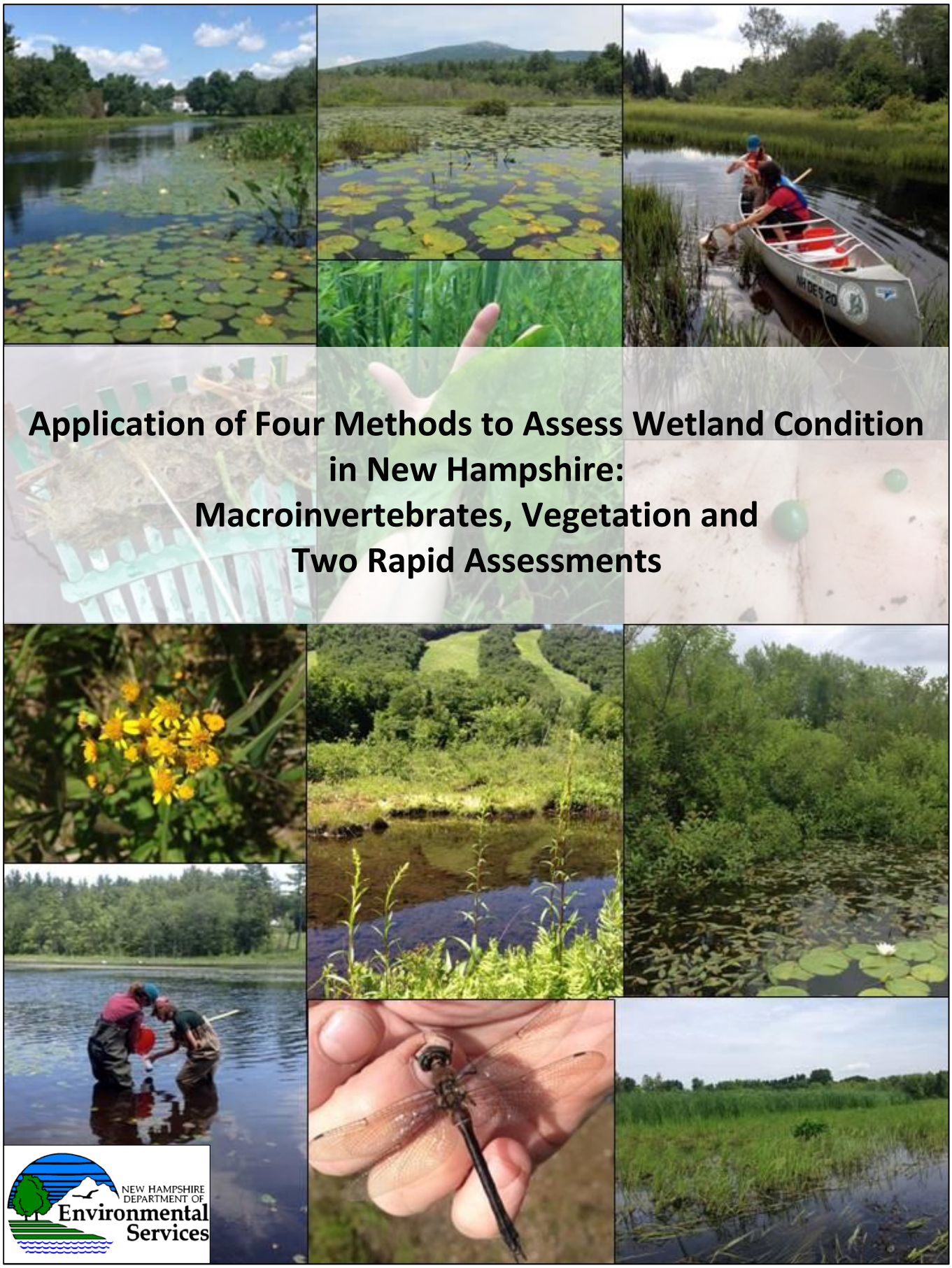

# Application of Four Methods to Assess Wetland Condition in New Hampshire: Macroinvertebrates, Vegetation and Two Rapid Assessments

