Appendix B: Upper Salem River Watershed Restoration and Protection Plan, Data Summary – Biological Assessment (Prepared January 2011)

UPPER SALEM RIVER WATERSHED RESTORATION & PROTECTION PLAN
DATA SUMMARY – AUGUST 2007 BIOLOGICAL ASSESSMENT

Rutgers Cooperative Extension Water Resources Program

Introduction

Based upon numerous monitoring sources including the New Jersey Department of Environmental Protection (NJDEP)/United States Geological Survey (USGS) water quality monitoring network, the Upper Salem River is impaired for phosphorus and aquatic life. Additionally, a total maximum daily load (TMDL) for fecal coliform has been approved for 17.9 miles of the Upper Salem River. This TMDL requires 84% reductions in fecal coliform from medium/high density residential, low density/rural residential, commercial, industrial, mixed urban/other urban, forest, and agricultural lands. The goal of this project is to improve the water quality of the Upper Salem River by developing a watershed restoration and protection plan that achieves the required TMDL reductions. The following is a data summary of the biological assessment conducted by the Rutgers Cooperative Extension (RCE) Water Resources Program in August 2007 to collect water quality data needed to support the development of the watershed restoration and protection plan.

Biological Data Collection

A survey of the benthic macroinvertebrate community within the Upper Salem River Watershed was conducted by the RCE Water Resources Program on August 28, 2007 in accordance with a Quality Assurance Project Plan (QAPP) (Submitted May 2006, Approved June 2007). The sampling and data analysis procedures were conducted in accordance with the Rapid Bioassessment Protocol (RBP) procedure used by the NJDEP Bureau of Freshwater and Biological Monitoring, which is based on USEPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers* (Barbour et al., 1999). Benthic macroinvertebrates were collected at three locations, S2 (Salem River below Daretown Lake), S8 (Salem River below Avis Mill Pond), and S10 (Salem River at the Woodstown USGS Station #01482500, just downstream of Memorial Lake), within the Upper Salem River Watershed as approved by the NJDEP Watershed Management Area #17 Watershed Manager, Mike Haberland, in August 2007 and identified in Figure 1.

A survey of the benthic macroinvertebrate community was originally proposed at four stations, (i.e., S1 (Salem River below the Salem River Reservoir), S3 (Salem River and Tributary 1 confluence at Commissioner's Pike), S6 (Salem River Tributary 2 at County 615), and S10 (Salem River at Woodstown USGS Station #01482500).

Due to unsafe site and stream conditions for benthic sampling in August 2007 at S1, S3, and S6, the proposed sampling stations were modified, with approval from the project's NJDEP project manager, Mr. Michael Haberland.

Biological sampling was conducted at S2 (Salem River below Daretown Lake), S8 (Salem River below Avis Mill Pond), and S10 (Salem River at the Woodstown USGS Station #01482500, just downstream of Memorial Lake) so that the benthic macroinvertebrate community within the Upper Salem River Watershed could be better characterized, compared, and evaluated for biological integrity. These stations were selected based on their comparable substrate characteristics, canopy coverage, and flow regime.

A multi-habitat sampling approach, concentrating on the most productive habitat of the stream, plus coarse particulate organic matter (CPOM) or leaf litter was used. Given the nature of the substrate and the flow conditions at Stations S2, S8, and S10, a Surber Square Foot Bottom Sampler was used to collect three grab type samples from the most productive habitat of the stream (i.e., riffle/run areas). Samples were sorted and processed in the field using a U.S. Standard No. 30 sieve, composited (i.e., the contents from the grab samples from each location were combined into a single container), 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. It is difficult to quantify the amount of CPOM collected in terms of weight or volume given the variability of its composition. Collection of several handfuls of material is usually adequate, and the material is typically found in depositional areas, such as in pools and along snags and undercut banks. The CPOM sample was processed using a U.S. Standard No. 30 sieve and was added to the composite of the grab samples for each location.

A 100-organism subsample of the benthic macroinvertebrate composite sample from each sampling location was taken in the laboratory according to the methods outlined in the Rapid Bioassessment Protocol used by the NJDEP Bureau of Freshwater & Biological Monitoring (Barbour et al., 1999). With the exception of any chironomids and oligochaetes, benthic macroinvertebrates were identified to genus. Chironomids were identified to subfamily as a minimum, and oligochaetes were identified to family as a minimum. Standard taxonomic

references were used and included Merritt and Cummins, 1988; Pennak, 1989; Peckarsky, *et al*., 1990; and Thorp and Covich, 1991.

