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WATER MONITORING AND STANDARDS ELEMENT
BUREAU OF FRESHWATER AND BIOLOGICAL MONITORING
P.O. Box 420; Mail Code 35-01
TRENTON, NEW JERSEY

Quality Assurance/Quality Control Project Plan
Headwaters Index of Biotic Integrity (Raritan Region)
2023 Monitoring

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Date

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1.0 Project Name: Headwaters Index of Biotic Integrity 2023 Monitoring

2.0 Requesting Agency: NJDEP Water Monitoring and Standards

3.0 Date of Project: 5/2023 - 10/2023

4.0 Project Fiscal Information: Job Number 35950000, Activity Code V4DT

5.0 Project Officer: Brian Henning, Research Scientist I, BFBM

6.0 Quality Assurance Officer: Jenna Majchrzak, Office of Quality Assurance

7.0 Special Training Needs/Certification

Assistants to the project will be trained in the operation and use of all sampling equipment including the proper safety and handling procedures for electroshocking equipment. The training will entail calibration methods, deployment techniques, and data retrieval from the equipment.

Safety training and safety requirements will comply with Bureau of Freshwater and Biological Monitoring Field Work Health and Safety Plan (HASP) and the Bureau of Freshwater and Biological Monitoring Standard Operating Procedures Fish Monitoring, 2019 and any amendments due to Covid safety.

The Project Officer or designee will be responsible for any necessary training.

BFBM is certified by the Office of Quality Assurance (certified lab ID # 11896) for all parameters to be measured in the field.

8.0 Project Description/ Objective:

The objective of the Headwaters IBI (HIBI) monitoring program is to assess stream conditions and water quality in headwater streams of the State. The HIBI monitoring program provides a rapid, cost-effective assessment of the water quality and condition of New Jersey's high gradient headwater streams (see Appendix A for map of high gradient headwater monitoring area) with drainage areas less than 4 mi². The HIBI is a multi-metric index that assesses the overall condition of a headwater stream based on the biological assemblage (fish, crayfish, and amphibians) present within and along a stream (Vile and Henning, 2018). The HIBI was developed to assess aquatic life use in NJ waters as mandated under the Federal Clean Water Act (CWA) and the data collected from this monitoring program is intended for use by the Department's Division of Water Monitoring and Standards – Bureau of Environmental Analysis, Restoration, and

Standards (BEARS) in their biennial report to the USEPA entitled, “New Jersey Integrated Water Quality and Monitoring and Assessment Report.” The Integrated Report consists of the 303 (d) List of Water Quality Limited Waters (“303 (d) Report”) and the 305 (b) The Integrated List of Waters Report (“305 (b) Report”) and provides the status of water quality and designated uses for New Jersey waterbodies. The data collected also informs the Surface Water Quality Standards (SWQS), N.J.A.C. 7:9B (NJDEP2020), stream classifications, (e.g. Trout Production), designated uses and anti-degradation categories (e.g., Category 1) for the State’s surface water and to inform the public of the quality of the State’s waters. NJ Threatened and Endangered Species are reported to the NJ Division of Fish & Wildlife Endangered and Nongame Species Program when encountered.

9.0 Network Design/ Site Selection

In 2023, HIBI monitoring will focus primarily on fixed sites in the Raritan region along with several sentinel sites (Figure 1). The fixed network design follows a rotating basin approach; in which waterbodies are targeted and sampled within a defined water region each year (Figure 1). New Jersey has five water regions and are rotated clockwise in the following order (Northwest, Northeast, Raritan, Atlantic, and Lower Delaware). A total of 11 monitoring locations will be sampled in 2023. The data from fixed sites is used to assess long-term trends. Starting in 2017, the Fish Index of Biotic Integrity (FIBI) and HIBI programs strategically selected sites or relocated existing fixed sites to ensure spatial coverage within each rotating basin. The goal is to have a representative fish site (FIBI or HIBI) at the pour point, the lowest point along the boundary of a watershed in which all the water flows; or as close as conditions and site access permit, of as many hydrologic units (HUC-14) as possible. This site selection process aligns with the NJ water quality assessment process for the Integrated Report which is based on HUC-14 assessment units. Seven fixed sites will be sampled in 2023. In addition, 4 sentinel sites will be sampled to monitor reference conditions, variability through time, the effects of climate change, and evaluate trends in NJ headwater streams (Table 1). Sentinel sites were selected based on the following criteria: 1) previous sampling must indicate at least three sensitive taxa; 2) designated by NJDEP Surface Water Quality Standards as FW1-TP waters (nondegradation waters) or Category One (C1) waters with trout production status; and 3) the percent Urban Land Cover within the stream’s drainage area must not exceed 10%, or are U.S. EPA’s Regional Monitoring Network sites to detect climate change-related trends at sites with low anthropogenic disturbance and are protected from future development.

Exact site locations are initially determined via the Global Positioning System (GPS) using a Trimble or hand-held GPS unit, either Garmin model “Oregon 450”, Garmin nuvi 2797, or Trimble “Geo XT. All positions are logged into the Geographic Information System (GIS). These handheld GPS units will be used to confirm correct locations for this sampling based on the availability of the equipment.

