Appendix B
Scenic Rivers Monitoring Program
Site Information and Quality Assurance and Control

Table B1: Locations for Baseline Scenic Rivers Monitoring (43 Sites)

UPPER DELAWARE RIVER MONITORING LOCATIONS (9)	
Buckingham Access Area (2001)	Ten-Mile River NYSDEC Access Area
Lordville Bridge	Barryville Bridge
Callicoon Bridge	Pond Eddy Bridge
Callicoon NYSDEC Access Area	Millrift
Cochecton Bridge	
MIDDLE DELAWARE RIVER MONITORING LOCATIONS (7)	
Port Jervis	Bushkill Access
Northern DEWA boundary	Smithfield Beach
Milford Beach	Delaware Water Gap
Dingmans Access	
UPPER DELAWARE TRIBUTARIES (14)	
West Branch Delaware	Masthope Creek
East Branch Delaware	Beaver Brook
Equinunk Creek	Lackawaxen River
Little Equinunk Creek	Halfway Brook
Callicoon Creek	Shohola Creek
Calkins Creek	Mongaup River
Ten Mile River	Shingle Kill
MIDDLE DELAWARE TRIBUTARIES (13)	
Neversink River	Flat Brook
Vandermark Creek	Little Flat Brook
Shimers Brook	Van Campens Brook
Sawkill Creek	Shawnee Creek
Raymondskill Creek	Brodhead Creek
Bushkill Creek	Cherry Creek
Little Bushkill	

Table B2: Flow Measurement Monitoring Locations

LOCATION	**AGENCY**	**TYPE**
DELAWARE RIVER FLOW MONITORING LOCATIONS		
Callicoon Access Area	U.S.G.S.	Continuous
North of Lackawaxen	U.S.G.S.	Continuous
Port Jervis	U.S.G.S.	Continuous
Milford	U.S.G.S.	Continuous
Tocks Island	U.S.G.S.	Discontinued
UPPER DELAWARE TRIBUTARY FLOW MONITORING LOCATIONS		
West Branch Delaware	U.S.G.S.	Continuous
East Branch Delaware	U.S.G.S.	Continuous
Equinunk Creek	DRBC/NPS	Instantaneous
Little Equinunk Creek	DRBC/NPS	Instantaneous
Calkins Creek	DRBC/NPS	Instantaneous
Callicoon Creek	DRBC/NPS	Instantaneous
Tenmile River	DRBC/NPS	Instantaneous
Masthope Creek	DRBC/NPS	Instantaneous
Beaver Brook	DRBC/NPS	Instantaneous
Halfway Brook	DRBC/NPS	Instantaneous
Shohola Creek	DRBC/NPS	Instantaneous
Shingle Kill	DRBC/NPS	Instantaneous

Table B2 continued

MIDDLE DELAWARE TRIBUTARY FLOW MONITORING LOCATIONS		
Neversink River	U.S.G.S.	Continuous
Cummins Creek	DRBC/NPS	Instantaneous
Vandermark Creek	DRBC/NPS	Instantaneous
Shimers Brook	DRBC/NPS	Instantaneous
Sawkill Creek	DRBC/NPS	Instantaneous
Raymondskill Creek	DRBC/NPS	Instantaneous
Dingmans Creek	DRBC/NPS	Instantaneous
Hornbecks Creek	DRBC/NPS	Instantaneous
Toms Creek	DRBC/NPS	Instantaneous
Saw Creek	DRBC/NPS	Instantaneous
Little Bushkill Creek	DRBC/NPS	Instantaneous
Bushkill Creek	U.S.G.S.	Continuous
Flat Brook	U.S.G.S.	Continuous
Little Flat Brook	DRBC/NPS	Instantaneous
Big Flat Brook	DRBC/NPS	Instantaneous
Van Campens Brook	DRBC/NPS	Instantaneous
Shawnee Creek	DRBC/NPS	Instantaneous
Marshalls Creek	DRBC/NPS	Instantaneous
Brodhead Creek	U.S.G.S.	Continuous
Adams Creek	DRBC/NPS	Instantaneous
Dunnfield Creek	DRBC/NPS	Instantaneous
Slateford Creek	DRBC/NPS	Instantaneous
Cherry Creek	DRBC/NPS	Instantaneous