A habitat assessment was conducted in accordance with the methods used by the NJDEP Bureau of Freshwater & Biological Monitoring for low gradient streams (NJDEP, 2007). The habitat assessment, which has been designed to provide a measure of habitat quality, involves a visual based technique for assessing stream habitat structure. The findings from the habitat assessment are used to interpret survey results and identify obvious constraints on the attainable biological potential within the study area.

Results

Physicochemical Characteristics:

The stream width at Station S2 was approximately 10 feet. The stream depth ranged from 0.1 feet to 0.3 feet in the run areas and was approximately 2.0 feet in pool areas. The stream velocity ranged from 0.1 ft/sec to 1.22 ft/sec. The canopy was closed at this location. The inorganic substrate at Station S2 consisted mostly of gravel and coarse sand over a silt layer. The organic substrate was comprised mainly of muck-mud and some detritus in the form of decomposing leaves and sticks. There was a distinct sulfur odor to the sediments, and slight sediment oils were present. Sediment deposits were comprised of sludge and fine sands. Water odors of sulfur were present, and surface oils were absent. The water was turbid. The water temperature was 25.2˚C; the pH was 8.95 SU, and the dissolved oxygen was 5.18 mg/L. The predominant surrounding land uses at Station S2 were forest and open water (i.e., Daretown Lake). Erosion was moderate to heavy at this location, and some potential sources of local nonpoint sources of pollution were noted from the surrounding land uses (e.g., drainage from the lake and nearby roadway).

The stream width at Station S8 was approximately 15 feet. The stream depth ranged from 0.1 feet to 2.0 feet in the riffle/run areas and was approximately 2.5 feet or greater in the pool areas. The stream velocity ranged from 0 ft/sec to 0.26 ft/sec. The canopy was mostly closed at this location. The inorganic substrate at Station S8 consisted mostly of gravel and coarse sand with some small cobbles. The organic substrate was comprised mainly of detritus in the form of sticks, decomposing leaves, and new fall with some muck-mud in pool areas. Sediment odors and oils were absent. The water was very turbid, almost opaque, and green in

color. Water odors and surface oils were absent. The water temperature was 25.6˚C; the pH was 6.74 SU, and the dissolved oxygen was 5.50 mg/L. The predominant surrounding land uses at Station S8 were forest and field/pasture. Local watershed erosion was noted as being heavy, and some potential sources of nonpoint source pollution included road runoff and drainage from the field/pasture areas and a nearby dairy farm.

The stream width at Station S10 was approximately 15 feet. The stream depth ranged from 0.2 feet to 0.5 feet in the riffle/run areas and was approximately 1.0 to 2.0 feet in the pool areas. The stream velocity ranged from 0.21 ft/sec to 1.15 ft/sec. The canopy was mostly closed at this location. The inorganic substrate at Station S10 consisted mostly of gravel and coarse sand with small cobbles. The organic substrate was minimal and was comprised mainly of detritus in the form of sticks, decomposing leaves, and new fall. Sediment odors and oils were absent. The water was turbid, and water odors and surface oils were absent. The water temperature was 28.2˚C; the pH was 8.65 SU, and the dissolved oxygen was 7.60 mg/L. The predominant surrounding land uses for Station S10 included forest and open water (i.e., Memorial Lake). Heavy erosion was noted, and some potential nonpoint sources of pollution included runoff from the local roadway and drainage from the lake.

Habitat Assessment:

The habitat assessment is designed to provide an estimate of habitat quality based upon qualitative estimates of selected habitat attributes. The assessment involves the numerical scoring of ten habitat parameters to evaluate instream substrate, channel morphology, bank structural features, and riparian vegetation. Each parameter is scored and summed to produce a total score which is assigned a habitat quality category of optimal (excellent), sub-optimal (good), marginal (fair), or poor. Table 1 outlines the habitat scoring criteria for low gradient streams by the NJDEP Bureau of Freshwater & Biological Monitoring. Sites with optimal habitat conditions have total scores ranging from 160 to 200; sites with sub-optimal habitat conditions have total scores ranging from 110 to 159; sites with marginal habitat conditions have total scores ranging from 60 to 109, and sites with poor habitat conditions have total scores less than 60. The scores for Stations S2, S8, and S10 are summarized in Table 2. All three stations were found to have sub-optimal habitat conditions.