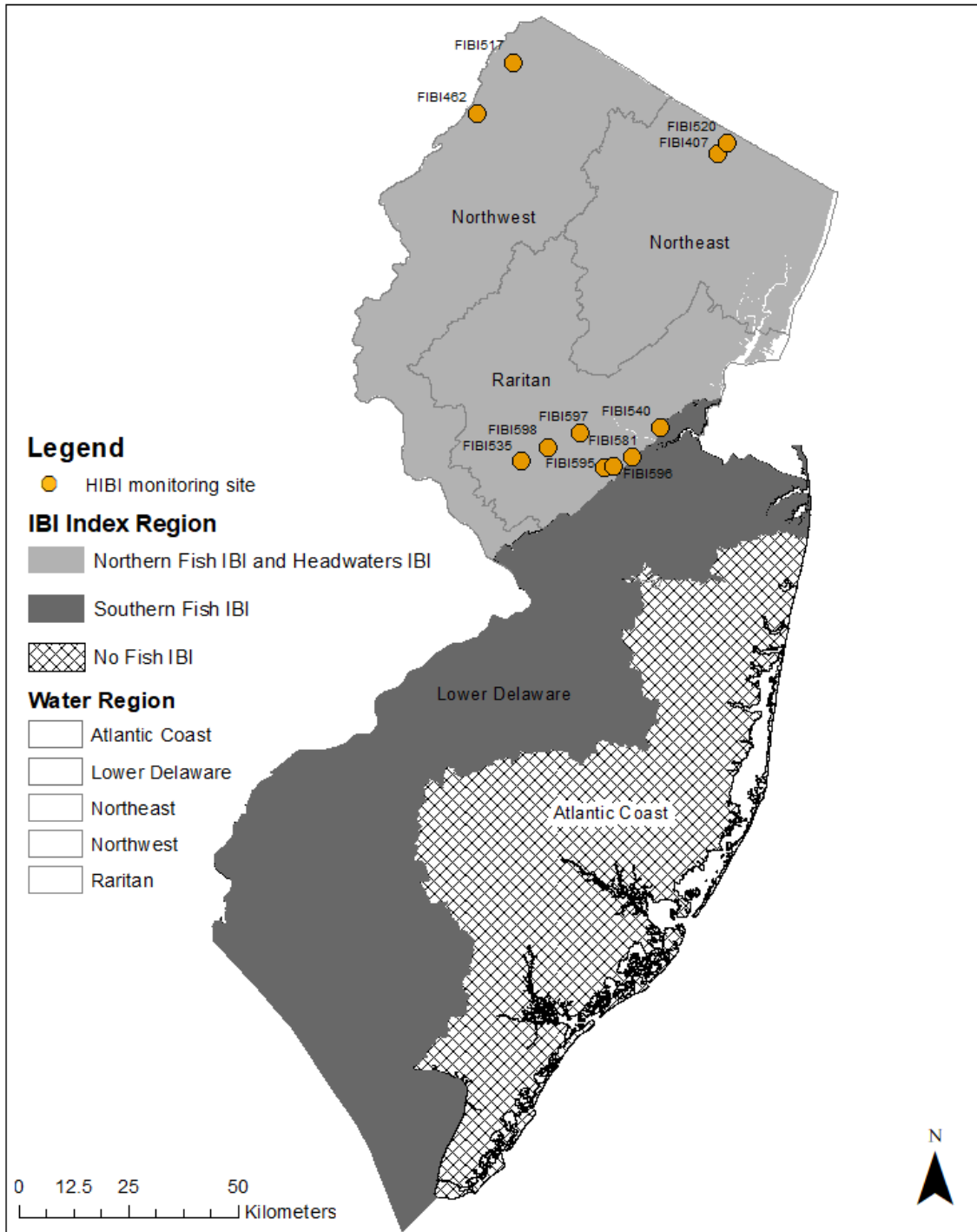


Figure 1. Map of 2023 proposed HIBI monitoring locations with DEP Water Regions and Index of Biotic Integrity programs.

Table 1. 2023 Headwaters IBI monitoring locations.

Station_ID	Waterbody	Latitude	Longitude	County	Municipality	Network
FIBI407	Bear Swamp Brook	41.07381	-74.21567	Bergen	Mahwah	Sentinel
FIBI462	Tillman Brook	41.15611	-74.86989	Sussex	Walpack	Sentinel
FIBI517	Beerskill	41.26163	-74.77101	Sussex	Montague	Sentinel
FIBI520	Havenmeyer Brook	41.09554	-74.19143	Bergen	Mahwah	Sentinel
FIBI535	Cat Tail Brook Trib	40.44461	-74.74477	Somerset	Hillsborough	Fixed
FIBI540	Mill Brook	40.51128	-74.37197	Middlesex	Edison	Fixed
FIBI581	Sucker Brook	40.4517	-74.448	Middlesex	Milltown Boro	Fixed
FIBI595	Oakeys Brook	40.4299	-74.5233	Middlesex	South Brunswick	Fixed
FIBI596	Lawrence Brook Trib	40.4326	-74.4971	Middlesex	North Brunswick	Fixed
FIBI597	Millstone River Tributary	40.5011	-74.5895	Somerset	Millstone Boro	Fixed
FIBI598	Pike Run Trib	40.4721	-74.676	Somerset	Hillsborough	Fixed

Site list may change due to site conditions and access (Final site list will be amended in the Addendum after the field season and all signees will be emailed an amended document if changes occur).

10.0 Sampling Methods

Additional details are outlined in the Bureau of Freshwater and Biological Monitoring Standard Operating Procedures Fish Monitoring, 2019. The Headwaters IBI sampling will take place between May 1 and September 31, 2023. All sampling is conducted during daylight hours between 0900 and 1600.