Table B3: Parameters for Scenic Rivers Monitoring Program

Parameter	Standard Methods – Number	Equipment	Min – Max	Accuracy(±)
BASELINE PARAMETERS - MONTHLY SAMPLING FREQUENCY				
Flow	See TABLE B2 for locations	Pygmy meter	0.07-3.00 fps	
Air temperature	2550 – thermometric	Thermometer	-10-110 °C	1 °C
Water temperature	2550 – thermometric	Thermometer	-10-110 °C	1 °C
		Thermistor probe (DO meter)	-5-45 °C	0.7 °C
		Thermistor probe (conductivity meter)	-2-50 °C	0.6 °C
Dissolved oxygen	4500-O C. - azide modification of Winkler titration method	Kit	0-20 mg/l	20-60 µg/l
	4500-O G. – membrane electrode	Meter	0-20 mg/l	1 % of scale
Specific conductance	2510 - platinum electrode conductivity cell	Meter	0-19,999 µmhos /cm	2 µmhos/cm
PH	4500-H+	Oakton pH meter	4-10 units	0.25 units
Turbidity	2130 B. Nephelometric	LaMotte colorimeter	5-400 NTU	.1-10 NTU
Fecal coliform	9222 D. m-FC media	Membrane filtration	> 0 colonies/100 ml	NA
Total Suspended Solids	2540 D. TSS dried at 103-105°C	Glass fiber filter system, oven, dessicator, analytical balance to 0.1 mg	2.5 -200 mg residue weight	5% of avg. weight 2.8 mg/L SD

Table B3 continued

Parameters **Not** Analyzed in 2000 and 2001 Programs *Some were used to define existing water quality in DRBC's Special Protection Waters rules, others form the basis of DRBC's Stream Quality Objectives for Zones 1A, 1B, 1C, and 1D of the Delaware River. Resource constraints during the 2000 and 2001 monitoring seasons prevented assessment of these against water quality standards and Special Protection Waters stream quality targets.*	
Alkalinity	2320 B. Titration. No criteria for this parameter. Deemed useful, but not funded.
Ammonia N	4500-NH3 F. Phenate Method. Special Protection Waters rules define existing water quality for this parameter. Replacement equipment has not been funded.
Biocriteria: Macroinvertebrate Shannon Diversity	Special Protection Waters rules defined existing water quality using this benthic macroinvertebrate metric as a numeric standard. Methods under development to assess this parameter's sensitivity to "measurable change", no resources allocated.
Biocriteria: Macroinvertebrate Equitability	Special Protection Waters rules defined existing water quality using this benthic macroinvertebrate metric as a numeric standard. Methods under development to assess this parameter's sensitivity to "measurable change", no resources allocated.
Biocriteria: Macroinvertebrate EPT Richness	Special Protection Waters rules defined existing water quality using this benthic macroinvertebrate metric as a numeric standard. Methods under development to assess this parameter's sensitivity to "measurable change", no resources allocated.
BOD5	5210 B. 5-Day BOD Test. Special Protection Waters rules define existing water quality for this parameter. Analysis of this parameter is not funded.
Hardness	2340 B. Calculation or 2340C – EDTA Titrimetric. Special Protection Waters rules define existing water quality for this parameter. Analysis of this parameter is not funded.
Nitrate+nitrite N	4500-NO3. No method decided. Special Protection Waters rules defined existing water quality for this parameter. Staff are averse to Cadmium Reduction method due to health and cost concerns regarding waste disposal. Alternative Zinc Reduction method not approved by U.S. EPA. Replacement equipment is not funded.
Ortho-phosphate	4500-P E. Ascorbic acid reduction. Special Protection Waters rules define existing water quality for this parameter. Replacement equipment has not been funded.
Total Dissolved Solids	2540 C. TDS dried at 180 °C. Special Protection Waters rules define existing water quality for this parameter. Analysis of this parameter is not funded.
Total Kjeldahl Nitrogen	4500-Norg A. Macro-Kjeldahl. . Special Protection Waters rules define existing water quality for this parameter. Analysis of this parameter is not funded.

DRBC BIOMONITORING – Macroinvertebrates and habitat for tributaries and Delaware River.	
Habitat Assessment (wadeable tributaries)	RBP 2nd Edition 1999, Habitat Protocols for High Gradient Streams (tributaries). Sampled as needed.
Habitat Assessment (Delaware River – special project)	USGS NAWQA Protocols (Fitzpatrick et al. 1998) in Delaware River OR Adaptation of RBP Habitat (2nd Ed., Barbour et al. 1999) to Delaware River. This is used to identify & quantify extent of riverine microhabitats for macroinvertebrates.
Macroinvertebrates (Rapid Assessment in Tributaries)	Indicator-organism field-level assessment w/ 10 point scoring system. Adapted from NYSDEC screening procedure developed by Bode et al. 1996. Assess 100 m reach upstream of fixed water quality sampling site. Sample as needed. If score < 5, call state for further investigation.
Macroinvertebrates (Delaware River Metric Development)	Best habitat (riffle, run, or island head), 33 sites, 3 replicates, 200-organism subsample of Delaware River from East & West Branches to Trenton, NJ. Index period is August-September, flow must be less than 6,000 cfs @ Trenton for access. Sampled annually.

