipes), and masks (1/person) should be included as part of consumables carried by each sampler crew.

Table 12. Project consumables for water, and organism collections and processing

Item	Supplier	Size	Quantity
Water chemistry supplies			
sample bottle labels	Staples	1	box
Liquinox cleaner	Geotech		
powder free nitrile gloves	Krackeler	1	case
filters	Geotech	100	each
Kaydrys wipes	Cole-Parmer	1	case
Neoprene gloves	Aramark	8	pair
Packing tape	Staples	35	roll
Pump tubing	ColeParmer	1	box
tygon tubing	GeoTech		
replacement bottles for handheld DH-81 sampler	Rickly	2	case
electrolytes for YSI556 and ProPlus	YSI		
Sediment toxicity supplies			
Nalgene Wide Mouth Polypropylene Jars 125 mL	VWR	3	36/Case
Sterileware Disposable Sterile Scoop 60 mL	VWR	1	100/Pack
Microtox Acute Reagent	Modern Water	5	10 Vials/Box
Microtox Diluent	Modern Water	3	1 L Bottle
Microtox Reconstitution Solution	Modern Water	1	50 mL Bottle
Microtox Disposable Glass Cuvettes	Modern Water	3	1000/Box
Nalgene Conical Centrifuge Bottles 175 mL	VWR	3	48/Case
Rectangular Bottles 125 mL	Fisher Scientific	8	48/Box
Whatman Membrane Filters	VWR	1	100/Box
Disposable Polystyrene Serological Pipets 10 mL	VWR	0	200/Case
Methanol 4L	VWR	0	4 L Bottle
VWR Universal Pipet Tips 100-1000 uL Natural	VWR	0	1000/pkg
Combitip 0.5 mL, 12.5 mL	VWR	0	100/Case
Biological supplies			
microscope slide coverslips	Krackeler	1	pack
Kimwipes	Krackeler	20	ea
forceps	Hamilton Bell	10	ea
laser copier labels	Staples	3	ea
4 oz jars; caps	Burch Bottle	3	gross
half gallon jugs for floats	Krackeler	1	case
bricks	True Value	20	ea
replacement kick nets	Forestry Suppliers	5	ea
turnbuckles	True Value	60	ea
batteries	Staples	4	pack
precleaned 4 oz. jars for tissue	Krackeler	10	case
CMCP-10 mounting media, euperal	Masters Chemical	3	bottle
1 dram vials	Krackeler	1	case
Rite in the Rain paper	Forestry Suppliers	5	each
Other supplies			
buffers/standards - conductivity, pH, rhodamine	Krackeler	140	500 ml bottles
Pocket knife for HABs rock scrapes	True Value	1	each

8. Data Management

A. Chemistry

Sample collection information (station, collection date, time) and field parameter measurements (temperature, dissolved oxygen, pH, conductivity, and algal parameters if applicable) will be entered from the sampling field sheets, iPad files, or laboratory results sheets into the Stream Monitoring and Assessment Section database by NYSDEC Central Office. Water column results and supporting documentation from contract laboratories will be reported electronically to NYSDEC in a complete data document either on CD or via a link to the laboratory secure data repository. The data documents include summaries of data validation conducted by the analytical laboratory. Inconsistencies in the data files are flagged for review and correction by program staff. Once the sample collection information (station, date, time, parameter) has been verified, the water quality result values are reviewed. Values are compared against assessment criteria, including established parameter-specific limits. If reported values exceed the established limit, the result is flagged for further investigation.

Investigation of laboratory values may result in confirmation of the results by the analytical laboratory, comparison of the value against other results from the same site, inserting an appropriate data qualifier, and/or accepting the value without qualification. Data qualifiers have been established for laboratory values that are known to be suspicious, less than the reported value, or affected by QA/QC blank contamination (see SOP-GEN-110_V21-1: Data Validation and Verification for a listing and definitions). Once data results have been reviewed and confirmed, water column data are stored in the Stream Monitoring and Assessment Section database.

