Appendix A: Musquapsink Brook Benthic Data Report & Species List, Marion McClary, Jr., Ph.D., Fairleigh Dickinson University

Musquapsink Brook Benthic Data Report

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for

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Restoration and Protection Plan

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Biological Monitoring Materials and Methods

Upon arrival at the sampling location, the end of a tape measure was placed and held below any road or bridge crossing that was present and stretched 100 meters upstream to minimize the effect of the road or bridge on stream velocity, depth, and overall habitat quality as per the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition. At this location, 100 meters upstream of the road or bridge crossing, the tape measure was again placed and held and stretched 100 meters upstream to include a 100 meter reach that was representative of the characteristics of the stream (the study area). Other road or bridge crossings were avoided. If this was not possible, the tape measure was placed and held below this road or bridge crossing and the aforementioned procedure was repeated until road and bridge crossing could be avoided. There were no major tributaries discharging to the stream in the study area as suggested by the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition. The tape measure was left in the study area for sampling.

Before sampling the physical/chemical field sheet (Chapter 5; Appendix A-1, Form 1 of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition) was completed to document the site description, weather conditions, and land use. After sampling this information was reviewed for accuracy and completeness.

The straight-away portions of the sampling reach were photographed with a digital camera starting downstream and ending upstream (with the exception of MB6 which was done in the reverse direction) to include in-stream attributes (e.g. riffles, falls, fallen trees, pools, bends, etc.) and important structures, plants, and attributes of the bank and near stream areas. If the sampling reach had curves, the "straight-away portions of each curve" were photographed. This means more photographs were taken of sampling reaches that had more curves because each "straight-away segment of the curve" received a photograph, and fewer photographs were taken of sampling reaches that had less curves.

Two sampling procedures were used. One procedure was used depending upon if the habitat was a single habitat or a multihabitat. Habitats that had a very slow current or were greater than 1 ft deep, and lacked riffles were considered to be multihabitats and a multihabitat approach was used for them. Habitats that were 1 ft deep or less and had riffles and runs were considered single habitats. The second procedure was used for all habitats whether they were single or multihabitats. For single habitats with riffles and runs, all riffle and run areas within the 100-m reach were candidates for sampling macroinvertebrates. A composite sample was taken from individual sampling spots in the riffle and runs representing different velocities.

Field Sampling Procedures for Single Habitat

Sampling began at the downstream end of the reach and proceeded upstream. Sampling was done in triplicate. The first replicate (A) was done along the bank on the right. The second replicate (B) was done along the bank on the left. The third replicate

(C) was done in the middle of the channel. For sampling, a surber sampler (0.3 m x 0.3 m with a mesh size of 500 μ) was placed horizontally on cobble substrate and 2 or 3 kicks (use of the toe or heel of the boot to dislodge the upper layer of cobble or gravel and to scrape the underlying bed) were done at various velocities in the riffle or series or riffles. Larger substrate particles were picked up and rubbed by hand to remove attached organisms. The net on the vertical section of the frame captured the dislodged organisms from the sampling area.

The kicks collected from three different locations in the cobble substrate were composited to obtain a single homogenous sample for each replicate. After each kick, the collected material was washed by running clean stream water through the net 2 to 3 times until the water was clear. Large debris was removed after rinsing and inspecting for organisms. Any organisms found were placed into a sample container.

The sample in the net was transferred to a sample container and enough 95 percent ethanol was added to cover the sample. Forceps were used to remove organisms from the net. A label indicating the date, stream name and sampling location was placed on the sample container. This information was recorded in the "Sample log" (Appendix A-3, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition.

The top portion of the "Benthic Macroinvertebrate Field Data Sheet" (Appendix A-3, Form 1) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was completed.

The percentage of each habitat type in the reach was recorded, and the sampling gear used and the conditions of the sampling, e.g. high flows, treacherous rocks, difficult access to the stream, or anything that would indicate adverse sampling conditions were noted.

Observations of aquatic flora and fauna were documented and qualitative estimates of macroinvertebrate composition and relative abundance as a cursory estimate of ecosystem health and to check adequacy of sampling were made.

Habitat assessment (Appendix A-1, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was performed after sampling was completed by walking the reach.

The samples were returned to the laboratory and the log-in form (Appendix A-3, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was completed.

After sampling was completed at the site, all nets, pans, and etc. that came in contact with a sample was rinsed thoroughly, examined carefully, and picked free of organisms or debris. Any additional organisms found were placed in the sample containers. The equipment was examined again prior to use at the next sampling site.

Field Sampling Procedures for Multihabitat

Different types of habitat were sampled in approximate proportion to their representation of surface area of the total macroinvertebrate habitat in the reach. For example, if snags comprised 50% of the habitat in a reach and riffles comprised 20%,

then 10 kicks were done in snag material and 4 kicks were done in riffle areas. The remainder of the kicks (6) would be done in any remaining habitat type. Habitat types contributing less than 5% of the stable habitat in the stream were not sampled. In this case, the remaining kicks were allocated proportionately among the predominate substrates. The number of kicks done in each habitat was recorded on the field data sheet.

Sampling began at the downstream end of the reach and proceeded upstream. Sampling was done in triplicate. The first replicate (A) was done along the bank on the right. The second replicate (B) was done along the bank on the left. The third replicate (C) was done in the middle of the channel. A total of 20 kicks were done over the length of the reach. A kick was a stationary sampling accomplished by positioning a D-frame dip net (0.3 m width and 0.3 m height and shaped as a "D" with a mesh size of 500 μ) and disturbing the substrate for a distance of 0.5 m upstream of the net.

Kicks collected from the multiple habitats were composited to obtain a single homogenous sample for each replicate. After every 3 kicks or more if necessary, the collected material was washed by running clean stream water through the net two to three times. Large debris was removed after rinsing and inspecting for organisms. Any organisms found were placed into a sample container.

The sample in the net was transferred to a sample container and enough 95 percent ethanol was added to cover the sample. Forceps were used to remove organisms from the net. A label indicating the date, stream name and sampling location was placed on the sample container. This information was recorded in the "Sample log" (Appendix

A-3, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition.

