

# Quality Assurance Project Plan for

## Biological Monitoring Pre and Post Dam Removal/Restorations

Musconetcong Watershed Association

River Watcher Volunteer Water Quality Monitoring Program

To be reviewed in conjunction with River Watch Manual

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\* note: This QAPP is a Tier D status for benthic macroinvertebrates sampling when all procedures outlined in the QAPP are followed and identification of macroinvertebrates is to the lowest possible level via the lab. Stream side identification will be at the Tier C status. Any deviation of the plan will be documented via attachment and submitted to the MSD in a bi-report.

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## **Objective and Scope**

Non-governmental organizations such as watershed associations are often approached by landowners for assistance in coordinating the removal of dams and/or restoration of degraded streams on their properties. Funders of such removals, (e.g. NRCS, NOAA) are often government agencies who have a public approval process that requires meetings with local stakeholders. These public approval processes are often contentious. The Musconetcong Watershed Association (MWA), and other organizations coordinating dam removals, have noted that citizens and local stakeholders often lack knowledge about the ecological benefits of the removal of dams and stream barriers, and express concern over the loss of habitat for existing species. Without high quality data demonstrating that the impounded areas change after dam removal, but don't degrade, it is difficult to reassure these citizens. Most importantly, these funders are increasingly asked to demonstrate the success of funded projects as a way to justify the basis for their funding. Having some means of evaluating these projects is imperative, but there are few tools available.

Removing dams, as opposed to replacing or repairing them, is in its infancy in New Jersey, but as many dams in the state are obsolete or have deteriorated so that they are stream barriers, removals of these structures and objects are becoming more common. Methods and extent of restoration vary considerably from project to project, and there is little evidence of how effective one method is compared to another in terms of gains of aquatic resources. Moreover, it is unclear whether some in-stream bed manipulation methods that are part of some restorations add more cost than benefit to said resources. MWA feels that, because considerable resources are required for dam removals and these restorations, it is important to have a way of tracking their success. Unfortunately, New Jersey, unlike other states, has no recognized approach to the monitoring of dam removals, or of their subsequent restoration. As a leader in dam removals in New Jersey, MWA wishes to contribute to the development of such project monitoring methods for future use.

The Musconetcong Watershed Association's major goal of ecological monitoring of dam/stream barrier removal and restoration sites is to give our partners, funders and agencies an assessment of the best biological condition before and after removal projects and subsequent restorations. It is important to monitor sites when taxa richness should still be at its highest, but still accessible and safe, in early April. Because funding for monitoring the success of such projects is limited, an additional and equally important goal is to provide cost-effective means of assessing stream sites in the Musconetcong Watershed specifically pre and post dam/stream barrier removal projects and subsequent restorations. The MWA feels that both goals can be pursued by sampling and analysis of macroinvertebrate communities, based on recommendations of American Rivers, the NJ Dam Removal and Restoration Work Group (which includes MWA), as well as recent work done by the Gulf of Maine Council on the Marine Environment, as codified in the Stream Barrier Removal Guide (see References).

## **Project Description**

To track changes in macroinvertebrate communities pre and post dam removal or restoration

projects, biological samples will be collected in the April prior to in-stream project work start and no sooner than one month after said project is complete dam structure is removed. Sites will be located in areas upstream and downstream of the impacted area. Two sites will also be located within the impounded waters. Samples will be analyzed using the NJ HGMI as well as its sub metrics (e.g. % EPT adjusted, % Functional Feeding Groups, % Habitat/Behavior assignments) to determine how the site assemblages have changed before and after dam removal. These sub metrics are very important in determining changes that result from habitat change vs. water quality changes. A habitat assessment will be performed at each site using the RBP Habitat Assessment form for NJ, as well as other parameters expected to change pre and post dam removal and the subsequent restoration, such as %canopy, % riparian habitat present, and bank angle. In addition, physical parameters such as width, depth of each site will also be measured. Note: A field count on the sample will also be performed following the method described by the NJDEP Volunteer Monitoring Program for high gradient streams; this will provide a baseline for future samples when funding for lab analyses is lacking. For this field count, only %EPT will be determined. This %EPT will not include common net-spinners (Tricoptera-Hydropsychidae) so that this score will be more comparable to the %EPT adjusted metric that is part of the HGMI.