B. Toxicity Testing

All sampling information for ambient waters undergoing acute and/or chronic toxicity testing using *Ceriodaphnia dubia*, including station, collection date and time, in addition to sample temperature measured upon receipt at AquaTOX Research, Inc., are captured on the Chain of Custody (Figure 3a). Toxicity test results and all supporting documentation from the contract laboratory are provided electronically in a complete data document package (i.e. emailed pdf), which are maintained on the NYSDEC servers. This includes the Chain of Custody, raw data/bench sheets, reference toxicant results, required QA/QC and statistical outputs etc. The data are then reviewed and validated, and the toxicity assessments completed for NYSDEC reporting purposes. Additional information can be found in SOP-402_V21-1, *Ceriodaphnia dubia* 7-Day Chronic Screening Test for Toxicity of Ambient Water Samples or Effluents.

All sampling information for ambient sediments, porewaters or effluents undergoing acute Microtox® toxicity testing, including locations, RIBS program “Station_ID”, and date and time of sample collection, are initially recorded in a dedicated bound laboratory notebook by the TTU. Extraction and run information is also recorded in the laboratory notebook. The proprietary MicrotoxOmni™software enables the Microtox® instrument and a dedicated desktop computer to interface, automatically performing all data collection, plotting and statistical analyses, as well as electronic report generation and storage. Hard copies are also printed and maintained in a three-ring binder, along with the bound laboratory notebook, at the NYSDEC Toxicity Testing laboratory space located at the USGS Technology Park. All sampling information and acute toxicity data for the year is entered in Microsoft Excel, and all sites ranked from most toxic to least toxic. The database is maintained on the NYSDEC server. Additional information can be found in SOP-403_V21-1, Microtox® Acute Toxicity Test for Sediments, Porewaters and Effluents.

C. HABs sample data

Refer to SOP-AMB-212_V21-1: Harmful Algal Blooms Sampling and Analysis for information on data and records management.

D. Biological Communities

Biological community data is received from the lab via electronic data delivery. All information including locations, field parameters, habitat assessments, and species enumeration data are entered into a custom-built database alongside the chemistry data as described in section 8A. Specifics of data management are contained in SOP-208_V21-1, Biological Monitoring of Surface Waters in New York State.

III. ASSESSMENT AND OVERSIGHT

1. Performance and System Audits

NYSDEC contract laboratories are audited on an annual basis by the NYSDEC Audit Team to determine the laboratory's compliance with the requirements of the PAP for all DEC programs submitting samples. EPA will be notified when these audits are done. Performance evaluation sample results are available. According to NYS Public Health Law 502, the laboratory contractors also must be certified by the New York State Department of Health. This program involves semi-annual performance evaluation samples and annual on-site audits. NYSDEC audits subcontractor laboratories on an as-needed basis for those laboratories which perform analysis of parameters which NYSDOH ELAP does not certify for.

The NYSDEC QA officer will conduct project specific field audits for both Central and Regional Office sampling personnel and report the results of these audits to the Program Manager.

2. Corrective Action

Revisions to the Quality Assurance Plan are to be approved by the Program Manager who will ensure that the plan is distributed to those on the distribution list upon completion of revision. Corrective action in response to QAPP non-compliance is to be taken prior to the next sampling event or 1 month, whichever is sooner.

Major sources of errors may include analytical and equipment problems and those resulting from the deviation from intended plans and procedures. If these problems occur in the field, corrective actions should be taken as described in SOP-AMB-210_V21-1, Standard Operating Procedure: Collection of Water Column Samples for the Rotating Integrated Basin Studies (RIBS) as part of the Statewide Ambient Water Quality Monitoring Strategy. For contract laboratories, Exhibits D and E of the PAP contain the procedures the laboratory is to follow when problems are encountered in the chemical analysis of samples.

Deviation from intended plans and procedures should be noted by the person observing the deviation and reported to project staff responsible for the operation or analysis in question. The appropriate project personnel shall (1) develop a corrective action plan to ensure that future sampling, analyses, etc. are conducted in accordance with the QA procedures presented in this QAPP; (2) rerun procedures in the appropriate manner and re-analyze samples, if sufficient sample material is available and holding times are not exceeded; and (3) report all problems and deviations to the RIBS program Data Management Coordinator, who will also be consulted during the development of any proposed corrective action plans. All deviations from intended plans and procedures are to be recorded in the appropriate field or laboratory

notebooks. Failure to implement corrective actions may result in suspension of sampling. Staff will be notified by email of suspension of sampling with follow up confirmation conducted by phone.

