

**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
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
2016 Monitoring

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1.0 Project Name: Headwaters Index of Biotic Integrity 2016 Monitoring

2.0 Requesting Agency: NJDEP Water Monitoring and Standards

3.0 Date of Project: 5/2016 - 10/2016

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 Office: Marc Ferko, 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. The Project Officer 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.

8.0 Project Description/ Objective:

The objective of the Headwaters IBI (HIBI) monitoring program is to assess stream condition 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 with drainage areas less than four square miles. The HIBI complements the established northern Fish IBI program that evaluates streams with drainages greater 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. 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 is also expected to inform Surface Water Quality Standards (SWQS), N.J.A.C. 7:9B (NJDEP 1996), stream classifications, (e.g. Trout Production), designated uses and anti-degradation categories (e.g., Category 1) for the State's surface water. The data will also be used to inform the public of the quality of the State's waters.

Samples will also be collected at HIBI sites designated in this QAPP for the Biological Nutrient Correlation Project. Sample collection will take place during a HIBI sampling visit or a reconnaissance visit no more than three weeks beforehand. Total Phosphorus and Total Nitrogen (calculated) samples will be collected. Project description and other details are defined in the QAPP for the Biological Nutrient Correlation Project.

9.0 Network Design/ Site Selection

In 2016, the Bureau of Freshwater and Biological Monitoring's rotating basin schedule focuses monitoring in the Lower Delaware region. Since the HIBI is not valid in that region, no regional fixed monitoring will occur. Sentinel sites however, 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 reference locations for chemical and physical monitoring as part of NJDEP's Ambient Surface Water Monitoring Network and the U.S. EPA's Regional Monitoring Networks to Detect Climate Change-Related Trends.

A total of 50 probabilistic sites were generated using a Generalized Random Tessellation Stratified (GRTS) survey design to provide a statistical Statewide survey of the Fish Index of Biotic Integrity Network (Northern Fish IBI, Headwaters IBI and Southern IBI). All probabilistically selected sites in Northern NJ, less than 4 mi² in drainage area (geographic area were HIBI is valid) will be sampled using the HIBI protocol.

Exact site locations are initially determined via the Global Positioning System (GPS) using a Trimble unit and the appropriate correction sources utilized by NJDEP. All positions are logged into the Geographic Information System (GIS). Hand-held GPS units, either Garmin model "Oregon 450", Garmin nuvi 2797, or Trimble "Geo XT", will be used to confirm correct locations for this sampling.

Table 1. 2016 Headwaters IBI monitoring locations.

Station ID	Waterbody/Location	Latitude-dd	Longitude-dd	County	Network
FIBI520	Havenmeyer Brook	41.0956	-74.1914	Bergen	Sentinel
FIBI502	Brass Castle	40.76846	-75.03983	Warren	Sentinel
FIBI523	Mill Brook UNT	41.3267	-74.7131	Sussex	Sentinel
NJS2016-002	Preakness Brook tributary	40.96593	-74.23372	Passaic	Probabilistic
NJS2016-004	Stony Brook tributary	40.41638	-74.80059	Hunterdon	Probabilistic
NJS2016-005	Nomahegan Brook tributary	40.68454	-74.33246	Union	Probabilistic
NJS2016-006	Preakness Brook tributary	40.9645	-74.21217	Passaic	Probabilistic
NJS2016-009	Dead River tributary	40.65398	-74.54784	Somerset	Probabilistic
NJS2016-010	Pochuck Creek	41.21972	-74.47855	Sussex	Probabilistic
NJS2016-012	Trout Brook	40.92838	-74.93569	Warren	Probabilistic
NJS2016-013	Great Brook tributary	40.71895	-74.46076	Morris	Probabilistic
NJS2016-014	Meadow Brook tributary	41.04314	-74.28591	Passaic	Probabilistic
NJS2016-015	Lamington River tributary	40.68506	-74.72724	Hunterdon	Probabilistic
NJS2016-016	Sparta Junction Brook tributary	41.06053	-74.66385	Sussex	Probabilistic
NJS2016-018	Passaic River tributary	40.90929	-74.31238	Morris	Probabilistic
NJS2016-020	Royce Brook tributary	40.51657	-74.65162	Somerset	Probabilistic
NJS2016-021	Nomahegan Brook	40.66962	-74.35851	Union	Probabilistic
NJS2016-022	Sprout Brook	40.94559	-74.07028	Bergen	Probabilistic
NJS2016-023	West Branch Shabakunk Creek tributary	40.28079	-74.80197	Mercer	Probabilistic
NJS2016-024	Bowers Brook	40.8574	-74.82399	Warren	Probabilistic
NJS2016-026	Neepaulakating Creek tributary	41.20336	-74.6145	Sussex	Probabilistic
NJS2016-027	Capoolong Creek	40.58623	-74.97248	Hunterdon	Probabilistic
NJS2016-028	Musconetcong River tributary	40.82402	-74.87005	Warren	Probabilistic