Electrofishing - A stream reach of 150 m is sampled using one or two backpack electrofishing units with a crew of two to five individuals. Electrofishing is conducted in an upstream manner in which the operator systematically samples all available habitats. Block nets are placed at the end of the reach to prevent fish from escaping upstream of the sampled area. All stunned fish, crayfish, frogs and salamanders are collected by the crew using dip nets and placed into live wells for later identification. All biota sampled by electrofishing are identified to species, enumerated and returned to the water. All fish are examined for anomalies or DELTs (DELT-Deformities, eroded fins, lesions or tumors), and the total length (TL; mm) of sport fish are measured and recorded on field data sheet. Any fish, crayfish or amphibian not readily identified in the field (except for NJ listed threatened or endangered species) or collected for voucher will be preserved in 10% formalin in a reusable 1 L high-density polyethylene bottle for later identification in the laboratory.

Area Constrained Surveys – An area of 90 m² (2 transects measuring 15 x 1 m area in the water and a 15 x 2 m area along the shore) is sampled by area constrained survey (ACS) by a crew of two individuals. All available cover (rocks, logs, debris) within the 90m² area greater than 15 inches² will be turned over by hand and all crayfish, salamanders and frogs will be captured with the aid of dip nets. All objects turned in the survey are returned to their original position to reduce habitat disturbance. The two transects of the ACS are conducted one on each bank, targeting the best available and diverse habitats. If

the 30m² search area on shore contained insufficient moveable cover, then the search area will be moved onto the adjacent floodplain. Taxa observed that escaped catchment are recorded and identified to the lowest taxonomic level based on observed characters. All biota sampled by ACS are identified to species and enumerated. The life stage (larval or adult) of each amphibian sampled is recorded on the field datasheet. Larval specimens not readily identified in the field will be preserved in 10% formalin in a reusable 1 L high-density polyethylene bottle for later identification in the laboratory using taxonomic keys (Altig, 1970; Petranka, 1998). Photo vouchers will be taken for all New Jersey State listed threatened (e.g. Eastern mud salamander *Pseudotriton montanus montanus* and longtail salamander *Eurycea longicauda longicauda*) and endangered species (e.g. Blue-spotted salamander *Ambystoma laterale*). Photo vouchers will consist of several photos for each specimen highlighting the distinguishing characteristics of each species so that positive identification can be made without sacrificing the animal. Each photo voucher will contain site information (e.g. waterbody name, date) in the picture along with the animal and be reported to the NJ Division of Fish Wildlife Endangered and Nongame Species Program when encountered. Animals will be released in close proximity to the object or habitat from which it was captured (e.g. rock, log, debris) so that the animal may return to the underside of an object on its own.

Field Precautions for aquatic invasive species - To prevent the potential spread of nuisance or invasive organisms such as *Didymosphenia* sp. from stream to stream, all nets, waders, etc. will be decontaminated in the field between sites by cleaning with a commercial disinfectant and rinsing with tap water, three times to ensure all disinfectant residue is removed prior to the next sampling. Also, the use of felt-soled waders will be avoided.

11.0 Field Measurements/QAQC

Dissolved oxygen (DO), pH, water temperature, and specific conductivity will be measured in-field at each site by biomonitoring staff, concurrent with faunal sampling, in accordance with N.J.A.C. 7:18 *Regulations Governing the Certification of Laboratories and Environmental Measures* (NJDEP, 2018) and NJDEP's *Field Sampling Procedures Manual* (NJDEP, 2005 or 2022, as available). These physical/chemical parameters will be taken *in situ*, mid-depth, in a free-flowing area of the stream. BFBM is certified by the Office of Quality Assurance for each parameter sampled (Certified Lab ID # 11896).

At the time of sampling, visual based habitat assessments will be performed at each site using the format given in the Rapid Bioassessment Protocols (Barbour et al, 1999) for high gradient streams. Several qualitative measurements will be made based on visual observation including substrate composition, weather conditions, water clarity, and presence of aquatic vegetation.

Dissolved oxygen (Hach 10360 – 10/2011 Rev 1.2) – Dissolved Oxygen is measured at each sampling location at mid depth in the thalweg of the channel in flowing water using the Hydrolab MS5 Water Quality Monitoring System or YSI ProDSS Multiparameter Digital Water Quality Meter. The meter and probe will be maintained and calibrated in accordance with the Operating Manual (February

2006 Edition 3, HACH Environmental, Loveland, CO). The meter is barometrically compensated and checked at each sampling site using fully oxygenated water. Weekly Winkler titrations will be performed to check the dissolved oxygen probe. All titrations and field DO measurements are recorded in the Headwaters IBI Field Logbook and are initialed and dated by the field staff that performed the calibration, titration, and analysis.

pH (SM 4500-H B-11) - The pH is measured at each sampling location at mid depth in the thalweg of the channel in flowing water using the Hydrolab MS5 Water Quality Monitoring System or YSI ProDSS Multiparameter Digital Water Quality Meter. The meter and probe will be maintained and calibrated in accordance with the Operating Manual (February 2006 Edition 3, HACH Environmental, Loveland, CO). The pH probe will be calibrated prior to each sampling event with certified pH buffers for the expected range of pH at the sampling location (e.g. pH buffers 4.0 and 7.0 for acidic streams and 7.0 and 10.0 for alkaline streams) and then checked with a mid-range buffer. The acceptance criteria for this check is a reading within ± 0.1 pH units from the true value. After three hours of continuous use, the pH of the mid-range buffer will be checked again. The acceptance criterion for this re-check is a reading within ± 0.2 pH units from the true value. All pH calibration readings and field pH measurements are recorded in the Headwaters IBI Field Logbook and are initialed and dated by the field staff that performed the calibration and analysis.