### **Data Usage**

These data will be used to characterize and assess stream segments prior to dam removal and track the progress of restorations post removal and subsequent restorations. MWA, its partners, and funders such as NRCS, NOAA, American Rivers, and other organizations coordinating dam removals will also use these data to design improved assessment methods of such removals and restorations, as well as compare the efficacy of different restoration methods. These data will also be shared with NJDEP to support the development of recognized monitoring methods for tracking dam removals and restoration success.

### **Sample Collection and Analysis**

Macroinvertebrate samples will be collected at wadeable sites at the following locations pre and post-removal/restoration: one site upstream above the influence of the impounded waters, one site immediately downstream of the dam in the area of impact, and one site downstream and beyond the influence of the dam. Prior to sampling, at each site an estimate will be made of %habitat, bank angle, canopy coverage and a visual/ habitat assessment using the RBP visual assessment form (with additional questions modeled on what is currently used for the NJ Watershed Ambassador Program [http://www.state.nj.us/dep/wms/bwqsa/vm/docs/rocky\\_bottom.pdf](http://www.state.nj.us/dep/wms/bwqsa/vm/docs/rocky_bottom.pdf)) will be performed. Estimations of current flow conditions will be made at each visit by measuring width, depth and float speed. The visual/habitat is performed by two volunteers who have received a minimum of 3 hours annually combined field and classroom visual assessment training through the MWA River Watcher program. This training program is run through a partnership between the NJ Americorps program and MWA, and is supervised by the MWA Water Quality Program Coordinator (WQPC). The MWA Quality Program Coordinator reviews the data within 24 hours of data collection and if the data seems

questionable, discusses the data with the volunteer and may visit the site. If discrepancies are noted, the WQPC will re-assess the site and re-train the volunteer if necessary.

In the case of removals of dams/stream barriers, two sites within the impoundment will be sampled, one directly upstream of the site of the removed dam structure, and one just downstream of the upstream end of the impounded waters. In impounded areas conditions are likely not to be wadeable and the accumulated sediment depth may present hazards to investigators; therefore, only post removal samples will be collected as per the method outlined below. These samples are intended to show the extent of recovery in the areas with various extents of streambed manipulation and may be sampled annually post removal.

Each sample will be taken in wadeable riffle-run areas, using a Wildco 800u D-frame net as described in the River Watcher Manual. Each sample will be comprised of 20 kicks in the reach, defined as 100-300 feet for this project. The kicks will reflect the percentage of each habitat in the reach. For example, if the site is 25% riffle, five kicks will be taken in the riffle. Samples will be placed in a sorting tray with water; large woody debris and rocks will be rinsed and removed after careful examination for organisms.

After the sample is collected, the sample will be examined; when funding is not available for lab samples, or when site macroinvertebrate information needs to be shared immediately with partners, organisms will be counted and identified to order level as per NJDEP Volunteer Monitoring method recommended for volunteers. After counting, the entire sample, including the organisms that were counted in the field, will be drained of water using a 500u sieve bucket, and placed in a one liter polyethylene jar containing 95% alcohol. If the sample is too large for one jar a second jar may be used. At the sampling location, each sample jar will have two labels completed with the site identification, the sampler's names, date/time in pencil. One label will be placed in the jar, the other taped to the jar with transparent packing tape, and transported back to the MWA office. Samples will be left in 95% alcohol for a minimum of 24 hours and refrigerated to keep from deteriorating. Samples will be decanted using nude pantyhose filtering method recommended by lab after this time, and re-packed in jars with labels intact. All samples will be sent to Ecoanalysts, Inc by overnight mail service for analysis as per lab instructions including chain of custody forms.