10.0 Sampling Methods

The Headwaters IBI sampling will take place between May 1 and September 31, 2016. 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 and enumerated. 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 for later identification in the laboratory. Voucher specimens, two of each species collected during the study, are preserved in 10% formalin and their taxonomic identification is verified by contracted taxonomists.

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 were turned over by hand and all crayfish, salamanders and frogs were 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 was 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. Larval specimens not readily identified in the field will be preserved in 10% formalin 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. 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.

11.0 Field Measurements

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, 2003), Subchapter 8, Analyze-Immediately Environmental Measurements, and NJDEP's *Field Sampling Procedures Manual* (NJDEP, 2005). 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 and low gradient streams. A number of qualitative measurements will be made based on visual observation including: substrate composition, weather conditions, water clarity, and presence of aquatic vegetation. Additionally, grab samples for Total Phosphorus, Nitrite-Nitrate, and Total Kjeldahl will be collected mid-depth, mid-stream, during biological sample collection or during reconnaissance visits up to three weeks prior to sampling. If collected at time of biological sampling, nutrients will be collected prior to sampling to avoid disturbance of the substrate (See Biological Nutrient Correlation QAPP (BFBM, 2016).

Dissolved oxygen – 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. The meter and probe will be maintained and calibrated in accordance with the Operating Manual (February 2006 Edition 3, HACH Environmental, Loveland, CO). Weekly Winkler titrations will be performed to calibrate the dissolved oxygen probe. All titrations and field DO measurements are recorded in the Headwaters IBI Field Log Book.

pH- 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. 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). All pH calibration readings and field pH measurements are recorded in the Headwaters IBI Field Log Book.

Specific Conductance- 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. 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 (50, 180, 500, 700 $\mu\text{mhos/cm}$). All specific conductance calibration readings and field specific conductance measurements are recorded in the Headwaters IBI Field Log Book.

Water Temperature- 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. 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 Quanta Water Quality Monitoring System will be tested against a NIST certified thermometer to ensure accuracy. All temperature checks and field water temperature measurements are recorded in the Headwaters IBI Field Log Book.

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.

Gradient- The gradient of the stream reach is measured using standard surveying equipment (sighting level, tripod, and stadia) prior to sampling date using techniques described in Bovee and Milhous (1978). The gradient of the 150 m stream reach will be measured relative to the stream channel length and will be calculated as the total change in elevation from the start to end of the sampled electrofishing reach.

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.

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.

The staff of the BFBM is experienced at identifying freshwater fauna species expected to be collected. Individuals that cannot be identified in the field will be preserved in 10% formalin and brought back to the lab for further evaluation. Additionally, experienced fisheries biologists from the USEPA are available to assist with unidentified or questionable individuals.

A voucher collection containing representatives of all fauna specimens collected will be sent to a contract lab (currently the Phila. Academy of Natural Sciences of Drexel University, Philadelphia, PA) for independent verification of identifications. In the event of disagreement over species identification, the BFBM will request assistance from a 3rd party. Chain of custody will be used for samples preserved for independent analysis of speciation.

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. The Headwater IBI metrics to be used are currently being refined; however, once the HIBI is finalized, scores will be applied to each sampling location. Data entered and calculated HIBI scores will be independently reviewed and scored for consistency and accuracy by the project leader and another 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 commersoni*) 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.

15.0 Resource Needs: BFBM will need two hourly staff to complete this project.

16.0 Data Storage and Distribution

Sampling results will be stored locally in a Microsoft Access database. Following the QA/QC verification of fauna identifications, data will be entered into New Jersey's Water Quality Data Exchange (WQDE) and USEPA STORET Data Warehouse by June of the following year 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 also recorded electronically in a Microsoft Access database.

All fauna identifications will be recorded on the BFBM's Data Sheet and entered into a Microsoft Access database. Habitat assessment data, taxonomic data and counts, and metric and index scores will also be transferred into NJDEP's Water Quality Data Exchange (WQDE). Taxa counts, metrics and indices will also be uploaded into USEPA's STORET Data Warehouse and the National Water Monitoring Council Water Quality Portal by June of the following year 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.