The top portion of the "Benthic Macroinvertebrate Field Data Sheet" (Appendix A-3, Form 1) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was completed.

The percentage of each habitat type in the reach was recorded, and the sampling gear used and the conditions of the sampling, e.g. high flows, treacherous rocks, difficult access to the stream, or anything that would indicate adverse sampling conditions were noted.

Observations of aquatic flora and fauna were documented and qualitative estimates of macroinvertebrate composition and relative abundance as a cursory estimate of ecosystem health and to check adequacy of sampling were made.

Habitat assessment (Appendix A-1, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was performed after sampling was completed by walking the reach.

The samples were returned to the laboratory and the log-in form (Appendix A-3, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was completed.

After sampling was completed at the site, all nets, pans, and etc. that came in contact with a sample was rinsed thoroughly, examined carefully, and picked free of

organisms or debris. Any additional organisms found were placed in the sample containers. The equipment was examined again prior to use at the next sampling site.

Coarse Particulate Organic Matter (CPOM) Sampling Procedures

Sampling began at the downstream end of the reach and proceeded upstream. Sampling was done in triplicate. The first replicate (D) was done along the bank on the right. The second replicate (E) was done along the bank on the left. The third replicate (F) was done in the middle of the channel. Three grab type samples were collected for each replicate. These samples were sorted in the field, composited (i.e., the contents from the three grab samples from each site was combined into a single container) for each replicate, and preserved in 80% ethanol for later subsampling, identification and enumeration.

A composite collection of a variety of CPOM forms (e.g., leaves, needles, twigs, bark, or fragments of these) was collected for each replicate. The material was sampled in depositional areas, such as pools and along snags and undercut banks. The CPOM sample was processed using a U.S. Standard No. 30 sieve, and added to the composite of the replicate grab samples for each site.

A label indicating the date, stream name and sampling location was placed on the sample container. This information was recorded in the "Sample log" (Appendix A-3, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition.

The top portion of the "Benthic Macroinvertebrate Field Data Sheet" (Appendix A-3, Form 1) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable

Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was completed.

The percentage of each habitat type in the reach was recorded, and the sampling gear used and the conditions of the sampling, e.g. high flows, treacherous rocks, difficult access to the stream, or anything that would indicate adverse sampling conditions were noted.

The samples were returned to the laboratory and the log-in form (Appendix A-3, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition was completed.

After sampling was completed at the site, the sieve was rinsed thoroughly, examined carefully, and picked free of organisms or debris. Any additional organisms found were placed in the sample containers. The sieve was examined again prior to use at the next sampling site.

Laboratory Processing For Macroinvertebrate Samples

All samples were dated and recorded in the "Sample Log" notebook or on sample log form (Appendix A-3, Form 2) of the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition in the laboratory. All information from the sample container label was included on the sample log sheet. All samples were sorted in a single laboratory to enhance quality control.

The identity and number of organisms were recorded on the Laboratory Bench Sheet (Appendix A-3, Form 3) of the Rapid Bioassessment Protocols for Use in Streams

and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition. The life stage of the organisms, the taxonomist's initials and the Taxonomic Certainty Rating (TCR) was recorded as a measure of confidence.

The back of the bench sheet was used to explain certain TCR ratings or condition of organisms. Other comments were included to provide additional insights for data interpretation.

A 100-organism subsample of the benthic macroinvertebrate composite sample from each sampling site was to be taken into the laboratory according to the methods outlined in the Rapid Bioassessment Protocol used by the NJDEP Bureau of Freshwater and Biological Monitoring. With the exception of chironomids and oligochaetes, benthic macroinvertebrates were to be identified to genus. Chironomids were to be identified to subfamily as a minimum, and oligochaetes were to be identified to family as a minimum.

Each individual organism was to be assigned a number and 100 numbers were to be randomly selected out of a hat. The organisms assigned to these numbers were to be the randomly selected sub-sample. Taxa richness (total families) was to be determined by totaling each different family represented in the sub-sample. The EPT (*Ephemeroptera*, *Plecoptera*, and *Trichoptera* orders; mayflies, stoneflies, and caddisflies) Index was to be determined by adding each individual EPT family in the sub-sample. Percent dominance was to be determined by the family that has the greatest number of individuals in the sub-sample. Percent EPT was to be determined by adding the total number of individuals found in all EPT families in the sub-sample. A Modified Family Biotic Index (FBI) was to be determined by $FBI = \Sigma\, x_i\, t_i / n$ where x_i = number of individuals within a family, t_i = tolerance value of a family (in appendix B, Tables C-1

and C-2 of the NJDEP guide), and n = total number of organisms within the sub-sample (100). Taxa richness, EPT Index, percent dominance, percent EPT, and FBI were to be assigned a biometric score of 0, 3, or 6 (in Table 1 of the NJDEP guide) and totaled. A score of 24-30 means the Musquapsink Brook is not impaired, 9-21 means it is moderately impaired, and 0-6 means it is severely impaired. A good or bad land assessment moves a score between a range up or down.

The measurement of physicochemical parameters was also conducted concurrent with the benthic macroinvertebrate sampling. These parameters, pH, temperature, dissolved oxygen, and total dissolved solids (TDS) were conducted by Rutgers University.

For archiving samples, specimen vials, (grouped by station and date), were placed in jars with a small amount of denatured 70% ethanol and tightly capped. The ethanol levels in these jars was examined periodically and replenished as needed. A stick-on label was placed on the outside of the jar indicating sample identifier and date.