Specific Conductance (SM 2510 B-11) - The specific conductance is measured at each sampling location at mid depth in the thalweg of the channel in flowing water using the Hydrolab MS5 Water Quality Monitoring System or YSI ProDSS Multiparameter Digital Water Quality Meter. The meter and probe will be maintained and calibrated in accordance with the Operating Manual (February 2006 Edition 3, HACH Environmental, Loveland, CO). The specific conductance probe will be calibrated prior to each sampling event with certified conductivity standards (1800 $\mu\text{mhos/cm}$). To ensure accuracy, the probe will be checked each day of use with a certified standard (1800 $\mu\text{mhos/cm}$). The check standard is required to read within $\pm 1\%$ of the true value of the standard prior to using the meter. All specific conductance calibration readings and field specific conductance measurements are recorded in the Headwaters IBI Field Logbook and are initialed and dated by the field staff that performed the calibration.

Water Temperature (SM 2550 B-10): The water temperature is measured at each sampling location at mid depth in the thalweg of the channel in flowing water using the Hydrolab MS5 Water Quality Monitoring System or YSI ProDSS Multiparameter Digital Water Quality Meter. The meter and probe will be maintained and calibrated in accordance with the Operating Manual (February 2006 Edition 3, HACH Environmental, Loveland, CO). The temperature readings of the Hydrolab MS5 Water Quality Monitoring System and the YSI ProDSS Multiparameter Digital Water Quality Meter will be tested against a NIST certified thermometer quarterly to ensure accuracy. All temperature checks and field water temperature measurements are recorded in the Headwaters IBI

Field Logbook and are initialed and dated by the field staff that performed the calibration.

Canopy Cover- The canopy cover of the stream is measured at 50 m intervals from the starting location to the end point of sampling (0 m, 50 m, 100 m and 150 m) during every sampling event. The canopy cover will be estimated using a convex spherical crown densitometer at breast height from the middle of the stream channel.

Habitat Assessment – Headwater habitat will be assessed at every site visited. Rapid habitat assessments were performed using EPA’s Rapid Habitat Assessment Form (Barbour et al, 1999), including the following measures: epifaunal substrate, embeddedness, velocity/depth regimes, sediment deposition, channel flow status, channel alteration, frequency of riffles, bank stability, bank vegetative protection, and riparian vegetative zone width.

Nutrients - Total Phosphorus (TP) and Total Nitrogen (TN) will be collected at Headwaters IBI sites. Total Nitrogen will be considered the sum of Nitrite-Nitrate (NO₂-NO₃) and Total Kjeldahl Nitrogen (TKN) concentrations. Sampling will consist of a single grab sample, during a biological sampling visit, or a reconnaissance visit no more than three weeks prior to biological sampling. If collected at time of biological sampling, nutrients will be collected prior to sampling to avoid disturbance of the substrate. Sample bottles will be single-use plastic bottles. Sample volume and container type will be as described in the respective laboratory’s “Quality Manual” and/ or SOP, approved by the Office of Quality Assurance (OQA). A table of the laboratory, methods and reporting limits are in Appendix D. All persons collecting, handling, or transporting the nutrient samples to the NJDOH laboratory will complete the appropriate sections of the NJDOH chain-of-custody form, prior to relinquishing the samples. A copy of the chain-of-custody to be used is included as Appendix E.

12.0 Identification of Stream Fauna\ QAQC

References used for the identification of species collected in HIBI sampling.

- Altig, R. (1970). A key to the tadpoles of the continental United States and Canada. *Herpetologica*, 180-207.
- Conant, R., and J. T. Collins. 1991. A field guide to reptiles and amphibians: eastern and central North America. Houghton Mifflin, Boston.
- Cooper, E.L. 1983. Fishes of Pennsylvania and the Northeastern United States. Pennsylvania State University Press, University Park, Pennsylvania, 243 pp.
- Heyer, W.R., Donnelly, M.A., McDiarmid, R.W., hayek, L.-A., Foster, M.S., 1994. Measuring and Monitoring Biological Diversity. Standard Methods for Amphibians. Smithsonian Institution Press, Washington.

- Peckarsky, B. L., P. R. Fraissinet, M. A. Penton, and D. J. Conklin, Jr. 1990. Freshwater macroinvertebrates of northeastern North America. Cornell University Press, Ithaca, New York, USA.
- Petranka, J.W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press.
- Schwartz, V. and D.M. Golden. 2002. Field Guide to Reptiles and Amphibians of New Jersey. New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program.
- Smith, C. L. 1985. The inland fishes of New York State. N.Y.S. Dept. of Environmental Conservation, Albany, NY.
- Stranko, S., S. Smith, L. Erb, and D. Limpert. 2010. A Key to the Reptiles and Amphibians of Maryland. Maryland Department of Natural Resources.
- Swecker, C. D., Jones, T., & Kilian, J. 2008. Photographic Key to the Crayfishes of Maryland. Marshall University.

13.0 Data Analysis

Fish sampling results (e.g. counts, lengths, DELTs, habitat) will be entered in a Microsoft Access database and overall Headwaters IBI score will be calculated according to the metrics developed by Vile and Henning (2018) in Appendix B. Data entered and calculated HIBI scores will be independently reviewed and scored for consistency and accuracy by the project officer and another designated BFBM staff member. An additional third reviewer will be used should any discrepancies occur in the data entered or calculated scores.