A report will be issued and will contain at a minimum: taxa and counts of fish, field chemistry results, score and assessment of biological condition ratings, and habitat assessment score and rating.

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 Assessment, Oversight, and Response

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. 1996. Regulations governing the certification of laboratories and environmental measurements. N.J.A.C. 7:18.

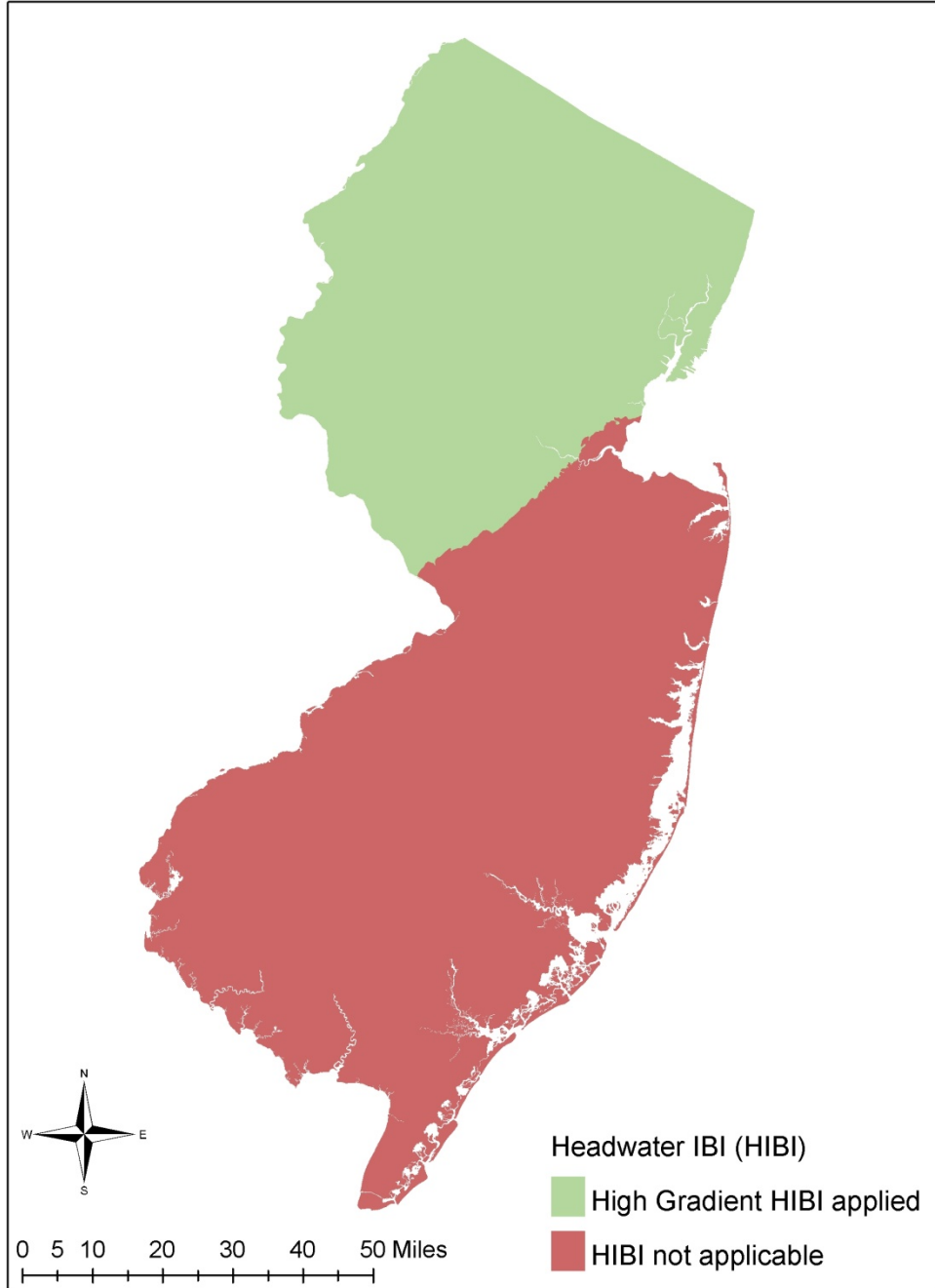
ADDENDUM

21.0 2016 Final Site Selection (as requested by OQA):