Biological Monitoring Results and Discussion

Physical characterization/water quality

The stations sampled in the Musquapsink Brook became deeper moving from an upstream to a downstream location. Station MB1, the most upstream sampling site, is composed of mainly bedrock and had the least amount of water of the other stations (Table 1). Station MB3, further downstream, has more water than MB1 and was composed of sediment and rocks (Table 2). Station MB6, even further downstream, has more water than MB3 and it too has sediment and rocks unlike station MB1 which lacks

sediment (Table 3). Station MB4, the most downstream sampling site, had the most water and was also the slowest moving of the other sites. It was the only site that lacked riffles (Table 4). Tables 1-4 also include information about the stream such as weather conditions during sampling, watershed features, riparian vegetation, instream features, large woody debris, aquatic vegetation, water quality, and sediment and substrate characteristics. The photographs of each station are immediately after the table. The table indicates the number of pages that contain the photographs.

Table 1. Physical characterization/water quality field data sheet for MB1.

Stream Name: Musquapsink Brook	
Station #: MB1	
Investigator: Dr. Marion McClary and students	
Form completed by: Dr. Marion McClary and students	Date: 8/30/07 Time: 8:28 am
Weather conditions:	Clear/sunny, no heavy rain in the last 7 days
Site location/photographs	See the next 3 pages
Watershed features	Predominant surrounding land use: forest and residential, no evidence of local watershed NPS pollution, moderate evidence of local watershed erosion
Riparian vegetation (18 meter buffer)	Trees are the dominant type
Instream features	Estimated reach length: 100 m, width: 2 m, stream depth: < 0.3 m, canopy cover: partly shaded, 40 riffle, 20% pool, 40% run, channelized, no dam present
Large woody debris	LWD: 0 m^2
Aquatic vegetation	0% of the reach with aquatic vegetation
Water quality	No water odors, no surface oils, clear
Sediment/substrate	No odors, no oils, no deposits
Inorganic substrate components % composition in reach (should add up to 100%)	Organic substrate components % composition in sampling area (does not necessarily add up to 100%)
Bedrock: 70%	Detritus: 5%
Boulder: 5%	
Cobble: 20%	Muck-Mud: 0%
Gravel: 5%	
Sand: 0%	Marl: 0%
Silt: 0%	
Clay: 0%	

Table 2. Physical characterization/water quality field data sheet for MB3.

Stream Name: Musquapsink Brook	
Station #: MB3	
Investigator: Dr. Marion McClary and students	
Form completed by: Dr. Marion McClary and students	Date: 8/30/07 Time: 11:07 am
Weather conditions:	70% cloud cover, clear/sunny, heavy rain in the last 7 days, air temperature: 22 ^{o} C
Site location/photographs	See the next 4 pages
Watershed features	Predominant surrounding land use: residential, no evidence of local watershed NPS pollution, moderate evidence of local watershed erosion
Riparian vegetation (18 meter buffer)	Trees and shrubs are the dominant type
Instream features	Estimated reach length: 100 m, width: 5 m, stream depth: < 0.3 m, canopy cover: partly shaded, 30% riffle, 30% pool, 30% run, channelized, no dam present
Large woody debris	LWD: 1 m^2
Aquatic vegetation	0% of the reach with aquatic vegetation
Water quality	No water odors, surface oils, slightly turbid
Sediment/substrate	No odors, no oils, trash
Inorganic substrate components % composition in reach (should add up to 100%)	Organic substrate components % composition in sampling area (does not necessarily add up to 100%)
Bedrock: 0%	Detritus: 60%
Boulder: 0%	
Cobble: 20%	Muck-Mud: 0%
Gravel: 20%	
Sand: 20%	Marl: 0%
Silt: 20%	
Clay: 20%	

Table 3. Physical characterization/water quality field data sheet for MB6.

Stream Name: Musquapsink Brook	
Station #: MB6	
Investigator: Dr. Marion McClary and students	
Form completed by: Dr. Marion McClary and students	Date: 9/13/07 Time: 9:30 am
Weather conditions:	Clear/sunny, heavy rain in the last 7 days, air temperature: 75 ^{o} F
Site location/photographs	See the next 3 pages
Watershed features	Predominant surrounding land use: residential, no evidence of local watershed NPS pollution, no evidence of local watershed erosion
Riparian vegetation (18 meter buffer)	Trees and shrubs are the dominant type
Instream features	Estimated reach length: 100 m, width: 7 m, stream depth: 0.3 m, canopy cover: partly shaded, 20% riffle, 40% pool, 20% run, not channelized, no dam present
Large woody debris	LWD: 1 m^2
Aquatic vegetation	0% of the reach with aquatic vegetation
Water quality	No water odors, no surface oils, slightly turbid to turbid
Sediment/substrate	No odors, no oils, trash
Inorganic substrate components % composition in reach (should add up to 100%)	Organic substrate components % composition in sampling area (does not necessarily add up to 100%)
Bedrock: 0%	Detritus: 20%
Boulder: 5%	
Cobble: 15%	Muck-Mud: 0%
Gravel: 20%	
Sand: 20%	Marl: 10%
Silt: 20%	
Clay: 20%	

