

**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

Fish Index of Biotic Integrity

2021 Statewide Monitoring Project (Raritan/Atlantic Targeted Region)

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Date

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1.0 Project Name: Fish IBI Monitoring Program

2.0 Requesting Agency: NJDEP Water Monitoring and Standards

3.0 Date of Project: 4/2021 - 5/2022; Index Period 6/2021 – 10/2021

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

5.0 Project Officer: John Vile, Research Scientist I, BFBM

6.0 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) Version #2 August 2019 and any addendums to address covid-19 precautions and the Bureau of Freshwater and Biological Monitoring Standard Operating Procedures Fish Monitoring, 2019.

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

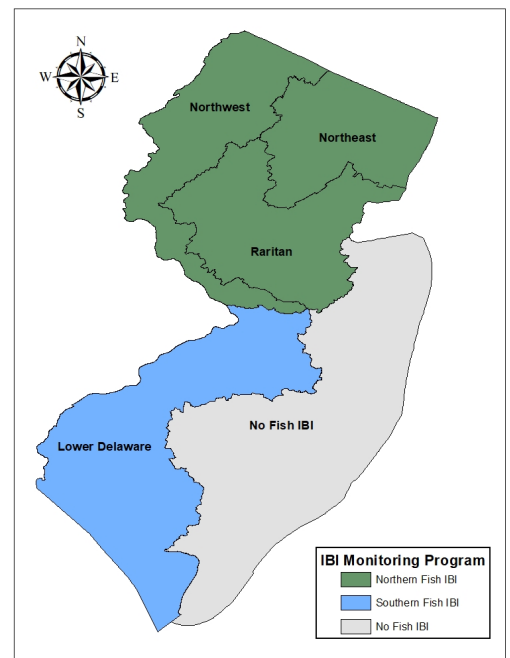
BFBM is certified by the Office of Quality Assurance (certified lab ID # 11896) for all parameters to be measured.

7.0 Project Description/Objective:

The objective of the project is to enhance the ability of Water Monitoring & Standards to evaluate water quality in wadeable streams by providing a comprehensive biological assessment. This will be done using the Index of Biotic Integrity (IBI) for New Jersey fish assemblages statewide using the Northern Fish IBI and the Inner Coastal Plain Fish IBI (Southern IBI). 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. In addition, Fish IBI data is a sub-category of the Category 1 (C-1) nomination process (N.J.A.C. 7:9B). Additional uses may occur, such as water quality classifications and trout status.

8.0 Network Design/Site Selection:

There will be a total of 27 sites (contingent on the addition of fulltime fisheries staff) sampled in 2021 consisting of fixed network sites from two regions (Raritan and Atlantic). The 2021 sampling priority will be given to those remaining sites in the Raritan Region, while sites in the Atlantic Region will be used in the future analysis to develop fish bioassessment protocols for this region. Sampling at sentinel sites will be suspended in 2021. The data from fixed sites is used to assess long term trends. Starting in 2017, the IBI and Headwaters IBI (HIBI) programs made an effort to select new sites or relocate old fixed sites to ensure spatial coverage within each rotating basin. The goal is to have a representative fish site (IBI or HIBI) at the pour point of as many hydrologic units (HUC-14) as possible. These sites are part of the new Fish IBI targeted monitoring network in which all fixed site sampling will occur in one of four specific DEP Water Regions (Upper Delaware, Lower Delaware, Raritan, and Northeast). In 2021, fixed sites will be mainly sampled in the Raritan and Atlantic regions. Sentinel sites are considered high quality waterbodies located in fully or partially protected watersheds which are sampled on a routine basis to assess environmental changes and natural variability. Sentinel sites are



split between the region north of the fall line and the inner coastal plain. Fixed sites are sampled on a five-year basis, while sentinel sites are sampled every other year.

All Northern IBI sites will be above the fall line with drainage areas greater than 4 square miles. Southern IBI sites will consist of Delaware drainage streams in the inner coastal plain with drainage areas greater than 2.0 square miles. The selected sites will address the varied program needs of the Bureau of Freshwater and Biological Monitoring.