3. Reports to Management

The Water Quality Standards & Analytical Support Section will perform a full data validation review on a minimum of 5% of all SDG packages for each chemical matrix in the RIBS Program. Additional SDG data validation reviews will be performed as identified by RIBS program staff in their initial review of the data. This evaluation together with the analysis of the completeness, precision, and accuracy of the program will provide a level of confidence to the data set and to the interpretations and conclusions drawn from the data.

The complete data packages provided to the Data Management Coordinator and the Contract Laboratory Coordinator by the analytical laboratory will report on analytical methods, sample holding times and laboratory preparation techniques that have deviated from the methods contained in this QAPP.

As soon as possible after receipt of data packages from the analytical laboratories, data are reviewed, compiled, and assessed using the established criteria in Section I, 4 of this QAPP and other procedures defined in the Consolidated Assessment and Listing Methodology (CALM) (NYSDEC March 2015) and individual data reports.

4. Data Validation and Usability

A. Water chemistry

Data results generated by the RIBS program are reviewed at three separate stages. First, analytical laboratory staff follows specific laboratory protocols to assure the quality and validity of the data. For additional information, refer to the NYSDEC Prescribed Analytical Protocols (2016). Second, RIBS program staff process the electronic data delivery files (EDDs) and run them through QAQC procedures. This includes an evaluation of the completeness, precision, accuracy, among other tests. SOP-GEN-102_V21-1 Data Handling and Archival and SOP-GEN-110_V21-1 Data Validation and Verification detail these procedures.

Laboratory QA sample evaluation shall include analysis of (1) matrix spikes to determine the average percent recovery and standard deviation and (2) method blanks, which will be compared to respective batch results. Methods defined in SOP-GEN-110_V21-1 Data Validation and Verification, will be utilized to quantify the precision, accuracy, and completeness of laboratory data resulting from this project. Results from these statistical calculations will be useful in determining whether data quality requirements presented in Section I, 4 have been met.

Performing duplicate analyses and comparing results will evaluate laboratory precision. Laboratory duplicate analysis will be conducted to evaluate inorganic and conventional parameters. These QC samples will be analyzed at a frequency of 1 per analytical batch as required by the PAP Exhibit E.

All data will be reviewed to determine its validity prior to use and distribution. Those data not meeting the previously identified criteria for precision, accuracy and blank values (Section I, 4) will be flagged with the appropriate qualifiers. An indication as to why flagged data did not meet the minimum QA criteria will be

provided. Laboratory and final validator qualifiers are listed and detailed in SOP-GEN-110_V21-1 Data Validation and Verification . This information will be noted in the final QAQC report.

B. Toxicity Testing

Chronic toxicity testing results (*Ceriodaphnia dubia*) are validated according to methods detailed in the EPA methods manual for toxicity testing, "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms", Fourth Edition. EPA-821-R-02-013. Specifically, the Test Acceptability Criteria (TAC) require $\geq$ 80% survival in the controls, $\geq$ 60% of the controls producing 3 broods in 7+/- 1 day with an average of $\geq$15 young produced per female. The only exception is in low hardness waters where an average of $\geq$10 young per female is acceptable.

Acute toxicity testing data (Microtox®) are determined to be useable by the calculation of R values for individual samples by the Microtox Omni™ software. Data are determined to be acceptable for use if the R value is $\geq$0.90, as documented in the Microtox® User Manuals. Additionally, if the confidence interval is +/-20% of the EC50 and/or straddles two different toxicity categories (e.g. slight and moderate), the sample is typically rerun to generate a higher confidence endpoint and subsequent toxicity categorization.

C. Community Composition Analysis

Biological (macroinvertebrate) data results are validated per the methods detailed in SOP-208_V21-1, Biological Monitoring of Surface Waters in New York State, and include internal checks among taxonomists, comparison of voucher specimens with the laboratory reference collection, and quality control subsampling on 5% of all samples. For contract laboratories conducting macroinvertebrate identifications, quality control requirements are contained in the contract.