Benthic Macroinvertebrates:

The results of the benthic macroinvertebrate survey are presented in Table 3. These results are organized by the order, the family, and then by the generic taxonomic levels. The number of taxa and individuals collected from each sampling location is also summarized in Table 3. A total of 16 different taxa of benthic macroinvertebrates was collected within the study area, representing four phyla (i.e., platyhelminthes, annelids, mollusks, and arthropods). The arthropods, in particular the insects, were the most strongly represented in terms of the number of different taxa present. A total of 6 insect families was represented.

To evaluate the biological condition of the sampling locations, several community measures were calculated from the data presented in Table 3 and included the following:

1. Taxa Richness: Taxa richness is a measure of the total number of benthic macroinvertebrate families identified. A reduction in taxa richness typically indicates the presence of organic enrichment, toxics, sedimentation, or other factors.

2. EPT (Ephemeroptera, Plecoptera, Trichoptera) Index: The EPT Index is a measure of the total number of Ephemeroptera, Plecoptera, and Trichoptera families (i.e., mayflies, stoneflies, and caddisflies). These organisms typically require clear moving water habitats.

3. %EPT: Percent EPT measures the numeric abundance of the mayflies, stoneflies, and caddisflies within a sample. A high percentage of EPT taxa are associated with good water quality.

4. % CDF (percent contribution of the dominant family): Percent CDF measures the relative balance within the benthic macroinvertebrate community. A healthy community is characterized by a diverse number of taxa that have abundances somewhat proportional to each other.

5. Family Biotic Index: The Family Biotic Index measures the relative tolerances of benthic macroinvertebrates to organic enrichment based on tolerance scores assigned to families ranging from 0 (intolerant) to 10 (tolerant) (Hilsenhoff, 1988).

This analysis integrates several community parameters into one easily comprehended evaluation of biological integrity referred to as the New Jersey Impairment Score (NJIS). The NJIS has been established for three categories of water quality bioassessment for New Jersey streams: non-impaired, moderately impaired, and severely impaired. A non-impaired site has a benthic community comparable to other high quality “reference” streams within the region. The community is characterized by maximum taxa richness, balanced taxa groups, and a good

representation of intolerant individuals. A moderately impaired site is characterized by reduced macroinvertebrate taxa richness, in particular the EPT taxa. Changes in taxa composition result in reduced community balance and intolerant taxa become absent. A severely impaired site is one in which the benthic community is significantly different from that of the reference streams. The macroinvertebrates are dominated by a few taxa which are often very abundant. Tolerant taxa are typically the only taxa present.

The scoring criteria used by the NJDEP Bureau of Freshwater & Biological Monitoring are outlined in Table 4. This scoring system is based on comparisons with reference streams and a historical database consisting of 200 benthic macroinvertebrate samples collected from New Jersey streams. While a low score indicates "impairment," the score may actually be a consequence of habitat or other natural differences between the subject stream and the reference stream. Non-impaired sites have total scores ranging from 24-30, moderately impaired sites have total scores ranging from 9 to 21, and severely impaired sites have total scores ranging from 0 to 6. Impairment scores for Stations S2, S8, and S10 are provided in Tables 5A, 5B, and 5C, respectively. All three stations were assessed as being moderately impaired. Station S2 had the lowest NJIS value and was close to being assessed as severely impaired.

Discussion

The NJDEP Bureau of Biological & Freshwater Monitoring maintains two Ambient Biological Monitoring Network (AMNET) stations within the Upper Salem River Watershed (Stations AN0690 and AN0691). Both stations were sampled in AMNET rounds in 1995, 2000, and 2006 (See Table 6). In August 1995, August 2000, and October 2006, AN0690 was assessed under the AMNET program as being moderately impaired. AN0690 is downstream from Station S2. In August 1995 and October 2006, AN0691 was assessed as being severely impaired, and in August 2000 the site was assessed as being moderately impaired. AN0691 corresponds with Station S10. Habitat assessments were also included in the October 2000 AMNET sampling. Optimal habitat conditions were found at locations AN0690 in August 2000 and conditions were downgraded to suboptimal in October 2006. At AN0691, suboptimal habitat conditions were noted in August 2000 and October 2006.