All network sites will be visited prior to selection to make sure they are wadeable, meet the habitat criteria of Barbour et al. (1999) where applicable, and to mark off a 150-meter stream reach. All sites to be sampled will be selected prior to the end of the index period. Using a Trimble GPS capable of sub-meter accuracy, the start and finish of each sample site are recorded as waypoints and later incorporated into GIS. Below is the list of 2021 Fish IBI sites. Note, final site list may change following site reconnaissance due to sampling conditions and access.

The final site list will be included in an addendum.

Site	Waterbody	Network	Latitude	Longitude
FIBI013	Heathcote Brook	N_IBI	40.370039	-74.615624
FIBI014	Royce Brook	N_IBI	40.537095	-74.589676
FIBI016	Pike Run	N_IBI	40.444733	-74.645744
FIBI017a	Rahway River SB	N_IBI	40.577472	-74.307192
FIBI019	Rahway River	N_IBI	40.618152	-74.278457
FIBI022	Six Mile Run	N_IBI	40.46984	-74.54425
FIBI023	Neshanic River	N_IBI	40.477307	-74.843006
FIBI025	Peters Brook	N_IBI	40.5677	-74.605447
FIBI030	Stony Brook	N_IBI	40.36991	-74.788945
FIBI038	Middle Brook	N_IBI	40.647695	-74.680555
FIBI070	Stony Brook	N_IBI	40.326692	-74.680448
FIBI071	Ambrose Brook	N_IBI	40.56497	-74.50739
FIBI084	Robinsons Branch	N_IBI	40.609503	-74.287627
FIBI087	Neshanic River	N_IBI	40.493409	-74.753366
FIBI089	Beden Brook	N_IBI	40.416024	-74.664723
FIBI097a	Green Brook	N_IBI	40.60545	-74.44968
NJS11-105	Beden Brook	N_IBI	40.390583	-74.734222
FIBI119	Cedar Brook	N_IBI	40.59303	-74.40968
FIBI126	Royce Brook	N_IBI	40.5048	-74.62397
FIBI127	Beden Brook	N_IBI	40.38137	-74.75249
FIBI301	Toms River UNT	S_IBI	40.11557	-74.40308
FIBI302	Mine Brook	S_IBI	40.2682	-74.19121
FIBI304	Little Silver Creek	S_IBI	40.33204	-74.04025
FIBI305	Milford Brook	S_IBI	40.30134	-74.31955
FIBI316	Pine Brook	S_IBI	40.28021	-74.11028
NJS11-246	Pine Brook	S_IBI	40.28064	-74.110353
NJS2016-033	SB Metedeconk River	S_IBI	40.13483	-74.2937

***Site list may change due to site conditions and access (Addendum). Final list will be submitted to all signees.**

9.0 Sampling Procedures:

Sampling procedures for fish collection are described by Kurtenbach (1994), available as a .pdf document upon request. The sampling objective is to obtain a representative sample of the fish assemblage in a 150 meter stream reach. Fish will be captured using electrofishing equipment (either backpack units or barge mounted unit), identified to species level, and then released. Electrofishing is inherently dangerous and, therefore, team leaders must be trained in safe electrofishing techniques and practices to ensure safe working conditions for themselves and the field staff (AFS Professional Safety Committee 2008). Exposure to low electrical current (like that used in electrofishing) may cause death due to respiratory arrest or cardiac fibrillation (AFS Professional Safety Committee 2008). Due to these dangers, the field team leader and at least one other crew member must be trained in CPR and AED procedures. All crew members are required to wear chest waders with non-slip soles and electrician gloves rated at 7,500 watts. All crew members are required to adhere to the BFBM Field Work Health and Safety Plan developed in cooperation with NJDEP Office of Occupational Health and Safety (OOHS). Crew members must also adhere to any guidance provided by OOHS during the QAPP period. Sampling gear and crew size is directly related to stream width, but is at the discretion of the field team leader.

Stream width (m)	Gear*	Crew size*
≤ 3	1 backpack	3 to 4
3 to 10	2 backpacks	5 to 6
10 to 15	3 backpacks/barge	6 to 8
> 15	barge	5 to 7
* At the discretion of the Team Leader		

Sampling will include qualitative habitat assessments for high gradient streams as described in Barbour et al. (1999). In-stream measurements of temperature, DO, pH, conductivity, discharge, substrate, and canopy will be taken at each site as described below in section 11.0.

