


Guidance for Understanding a Biomonitoring River and Stream Macroinvertebrate Aquatic Life Classification Attainment Report

The ME DEP Biological Monitoring Program generates a Macroinvertebrate Aquatic Life Classification Attainment Report for each river and stream macroinvertebrate sampling event. This ‘Key’ Report contains many attributes about the biological sample as well as any physical and chemical data collected in conjunction with the biological sampling. This document takes a representative Macroinvertebrate Aquatic Life Classification Attainment report and attempts to explain items from each section that may not be self-explanatory. See the Sampling and Analysis page of the Biomonitoring website for more details on our sampling methods (<http://www.maine.gov/dep/water/monitoring/biomonitoring/sampling/index.htm>). These reports can be found in the Biomonitoring Google Earth project by clicking on a station and then selecting the desired report from the ‘Report’ column. Access our Google Earth project through the Data and Maps page of our website (<http://www.maine.gov/dep/water/monitoring/biomonitoring/data.htm>)

	Maine Department of Environmental Protection Biological Monitoring Program Aquatic Life Classification Attainment Report	
	Station Information	
Station Number: S-665	DEP Drainage: Penobscot	HUC8: 01020004
Waterbody: Sebocis Stream - Station 665	HUC8 Name: Piscataquis	Latitude: 45 16 15.13 N
Town: Howland	Longitude: 68 41 24.06 W	Stream Order: 4
Directions: UPSTREAM OF HOWLAND RD.		

The **Station Information** section contains a basic description of the station’s location.

- **Latitude** and **Longitude** are projected in NAD83, meters.
- **HUC8 (Hydrologic Unit Code)** – **HUC8 refers to the U.S. Geological Survey (USGS) 8-digit hydrologic unit code.** The United States is divided and sub-divided into nested hydrologic units by the USGS using a nationwide numeric coding system. Two-digit codes (HUC2) are assigned to the largest hydrologic units. Successively smaller hydrologic units are designated by 4-digit (HUC4), 6-digit (HUC6), 8-digit (HUC8), 10-digit (HUC10) and 12-digit (HUC12) codes. Additional information on the USGS HUC system may be found at <http://water.usgs.gov/GIS/huc.html>.
- **DEP Drainage** – This is the name of the 4-digit hydrologic unit code.

Sample Information		
Log Number: 1575	Type of Sample: ROCK BAG	Date Deployed: 7/20/2006
Subsample Factor: X1	Replicates: 3	Date Retrieved: 8/17/2006

The **Sample Information** section contains information about the macroinvertebrate sample.

- **Log number** (Sample ID) – Unique identifier assigned to each biological sample.
- **Subsample factor** – The inverse of the fraction of the sample identified by the taxonomist. Only a portion of the sample is identified when the number of organisms exceeds established criteria. For example, a subsampling factor of 4 means that the taxonomist selected ¼ of the sample, using protocols established in the Methods Manual, identified and counted the organisms in that subsample, and then multiplied the counts by 4. The example above has a subsampling factor of X1, indicating that the sample was not

subsampled. The Biomonitoring methods manual, "Methods for Biological Sampling and Analysis of Maine's Rivers and Streams" (DEP LW0387-B2002), can be found here: <http://www.maine.gov/dep/water/monitoring/biomonitoring/materials/finlmeth1.pdf>, and is subsequently referred to throughout this document as the Methods Manual.

- **Replicates** – Usually, 3 replicate samples are collected during a sampling event. Very rarely, less than 3 replicates are collected.

Classification Attainment			
Statutory Class:	A	Final Determination:	A
Model Result with P>.6:	A	Reason for Determination:	Model
Date Last Calculated:	5/3/2007	Comments:	

- **Statutory Class** – Water classification assigned by the Maine Legislature, consisting of designated uses, numeric criteria, and specific limitation on certain activities. If a water body is meeting all of its classification standards, it is attaining its class. See the Classification of Maine Waters page on the DEP’s website for more information (<http://www.maine.gov/dep/water/monitoring/classification/index.html>).
- **Model Results with P>0.6** – The Class listed here is the aquatic life classification attainment predicted by the DEP’s linear discriminant statistical model (LDM). The “P” refers to the probability of attaining a class. For the example above, the site has a greater than 60% probability of attaining class A.
- **Date Last Calculated** – Date sample was analyzed with the statistical model.
- **Final Determination** – The aquatic life classification attained, as determined by a qualified DEP biologist using DEP's statistical model and/or Best Professional Judgment (BPJ).
- **Reason for Determination** – Method used to assign the Final Determination (Model or BPJ). Rarely and under certain circumstances, DEP Biologists may adjust the Final Determination based on analytical, biological and habitat information that may result in a Final Determination that is not consistent with the Model Result.
- **Comments** – Explanation of why the Final Determination does not match the Model Result, if applicable.
- **Date** – Date Final Determination was made.