The data collected by the RCE Water Resources Program indicate that the Upper Salem River Watershed, within the study area, continues to support a moderately impaired benthic

macroinvertebrate community. The benthic macroinvertebrate community occurring within the Upper Salem River Watershed is apparently under some type of stress as evidenced by low taxa richness, the lack of representation of EPT taxa, and relatively high family biotic index scores. The types of organisms found, or the lack thereof, indicate that possible chemical perturbations are occurring within the system, and/or the benthic community may be subject to physical or habitat constraints. The habitat assessment revealed sub-optimal habitat conditions, which may also explain the observed impaired benthic macroinvertebrate community.

Recommendations

Biological assessments have become an important tool for managing water quality to meet the goal of the Clean Water Act (i.e., to maintain the chemical, physical, and biological integrity of the nation's water). However, although biological assessments are a critical tool for detecting impairment, they do not identify the cause or causes of the impairment. The U.S. Environmental Protection Agency (USEPA) developed a process, known as the Stressor Identification (SI) process, to accurately identify any type of stressor or combination of stressors that might cause biological impairment (USEPA, 2000). The SI process involves the critical review of available information, the formation of possible stressor scenarios that may explain the observed impairment, the analysis of these possible scenarios, and the formation of conclusions about which stressor or combination of stressors are causing the impairment. The SI process is iterative, and in some cases additional data may be needed to identify the stressor(s). In addition, the SI process provides a structure or a method for assembling the scientific evidence needed to support any conclusions made about the stressor(s). When the cause of a biological impairment is identified, stakeholders are then in a better position to locate the source(s) of the stressor(s) and are better prepared to implement the appropriate management actions to improve the biological condition of the impaired waterway. The SI process is recommended as the next step toward improving the biological condition within the Upper Salem River Watershed, particularly in the vicinity of Station S2, which was found to be bordering on being severely impaired with sub-optimal habitat conditions. The SI process is not an identified or required task under this grant award; conducting the SI process is beyond the scope of this project.