Station ID	Waterbody/Location	Latitude-dd	Longitude-dd	County	Network
FIBI502	Brass Castle Creek UNT	-75.03983	40.76846	Warren	Sentinel
FIBI520	Havenmeyer Brook	-74.19141	41.09557	Bergen	Sentinel
NJS2016-002	Preakness Brook	-74.23372	40.96593	Passaic	Probabilistic
NJS2016-004	Stony Brook Trib	-74.80059	40.41638	Mercer	Probabilistic
NJS2016-005	Nomahegan Brook Trib	-74.33246	40.68454	Union	Probabilistic
NJS2016-012	Trout Brook	-74.93569	40.92838	Warren	Probabilistic
NJS2016-016	Sparta Junction Brook	-74.66385	41.06053	Sussex	Probabilistic
NJS2016-022	Sprout Brook	-74.07028	40.94559	Bergen	Probabilistic
NJS2016-029	Lamington River Trib	-74.63123	40.83077	Morris	Probabilistic
NJS2016-044	Pophandusing Brook	-75.02581	40.8201	Warren	Probabilistic
NJS2016-047	Chambers Brook Trib	-74.70863	40.59708	Somerset	Probabilistic
NJS2016-055	Mulhockaway Creek Trib	-75.01259	40.64729	Hunterdon	Probabilistic
NJS2016-059	Walnut Brook	-74.86404	40.49122	Hunterdon	Probabilistic
NJS2016-063	Bushkill Brook	-74.84495	40.51986	Hunterdon	Probabilistic

APPENDIX A

New Jersey Headwater IBI Monitoring



APPENDIX B

DATA MANAGEMENT TABLES

For Data Management purposes, Water Chemistry is defined as parameters analyzed by a lab; Field measurements are defined as analyze immediately parameters.

Table 1. Sample locations

Station ID(WQDE compliant and referenced)	Waterbody/Location	Latitude-dd	Longitude-dd	County	Site exists in WQDE already?	Location Type
FIBI520	Havenmeyer Brook	41.0956	-74.1914	Bergen	No	River/stream
FIBI502	Brass Castle	40.76846	-75.03983	Warren	No	River/stream
FIBI523	Mill Brook UNT	41.3267	-74.7131	Sussex	No	River/stream
NJS2016-002	Preakness Brook tributary	40.96593	-74.23372	Passaic	No	River/stream
NJS2016-004	Stony Brook tributary	40.41638	-74.80059	Hunterdon	No	River/stream
NJS2016-005	Nomahegan Brook tributary	40.68454	-74.33246	Union	No	River/stream
NJS2016-006	Preakness Brook tributary	40.9645	-74.21217	Passaic	No	River/stream
NJS2016-009	Dead River tributary	40.65398	-74.54784	Somerset	No	River/stream
NJS2016-010	Pochuck Creek	41.21972	-74.47855	Sussex	No	River/stream
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NJS2016-014	Meadow Brook tributary	41.04314	-74.28591	Passaic	No	River/stream
NJS2016-015	Lamington River tributary	40.68506	-74.72724	Hunterdon	No	River/stream
NJS2016-016	Sparta Junction Brook tributary	41.06053	-74.66385	Sussex	No	River/stream
NJS2016-018	Passaic River tributary	40.90929	-74.31238	Morris	No	River/stream
NJS2016-020	Royce Brook tributary	40.51657	-74.65162	Somerset	No	River/stream
NJS2016-021	Nomahegan Brook	40.66962	-74.35851	Union	No	River/stream
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NJS2016-023	West Branch Shabakunk Creek tributary	40.28079	-74.80197	Mercer	No	River/stream
NJS2016-024	Bowers Brook	40.8574	-74.82399	Warren	No	River/stream
NJS2016-026	Neepaulakating Creek tributary	41.20336	-74.6145	Sussex	No	River/stream
NJS2016-027	Capoolong Creek	40.58623	-74.97248	Hunterdon	No	River/stream
NJS2016-028	Musconetcong River tributary	40.82402	-74.87005	Warren	No	River/stream

Table 2. Sample types

STATION ID	Field Msr/Obs	Flow	Water Chemistry	Continuous Monitoring	Biological Sampling	Sediment Collection	Bacteria Collection	Habitat	Metrics	Indices
FIBI520	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI502	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI523	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-002	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-004	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-005	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-006	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-009	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-010	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-012	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-013	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-014	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-015	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-016	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-018	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-020	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-021	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-022	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-023	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-024	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-026	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-027	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS2016-028	YES	NO	NO	NO	YES	NO	NO	Yes	Yes	Yes