Model Probabilities					
	<u>First Stage Model</u>			<u>C or Better Model</u>	
Class A	0.54	Class C	0.02	Class A, B, or C	1.00
Class B	0.44	NA	0.00	Non-Attainment	0.00
	<u>B or Better Model</u>			<u>A Model</u>	
Class A or B			1.00	Class A	0.98
Class C or Non-Attainment			0.00	Class B or C or Non-Attainment	0.02

DEP uses a series of linear discriminant models based on quantitative ecological attributes of the macroinvertebrate community to determine the strength of the association of a test community to any of the water quality classes (Class A, B, or C), as described in Rule 579 (<http://maine.gov/dep/water/rules/index/.html>).

- The **First Stage Model** uses variables 01-09 (see screenshot below), which reflect the diversity and sensitivity of the macroinvertebrate community, to determine the probabilities that a site attains one of three classes (A, B, or C) or is in non-attainment (NA) of the minimum criteria for any class. These probabilities have a possible range from 0.0 to 1.0 and are used, after transformation, as variables in each of the three subsequent second stage or final decision models. The sample shown above is most similar to the

class A and class B groups as shown by the 0.54 and 0.44 probabilities. A probability of 0.54 means a “54% chance” of belonging to the class A group. It is unlikely that the sample belongs to the class C or NA groups because of the low probabilities (0.02 and 0.00).

- The three final decision models refine the initial predictions and sequentially determine attainment of class C, class B, and class A.
 - The **C or Better Model** calculates the probability of attaining class C using variables 11-13 and the sum of the probabilities of attaining class A, class B, and class C from the first stage model. In this example, the model is certain that the sample attains at least class C criteria as shown by a probability Class A, B, or C of 1.00 (100% chance).
 - The **B or Better Model** calculates the probability of attaining class B using variables 15-21 and the sum of the probabilities of attaining class A and class B from the first stage model. In this example, the model is certain that the sample attains at least class B as shown by the probability of Class A or B of 1.00 (100% chance).
 - The **A Model** calculates the probability of attaining class A using variables 23-30 and the probability of attaining class A from the first stage model. In this example, there is a high probability (0.98 or “98% chance”) that the sample attains class A.

Model Variables			
01 Total Mean Abundance	335.33	18 Relative Abundance Ephemeroptera	0.26
02 Generic Richness	57.00	19 EPT Generic Richness	24.00
03 Plecoptera Mean Abundance	6.33	21 Sum of Abundances: <i>Dicrotendipes</i> , <i>Micropsectra</i> , <i>Parachironomus</i> , <i>Helobdella</i>	6.10
04 Ephemeroptera Mean Abundance	88.33	23 Relative Generic Richness- Plecoptera	0.04
05 Shannon-Wiener Generic Diversity	4.17	25 Sum of Abundances: <i>Cheumatopsyche</i> <i>Cricotopus</i> , <i>Tanytarsus</i> , <i>Ablabesmyia</i>	30.53
06 Hilsenhoff Biotic Index	5.13	26 Sum of Abundances: <i>Acroneuria</i> , <i>Maccaffertium</i> , <i>Stenonema</i>	30.99
07 Relative Abundance - Chironomidae	0.43	28 EP Generic Richness/14	0.93
08 Relative Generic Richness Diptera	0.37	30 Presence of Class A Indicator Taxa/7	0.57
09 <i>Hydropsyche</i> Abundance	7.93	Five Most Dominant Taxa	
11 <i>Cheumatopsyche</i> Abundance	21.72	Rank	Taxon Name
12 EPT Generic Richness/ Diptera Generic Richness	1.14	1	<i>Psectrocladius</i>
13 Relative Abundance - Oligochaeta	0.03	2	<i>Acerpenna</i>
15 Perlidae Mean Abundance (Family Functional Group)	6.00	3	<i>Chimarra</i>
16 Tanypodinae Mean Abundance (Family Functional Group)	34.90	4	<i>Maccaffertium</i>
17 Chironomini Abundance (Family Functional Group)	22.02	5	<i>Pentaneura</i>
			Percent
			19.20
			15.30
			11.03
			7.45
			6.97

See the “ME DEP Aquatic Life Decisions Model and Sample Variable” document for more information about the model variables and see the Benthic Macroinvertebrate page of the Biomonitoring website for a discussion of specific macroinvertebrates and their ecology (<http://www.maine.gov/dep/water/monitoring/biomonitoring/sampling/bugs/index.htm>).