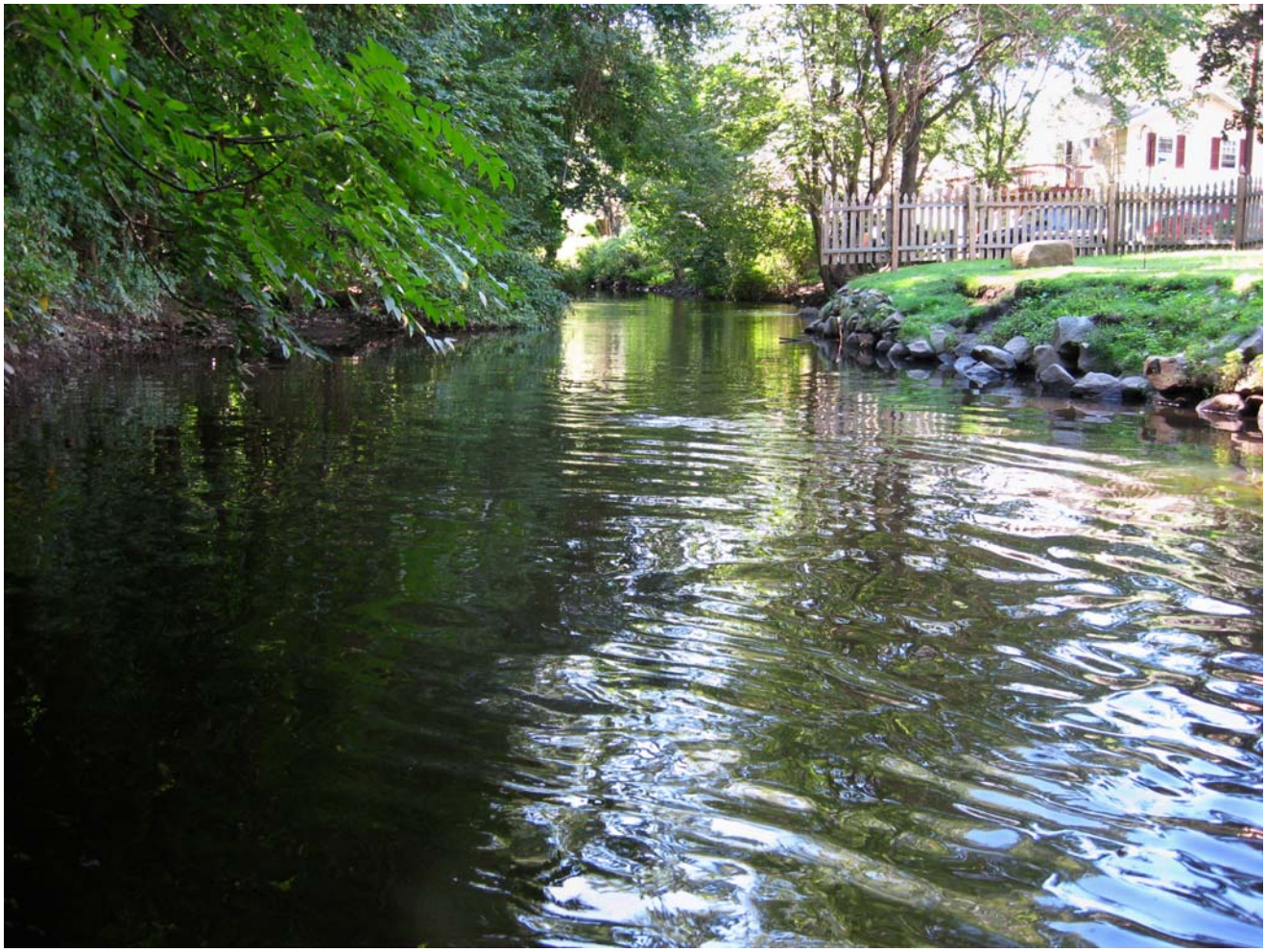
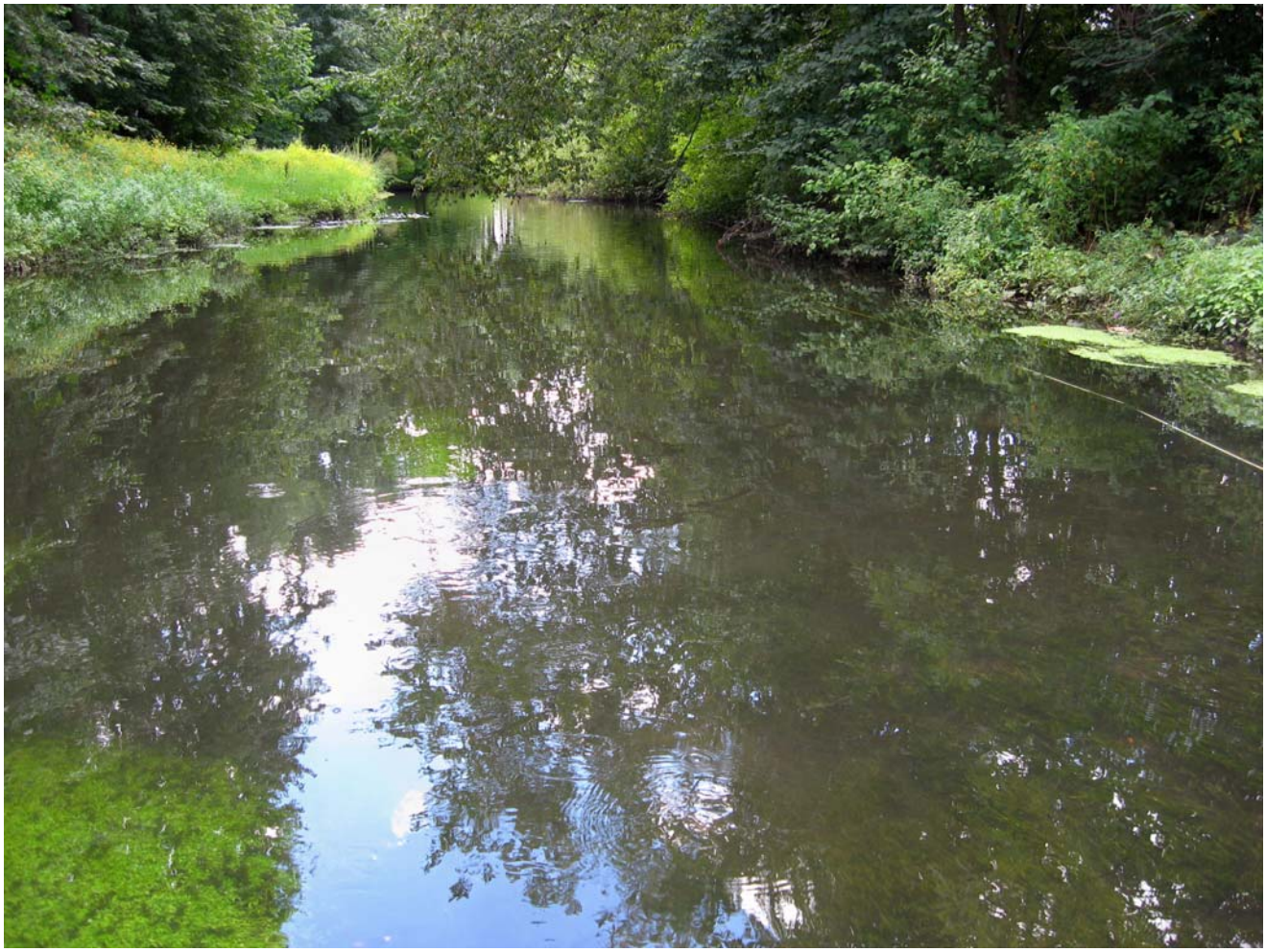


Table 4. Physical characterization/water quality field data sheet for MB4.