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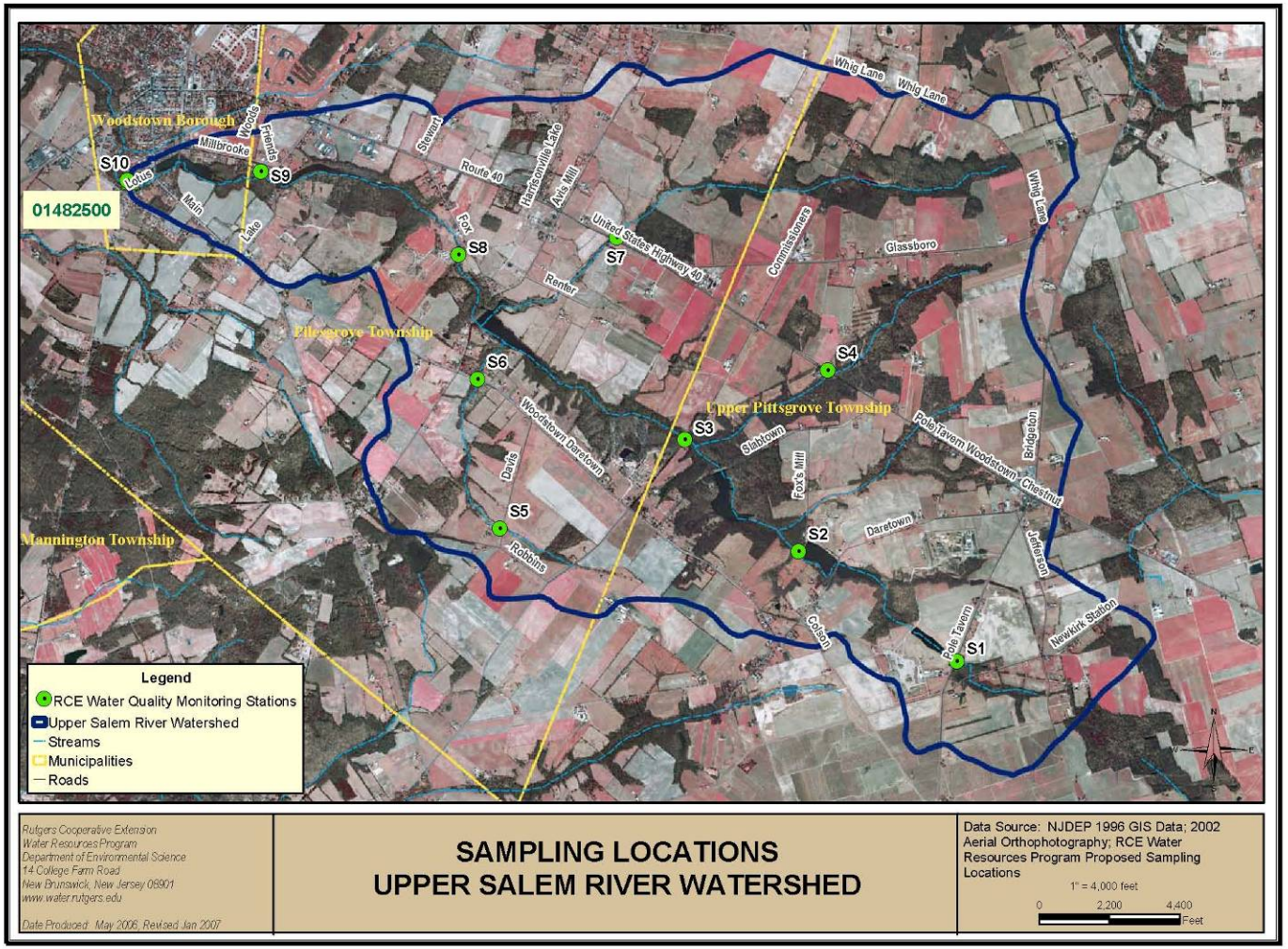

FIGURE 1. Biological Assessment Sampling Stations S2, S8, S10

TABLE 1. Scoring Criteria for Habitat Assessment

Table 4 (cont.) — **HABITAT ASSESSMENT FOR *LOW* GRADIENT STREAMS**

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/Available Cover	Greater than 50% of substrate favorable for 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% <20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	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.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yrs.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, under story shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

HABITAT SCORES	VALUE
OPTIMAL	160 • 200
SUB-OPTIMAL	110 • 159
MARGINAL	60 • 109
POOR	<60

TABLE 2. Habitat Assessment Results

Habitat Parameter	Scores		
	S2	**S8**	**S10**
1. Epifaunal Substrate/Available Cover	13	13	8
2. Pool Substrate Characterization	8	13	8
3. Pool Variability	8	8	12
4. Sediment Deposition	2	8	8
5. Channel Flow Status	13	13	13
6. Channel Alteration	18	18	18
7. Channel Sinuosity	18	18	18
8a. Bank Stability (Left Bank)	4	1	1
8b. Bank Stability (Right Bank)	4	1	1
9a. Bank Vegetative Protection (Left Bank)	7	7	7
9b. Bank Vegetative Protection (Right Bank)	7	7	7
10a. Riparian Vegetative Zone Width (Left Bank)	10	9	7
10b. Riparian Vegetative Zone Width (Right Bank)	10	9	7
Total Score	*122*	*125*	*115*
Condition Category	*sub-optimal*	*sub-optimal*	*sub-optimal*

TABLE 3. Results of the Benthic Macroinvertebrate Sampling

Taxa:	***Station S2***	***Station S8***	***Station S10***
Tricladida (flatworms)			
Planariidae			
Dugesia sp.	16	1	
Arhynchobdellida (leeches)			
Erpobdellidae			
Dina sp.	3		
Rhynchobdellida (leeches)			
Glossiphoniidae			
Gloiobdella sp.		1	
Limnophila (snails)			
Physidae			
Physa sp.	2		
Sphaeracea (clams)			
Corbiculidae			
Corbicula fluminea			2
Sphaeriidae			
Pisidium sp.			3
Unionacea (mussels)			
Unionidae			
Elliptio sp.		3	2
Isopoda (pill bug/sow bug)			
Asellidae			
Caecidotea sp.		6	
Ephemeroptera (mayflies)			
Baetidae			
Baetis sp.		1	
Odonata (damselflies/dragonflies)			
Gomphidae			
Stylurus sp.		1	