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 by cleaning with a commercial disinfectant (Simple Green), rinsing with tap water, and hanging equipment to dry. 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 fish 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). Water temperature, pH, specific conductance, and dissolved oxygen are measured using a Hydrolab MS5. The Hydrolab MS5 is a multi-parameter water quality system that combines temperature, pH, conductance, and luminescent dissolved oxygen (LDO) probes into one meter. The pH, specific conductance, and dissolved oxygen probes will be calibrated on a weekly basis per the manufacturer recommendations.

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. Habitats will be assessed at each site at the time that fish are collected from the site. In addition, a number of qualitative measurements will be made based on visual observation including: substrate composition, weather conditions, water clarity, and presence of aquatic vegetation.

pH: pH will be measured in-stream using a 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 probe is calibrated on a weekly basis per the manufacturer recommendations. The probe is also checked each day of use with a buffer which corresponds to the expected range of the values to be measured. After three hours of continuous use, the pH of the certified buffer will be checked. Records of all calibrations and calibration checks shall be maintained in the BFBM Fish IBI Field Log.

Dissolved Oxygen: Dissolved oxygen will be measured in-stream using a Hydrolab MS5 Water Quality Monitoring System. The meter and probe will be maintained and air calibrated at each site 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. The meter will be checked weekly against a Winkler DO analysis. Calibration records are maintained in the BFBM Fish IBI Field Log.

Water Temperature: Water temperature will be measured in-stream using a 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). Water temperature will be checked against a NIST certified thermometer once each quarter. Calibration records are maintained in the BFBM Fish IBI Field Log.

Ambient Air Temperature: Air temperature will be measured streamside using a Traceable Flip-Stick thermometer (Fisher Scientific, Friendswood, Texas). The thermometer accurately measures ambient air temperature. The thermometer will be maintained and sent for recalibration in accordance with operating procedures. Air temperature will be checked against a NIST certified thermometer once each quarter. Calibration records are maintained in the BFBM Fish IBI Field Log.

Specific Conductance: Specific conductance will be measured in-stream using a 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). Specific conductance will be calibrated weekly using the conductivity standard (1800 $\mu\text{mhos/cm}$). To ensure accuracy, the probe will be checked each day of use with a certified standard (1800 $\mu\text{mhos/cm}$). Calibration records are maintained in the BFBM Fish IBI Field Log.

Canopy: The percentage of open or closed forest canopy cover over the stream channel will be measured using either a convex or concave Forestry Suppliers Spherical Crown Densiometer. Measurements will be taken at the starting point and at intervals 50, 100, and 150 meters along the sampled reach.

Discharge: Stream discharge will be measured at each stream reach sampled. A typical stream cross-section will be located at each sampling site and the cross-section width measured and divided into approximately 10 equal segments. (For small streams with a width of less than 20 feet, the number of segments may be reduced.) At each segment, the average velocity will be measured using a Marsh McBirney Flo-Mate 2000; the depth of the water at each segment will also be measured. This data will be used to calculate discharge in cubic feet or meters per second.

Nutrients: Total phosphorus and total nitrogen (calculated).

12.0 Fish Identification/QAQC:

Identification of IBI species shall be according to the following references:

Cooper, E. L. 1983. Fishes of Pennsylvania and the United States. The Pennsylvania State University Press, University Park, PA.

Eddy, S., and J.C. Underhill. 1983. How to Know the Freshwater Fishes 3rd ed. William C. Brown Company, Dubque, Iowa.

Jenkins, R.E. and N.M. Burkhead. 1993. Freshwater Fishes of Virginia American Fisheries Society. Bethesda, MD.

Page, L.M., and B.M. Burr. 1991. Peterson Field Guides, Freshwater Fishes. Houghton Mifflin Company, New York.

Werner, R.G. 1980. Freshwater Fishes of New York State: A Field Guide. Syracuse University Press, New York.

The staff of the BFBM is experienced at identifying freshwater fish 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 Philadelphia Academy of Natural Sciences of Drexel University are available to assist with unidentified or questionable individuals.