Stream Name: Musquapsink Brook	
Station #: MB4	
Investigator: Dr. Marion McClary and students	
Form completed by: Dr. Marion McClary and students	Date: 9/13/07 Time: 11:30 am
Weather conditions:	Clear/sunny, heavy rain in the last 7 days, air temperature: 78 ^{o} F
Site location/photographs	See the next 4 pages
Watershed features	Predominant surrounding land use: park, no evidence of local watershed NPS pollution, no evidence of local watershed erosion
Riparian vegetation (18 meter buffer)	Shrubs are the dominant type
Instream features	Estimated reach length: 100 m, width: 8 m, stream depth: > 1 m, canopy cover: partly shaded, 100% run, channelized, no dam present
Large woody debris	LWD: 1 m^2
Aquatic vegetation	Rooted emergent (70%), rooted submergent (30%) are dominant, 100% of the reach with aquatic vegetation
Water quality	No water odors, no surface oils, turbid
Sediment/substrate	No odors, no oils, no deposits
Inorganic substrate components % composition in reach (should add up to 100%)	Organic substrate components % composition in sampling area (does not necessarily add up to 100%)
Bedrock: 0%	Detritus: 10%
Boulder: 0%	
Cobble: 0%	Muck-Mud: 90%
Gravel: 0%	
Sand: 0%	Marl: 0%
Silt: 50%	
Clay: 50%	



Benthic Macroinvertebrates

Because station MB1 was shallow and had riffles (see Table 1), a surber was used to collect macroinvertebrates. An average of 0 (absent/not observed) were collected from MB1 using this technique and grab samples (Table 5).

Because MB3 was shallow and had riffles (see Table 2), a surber was used to collect macroinvertebrates. An average of 1 (rare) was collected from MB3 using this technique and grab samples (Table 6). Of the macroinvertebrates collected, the most abundant was an average of 1 (rare) which was found for Coleoptera and Trichoptera (Table 6).

Because MB6 was shallow and had riffles (see Table 3), a surber was used to collect macroinvertebrates. An average of 2 (common) was collected from MB6 using this technique and grab samples (Table 7). Of the macroinvertebrates collected, the most abundant was an average of 1 (rare) which was found for Amphipoda, Coleoptera and Chironomidae (Table 7).

Because station MB4 was deep and lacked riffles (see Table 4), a D frame dip was used to collect macroinvertebrates. An average of 1 (rare) was collected from MB4 using this technique and grab samples (Table 8). Of the macroinvertebrates collected, the most abundant was an average of 1 (rare) which was found for Anisoptera and Zygoptera (Table 8).

Table 5. Benthic macroinvertebrate field data sheet for MB1.

Stream Name: Musquapsink Brook								
Station #: MB1								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
Habitat types: % c = cobble, s = snags, vb = vegetated banks, s = sand, sm = submerged veg.				0s				0vb
Sample collection: d = d frame, s = surber, g = grab	s	s	s		g	g	g	
Qualitative listing of aquatic biota: 0 = absent/not observed, 1 = 1-3, 2 = 3-9, 3 = > 10, 4 = > 50 orgs.								
Periphyton	0	0	0	0	0	0	0	0
Filamentous algae	0	0	0	0	0	0	0	0
Macrophytes	0	0	0	0	0	0	0	0
Slimes	0	0	0	0	0	0	0	0
Macroinvertebrates	0	0	0	0	0	0	0	0
Fish	0	0	0	0	0	0	0	0
Field observations of macrobenthos: 0 = absent/not observed, 1 = rare (1-3), 2 = common (3-9), 3 = abundant (>10), 4 = dominant (>50 organisms)								
Porifera	0	0	0	0	0	0	0	0
Hydrozoa	0	0	0	0	0	0	0	0
Platyhelminthes	0	0	0	0	0	0	0	0
Turbellaria	0	0	0	0	0	0	0	0
Hirudinea	0	0	0	0	0	0	0	0
Oligochaeta	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	0	0
Amphipoda	0	0	0	0	0	0	0	0
Decapoda	0	0	0	0	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0
Bivalvia	0	0	0	0	0	0	0	0
Anisoptera	0	0	0	0	0	0	0	0
Zygoptera	0	0	0	0	0	0	0	0
Hemiptera	0	0	0	0	0	0	0	0
Coleoptera	0	0	0	0	0	0	0	0
Lepidoptera	0	0	0	0	0	0	0	0
Sialidae	0	0	0	0	0	0	0	0
Corydalidae	0	0	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	0
Empididae	0	0	0	0	0	0	0	0
Simuliidae	0	0	0	0	0	0	0	0
Tabanidae	0	0	0	0	0	0	0	0
Culicidae	0	0	0	0	0	0	0	0
Chironomidae	0	0	0	0	0	0	0	0
Ephemeroptera	0	0	0	0	0	0	0	0
Trichoptera	0	0	0	0	0	0	0	0
Other (Nematocera)	0	0	0	0	0	0	0	0

Table 6. Benthic macroinvertebrate field data sheet for MB3.