D. HABs sample data

Refer to SOP-AMB-212_V21-1: Harmful Algal Blooms Sampling and Analysis for information on HABs data Quality Assurance and Quality Control measures.

E. Reporting

After the above QC calculations and examinations have been performed for all media, the results will be summarized in a final report. This will include a discussion and summary of the accuracy, precision, completeness, comparability, and representativeness observed during the study.

REFERENCES

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Appendix A

Screening Network Sites

Allegheny River, Seneca-Oswego-Oneida Rivers, and Upper Hudson River basins

The list of potential Screening Network sites for the target basins is drawn from all streams in each watershed. Sites are selected for sampling using the criteria described in this document section II. 1. A. The list is generated by July 1 of the sampling year and will be added to this QAPP as an addendum when complete. The link below connects to the RIBS program online screening map and will be updated with the QAPP.

Appendix B

Permanent Statewide Network Sites

DEC REGION	STREAM NAME	SBU SITE ID	DESCRIPTION	MUNICIPALITY	USGS GAGE ID	LATITUDE	LONGITUDE	TOXICITY SAMPLING YEAR
1	Carmans River	17-CARM-9.0	Below foot bridge at USGS gaging station	Brookhaven	01305000	40.830000	-72.906940	2023
2	Bronx River	17-BRNX-5.6	150 m above East Gun Hill Rd. bridge	New York	01302020	40.880000	-73.868610	2023
3	Delaware River	14-DELA-1.3	Above Route 6/209 bridge - PA side	Port Jervis	01434000	41.372220	-74.697220	2024
3	Neversink River (Lower)	14-NEVR-8.9	100 m above Graham Rd. bridge	Deerpark	01437500	41.442200	-74.600200	2024
3	Rondout Creek	13-ROND-9.9	40 m above Rt. 213 bridge	Rosendale	01367500	41.842780	-74.085830	2022
3	Wallkill River	13-WALK-18.6	Main St./Rte 44 bridge	Gardner	01371500	41.687831	-74.165700	2022
4	Delaware River - West Branch	14-WDEL-16.2	Above Cold Spring Br. mouth; nr Rte 10 cross.of ck	Deposit	01425000	42.080000	-75.401390	2024
4	Hoosic River	11-HOOS-20.8	Rte 67 bridge	Eagle Bridge	01334500	42.951539	-73.390542	2021
4	Hudson River (Lower)	13-LHUD-125.8	At Port of Albany	Albany	01358000	42.619495	-73.758796	2022
4	Schoharie Creek	12-SCHO-14.6	Above Braman Corners Rd. bridge	Duanesburg	01351500	42.800000	-74.263340	2020
4	Unadilla River	06-DILA-5.4	Rte. 1/40 bridge	Rockdale	01502500	42.378737	-75.406399	2023
5	Ausable River	10-SABL-14.6	Bridge on Lower Rd.	Clintonville	04275500	44.464375	-73.575255	2023
5	Bouquet River	10-BOQT-2.6	N. Main St./Rte 22 bridge	Wilsboro	04276500	44.363890	-73.390881	2023
5	Hudson River (Upper)	11-UHUD-267.8	Rte. 28N bridge	Chester	01315500	43.700830	-73.982500	2021
5	Hudson River (Upper)	11-UHUD-42.5	Rte 27/Hudson Falls Rd. bridge	Moreau	01327750	43.297830	-73.589607	2021
5	Little Salmon River	09-LSAL-7.6	Rte 4 bridge	Bombay	04270200	44.939851	-74.556944	2024
5	Mohawk River	12-MOHK-1.5	20 m above Rt. 32 and RR bridges	Cohoes	01357500	42.778330	-73.696670	2020
5	Saranac River	10-SARA-0.4	Bridge St. Bridge	Plattsburgh	04273500	44.697538	-73.450850	2023
6	Black River	08-BLCK-8.0	Van Duzee St. bridge	Watertown	04260500	43.984720	-75.925000	2022
6	Black River	08-BLCK-84.5	5 m above Moose River Rd. bridge	Boonville	04252500	43.511670	-75.306660	2022
6	Grass River	09-GRAS-7.8	Chase Mills - Lousville Rd./Rte 36 bridge	Chase Mills	04265432	44.846933	-75.078952	2024