### **Macroinvertebrate Sampling/ Frequency of Collection**

Benthic macroinvertebrates will be sampled from each site during the April-Nov prior to dam removal and no less than one month post removal (also in April-Nov). If funding permits, additional sampling will be performed annually at lowest taxonomic level for a period of one to three years. If funding is not available, the volunteers will still preform the annual sample collection using the stream side identification protocol identifying macroinvertebrates. A riffle-run methodology as outlined in the MWA *River Watcher Field Manual* will be used as appropriate for High Gradient streams. This methodology follows the EPA Rapid Bioassessment Protocol (RBP) and is described

in the NJDEP AMNET SOP.

### **Site Selection Criteria-See Appendix B for project site coordinates**

To properly track changes to macroinvertebrate assemblages that accompany dam removals and/or restorations, a minimum number of sites will be selected accordingly:

- (1) One site upstream of the dam impoundment/restoration area, above the zone of influence of the dam and where no restoration will be occurring; this will represent the least disturbed conditions of the river in this part of the river. This site has wadeable conditions and will be sampled pre and post removal.
- (2) One site within 200 feet downstream of the upper end of the impounded waters. The site will represent the area where a drop in stream depth post-removal is most likely to reveal a riffle run area. This site will only be sampled post-removal due to non-wadeable conditions, but will be documented for pre-removal habitat conditions and photographed.
- (3) One site will be within 50 feet upstream of the current dam structure. This site will represent the area that is most affected by the dam removal and is expected to demonstrate improved stream health conditions. This site will be sampled post-removal only due to non-wadeable conditions but pre-removal stream habitat conditions will be documented and site will be photographed.
- (4) One site will be located immediately downstream of the dam, in the first riffle-run area downstream of the dam. This site represents the area most likely to be impacted by both poor quality impounded waters created by the dam and the dam removal. This site should be carefully determined with regard to safety; areas immediately downstream of dams can contain a hydraulic which can be hazardous to monitors.
- (5) One site should be in a riffle-run area downstream of the dam outside of the zone of influence of the dam. This site will be at least 1000 feet from the dam site.

All monitoring sites will be marked with a combination of flags and painted re-bar hammered into the stream bank; this will aid monitors in locating the exact location post removal as the stream morphology and appearance can change dramatically and disorient even personnel familiar with the location. In addition, all sample site locations (latitude and longitude, to nearest seconds) are determined via the Global Positioning System (GPS) using a Garmin Oregon 550t hand held GPS unit. This will allow volunteers and/or staff to return to the exact site locations for current and future sampling.

### **Macroinvertebrate Identification**

After sampling, the entire sample will be placed in a sorting pan and identified in the field. The method will follow the NJDEP Watershed Ambassador Protocol. This count will be used long-

term to compare to samples taken after the dam or stream barrier is removed if funding is not available for lab analysis in subsequent years. After counting, the entire sample, including the counted organisms and debris, will be sent to Ecoanalysts, Inc in Moscow, Idaho. A 100 organism subsample will be randomly sorted from each sample by Ecoanalyst, Inc, as described in USEPA (1999). Ecoanalyst, Inc is a certified lab; their staff is required to be certified by the North American Benthological Society on a regular basis in macroinvertebrate identification and assessment. All individuals will be identified to the lowest practicable taxonomic level (usually genus and species). If verification is required by the data user, 10% of the samples are sent to a qualified independent consultant for parallel identifications. A macroinvertebrate specimen reference collection is maintained in the laboratory for 6 months and then returned to MWA. All sampling equipment will be maintained, and used following manufacturer's instructions and in accordance with River Watch Volunteer Monitoring Manual.

### **Data Completeness**

All sites will be sampled from April to Nov. It is expected that 100% of samples will be collected. If 100% of the samples are not collected or not analyzed due to human error, the error will be recorded and documented.

### **Data Analysis**

The biometrics employed in this project are the NJ High Gradient Macroinvertebrate Index (see NJDEP AMNET SOP Appendix A for HGMI in References). Sub-metrics (e.g. % EPT adjusted) will be used to track changes in impounded areas as well as at other sites. The NJDEP Volunteer Monitoring Protocol for High Gradient Streams is a less precise analysis, but has been shown by NJDEP to be comparable to the HGMI.

### **Data Validation**

The MWA Water Quality Monitoring Program Coordinator responsible for all final data validation.