Stream Name: Musquapsink Brook								
Station #: MB3								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
Habitat types: % c = cobble, s = snags, vb = vegetated banks, s = sand, sm = submerged veg.				30s				0vb
Sample collection: d = d frame, s = surber, g = grab	s	s	s		g	g	g	
Qualitative listing of aquatic biota: 0 = absent/not observed, 1 = 1-3, 2 = 3-9, 3 = > 10, 4 = > 50 orgs.								
Periphyton	0	0	0	0	0	0	0	0
Filamentous algae	0	0	0	0	0	0	0	0
Macrophytes	0	0	0	0	0	0	0	0
Slimes	0	0	0	0	0	0	0	0
Macroinvertebrates	0	1	3	1.3	1	1	2	1.3
Fish	0	0	0	0	0	0	0	0
Field observations of macrobenthos: 0 = absent/not observed, 1 = rare (1-3), 2 = common (3-9), 3 = abundant (>10), 4 = dominant (>50 organisms)								
Porifera	0	0	0	0	0	0	0	0
Hydrozoa	0	0	0	0	0	0	0	0
Platyhelminthes	0	0	0	0	0	0	0	0
Turbellaria	0	0	0	0	0	0	0	0
Hirudinea	0	0	0	0	0	0	0	0
Oligochaeta	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	1	0	0	0.3
Amphipoda	0	0	0	0	0	0	1	0.3
Decapoda	0	0	1	0.3	1	0	0	0.3
Gastropoda	0	0	0	0	0	0	0	0
Bivalvia	0	0	0	0	0	0	0	0
Anisoptera	0	0	0	0	0	0	0	0
Zygoptera	0	0	0	0	0	0	0	0
Hemiptera	0	0	0	0	0	0	0	0
Coleoptera	0	1	2	1	0	0	0	0
Lepidoptera	0	0	0	0	0	0	0	0
Sialidae	0	0	0	0	0	0	0	0
Corydalidae	0	0	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	0
Empididae	0	0	0	0	0	0	0	0
Simuliidae	0	0	0	0	0	0	0	0
Tabanidae	0	0	0	0	0	0	0	0
Culicidae	0	0	0	0	0	0	0	0
Chironomidae	0	0	1	0.3	0	1	2	1
Ephemeroptera	0	0	0	0	0	0	0	0
Trichoptera	0	0	2	0.7	0	0	0	0
Other (Nematocera)	0	0	0	0	0	0	0	0

Table 7. Benthic macroinvertebrate field data sheet for MB6.

Stream Name: Musquapsink Brook								
Station #: MB6								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
Habitat types: % c = cobble, s = snags, vb = vegetated banks, s = sand, sm = submerged veg.				30s				50vb
Sample collection: d = d frame, s = surber, g = grab	s	s	s		g	g	g	
Qualitative listing of aquatic biota: 0 = absent/not observed, 1 = 1-3, 2 = 3-9, 3 = > 10, 4 = > 50 orgs.								
Periphyton	0	0	0	0	0	0	0	0
Filamentous algae	0	0	0	0	0	0	0	0
Macrophytes	0	0	0	0	0	0	0	0
Slimes	0	0	0	0	0	0	0	0
Macroinvertebrates	2	2	2	2	1	3	2	2
Fish	0	0	0	0	0	0	0	0
Field observations of macrobenthos: 0 = absent/not observed, 1 = rare (1-3), 2 = common (3-9), 3 = abundant (>10), 4 = dominant (>50 organisms)								
Porifera	0	0	0	0	0	0	0	0
Hydrozoa	0	0	0	0	0	0	0	0
Platyhelminthes	0	0	0	0	0	0	0	0
Turbellaria	0	0	0	0	0	0	0	0
Hirudinea	0	0	0	0	0	0	0	0
Oligochaeta	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	0	0
Amphipoda	1	1	0	0.7	1	2	1	1.3
Decapoda	1	0	0	0.3	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0
Bivalvia	0	0	1	0.3	0	1	0	0.3
Anisoptera	0	0	0	0	0	1	0	0.3
Zygoptera	0	0	0	0	0	0	0	0
Hemiptera	0	0	0	0	0	0	0	0
Coleoptera	2	0	0	0.7	0	0	1	0.3
Lepidoptera	0	0	0	0	0	0	0	0
Sialidae	0	0	0	0	0	0	0	0
Corydalidae	0	0	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	0
Empididae	0	0	0	0	0	0	0	0
Simuliidae	0	0	0	0	0	0	0	0
Tabanidae	0	0	0	0	0	0	0	0
Culicidae	0	0	0	0	0	0	0	0
Chironomidae	0	1	1	0.7	0	1	1	0.7
Ephemeroptera	0	1	0	0.3	0	0	0	0
Trichoptera	0	0	0	0	0	1	0	0.3
Other (Nematocera)	0	0	0	0	0	0	0	0

Table 8. Benthic macroinvertebrate field data sheet for MB4.

Stream Name: Musquapsink Brook								
Station #: MB4								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
Habitat types: % c = cobble, s = snags, vb = vegetated banks, s = sand, sm = submerged veg.				20s				100 Vb
Sample collection: d = d frame, s = surber, g = grab	d	d	d		g	g	g	
Qualitative listing of aquatic biota: 0 = absent/not observed, 1 = 1-3, 2 = 3-9, 3 = > 10, 4 = > 50 orgs.								
Periphyton	0	0	0	0	0	0	0	0
Filamentous algae	0	0	0	0	0	0	0	0
Macrophytes	0	0	0	0	0	0	0	0
Slimes	0	0	0	0	0	0	0	0
Macroinvertebrates	1	1	1	1	1	1	0	0.7
Fish	0	0	0	0	0	0	0	0
Field observations of macrobenthos: 0 = absent/not observed, 1 = rare (1-3), 2 = common (3-9), 3 = abundant (>10), 4 = dominant (>50 organisms)								
Porifera	0	0	0	0	0	0	0	0
Hydrozoa	0	0	0	0	0	0	0	0
Platyhelminthes	0	0	0	0	0	0	0	0
Turbellaria	0	0	0	0	0	0	0	0
Hirudinea	0	0	0	0	0	0	0	0
Oligochaeta	0	0	0	0	0	0	0	0
Isopoda	0	0	0	0	0	0	0	0
Amphipoda	0	0	0	0	0	0	0	0
Decapoda	0	0	0	0	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0
Bivalvia	0	0	0	0	0	0	0	0
Anisoptera	1	1	0	0.7	0	0	0	0
Zygoptera	0	0	1	0.3	1	1	0	0.7
Hemiptera	0	0	0	0	0	0	0	0
Coleoptera	1	0	0	0.3	0	0	0	0
Lepidoptera	0	0	0	0	0	0	0	0
Sialidae	0	0	0	0	0	0	0	0
Corydalidae	0	0	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	0
Empididae	0	0	0	0	0	0	0	0
Simuliidae	0	0	0	0	0	0	0	0
Tabanidae	0	0	0	0	0	0	0	0
Culicidae	0	0	0	0	0	0	0	0
Chironomidae	0	0	0	0	0	0	0	0
Ephemeroptera	0	0	0	0	0	0	0	0
Trichoptera	0	0	0	0	0	0	0	0
Other (Nematocera)	0	0	0	0	0	0	0	0