14.0 Project Timeline

The Headwaters IBI sampling takes place between May and October. This sampling schedule reduces the occurrence of spawning migratory fish (e.g. white sucker *Catostomus commersonii*) in headwater streams and presumes a resident fish assemblage. In addition, the sampling timeline provides stable flows that permit safe wading conditions and increases electrofishing sampling efficiency. Sampling will not be conducted in trout production waters after September 1 to prevent disturbance of spawning trout and destruction of redds (egg nests).

15.0 Resource Needs: BFBM will need two hourly staff in addition to available full-time staff to complete this project.

16.0 Data Storage and Distribution

Sampling results will be stored locally on a Microsoft Access database. Following the QA/QC verification of fauna identifications, data will be entered into USEPA's Water Quality Data Exchange (WQX) and will be accessible through the USEPA, USGS and National Water Monitoring Council's Water Quality Portal by June of the following year that it is verified. All raw data records shall be maintained for a period of no less than five years.

17.0 Data Reporting

All habitat assessment data, physical/chemical analysis, and site observations will be recorded on the BFBM's Biological Field Observations and data sheet and recorded electronically on a Microsoft Access database.

All fauna identifications will be recorded on the BFBM's Data Sheet and into a Microsoft Access database. Habitat assessment data, taxonomic data and counts, physical/chemical data and metric and index scores will also be transferred into USEPA's Water Quality Data Exchange (WQX) and will be accessible through the USEPA, USGS and National Water Monitoring Council's Water Quality Portal by June of the following year that it is verified.

A data summary table, including index scores and ratings, will be posted on the BFBM website (www.state.nj.us/dep/wms/bfbm) after completion of all sample analyses for the Water Region and data review within one year from the date of sampling.

A summary report will be issued for each site and will contain at a minimum: taxa count, field chemistry results, index score and assessment of biological condition ratings, and habitat assessment score and rating. Information on potential stressors for sites with poor or very poor ratings that are deemed non-attaining for Aquatic Life Use will also be included as available.

18.0 Audits

The Office of Quality Assurance will be notified prior to performing any sampling activity to allow the Office of Quality Assurance to conduct an audit.

19.0 Corrective Actions

The Project Officer will be responsible for the oversight of all activities relating to this project. The Project Officer will assess field collection functions and make corrections when necessary to maintain the data accuracy as defined in this plan. If any changes or modifications are made to this plan regarding data collection, as it relates to the objectives(s) and data accuracy required in this project, all original signees of the QAPP will be notified.

20.0 Literature Cited

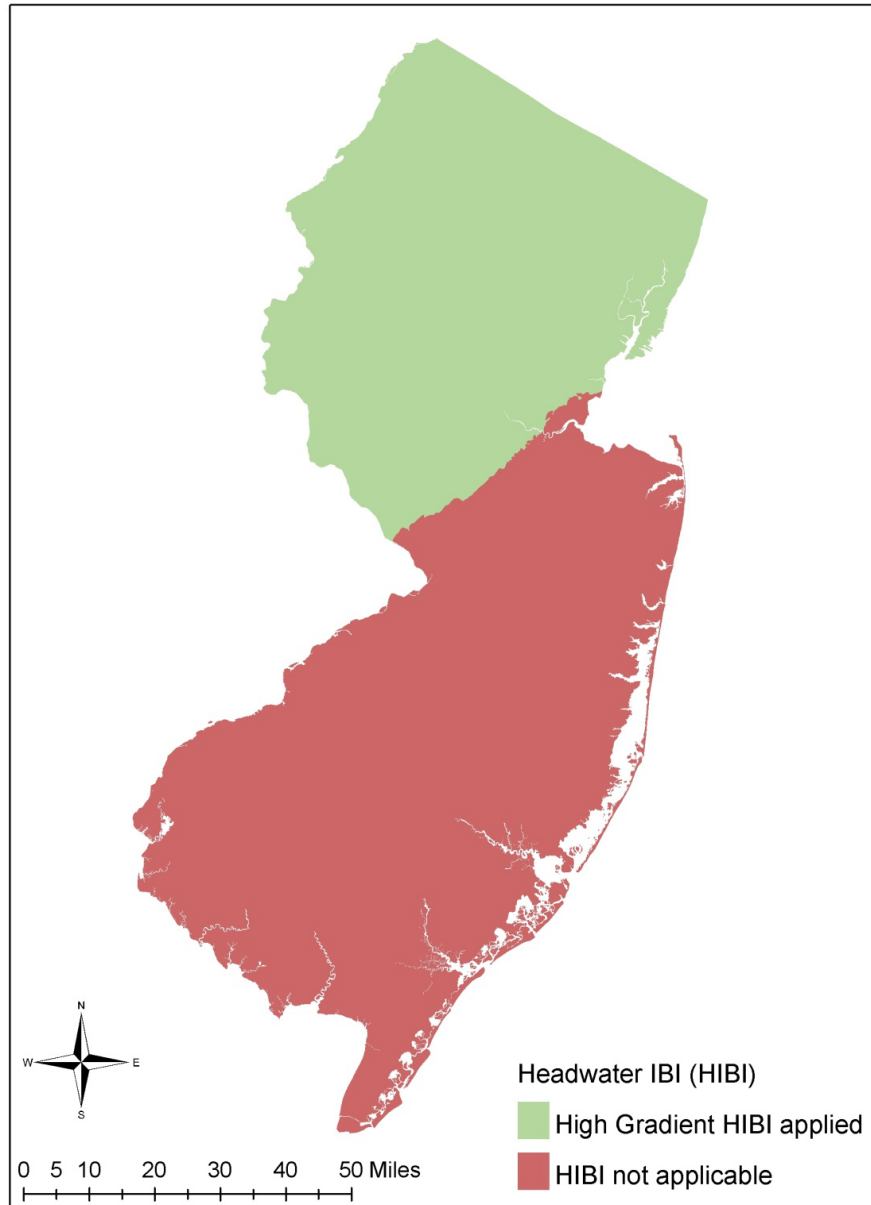
Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. "Rapid Bioassessment Protocols for Use in Streams and Wadable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition." EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