### **Chain of Custody**

Chain of custody forms accompany all biological samples as per shipping instructions by Ecoanalyst, Inc.

### **Corrective Actions**

Any change to this Quality Assurance Project Plan will be approved by the all signing authorities of



this plan either in the form of a plan amendment or new QA plan.

### **Data Reporting**

All habitat analysis, physical/ chemical analysis, and site observations will be recorded on the MWA Biological Assessment Data Sheet, and also recorded electronically in a Microsoft Excel spreadsheet on the River Watcher laptop. All data will be entered into the NJDEP Water Quality Data System, as recommended by the NJDEP Volunteer Monitoring Program, at the MWA River Resource Center on a lap top.

All macroinvertebrate identifications documents from the lab will be kept by the Musconetcong Watershed Association and will be sent to the NJDEP as requested.

## Appendix A

### References

Gulf of Maine Council on the Marine Environment (2007). *Stream Barrier Removal Monitoring Guide*. <http://www.gulfofmaine.org/streambarrierremoval/>

Barbour, M.T., J. Gerritson, B.D. Snyder and J.B. Stribling (USEPA). 1999. Rapid bioassessment protocols for use in streams and rivers: periphyton, benthic macroinvertebrates, and fish. Second edition. EPA 841-B-99-002. U.S. Environmental Protection Agency. Washington, D.C. Ch. 1–11 and appendices.

Kurtenbach, J. 1990. A method for rapid bioassessment of streams in New Jersey using benthic macroinvertebrates. *Bull. N. Am. Benth. Soc.* 8(1):129.

*MWA River Watcher Field Manual.*

<http://www.musconetcong.org/files/River%20Watcher%20Water%20Quality%20Monitoring%20Program%20Methods%20Manual%20updated%20March%202012.pdf>

*NJDEP AMNET SOP Appendix A& B for Habitat Assessment forms and HGMI*

[http://www.state.nj.us/dep/wms/bfbm/download/AMNET\\_SOP.pdf](http://www.state.nj.us/dep/wms/bfbm/download/AMNET_SOP.pdf)

NJDEP Volunteer Monitoring Program Manual and scoring sheets for Biological Monitoring