Habitat assessment

Station MB1 is poor for epifaunal substrate/available cover, optimal for embeddedness, marginal for velocity/depth regime, optimal for sediment deposition and marginal for channel flow status for an overall score of marginal (Table 9).

MB3 is suboptimal for epifaunal substrate/available cover, marginal for embeddedness, suboptimal for velocity/depth regime, optimal for sediment deposition and suboptimal for channel flow status for an overall score of suboptimal (Table 10).

MB6 is suboptimal for epifaunal substrate/available cover, poor for embeddedness, suboptimal for velocity/depth regime, optimal for sediment deposition and optimal for channel flow status for an overall score of suboptimal (Table 11)

Station MB4 is marginal for epifaunal substrate/available cover, poor for embeddedness, poor for velocity/depth regime, optimal for sediment deposition and optimal for channel flow status for an overall score of marginal (Table 12).

MB6 having an overall score of suboptimal (Table 11) may be the reason why it was the only station to have a macroinvertebrate collection average of 2 (the number of macroinvertebrates collected is common) (Table 7). When considering the type of macroinvertebrates present, all stations, including MB6, have a collection average of 1 (the number in the different types of macroinvertebrates is rare) or 0 (the macroinvertebrates are absent/not observed). This suggests a lack of diversity or a lack in general. Like MB6, MB3 also has an overall habitat assessment score of suboptimal (Table 10) but it does not have a macroinvertebrate collection average of 2 (Table 6) like MB6. This suggests that the problem is not entirely related to the habitat.

Table 9. Habitat assessment field data sheet for MB1.

Stream Name: Musquapsink Brook				
Habitat parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal substrate/ available cover Score:	Greater than 70% of substrate favorable for the epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
2. Embeddedness Score:	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
3. Velocity/depth regime Score:	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 10	Dominated by 1 velocity/depth regime (usually slow-deep).
4. Sediment deposition Score:	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
5. Channel flow status Score:	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10	Very little water in channel and mostly present as standing pools.

Table 10. Habitat assessment field data sheet for MB3.

Stream Name: Musquapsink Brook				
Habitat parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal substrate/ available cover Score:	Greater than 70% of substrate favorable for the epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 14	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
2. Embeddedness Score:	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
3. Velocity/depth regime Score:	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 13	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
4. Sediment deposition Score:	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
5. Channel flow status Score:	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.

Table 11. Habitat assessment field data sheet for MB6.

Stream Name: Musquapsink Brook				
Habitat parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal substrate/ available cover Score:	Greater than 70% of substrate favorable for the epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 13	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
2. Embeddedness Score:	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5
3. Velocity/depth regime Score:	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
4. Sediment deposition Score:	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
5. Channel flow status Score:	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.

Table 12. Habitat assessment field data sheet for MB4.

Stream Name: Musquapsink Brook				
Habitat parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal substrate/ available cover Score:	Greater than 70% of substrate favorable for the epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
2. Embeddedness Score:	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 0
3. Velocity/depth regime Score:	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep). 5
4. Sediment deposition Score:	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
5. Channel flow status Score:	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.

Benthic Macroinvertebrates

At MB1 no macroinvertebrates were found (Table 13).

At MB3, the Hydropsychidae, the Gammaridae and the Chironomidae averaged 1 individual followed by the Asellidae with 0.3 (Table 14).

At MB6, the Gammaridae averaged 3 individuals by grab samples and 1 individual with the surber followed by the Elmidae, the Chironomidae and the Gomphidae with 1 (Table 15).

At MB4, the Coenagrionidae averaged 1 individual followed by the Psephenidae with 0.3 (Table 16).

Due to the inability of obtaining a 100-organism subsample, even if combining replicates A-C with D-F which could not be done because different techniques were used in replicates A-C and D-F, taxa richness, EPT Index, percent dominance, percent EPT, and FBI were not calculated for a score. This suggests that Musquapsink Brook should receive the most severe level of biological impairment.

Table 13. Benthic macroinvertebrate field data sheet for MB1.

Stream Name: Musquapsink Brook								
Station #: MB1								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda	0	0	0	0	0	0	0	0
# of Amphipoda	0	0	0	0	0	0	0	0
# of Decapoda	0	0	0	0	0	0	0	0
# of Ephemeroptera	0	0	0	0	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera	0	0	0	0	0	0	0	0
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera	0	0	0	0	0	0	0	0
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda	0	0	0	0	0	0	0	0
# of Other	0	0	0	0	0	0	0	0

Table 14. Benthic macroinvertebrate field data sheet for MB3.

Stream Name: Musquapsink Brook								
Station #: MB3								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda, Asellidae	0	0	0	0	1	0	0	0.3
# of Amphipoda, Gammaridae	0	0	0	0	0	0	2	0.7
# of Decapoda, Cambaridae	0	0	1	0.3	1	0	0	0.3
# of Ephemeroptera	0	0	0	0	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera, Hydropsychidae	0	0	4	1.3	0	0	0	0
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera, beetle larva	0	1	3	1.3	0	0	0	0
Elmidae	0	0	1	0.3	0	0	0	0
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda	0	0	0	0	0	0	0	0
# of Other, Nematocera, Chironomidae	0	0	1	0.3	0	1	4	1.7

Table 15. Benthic macroinvertebrate field data sheet for MB6.