- Bovee, K.D., and R.T. Milhous. 1978 Hydraulic simulation in instream flow studies: theory and techniques. U.S. Fish and Wildlife Service FWS-OBS-78/33. (Instream Flow Paper 5).
- Keller, D.H., R.J. Horwitz, A.M. Kreit, and P.F Overbeck. 2012. Development of Bioassessment Criteria for Headwater Streams, Phase III. The Academy of Natural Sciences of Drexel University. Philadelphia, PA.
- NJDEP. 2018. Regulations governing the certification of laboratories and environmental measurements. N.J.A.C. 7:18.
- Vile, J.S. and Henning, B.F., 2018. Development of indices of biotic integrity for high-gradient wadeable rivers and headwater streams in New Jersey. *Ecological Indicators*, 90, pp.469-484.

APPENDIX A

HIBI Geographic Range Map

New Jersey Headwater IBI Monitoring



APPENDIX B

HIBI Index metrics

Headwaters IBI Metrics

Richness

Number of Intolerant Vertebrate Species – American Brook Lamprey, Brown Trout, Rainbow Trout, Brook Trout, Cutlips Minnow, Northern Hog Sucker, Shield Darter, Slimy Sculpin, Margined Madtom, Northern Dusky Salamander, Mountain Dusky Salamander, Longtail Salamander, Northern Red Salamander, Northern Spring Salamander

Trophic

Proportion of Vertebrate species as top carnivores (excluding American Eel) – Black Crappie, Brown Trout, Rainbow Trout, Brook Trout, Chain Pickerel, Largemouth Bass, Northern Pike, Redfin Pickerel, Rock Bass, Smallmouth Bass, Striped Bass, Walleye, White Catfish, White Crappie, White Perch, Yellow Perch, Bullfrog, Northern Red Salamander, Northern Spring Salamander

Tolerance

Percent Tolerant Fish – American Eel, Green Sunfish, White Sucker, Banded Killifish, Mummichog, Common Carp, Fathead Minnow, Goldfish, Pumpkinseed, Western Mosquitofish

Non-native

Proportion of total richness as native – Excludes: Black crappie, Bluegill, Brown trout, Common carp, Fathead minnow, Goldfish, Green sunfish, Largemouth bass, Northern Pike, Northern Snakehead, Oriental Weatherfish, Rock Bass, Smallmouth bass, Walleye, Western Mosquitofish, White Crappie, Rainbow Trout, Allegheny Crayfish, Rusty Crayfish, Virile Crayfish, Red Swamp Crayfish

Composition

% Native crayfish – Common Crayfish, Spinycheek Crayfish, White River Crayfish

Composition/Indicator Species

Brook trout density (individuals/100m²)

Table B1.

Metric	Response	Scoring
Intolerant Vertebrate Richness	↓	= (Metric ÷ 3) *100
Proportion of Vertebrate Richness as Top Carnivore ^a	↓	= (Metric ÷ 38.0) *100
% Tolerant Fish Individuals	↑	= (96.1- Metric)/ (96.1- 0) *100
Proportion of Total Richness as Native	↓	= (Metric ÷ 100) *100
% Native Crayfish	↓	= (Metric ÷ 100) *100
Brook Trout Density (individuals/100m ²)	↓	= (Metric ÷ 10.1) *100

^a Excludes American eel

Assessment Rating	HIBI Score
Excellent	100-82
Good	81-51
Fair	50-29
Poor	28-13
Very poor	12-0

APPENDIX C

Water Quality Meter Calibration Procedures

HYDROLAB MS5 Datasonde

Things to Remember and Maintenance

Things to Remember

1. **Maintenance of all probes must be performed at least monthly.**
2. **As specified by NJDEP OQA, Hydrolab MS5 must be calibrated weekly and checked daily. Results of lab/field calibrations and checks must be recorded in field notebook with proper units.**
3. **All water and standards used for rinse or LDO checks must be room temp.**
4. **Always rinse 3X with room temp DI after each standard.**
5. **ALWAYS pour fresh standards into corresponding "rinse" container after use in calibration/check.**
6. **Calibrate specific conductivity before any other parameters. All probes and calibration cup must be dried with Kimwipes so there is NO residual water as indicated in the "Weekly Calibration Guide."**
7. **If there is significant difference from the standard when checking, record extra readings to ensure stabilization.**
8. **When storing sonde, fill calibration cup with appx 15mL of pH 4 buffer or tap water.**
9. **LDO must be calibrated with site-specific barometric pressure and checked using the air-saturated water method.**