TABLE 3. Results of the Benthic Macroinvertebrate Sampling (continued)

Taxa:	***Station S2***	***Station S8***	***Station S10***
Trichoptera (caddisflies)			
Hydropsychidae			
Cheumatopsyche sp.	21	45	38
Hydropsyche sp.	1	3	24
Philopotamidae			
Chimarra sp.		1	
Coleoptera (beetles)			
Elmidae			
Macronychus sp.		1	
Stenelmis sp.	1	18	2
Diptera (true flies)			
Chironomidae			
Chironominae	58	26	33
Total # taxa:	***7***	***12***	***7***
Total # individuals:	***102***	***107***	***104***

TABLE 4. Scoring Criteria for Rapid Bioassessments in New Jersey Streams

	Non-impaired	***Moderately Impaired***	***Severely Impaired***
Biological Condition Score:	***6***	***3***	***0***
Biometrics:			
1. Taxa Richness	>10	10-5	4-0
2. EPT Index	>5	5-3	2-0
3. %CDF	<40	40-60	>60
4. %EPT	>35	35-10	<10
5. Family Biotic Index	<5	5-7	>7
Biological Condition:	Total Score		
Non-impaired	24-30		
Moderately Impaired	9-21		
Severely Impaired	0-6		

TABLE 5A. Calculation of Biological Condition for Station S2

Taxa	*Tolerance Value*	*Station S2 Number of Individuals*
Planariidae	1	16
Erpobdellidae	8	3
Physidae	8	2
Hydropsychidae	4	22
Elmidae	4	1
Chironomidae	8	58
Taxa Richness		6
EPT Index		1
%CDF		57% Chironomidae
%EPT		22%
Family Biotic Index		6.00 Fairly poor - substantial pollution likely
NJIS Rating		9
Biological Condition		***Moderately Impaired***

TABLE 5B. Calculation of Biological Condition for Station S8

Taxa	*Tolerance Value*	*Station S8 Number of Individuals*
Planariidae	1	1
Glossiphoniidae	8	1
Unionidae	8	3
Asellidae	8	6
Baetidae	4	1
Gomphidae	1	1
Hydropsychidae	4	48
Philopotamidae	3	1
Elmidae	4	19
Chironomidae	8	26
Taxa Richness		10
EPT Index		3
%CDF		42% Hydropsychidae
%EPT		23%
Family Biotic Index		5.28 Fair - fairly substantial pollution likely
NJIS Rating		15
Biological Condition		***Moderately Impaired***

TABLE 5C. Calculation of Biological Condition for Station S10

Taxa	*Tolerance Value*	*Station S10 Number of Individuals*
Corbiculidae	6	2
Sphaeriidae	8	3
Unionidae	8	2
Hydropsychidae	4	62
Elmidae	4	2
Chironomidae	8	33
Taxa Richness		6
EPT Index		1
%CDF		60% Hydropsychidae
%EPT		60%
Family Biotic Index		5.50 Fair - fairly substantial pollution likely
NJIS Rating		15
Biological Condition		***Moderately Impaired***

TABLE 6. Summary of NJDEP Ambient Biological Monitoring Network Results (NJDEP, 1996; NJDEP, 2003; NJDEP, 2009b)

		1996 Results		2000 Results			2006 Results		
Station	**Location**	**Date Sampled**	**Impairment Status (Score)**	**Date Sampled**	**Impairment Status (Score)**	**Habitat Analysis Result (Score)**	**Date Sampled**	**Impairment Status (Score)**	**Habitat Analysis Result**
AN0690	Commissioners Rd. Pittsgrove Twp.	8/24/95	Moderately Impaired	8/2/00	Moderately Impaired	Optimal	10/19/2006	Moderately Impaired	Sub-optimal
AN0691	Mill St. Woodstown Boro.	8/22/95	Severaly Impaired	8/2/00	Moderately Impaired	Sub-optimal	10/19/2006	Severely Impaired	Sub-optimal