13.0 Data Analysis:

Once fish from sample collections have been identified, counted, examined for disease and anomalies, and recorded, a Fish IBI score will be calculated using the appropriate Northern IBI or Southern IBI metrics. Fish IBI scores are calculated automatically in Access and are hand checked by staff members to ensure accuracy. Any discrepancies in scoring are re-evaluated by the project officer.

14.0 Time Line – Schedule of Tasks:

Site evaluation and selection is expected to begin during March/April 2021.

Fish IBI sampling will take place in the daytime, June through early October 2021, during normal or low flows, and never under atypical conditions such as drought, high flows or excessive turbidity caused by significant precipitation. The postponement of a sampling event is determined by the professional judgment of the field crew leader following a visual inspection of the waterbody. Waters stocked with trout will be sampled between July 1 and early October 2021.

15.0 Resource Needs: BFBM will need two hourly staff and one additional experienced fulltime staff to complete this project following those safety procedures outlined in the Bureau of Freshwater and Biological Monitoring Standard Operating Procedures Fish Monitoring, 2019.

16.0 Data Storage and Distribution:

Sampling results will be stored locally in a Microsoft Access database. Following the QA/QC verification of fish identifications and water quality measurements, data will be entered into New Jersey's Water Quality Data Exchange (WQDE) and will be accessible through the USEPA, USGS and National Water Monitoring Council's Water Quality Portal June the following year data is verified. (Appendix). This data includes: habitat assessment data, taxonomic data and counts, and metric and index scores, as well as water quality data.

All raw data records shall be maintained for a period of no less than five years.

17.0 Data Reporting

All habitat assessment and flow 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 fish identifications will be recorded on the BFBM's Data Sheet and entered into a Microsoft Access database.

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

Final data and evaluations will be forwarded to the DEP BEARS for use in the generation of the biennial New Jersey Integrated Water Quality Monitoring and Assessment Report [305(b) and 303(d)].
 Summary data will be available on BFBM’s website: <http://www.state.nj.us/dep/wms/bfbm/>.

18.0 Audits

The Office of Quality Assurance (OQA) will be notified prior to commencement of any sampling activities in order that an audit may be performed.

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.

Kurtenbach, J. P. 1994. “*Index of Biotic Integrity Study of Northern New Jersey Drainages*” U.S.EPA, Region 2, Div. Of Environmental Assessment, Edison, N. J. (Metrics revised April, 2000).

New Jersey Department of Environmental Protection (NJDEP), 2003. Regulations governing the certification of laboratories and environmental measures, N.J.A.C. 7:18, subchapter 8. Trenton, NJ.

New Jersey Department of Environmental Protection (NJDEP), 2005. Field sampling procedures manual. Ch. 6, Trenton, NJ.

New Jersey Department of Environmental Protection (NJDEP), 2005-2008. Annual Volume I Fish IBI Reports. <http://www.nj.gov/dep/wms/bfbm/ibireports.html>. Trenton, NJ.

Professional Safety Committee. 2008. Fisheries safety handbook. American Fisheries Society, Bethesda, Maryland.

Addendum

21. 2020 Final Site Selection (as requested by OQA):

WMA	Waterbody	Network

Appendix

Inventory

Geographic Regions	Statewide
Counties	Monmouth, Hunterdon, Union, Somerset, Middlesex, Mercer, Ocean
Dates	6/1/2021 - 10/9/2021
Status	Future/Planned
Sample Frequency	Other
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 water quality in wadeable streams by providing a comprehensive biological assessment. This will be done using the Index of Biotic Integrity (IBI) for New Jersey fish assemblages statewide using the Northern Fish IBI and the Inner Coastal Plain Fish IBI (Southern IBI). 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. In addition, Fish IBI data is a sub-category of the Category 1 (C-1) nomination process (N.J.A.C. 7:9B). Additional uses may occur, such as water quality classifications.
Parameters analyzed type	Habitat, Biology:Fish,

Data Management Supplement

QAPP network path file location?	V:\LUM\BFBM\Bfbm\Quality Assurance Plans\Calendar Year 2021 QAPPS\IBI2021
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/WQX?	Yes