- **Five Most Dominant Taxa** – List of the top 5 most abundant taxa found in the sample and their percentage of the sample’s total abundance.



**Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report**

Station Number: S-665 Town: Howland Date Deployed: 7/20/2006
Log Number: 1575 Waterbody: Sebobeis Stream - Station 665 Date Retrieved: 8/17/2006

Sample Collection and Processing Information

Sampling Organization: BIOMONITORING UNIT
 Taxonomist: MICHAEL WINNELL

- **Sampling Organization** – Sampling must be performed by persons who can demonstrate their qualifications and ability to carry out the department's sampling protocol set forth in the Methods Manual and is usually done by the Biomonitoring Unit. Occasionally the department may also require monitoring as a condition of any license, permit or certification that it issues. Such monitoring must be conducted according to a plan provided to, and approved by, the department. In those cases, this field shows the name of the sampling organization, agency or person.
- **Taxonomist** – Sample taxonomy for macroinvertebrates must be performed or supervised by a professional freshwater macroinvertebrate taxonomist who has the qualifications specified in the Methods Manual and is certified by the Society for Freshwater Science in the identification of eastern taxa.

Waterbody Information - Deployment		Waterbody Information - Retrieval	
Temperature:	24.7 deg C	Temperature:	22.9 deg C
Dissolved Oxygen:	8.4 mg/l	Dissolved Oxygen:	8.6 mg/l
Specific Conductance:	18 uS/cm	Specific Conductance:	21 uS/cm
Velocity:	50 cm/s	Velocity:	48 cm/s
pH:		pH:	6.76
Wetted Width:	33 m	Wetted Width:	
Bankfull Width:		Bankfull Width:	
Depth:	70 cm	Depth:	60 cm

Physical characteristics of the waterbody collected using meters and measuring devices at the time the macroinvertebrate samplers were deployed and retrieved. See SOPs for procedures (<http://www.maine.gov/dep/water/monitoring/biomonitoring/material.htm#QAandSOPs>)

Water Chemistry - Retrieval			
Ammonia As Nitrogen	<0.01 mg/l	Soluble Reactive Phosphorus	1 ug/l
Nitrate+nitrite As N	<0.01 mg/l	Total Phosphorus	0.009 mg/l
Total Kjeldahl Nitrogen	0.3 mg/l	Total Suspended Solids	0.8 mg/l
Dissolved Organic Carbon	7 mg/l	Total Dissolved Solids	<20 mg/l

Water quality parameters analyzed by an outside laboratory. DEP only collects water for chemical analyses at the time the macroinvertebrate samplers are retrieved. See water grab SOP (<http://www.maine.gov/dep/water/monitoring/biomonitoring/material.html#QAandSOPs>)

Summary of Habitat Characteristics		
<u>Landuse Name</u>	<u>Canopy Cover</u>	<u>Terrain</u>
Upland Conifer	Canopy Open	Flat Terrain
Upland Hardwood		
<u>Stressor</u>	<u>Location</u>	<u>Substrate</u>
	Above Road Crossing	Boulder 5 %
		Gravel 25 %
		Rubble/Cobble 65 %
		Sand 5 %

Characteristics of the area surrounding a sampling station and a description of the substrate in the area where the samplers were deployed.

Landcover Summary - 2004 Data							
Total Area (ac)	103141	High Int. Dev. %	0.0	Water %	10.7	Non-vegetated %	0.0
Total Land (ac)	93136	Med Int. Dev. %	0.0	Wetland %	8.8	Tilled Agriculture %	0.1
		Low Int. Dev. %	1.7	Upland Woody %	89.3	Human Altered %	1.9
		Development %	1.8	Natural %	98.1	Impervious %	0.2

Land used calculations are based on 2004 Maine Land Cover Data (MELCD). MELCD is a land cover map for Maine primarily derived from Landsat Thematic Mapper 5 and 7 imagery. This imagery constitutes the basis for the National Land Cover Dataset (NLCD 2001) and the NOAA Coastal Change Analysis Program (C-CAP). This land cover map was refined to the State of Maine requirements using SPOT 5 panchromatic imagery from 2004. For more information on these land cover layers and how each category is calculated, contact the ME DEP GIS Unit (<http://www.maine.gov/dep/gis/datamaps>) or the ME Office of GIS (<http://megis.maine.gov/>).