Quality Assurance and Control

The data collection quality objectives of the SRMP are:

- To accurately describe the water quality conditions in the study area. The water quality parameters should be sufficient to:

1. define and evaluate the quality of the waters within the Scenic Rivers region;
2. determine if numerical standards of Special Protection Waters are maintained
3. categorize tributaries and river locations as point source or non-point source-impacted;
4. support management actions such as follow-up monitoring and directing intensive surveys by state enforcement agencies;
5. determine if water quality meets or exceeds primary contact recreation standards.

- To obtain data so that sound, scientifically-based management decisions involving the ecosystem can be made. The level of precision and accuracy should be sufficient to characterize:

1. the chemical, biological, and physical characteristics of the ecosystem;
2. the aquatic and riparian habitats of the ecosystem;
3. the natural variability of the biological communities of each habitat;
4. the sensitivity of biological communities to natural and anthropogenic impacts;
5. the interrelationship of chemical, physical, and biological components; and
6. measures of the ecosystem's general integrity and health.

Quality Assurance Practices and Procedures

Attainment of quality assurance objectives is achieved by maintaining a running check of precision and accuracy of analyses throughout the sampling program. Instrument variations are controlled by calibration of equipment and use of standard solutions. These are recorded on Calibration Quality Assurance forms.

SRMP staff is required to maintain a daily log of activities. Separate notebooks are also kept for each individual program element. These notebooks are used to record observations, describe sampling station locations, and to present results. The SRMP has also developed three data record/analyses sheets for recording results. These are used routinely for water quality, flow and macroinvertebrate/habitat.

Separate notebooks are also maintained for all quality control checks for bacteriological samples. Examples of information recorded include tests using sample blanks, parallel tests (external and internal) and replicate samples. QA report forms have been developed for use by the SRMP staff for their monthly and other QA reporting activities.

Sample Custody

Samples are generally in the custody of the same individuals from initial collection through analysis and recording of data. One individual has designated responsibility for record-keeping, which includes the preparation of sample labels, laboratory logging procedures and the maintenance of reports as described above. In cases where a laboratory is contracted for analyses (e.g., the Academy of Natural Sciences contracted from 1995-1997), sample custody procedures of the contract lab are followed by the sampling personnel.

Performance and System Audits

Before the initiation of the SRMP, the DRBC/NPS Co-Managers should prepare the program by checking all equipment, making repairs, and by purchasing equipment and chemicals. This activity is coordinated and shared with National Park Service lab personnel. A Co-manager or QA Officer from both DRBC and NPS performs training and field/laboratory audits prior to and during the monitoring season, checking sampling and analytical methods for proper quality controls and other activities related to program administration.

Field audits evaluate sampling technique, sample handling, and preservation to insure representative results. Personnel safety measures are highlighted. Laboratory audits review analytical techniques, sample preparation, and data reporting procedures. Also, laboratory cleanliness and safety are emphasized.

Corrective Actions

Corrective actions are initiated during routine internal and external quality control checks. The Quality Assurance Officer orders corrective actions after consultation with the program co-managers when periodic quality assurance inspections turn up unacceptable variations in data sets obtained during implementation of quality control procedures. If the problems noted by the Quality Assurance Officer are not corrected to his/her satisfaction, a memo report is prepared by the Quality Assurance Officer and sent to each Co-manager.

Quality Assurance Records to Management

The SRMP uses a reporting procedure by which the co-managers prepare quarterly reports to the Quality Assurance Officer before his inspection and institution of performance and system audits. The reports present the results of internal and external quality checks, corrective actions taken and other information such as timing of critical steps in bacterial analyses, sterilization steps taken, incubator temperature monitoring results, etc. The reporting procedures consist of the submittal of logbooks and filling out forms.

Data Storage, Management and Sharing

Data are entered into STORET by DRBC staff as soon as practical after internal review. Dissolved oxygen concentrations and water temperatures are used to calculate percent dissolved oxygen saturation.