Table 1. Site List

Station ID (WQDE compliant and referenced)	Waterbody/Location	Latitude	Longitude	County	Site exists in WQDE already?	Location Type
FIBI013	Heathcote Brook	40.3700	-74.6156	MIDDLESEX	YES	River/stream
FIBI014	Royce Brook	40.53709	-74.58967	SOMERSET	YES	River/stream
FIBI016	Pike Run	40.44473	-74.64574	SOMERSET	YES	River/stream
FIBI017a	Rahway River SB	40.5775	-74.3072	MIDDLESEX	YES	River/stream
FIBI019	Rahway River	40.61815	-74.27846	UNION	YES	River/stream
FIBI022	Six Mile Run	40.46984	-74.54425	SOMERSET	YES	River/stream
FIBI023	Neshanic River	40.47731	-74.84301	HUNTERDON	YES	River/stream
FIBI025	Peters Brook	40.5677	-74.6054	SOMERSET	YES	River/stream
FIBI030	Stony Brook	40.36991	-74.78895	MERCER	YES	River/stream
FIBI038	Middle Brook	40.6477	-74.6806	SOMERSET	YES	River/stream
FIBI070	Stony Brook	40.3267	-74.6804	MERCER	YES	River/stream
FIBI071	Ambrose Brook	40.56497	-74.50739	MIDDLESEX	YES	River/stream
FIBI084	Robinsons Branch	40.6095	-74.28763	UNION	YES	River/stream
FIBI087	Neshanic River	40.4934	-74.7534	SOMERSET	YES	River/stream
FIBI089	Beden Brook	40.41602	-74.66472	SOMERSET	YES	River/stream
FIBI097a	Green Brook	40.60545	-74.44968	UNION	YES	River/stream
NJS11-105	Beden Brook	40.390583	-74.73422	MERCER	YES	River/stream
FIBI119	Cedar Brook	40.5930	-74.4097	MIDDLESEX	NO	River/stream
FIBI126	Royce Brook	40.5048	-74.6240	SOMERSET	NO	River/stream
FIBI127	Beden Brook	40.3814	-74.7525	MERCER	NO	River/stream
FIBI301	Toms River UNT	40.11557	-74.40308	Ocean	NO	River/stream
FIBI302	Mine Brook	40.2682	-74.19121	Monmouth	NO	River/stream
FIBI304	Little Silver Creek	40.33204	-74.04025	Monmouth	NO	River/stream
FIBI305	Milford Brook	40.30134	-74.31955	Monmouth	NO	River/stream
FIBI316	Pine Brook	40.28021	-74.11028	Monmouth	NO	River/stream
NJS11-246	Pine Brook	40.28064	-74.110353	Monmouth	NO	River/stream
NJS2016-033	SB Metedeconk River	40.13483	-74.2937	Ocean	NO	River/stream

Table 2. Parameters

STATION ID	Field Msr/Obs	Flow	Water Chemistry	Continuous Monitoring	Biological	Sediment	Bacteria Collection	Habitat	Metrics	Indices
					Sampling	Collection				
FIBI013	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI014	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI016	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI017a	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI019	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI022	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI023	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI025	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI030	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI038	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI070	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI071	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI084	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI087	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI089	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI097a	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
NJS11-105	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI119	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI126	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI127	YES	YES	NO	NO	YES	NO	NO	Yes	Yes	Yes
FIBI301	YES	YES	NO	NO	YES	NO	NO	Yes	NO	NO
FIBI302	YES	YES	NO	NO	YES	NO	NO	Yes	NO	NO
FIBI304	YES	YES	NO	NO	YES	NO	NO	Yes	NO	NO
FIBI305	YES	YES	NO	NO	YES	NO	NO	Yes	NO	NO
FIBI316	YES	YES	NO	NO	YES	NO	NO	Yes	NO	NO
NJS11-246	YES	YES	NO	NO	YES	NO	NO	Yes	NO	NO
NJS2016-033	YES	YES	NO	NO	YES	NO	NO	Yes	NO	NO