DEC REGION	STREAM NAME	SBU SITE ID	DESCRIPTION	MUNICIPALITY	USGS GAGE ID	LATITUDE	LONGITUDE	TOXICITY SAMPLING YEAR
6	Mohawk River	12-MOHK-79.5	Green buoy 459, below Lock 17	Little Falls	01347000	43.037780	-74.840550	2020
6	Oswegatchie River	09-GTCH-17.7	Rensselaer St. bridge	Rensselaer Falls	04263000	44.589251	-75.321112	2024
7	Onondaga Creek	07-ONON-1.0	West Kirkpatrick St. Bridge	Syracuse	04240010	43.057780	-76.163450	2021
7	Oswego River	07-OSWE-5.2	Minetto Rd./ Rte. 57 bridge	Minetto	04249000	43.397974	-76.471403	2021
7	Salmon River	03-SALM-12.0	At the CR 48 bridge	Albion	04250200	43.530892	-76.037615	2020
7	Susquehanna River	06-SUSQ-31.4	Vestal Ave./Bridge St. bridge	Vestal	01513500	42.090970	-76.055787	2023
7	Tioughnioga River	06-TOGH-32.8	Main St./Rte 121A bridge	Blodgett Mills	01509000	42.568252	-76.121111	2023
8	Canacadea Creek	05-CDEA-1.8	100 m above Rt. 21 bridge @gaging station	Hornellsville	01523500	42.335670	-77.682670	2022
8	Canaseraga Creek	04-RAGA-1.4	At Rt. 408 bridge, USGS gage station spillway	Mount Morris	04227000	42.735980	-77.841840	2024
8	Chemung River	05-CHEM-5.4	10 m below Rt. 427 bridge	Chemung	01531000	42.002780	-76.635000	2022
8	Genesee River	04-GENS-2.6	Genesee Docks at Boxart St.	Rochester	04231600	43.227220	-77.616390	2024
8	Keuka Lake Outlet	07-KEUK-0.3	Kings Hill Rd	Torrey	04232482	42.680370	-76.953960	2021
8	Northrup Creek	03-NRUP-3.1	At Rte 18/Latta Rd. bridge	Greece	0422026250	43.254000	-77.742000	2020
9	Allegheny River	02-ALGY-20.3	200 m below Main Street bridge	Salamanca	03011020	42.157160	-78.717940	2021
9	Buffalo River	01-BUFF-1.7	Ohio St. bridge	Buffalo	*Estimated	42.861940	-78.867870	2020
9	Chadakoin River	02-CHAD-2.2	50 m below South Dow St. bridge	Ellicott	03014500	42.112450	-79.20303	2021
9	Eighteenmile Creek	03-EMIL-5.1	Ewings/McKee Rd. bridge	Newfane	04219768	43.277973	-78.711186	2020
9	Genesee River (Upper)	04-UGNS-137.8	State St; 150m above bridge	Wellsville	04221000	42.118660	-77.946540	2024
9	Tonawanda Creek	01-TONA-19.4	500 m below Rapids Rd. bridge	Lockport	04218000	43.093330	-78.636390	2020

*Ohio St. Discharge = 1.55(Gage04215500 + Gage04214500 + Gage04215000)

Appendix C

Field Sheets

1. Field sheets for the collection of water column samples (can be collected as hard copy or using an iPad and Survey123 software, downloaded for entry into the Stream Monitoring and Assessment Section Database). Regional Routine field sheets will be scanned as pdfs and emailed to StreamData@dec.ny.gov, after which they will be archived in the L drive folder L:\DOW\SMAS\projects\routine_network\field_sheets\.

2. Field sheet for the collection of biological monitoring data (collected using an iPad and Survey123 software, downloaded to biological database).

3. Field sheet for the assessment of user perception (collected using an iPad and Survey123 software, downloaded to biological database).

4. Field sheet for rapid assessment of habitat condition in high gradient streams (collected using an iPad and Survey123 software, downloaded to biological database).

5. Field sheet for rapid assessment of habitat condition in low gradient streams (collected using an iPad and Survey123 software, downloaded to biological database).