- **Total Land** – total area minus open water and mudflats
- **High Int. Dev.** – High Intensity Developed
- **Med Int. Dev.** – Medium Intensity Developed
- **Low Int. Dev.** – Low Intensity Developed
- **Development** – total of high, medium and low development and roads/runways
- **Water** – open water
- **Wetland** – wetlands, including forested wetlands
- **Upland woody** – total of all forest types except forested wetlands, including recent clear cuts and partially cut lands
- **Natural** – total land area minus the human altered land category (see below)
- **Non-vegetated** – unconsolidated shores and bare land, mostly gravel pits but also rocky mountain tops, mud flats, beaches and rocky shoreline
- **Tilled Agriculture** – cultivated crops
- **Grassland** – unmanaged grasslands
- **Human Altered** –total of all the developed classes, road/runways, all agriculture classes and bare lands (which are mostly gravel pits)
- **Impervious** – The impervious data set was derived from 5 meter SPOT imagery collected in the summer of 2004 over the State of Maine. The impervious data set is part of a larger mapping initiative by the State of Maine to quantify land cover at a 5 meter resolution over the entire state. Areas of imperviousness are characterized by anthropogenic features such as buildings, roads, parking lots, etc.


Sample Comments

Report Printed: 5/6/2008

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Any pertinent comments not captured elsewhere on this report.

 <p style="text-align: center;">Maine Department of Environmental Protection Biological Monitoring Program Aquatic Life Taxonomic Inventory Report</p>							
Station Number: S-665	Waterbody: Sebobeis Stream - Station 665			Town: Howland			
Log Number: 1575	Subsample Factor: X1	Replicates: 3		Calculated: 5/3/2007			
Taxon	Maine Taxonomic Code	Count (Mean of Samplers)		Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance	
		Actual	Adjusted			Actual	Adjusted
<i>Pristina</i>	08020202004		0.33		--		0.1
<i>Pristina proboscidea</i>	08020202004009	0.33			--	0.1	
<i>Nais</i>	08020202009		5.33		CG		1.6
<i>Nais behningi</i>	08020202009003	0.33			--	0.1	
<i>Nais communis</i>	08020202009005	5.00			--	1.5	
<i>Stylaria</i>	08020202014		3.67		CG		1.1
<i>Stylaria lacustris</i>	08020202014002	3.67			--	1.1	
<i>Hyalella</i>	09010203006		1.00	8	CG		0.3
<i>Hyalella azteca</i>	09010203006011	1.00			--	0.3	
Perlodidae	09020207	0.33	0.33		--	0.1	0.1

- **Maine Taxonomic Code** – The Biomonitoring Unit use a hierarchical coding system to assign unique numeric identifiers to each taxa in our database.
- **Actual Mean count** – Calculated independently for each taxon by adding the number of individuals from each replicate and dividing by the number of replicates. For example, there was one individual of *Nais behningi* in the three samplers, which makes the actual count 0.33 [(1 + 0 + 0) / 3 = 0.33]. Note that for taxa that are only observed in the pupal stage, no actual mean count is shown as pupae are excluded from model calculations.
- **Adjusted Mean count** – The LDM uses the adjusted counts that have been aggregated to the genus level. The mean abundances of all species are transferred to the corresponding genus. For example, this sample had two species in the genus *Nais*. The mean counts for *Nais behningi* and *N. communis* were 0.33 and 5.00. The species counts were adjusted to genus by adding them together [0.33 + 5.00 = 5.33]. In some circumstances, counts of taxa at the family or order level are also aggregated to the genus level. See the Methods Manual for a detailed description of applying the counting rules. Note that for taxa that are only observed in the pupal stage, no actual mean count is shown as pupae are excluded from model calculations.
- **Hilsenhoff Biotic Index** (Hilsenhoff 1987.) – The biotic index provides a measure of the general tolerance level of the sample community toward organic (nutrient) enrichment. The index ranges from 0 (no apparent organic pollution) to 10 (severe organic pollution).
- **Functional Feeding Group** – Aquatic invertebrates can be grouped into groups according to how and what they eat:
 - Collector-filterers (CF) strain particles out of flowing water with brushes or nets.

- Collector-gatherers (CG) are opportunistic omnivores that feed on whatever is easiest to find, using a variety of feeding methods.
- Piercers (P) are organisms that obtain nourishment by piercing plant or animal tissue and sucking fluids.
- Predators (PR) are carnivores that hunt and eat other organisms.
- Scrapers (SC) remove algae, bacteria and fungus growing on the surface of rocks, twigs and leaf debris.
- Shredders (SH) chew on coarse leaves and twigs that have started to decay to obtain nourishment from associated fungi, bacteria and other organic material.
- **Actual Relative abundance** – This is calculated by dividing a taxon's actual count by the total number of macroinvertebrates in a sample (model variable 01).
- **Adjusted Relative abundance** – This is calculated by dividing a taxon's adjusted count by the total number of macroinvertebrates in a sample (model variable 01).