Table 3. Partners

STATION ID	Field Msr/Obs	Flow	Water Chemistry	Continuous Monitoring	Biological Sampling	Sediment Collection	Bacteria Collection
FIBI013	DEP	DEP	NO	NO	DEP	NO	No
FIBI014	DEP	DEP	NO	NO	DEP	NO	No
FIBI016	DEP	DEP	NO	NO	DEP	NO	No
FIBI017a	DEP	DEP	NO	NO	DEP	NO	No
FIBI019	DEP	DEP	NO	NO	DEP	NO	No
FIBI022	DEP	DEP	NO	NO	DEP	NO	No
FIBI023	DEP	DEP	NO	NO	DEP	NO	No
FIBI025	DEP	DEP	NO	NO	DEP	NO	No
FIBI030	DEP	DEP	NO	NO	DEP	NO	No
FIBI038	DEP	DEP	NO	NO	DEP	NO	No
FIBI070	DEP	DEP	NO	NO	DEP	NO	No
FIBI071	DEP	DEP	NO	NO	DEP	NO	No
FIBI084	DEP	DEP	NO	NO	DEP	NO	No
FIBI087	DEP	DEP	NO	NO	DEP	NO	No
FIBI089	DEP	DEP	NO	NO	DEP	NO	No
FIBI097a	DEP	DEP	NO	NO	DEP	NO	No
NJS11-105	DEP	DEP	NO	NO	DEP	NO	No
FIBI119	DEP	DEP	NO	NO	DEP	NO	No
FIBI126	DEP	DEP	NO	NO	DEP	NO	No
FIBI127	DEP	DEP	NO	NO	DEP	NO	No
FIBI301	DEP	DEP	NO	NO	DEP	NO	No
FIBI302	DEP	DEP	NO	NO	DEP	NO	No
FIBI304	DEP	DEP	NO	NO	DEP	NO	No
FIBI305	DEP	DEP	NO	NO	DEP	NO	No
FIBI316	DEP	DEP	NO	NO	DEP	NO	No
NJS11-246	DEP	DEP	NO	NO	DEP	NO	No

NJS2016-033	DEP	DEP	NO	NO	DEP	NO	No
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Table 4. Field Measurements

<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
Flow	Flow	Water	cfs
Barometric Pressure	Barometric Pressure	Air	mmHg
DO Sat	Dissolved oxygen saturation	Water	%
Temperature, air	Temperature, air	Air	deg C

Table 7. RBP Habitat

Characteristic Name

RBP2, Low G, Pool Variability (choice list)
RBP2, Low G, Sediment Deposition (choice list)
RBP2, Low G, Channel Flow Status (choice list)
RBP2, Low G, Channel Alteration (choice list)
RBP2, Low G, Epifaunal Substrate/Available Cover (choice list)
RBP2, Low G, Pool Substrate Characterization (choice list)
RBP2, Low G, Bank Stability, Left Bank (choice list)
RBP2, Low G, Vegetative Protection, Left Bank (choice list)
RBP2, Low G, Channel Sinuosity (choice list)
RBP2, Low G, Bank Stability, Right Bank (choice list)
RBP2, Low G, Vegetative Protection, Right Bank (choice list)
RBP2, Low G, Riparian Vegetative Zone Width, Left Bank (choice list)
RBP2, Low G, Riparian Vegetative Zone Width, Right Bank (choice list)
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 8. RBP Total Habitat

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

Table 9. Fish Metrics

CharacteristicName
Percent Richness of Rheophilic Species (adjusted for drainage size minus T. Darter)
Percent Abundance Cold and Nontolerant Coolwater Species (adjusted for drainage size)
Percent Richness Generalist Feeders
Tolerance Index
Percent Richness of Lithophilic Spawners (minus w. sucker)
Percent Abundance Cyprinidae (adjusted for drainage size)
Percent Abundance Dominant Three Taxa (not including Blacknose Dace)
Percent Richness Benthic Insectivores
Percent Insectivore Individuals
Number of individuals in sample
Percent Piscivore Individuals
Percent DELT Anomalies
Native Species Richness
Benthic Species Richness
Intolerant Species Richness
Percent Tolerant Individuals

Table 10. Total Fish Score and Rating

CharacteristicName
Fish Index of Biotic Integrity
FIBI Rating
Inner Coastal Plain Low Gradient Fish Index
ICPLGFI Rating