6. Field sheet for recording pebble count and algal/siltation substrate cover (collected using an iPad and Survey123 software, downloaded to biological database).

7. Field sheet for the collection of sediment samples will be scanned and archived on the L drive.

FIELDSHEETS FOR RIBS SAMPLING

NYSDEC Division of Water **RIBS Field Sheet** **Region ___ – Week of _____**

General Information and Sample Types:

Sampling Date:	Station ID:
Sampling Time:	Location:
Samplers:	SDG: MMDDYYR__W (fill in for this week's Monday and region #)
Sampled from: Bridge Waded Other*	Equip: DH-81 Kemmerer/Van Dorn Poly-pro/Medora Other*
Sampling Specifics: # of Transects: _____	# of Dips (per transect): _____ # of Trips: _____
Dissolved Oxygen (mg/L):	Dissolved Oxygen (% sat.):
Specific Conductance (µS/cm):	Water Temperature (°C):
pH:	Flow characterization: Low Normal High
Additional sampling: □ Toxicity □ CECs – PFAS (TestAmerica) □ CECs – PPCPs/Hormones (ALS Kelso) **RIBS QAQC**: □ Seq. Dup. ("SEQ") □ Equip. Blank ("EB") □ Field Blank ("FB"; Hg only) □ MS/MSD **CEC QAQC**: □ Field Blank □ MS/MSD	

Other observations/comments/method exceptions*: _____

*Note why "other" location/equipment selected.

Assessment of Recreational User Perception:

Circle the one answer which best describes your ability to participate in **primary** contact recreation:

a) Beautiful. Could not be nicer. Ability to swim, wade, dive water ski etc. fully attained.
b) Minor aesthetic problems, but still excellent for primary recreation.
c) Primary contact recreation slightly impacted.
d) Desire to participate in primary contact recreation substantially reduced.
e) Awful! Primary contact recreation impossible.
f) Not applicable (headwater/high flows/dry, etc.).

Circle the one answer which best describes your ability to participate in **secondary** contact recreation:

a) Beautiful. Could not be nicer. Ability to fish and boat fully attained.
b) Minor aesthetic problems, but still excellent for secondary contact recreation.
c) Secondary contact recreation slightly impacted.
d) Desire to participate in secondary contact recreation substantially reduced.
e) Awful! secondary contact recreation impossible.
f) Not applicable (headwater/high flows/dry, etc.)

Weather Conditions (Current): Sun Rain Clouds Weather Conditions (Past 24 hours): Sun Rain Clouds

Water Clarity:	0	1	2	3	4	5	6	7	8	9	10
	Clear					Intermediate					Turbid
Phytoplankton: (suspended)	0	1	2	3	4	5	6	7	8	9	10
	Natural					Intermediate					Severe
Periphyton: cover	0	1	2	3	4	5	6	7	8	9	10
	Natural					Intermediate					Severe
Macrophyte: cover	0	1	2	3	4	5	6	7	8	9	10
	Natural					Intermediate					Severe
Odor:	0	1	2	3	4	5	6	7	8	9	10
	Natural					Intermediate					Noxious
Trash:	0	1	2	3	4	5	6	7	8	9	10
	None					Intermediate					Landfill
Discharges/Pipes:	0	1	2	3	4	5	6	7	8	9	10
	None					Intermediate					Dominant

Circle all the variables that negatively affect your opinion of recreational use of the waterbody today:

Water Clarity Phytoplankton Periphyton Macrophytes Odor Trash Discharges/Pipes

None Other: _____

Please scan and email completed field sheet to: StreamData@dec.ny.gov

NYSDEC Division of Water **RIBS Field Sheet – Sequential Duplicate**

Sequential Duplicate Sampling Information:

Sampler(s):	
Sampling Date:	Station ID:
Initial Sample Time:	Waterbody Name:
Sequential Duplicate Sample Time:	-----
Sampled from: Bridge Waded Shoreline*	Equip: Kemmerer Depth-Integrated Pail* Bottle*
Sampling Specifics: # of Transects: _____	# of Dips (per transect): _____ # of Trips: _____
Flow characterization: Low Normal High	

Sequential Duplicate YSI readings:

Dissolved Oxygen (mg/L):	Dissolved Oxygen (% sat.):
Specific Conductance (µS/cm):	Water Temperature (°C):
pH:	

Other observations/comments/exceptions: _____

_____

Please scan in consecutive order with associated site field sheet and email to:
StreamData@dec.ny.gov

FIELDSHEET FOR THE COLLECTION OF BIOLOGICAL MONITORING DATA

New York State Department of Environmental Conservation

FIELD DATA SHEET **4-letter identifier** _____

STREAM / STATION _____ **CITY/TOWN/VILLAGE** _____
ROUTE NO. _____
DATE _____
TIME : ARRIVAL _____ **UNIQUE FEATURES** _____
DEPARTURE _____
COLLECTORS _____ **SITE TYPE:** **RIBS SCREENING** _____
LATITUDE\ LONGITUDE _____ **RIBS INTENSIVE** _____
MULTI-SITE SURVEY _____

PHYSICAL AND CHEMICAL PARAMETERS

DEPTH (meters) _____ TEMPERATURE (ºC) _____

WIDTH (meters) _____ SPEC. CONDUCT. (µmhos) _____

CURRENT (cm/sec) _____ pH _____

CANOPY (%) 0 10 25 50 75 90 100 D.O. (mg/l; ppm) _____ / sat. % _____

EMBEDDEDNESS (%) _____ SALINITY _____

SECCHI DISK _____

SUBSTRATE: (%) Rock _____ Rubble _____ Gravel _____ Sand _____ Silt _____

AQUATIC VEGETATION: Algae (suspended) _____ Algae (filamentous) _____

Diatoms (on rocks) (%) _____ Thickness _____ Macrophytes (%) _____

TYPE OF SAMPLE

Multiplate _____
Kick, sample retained _____
Kick, sample not retained _____
Ponar _____
Organisms for toxics _____
Photograph _____
Microtox sample _____
Other _____

OCCURRENCE OF MACROINVERTEBRATES

Ephemeroptera	_____	Chironomidae	_____		
Plecoptera	_____	Simuliidae	_____		
Trichoptera	_____	Decapoda	_____		
Coleoptera	_____	Gammaridae	_____		
Megaloptera	_____	Mollusca	_____		
Odonata	_____	Oligochaeta	_____		
Other	_____		_____		

FAUNAL CONDITION: very good _____ good _____ poor _____ very poor _____
Habitat: adequate _____ impoundment _____ headwater _____ sand _____ gravel _____
bedrock _____ low flow _____ other _____
Landuse: Residential _____ Agriculture _____ Commmerical _____ Industrial _____
Forest _____ Recreational _____ Wetland _____

NOTES, OBSERVATIONS

RIBS SCREENING SITE CRITERIA

1. Mayflies (3 or more taxa) _____
2. Stoneflies (present) _____
3. Caddisflies (less abund. than mayflies) _____
4. Beetles (present) _____
5. Worms (sparse or absent) _____

FIELDSHEET FOR THE ASSESSMENT OF RECREATIONAL USE

NYSDEC - Assessment of Recreational Use Perception

Circle the one answer which best describes your ability to participate in 1^0 contact recreation:

a. Beautiful, could not be nicer. Ability to swim, wade, dive, water ski etc…fully attained.
b. Minor aesthetic problems, but still excellent for 1^0 contact recreation.
c. 1^0 contact recreation slightly impacted.
d. Desire to participate in 1^0 contact recreation substantially reduced.
e. Awful! 1^0 contact recreation impossible.
f. Not applicable (headwater/high flows/dry, etc.)

Circle the one answer which best describes your ability to participate in 2^0 contact recreation:

a. Beautiful, could not be nicer. Ability to fish and boat fully attained.
b. Minor aesthetic problems, but still excellent for 2^0 contact recreation.
c. 2^0 contact recreation slightly impacted.
d. Desire to participate in 2^0 contact recreation substantially reduced.
e. Awful! 2^0 contact recreation impossible.
f. Not applicable (headwater/high flows/dry, etc.)