Table 3. Partners

STATION ID	Field Msr/ Obs	Flow	Water Chemistry	Continuous Monitoring	Biological Sampling	Sediment Collection	Bacteria Collection
FIBI520	DEP	NO	NO	NO	DEP	NO	NO
FIBI502	DEP	NO	NO	NO	DEP	NO	NO
FIBI523	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-002	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-004	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-005	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-006	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-009	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-010	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-012	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-013	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-014	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-015	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-016	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-018	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-020	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-021	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-022	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-023	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-024	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-026	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-027	DEP	NO	NO	NO	DEP	NO	NO
NJS2016-028	DEP	NO	NO	NO	DEP	NO	NO

Table 4. Field measures

<u>Field Name</u>	<u>WQDE Name</u>	<u>Media</u>	<u>Units</u>
DO	Dissolved oxygen (DO)	Water	mg/l
Water Temp	Temperature, Water	Water	deg C
Spec Cond	Specific conductance	Water	uS/cm
pH	pH	Water	None

Table 5. Habitat

Characteristic Name
RBP2, High G, Embeddedness (choice list)
RBP2, High G, Velocity/Depth Regime (choice list)
RBP2, High G, Sediment Deposition (choice list)
RBP2, High G, Channel Flow Status (choice list)
RBP2, High G, Frequency of Riffles (or bends) (choice list)
RBP2, High G, Epifaunal Substrate/Available Cover (choice list)
RBP2, High G, Bank Stability, Right Bank (choice list)
RBP2, High G, Channel Alteration (choice list)
RBP2, High G, Bank Stability, Left Bank (choice list)
RBP2, High G, Vegetative Protection, Left Bank (choice list)
RBP2, High G, Vegetative Protection, Right Bank (choice list)
RBP2, High G, Riparian Vegetative Zone Width, Left Bank (choice list)
RBP2, High G, Riparian Vegetative Zone Width, Right Bank (choice list)

Table 6. Habitat metrics

CharacteristicName
RBP2, High G, habitat assessment total score
RBP2, High G, habitat assessment total rating

Table 7. Individual index metrics

CharacteristicName
Intolerant Vertebrate Richness
Proportion of Vertebrate Richness as Top Carnivore
% Tolerant Fish Individuals
Proportion of Total Richness as Native
% Native Crayfish
Brook Trout Density (individuals/100m2)

Table 8. Overall metrics

CharacteristicName
Headwaters Index of Biotic Integrity
HIBI Rating

Table 9. Data Inventory Supplement

Geographic Regions	North & South Branch of the Raritan, Highlands, Upper Passaic, Whippany & Rockaway, Hackensack, Hudson & Pascack, Lower Passaic and Saddle, Pompton, Pequannock, Wanaque & Ramapo, Wallkill, Upper Delaware
Counties	Bergen, Essex, Hunterdon, Mercer, Middlesex, Morris, Passaic, Somerset, Sussex, Union, Warren
Dates	5/1/2016 - 10/1/2016
Status	Future/Planned
Sample Frequency	Once
Seasons Sampled	Spring, Summer, Fall
Waterbody Type	River/Stream
Salinity Category	Fresh
Tidal Influence	Non-tidal
Project Description	The objective of the project is to enhance the ability of Water Monitoring & Standards to evaluate environmental conditions at selected sites by providing an additional level of biological assessment. This will be done using the Headwaters Index of Biotic Integrity (HIBI). The intended use is the assessment of aquatic life use in State waters as required by the federal CWA under section 305(b) and the identification of State impaired waters under section 303(d) of the federal CWA.
Parameters analyzed type	Habitat, Biological: Fish, macroinvertebrates, amphibians

Table 10. Data Management Supplement

QAPP network path file location?	V:\LUM\BFBM\Bfbm\Quality Assurance Plans\Calendar Year 2016 QAPPS\HeadwatersIBI_2016DRAFT
Where will data be recorded in field (media)	Paper
If on tablets or phones, will download at office occur or will you connect wirelessly?	
If on tablets or phones, who will do the download?	
If data collected electronically, where will it be stored?	
Format to be received from Lab	
Method of receipt from lab/s	
Personnel receiving outside lab data	
Is data expected to go to WQDE/STORET?	Yes
Data manager - (Bureau and Name)	BFBM Leigh Lager