Monthly Maintenance

- **Record Date and Type of Maintenance in the Field Notebook**
- **Invert the sonde vertically and secure in a stable lab stand.**
- **Gently clean probes with Simple Green and toothbrush then rinse thoroughly.**
- **For integrated pH probe, cover pH bulb with thumb and use flathead screwdriver to carefully unscrew the Teflon junction cap.**
- **For standard pH probe, hold the base of reference probe and unscrew Teflon junction cap.**
- **Empty contents into sink, shaking or use q-tip end, and flush with fresh pH reference solution (AgCl).**
- **Flush pH tube (use syringe for integrated probe) with AgCl. Add two KCl crystals and refill with AgCl to prevent introduction of air bubbles.**
- **Teflon junction cap should be replaced annually.**
- **When replacing integrated Teflon junction, plastic will cross thread easily so begin by hand then tighten with screwdriver to top of probe.**
- **LDO probe maintenance consists of unscrewing the cap by hand and blotting any moisture inside with Kimwipes.**
- **LDO cap should be replaced annually.**

HYDROLAB MS5 Datasonde

Daily Calibration Guide

Calibration Prep

1. Connect sonde to computer by lining up dimple on probe and dot on plug then “burp” the plug to ensure a proper fit. Sonde will audibly “beep” when connected.
2. Open HYDRAS 3 LT on desktop and sonde will beep again.
3. Once sonde appears (COM1), double click to initialize the sonde. If the sonde does not appear in the list, click “Re-Scan for Sondes.” Full initialization takes appx 30 seconds and during this process you should see a blue progress bar at the bottom of the screen.
4. **THIS STEP DESCRIBES INITIAL SETTINGS AND SHOULD BE SET FROM PREVIOUS USE.**
In “System” tab, click on “Level 3”, then enter the password “Hydrolab.” In “Parameter Setup”, click the “pH” tab and “Cal Points” field should contain a “2.” If not, type “2” and click “Save Settings”.

Specific Conductivity

1. Navigate to the “Calibration” tab and then the “SpC $\mu\text{S}/\text{cm}$ ” tab.
2. Rinse 3X with DI then dry probes and calibration cup with Kimwipes.
3. Click the “Reset” button and asterisk will appear next to reading.
4. Calibrate to zero first by typing “0” in the standard field and click “Calibrate.”
5. Rinse with the 1800 $\mu\text{S}/\text{cm}$ “rinse” then fill with fresh standard.
6. Let readings stabilize, type standard value (1800), then click “Calibrate.”
7. Once proper calibration is complete, the asterisk will disappear.
8. Perform CHECK as described on the “Daily Checks in Lab” instruction sheet.

pH

1. Navigate to the “Calibration” tab and then to the “pH” tab
2. Click the “Reset” button and an asterisk will appear next to reading.
3. Get the pH standards of 7 and 4 or 7 and 10 ready, depending on expected field conditions.
4. Rinse probes 3X with DI, then rinse with the bottle labeled “pH 7 Rinse.”
5. Fill the probe with fresh pH 7 standard and record the temperature of the standard.
6. In front of the large boxed pH container, there will be a chart comparing the pH value to temperature. Use the pH value listed next to the nearest temperature.
7. Let the readings stabilize, type in the temperature corrected value, and click “Calibrate.”
8. Repeat steps 4 - 7 with the next pH standard.
9. Once proper calibration is complete, the asterisk will disappear.
10. Perform CHECK with pH standard 5 or 8 depending on expected field conditions as described on the “Daily Checks in Lab” instruction sheet.

Luminescent Dissolved Oxygen

The LDO must be calibrated daily by compensating for barometric pressure. LDO should be checked in the lab bubbler water bath. After traveling to your sampling location, LDO should be calibrated with site-specific barometric pressure and checked using the air-saturated water method. See the “Daily Checks in Lab” instruction sheet for both methods.

HYDROLAB MS5 Datasonde
Daily Checks in Lab

Specific Conductivity

1. After calibrating, navigate to "Online Monitoring" and check SpCond in $\mu\text{S}/\text{cm}$ in the Parameters list.
2. Set "Monitoring Interval" to 30 seconds and click "Start" at top right-hand side.
3. "Online monitoring in progress" will begin to blink red. Once the "# Samples" reaches "1," the buttons below will become clickable.
4. Click "New Table" and a new window will appear which will display readings according to the set monitoring interval. Record for 2 minutes or until reading stabilizes.
5. Write both time and reading in note book and be sure to include proper units.
6. If the check gives results outside of the acceptable range (99% - 101%), recalibrate and repeat the check.

pH

1. After calibrating, rinse probes 3x with DI, no need to dry.
2. Depending on calibration or expected field conditions, check with pH with 5 or 8 standard.
3. Rinse with standard from "rinse" container then fill with fresh standard and allow 2 minutes for stabilization.
4. Navigate to "Online Monitoring" and check pH in the Parameters list.
5. Repeat steps 5 through 9 from *Specific Conductivity* section above.

LDO

Lab Bubbler Water Bath

1. This procedure should be performed before leaving the office (AM) and upon return (PM).
2. Remove the calibration cup and install the probe guard then attach the Surveyor handheld.
3. Immerse the sonde and immerse in the water bath and allow it to stabilize.
4. Enter the barometric pressure in the "LDO%" calibration screen on the Surveyor handheld and select "Calibrate."
5. Compare the sonde temp and DO readings to the USGS Oxygen Solubility Table and record barometric pressure, sonde temp and DO along with USGS Table DO.