Weather conditions (Current):	Sun	Rain	Clouds
Weather conditions (Past 24hrs):	Sun	Rain	Clouds

Water Clarity:	0	1	2	3	4	5	6	7	8	9	10
	Clear				Intermediate						Turbid
Phytoplankton: (suspended)	0	1	2	3	4	5	6	7	8	9	10
	Natural				Intermediate						Severe
Periphyton Cover:	0	1	2	3	4	5	6	7	8	9	10
	Natural				Intermediate						Severe
Macrophyte Cover:	0	1	2	3	4	5	6	7	8	9	10
	Natural				Intermediate						Severe
Odor:	0	1	2	3	4	5	6	7	8	9	10
	Natural				Intermediate						Noxious
Trash:	0	1	2	3	4	5	6	7	8	9	10
	None				Intermediate						Landfill
Discharges/Pipes:	0	1	2	3	4	5	6	7	8	9	10
	None				Intermediate						Dominant

Circle all the variables that negatively affect your opinion of recreational use of the waterbody today.

Water Clarity Phytoplankton Periphyton Macrophytes Odor Trash Discharges/Pipes

Other (Please list):

FIELDSHEET FOR RAPID ASSESSMENT OF HABITAT CONDITION IN HIGH GRADIENT STREAMS

New York State Department of Environmental Conservation
Field Sheet for Rapid Assessment of Habitat Condition (High Gradient)

Stream Name:_____
4-letter Identifier/Station Number:_____
Collectors:_____
Biological Sample: Y N
Site Type: Screening Intensive Multi-Site

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e. logs/snags that are not new fall and not transient)	40 – 70% mix of stable habitat; well-suited for full colonization potential, adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20 – 40 % mix of stable habitat; habitat availability less than desirable, substrate frequently disturbed or removed.	Less than 20 % stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble and boulder particles are 0-25 % surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble and boulder particles are 25-50 % surrounded by fine sediment.	Gravel, cobble and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble and boulder particles are more than 75 % surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderated deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion; mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion potential during floods.	Unstable, many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9.Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation very high vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Note: determine left or right side by facing downstream.

FIELDSHEET FOR RAPID ASSESSMENT OF HABITAT CONDITION IN LOW GRADIENT STREAMS

New York State Department of Environmental Conservation
Field Sheet for Rapid Assessment of Habitat Condition (Low Gradient)

Stream Name:_____
4-letter Identifier/Station Number:_____
Collectors:_____
Biological Sample: Y N
Site Type: Screening Intensive Multi-Site

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e. logs/snags that are not new fall and not transient)	30 – 50% mix of stable habitat; well-suited for full colonization potential, adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	10 – 30 % mix of stable habitat; habitat availability less than desirable, substrate frequently disturbed or removed.	Less than 10 % stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderated deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long time.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable, infrequent, small areas of erosion; mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion potential during floods.	Unstable, many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE____(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE____(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9.Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation very high vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE____(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE____(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE____(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE____(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Note: determine left or right side by facing downstream.

FIELDSHEET FOR RECORDING PEBBLE COUNT AND ALGAL/SILTATION SUBSTRATE COVER

New York State Department of Environmental Conservation
Pebble Count and Algae Cover Field Form

Stream Name: _____
4-letter Identifier/Station Number: _____
Collectors: _____
Biological Sample: Y N
Site Type: Screening Intensive Multi-Site

Pebble Count Observations

Particle	Millimeters	Transect 1 (100 pebbles)		Item %
		Dry	Wet	
Silt	.004 -0.6			
Sand	0.06 – 2.0			
Gravel	2.0 - 16			
Crse. Gravel	16 - 64			
Rubble	64 – 256			
Rock	>256			
Bedrock	----------			
TOTALS				

Periphyton Cover Observations

	Moss Cover Index			
Category	0	1(<5%)	2(5-25%)	3(>25%)
Tally				

	Macro-Algae Cover Index			
Category	0	1(<5%)	2(5-25%)	3(>25%)
Tally				

	Micro-Algae Cover Index						
Category	0	1 (slimy)	2 (draw line)	3(.5-1mm)	4(1-5mm)	5(5-20mm)	6(>20mm)
Tally							

	Siltation Cover Index				
Category	0	1 (draw line)	2(.5-5mm)	3(5-20mm)	4(>20mm)
Tally					

Other Observations