Stream Name: Musquapsink Brook								
Station #: MB6								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda, Asellidae	0	1	0	0.3	0	0	0	0
# of Amphipoda, Gammaridae	1	3	0	1.3	2	5	1	2.7
# of Decapoda, Cambaridae	1	0	0	0.3	0	0	0	0
# of Ephemeroptera, Baetidae	0	2	0	0.7	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera, Hydropsychidae	0	0	0	0	0	1	0	0.3
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera, beetle larva	7	0	0	2.3	0	0	0	0
Elmidae	1	0	0	0.3	0	0	2	0.7
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda, Corbiculidae	0	0	3	1	0	1	0	0.3
# of Other, Nematocera, Chironomidae	0	2	1	1	0	1	1	0.7
Anisoptera, Gomphidae	0	0	0	0	0	2	0	0.7

Table 16. Benthic macroinvertebrate field data sheet for MB4.

Stream Name: Musquapsink Brook								
Station #: MB4								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda	0	0	0	0	0	0	0	0
# of Amphipoda	0	0	0	0	0	0	0	0
# of Decapoda	0	0	0	0	0	0	0	0
# of Ephemeroptera	0	0	0	0	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera	0	0	0	0	0	0	0	0
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera, Psephenidae	1	0	0	0.3	0	0	0	0
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda	0	0	0	0	0	0	0	0
# of Other, Anisoptera	1	1	0	0.7	0	0	0	0
Zygoptera, Coenagrionidae	0	2	1	1	2	2	0	1.3

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Musquapsink Brook Benthic Species List

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for

Rutgers Cooperative Extension Water Resources Program
as part of
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Restoration and Protection Plan

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Table 1. Benthic macroinvertebrate field data sheet for MB1.

Stream Name: Musquapsink Brook								
Station #: MB1								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda	0	0	0	0	0	0	0	0
# of Amphipoda	0	0	0	0	0	0	0	0
# of Decapoda	0	0	0	0	0	0	0	0
# of Ephemeroptera	0	0	0	0	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera	0	0	0	0	0	0	0	0
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera	0	0	0	0	0	0	0	0
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda	0	0	0	0	0	0	0	0
# of Other	0	0	0	0	0	0	0	0

Table 2. Benthic macroinvertebrate field data sheet for MB3.

Stream Name: Musquapsink Brook								
Station #: MB3								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda, Asellidae, *Caecidotea* sp.	0	0	0	0	1	0	0	0.3
# of Amphipoda, Gammaridae,	0	0	0	0	0	0	2	0.7
Gammarua fasciatus								
# of Decapoda, Cambaridae	0	0	1	0.3	1	0	0	0.3
Orconectes virilis								
# of Ephemeroptera	0	0	0	0	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera, Hydropsychidae,	0	0	4	1.3	0	0	0	0
Hydropsyche sp.								
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera, beetle larva	0	1	3	1.3	0	0	0	0
Elmidae, *Dubiraphia* sp.	0	0	1	0.3	0	0	0	0
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda	0	0	0	0	0	0	0	0
# of Other, Nematocera, Chironomidae,	0	0	1	0.3	0	1	4	1.7
Axarus sp.								

Table 3. Benthic macroinvertebrate field data sheet for MB6.

Stream Name: Musquapsink Brook								
Station #: MB6								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda, Asellidae, *Caecidotea* sp.	0	1	0	0.3	0	0	0	0
# of Amphipoda, Gammaridae,	1	3	0	1.3	2	5	1	2.7
Gammarus fasciatus								
# of Decapoda, Cambaridae,	1	0	0	0.3	0	0	0	0
Orconectes virilis								
# of Ephemeroptera, Baetidae, *Callibaetis* sp.	0	2	0	0.7	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera, Hydropsychidae,	0	0	0	0	0	1	0	0.3
Hydropsyche sp.								
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera, *Optioservus* sp.	7	0	0	2.3	0	0	0	0
Elmidae, *Dubiraphia* sp.	1	0	0	0.3	0	0	2	0.7
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda, Corbiculidae,	0	0	3	1	0	1	0	0.3
Corbicula fluminea								
# of Other, Nematocera, Chironomidae,	0	2	1	1	0	1	1	0.7
Axarus sp.								
Anisoptera, Gomphidae, *Hagenius* sp.	0	0	0	0	0	2	0	0.7

Table 4. Benthic macroinvertebrate field data sheet for MB4.

Stream Name: Musquapsink Brook								
Station #: MB4								
Investigator: Dr. Marion McClary and students								
A-C are replicates, D-F are replicates	A	B	C	Ave.	D	E	F	Ave.
# of Oligochaeta	0	0	0	0	0	0	0	0
# of Hirudinea	0	0	0	0	0	0	0	0
# of Isopoda	0	0	0	0	0	0	0	0
# of Amphipoda	0	0	0	0	0	0	0	0
# of Decapoda	0	0	0	0	0	0	0	0
# of Ephemeroptera	0	0	0	0	0	0	0	0
# of Plecoptera	0	0	0	0	0	0	0	0
# of Trichoptera	0	0	0	0	0	0	0	0
# of Hemiptera	0	0	0	0	0	0	0	0
# of Megaloptera	0	0	0	0	0	0	0	0
# of Coleoptera, Psephenidae,	1	0	0	0.3	0	0	0	0
Psephenus herricki								
# of Diptera	0	0	0	0	0	0	0	0
# of Gastropoda	0	0	0	0	0	0	0	0
# of Pelecypoda	0	0	0	0	0	0	0	0
# of Other, Anisoptera, *Hagenius* sp.	1	1	0	0.7	0	0	0	0
Zygoptera, Coenagrionidae, *Argia* sp.	0	2	1	1	2	2	0	1.3

References

NWCC Technical Note 99-1, Stream Visual Assessment Protocol, December 1998. 2 pgs.

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