Field Air-saturated Water

1. **Uncap then recap** 1L bottle of water (keep bottle in truck cab to maintain room temp) and shake bottle appx 1 minute to saturate with oxygen.
2. Fill calibration cup so water covers the LDO probe by appx 0.5 inches and allow it to stabilize.
3. Set the cap on top and enter the barometric pressure in the "LDO%" calibration screen on the Surveyor handheld and select "DONE."
4. Perform CHECK.

APPENDIX D

Laboratory Analysis

Parameter	Laboratory	Lab Number	Method	Media	Lower Reporting Limit	units	Method Detection Limit	units	Holding Time	Preservative
Nitrite + Nitrate, as N	NJ DEPARTMENT OF HEALTH - 11036	11036	SM 4500-NO3(F)-16	Water	0.012	mg/l	0.0069	mg/l	28 days	pH<2, Ice to 4°C
Total Kjeldahl Nitrogen	NJ DEPARTMENT OF HEALTH - 11036	11036	EPA 351.2	Water	0.1	mg/l	0.041	mg/l	28 days	pH<2, Ice to 4°C
Phosphorus, Total	NJ DEPARTMENT OF HEALTH - 11036	11036	EPA 365.1	Water	0.01	mg/l	0.007	mg/l	28 days	pH<2, Ice to 4°C

APPENDIX E

NJDOH Laboratory Chain-of-Custody

Field ID Number

New Jersey Department of Health
Environmental and Chemical Laboratory Services
PO Box 361, Trenton, NJ 08625-0361
Phone: 609-530-2820
ORGANIC AND INORGANIC CHEMISTRY SAMPLE SUBMITTAL
(See Instructions)

Lab Sample Number
(For Lab Use Only)

AGENCY INFORMATION
Submitting Agency: NJDEP-BFBM
Send Results To:
Agency No.: 207
Project Name: Biological Nutrient Correlation Project
Street Address: 35 Arctic Parkway
Final Report Option: Tier 1, Tier 2
Electronic Report Option: EDD, E-2
Would you like copies of the internal chain of custody forms sent with your report? Yes, No
Project Code: BIONTR
Memo Number:
City, State, Zip Code: Trenton, NJ 08625
Phone: 609-292-0427
Fax: 609-633-1095
Email: brian.henning@dep.nj.gov

SAMPLE INFORMATION
Sample Point/Station ID Number/Water Facility ID:
Collection Date (YY/MM/DD): 23 / /
Sampling Site/Facility/Supply Location/Sampling Point ID:
Coll. Time (24h) Start:
Coll. Time (24h) End: 1200
Waterbody Name:
Municipality/County:
Sample Retention: Retain? No, Yes
Duration:
Type of Sampling Event: Regular, Compliance, Repeat, Non-Regulatory, Other
Sampling Point Street Address: FIBI
Sample Collector:
PWSID:
Trip #:
Sample Type: Non-Potable: Stream/Surface, Ground Water, Private Well, Septic, Ocean/Saline, Sediment
Potable: Groundwater Rule, Source, Confirmation, Raw, Finished, Private Well
Fraction: Total, Dissolved
Other:
Priority: Routine, Priority, Emergency

FIELD INFORMATION
Air Temp °C:
Water Temp °C:
Stream Flow-CFS:
Weather Conditions:
Sample pH (Field):
Gage Height-Ft.
Preserved in: Field, Lab
Date: 23 / /
Time:
DO (mg/l):
Spec. Cond. (µS/CM):
DO% Sat:
Salinity (ppm):
Chlorine Residual:
Sample Depth Ft.
Tide Stage:
Comments/Field Checks:
Barometric Pressure (mmHg):
Turbidity (NTU):

ANALYSIS REQUESTS
Metals: Ag, Al, As, B, Ba, Be, Ca, Cd, Co, CR-T, Cu, Fe, K, ...
Magnesium, Manganese, Molybdenum, Sodium, Nickel, Lead, Antimony, Selenium, Silica, Thallium, Uranium, Vanadium, Zinc
General: Alkalinity, Bromide by IC, Chloride by IC, Chromium, Hexavalent by IC, Color, Conductance, Cyanide, Dissolved Oxygen, Fluoride
Mercury: Mercury by EPA 245.1, Low Level Mercury EPA 1631E
Nutrients: Nitrite, Total Phosphorus, Ammonia, Nitrate (Calculated), Nitrogen, Total (Calculated)
Organics (Drinking Water): EPA 504.1 - EDB, DBCP, 123TCP, EPA 505 - Chlordane, EPA 505 - Toxaphene, EPA 507 - N and P containing Pesticides, EPA 515.3 - Chlorinated Acid Herbicides, EPA 524.2 - Purgeables, EPA 525.2 - Liquid-Solid Extractables, EPA 531.1 - N-Methylcarbamoyloximes and N-Methylcarbamates
Organics (Non-Potable Water): EPA 624 - Purgeables, EPA 625 - Base/Neutral and Acid Extractables
Residues: Total Suspended Solids (TSS), Total Solids (TS), Total Dissolved Solids (TDS), Settleable Solids (SS), Total Volatile Solids (TVS)
Demands: Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC), Chemical Oxygen Demand (COD)
Suggested Dilutions: BOD5, BOD20, CBOD5, CBOD20

Relinquished By: Name (Print), Signature
Affiliation: NJDEP-BFBM
Received By: Name (Print), Signature
Affiliation:
Date/Time:
Reason for Custody Change:

CHEM-44
FEB 16