<http://www.state.nj.us/dep/wms/bwqsa/vm/biomon.html>

Ecoanalysts, Inc shipping instructions

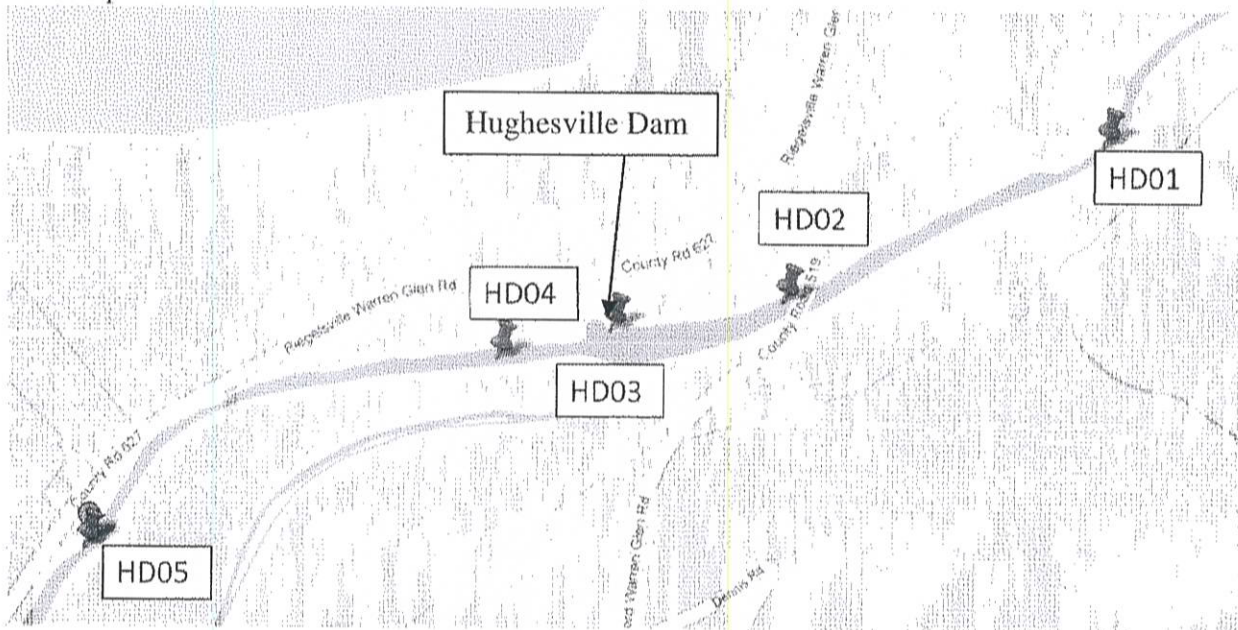
<http://www.ecoanalysts.com/sample.php>

## **Appendix B Project Sampling Site locations**

## Hughesville Dam Removal Study

Hughesville Dam Removal				
Site	Access (MWA has owner's permission)	Description	Latitude	Longitude
HD01	Through IPPP parking lot over bridge, on Hunterdon Cty side	75 feet upstream of bridge	40.632466	-75.130085
HD02	Through IPPP parking lot on Warren side	50 feet downstream of 519 bridge	40.630512	-75.135407
HD03	By dam structure, slope/stairs, Warren Cty	50 feet upstream of dam structure	40.630109	-75.138191
HD04	through IPPP property (MWA has owner permission), Hunterdon Cty side	rifle-run 75 feet downstream of dam structure	40.6298	-75.140208
HD05	F&W fishing access on rte 627, Warren Cty	sample at riffle at lower end of access	40.627406	-75.147064

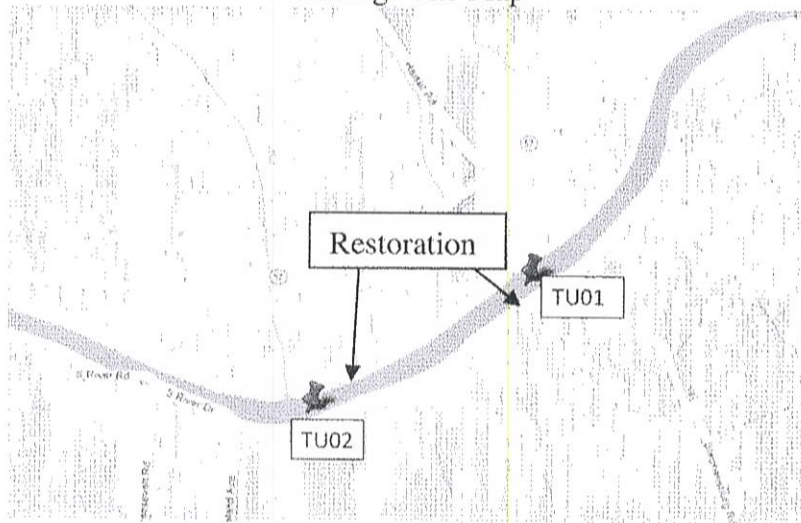
Site Map



## Trout Unlimited (Heritage/Heiser Dunn) Stream Barrier Removal/Restorations

Heritage-Heiser-Dunn removal/restoration (sites approximate)				
Site	Access (MWA has owner's permission)	Description	Latitude	Longitude
TU01	1280 Rte 57 Port Murray	Above ditch at upper end of property, Warren Cty side	40.791715	-74.87785
TU02	1280 Rte 57 Port Murray (2)	At fishing access at lower end of property, Warren Cty side	40.790608	-74.880189
TU03	144 Bryans Rd	300 feet upstream of end of fence, Warren cty side	40.710764	-74.9762234
TU04	177 Bryans Rd	100 feet downstream of spring house, Warren Cty side	40.710859	-74.977744
TU05	177 Bryans Rd (2)	rifle-run 75 feet downstream of dam structure, Warren Cty side	40.710662	-74.979651

Heritage Site Map



Heiser Dunn Site Map