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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# Application of Four Methods to Assess Wetland Condition in New Hampshire: Macroinvertebrates, Vegetation and Two Rapid Assessments

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# 1 Background

New Hampshire has had requirements related to protection of its wetlands since 1955, when the New Hampshire legislature created an approval process to place fill in public waters. In the late 1960s, predating the federal Clean Water Act (CWA), state permits became required for dredge or fill in tidal and freshwater wetlands and waters. Under RSA 482-A, the state's current dredge and fill law (enacted under a different statute number in 1967), wetlands are recognized for their functions and values, including:

- Sources of nutrients for finfish, crustacea, shellfish and wildlife of significant value.
- Habitats and reproduction areas for plants, fish and wildlife of importance.
- Commerce, recreation and aesthetic enjoyment.
- Adequate groundwater levels.
- Stream channels and their ability to handle the runoff of waters.
- Natural ability of wetlands to absorb flood waters and silt.
- Interests of the general public.

Permits for activities that result in dredging or filling wetlands require applicants to avoid and minimize impacts before mitigating for certain unavoidable impacts. However, wetlands can also be degraded from adjacent land use activities (Houlahan and Findlay, 2004; Wilkerson et al., 2006; McElfish et al., 2008).

The objective of the federal Clean Water Act (CWA) of 1972, as amended, is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters," as described in CWA section 101(a). This applies to all surface waters, including wetlands. To help achieve this objective, states are required to adopt water quality standards, which include designated uses (such as aquatic life), narrative or numeric criteria to protect those uses, and an antidegradation policy. New Hampshire's surface water quality standards are provided in state statute (RSA 485-A) and rule (Env-Wq-1700). With regards to wetlands, Env-Wq 1703.02(b) of the state's surface water quality regulations states, *"Wherever the naturally-occurring conditions of the wetlands are different from the criteria listed in these rules, the naturally-occurring conditions shall be the applicable water quality criteria."* New Hampshire's surface water quality regulations (Env-Wq 1702.08) also define "biological integrity" as *"...the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region."*

In New Hampshire, the term “criteria” refers to numeric or narrative criteria that are in regulation, such as Env-Wq 1700. The term “threshold” describes numeric translators (of narrative criteria) that are not found in regulation. Numeric thresholds for surface water quality assessments are typically included in the state’s Consolidated Assessment and Listing Methodology.

In accordance with § 305(b) of the CWA, each state is required to assess all of their waters and report on their attainment status in relation to water quality standards every two years. To assess a waterbody it is first necessary to establish the numeric criterion or threshold for the chemical, physical and/or biological parameter of interest, which, if exceeded, causes impairment of the designated use. Chemical and physical parameters measure conditions at one point in time and only the specific selected parameters. Measures of biological assemblages integrate the cumulative effects of past and present water quality. However, if biological health is determined to be poor, the biological assemblage(s) do not indicate which physical, chemical, or biological stressor may be causing impairment. Numeric criteria or thresholds for biological assemblages are often referred to as biological indices or index of biological integrity (Reiss, 2006; NHDES, 2017).

New Hampshire like many other states, has not assessed and reported on the condition of its wetlands for CWA purposes due to the lack of quantifiable biological criteria and thresholds and reproducible assessment methods for all wetlands. Maine is one of the few states that has included the results of wetland assessments in its §305(b) reports (MDEP, 2010, 2012, 2014, 2016).

The Maine Department of Environmental Protection (MDEP) has a biological monitoring and assessment program for freshwater wetlands that is integrated with its biomonitoring of other surface waters. The MDEP wetlands biomonitoring team samples aquatic macroinvertebrates as the primary taxonomic indicator for assessing wetland condition (MDEP, 2010). Macroinvertebrates are an essential component of wetland food webs and play an integral role in nutrient cycling and energy transfer within wetland ecosystems, and between wetlands and other habitats (Batzer, 2013). The MDEP Biomonitoring Program has also developed a provisional statistical (linear discriminant) model to evaluate the biological condition of wetlands and determine attainment of narrative aquatic life criteria which correspond with Maine legislatively defined classes (MDEP, 2010). MDEP also conducts a rapid assessment, the Wetland Human Disturbance Assessment (WHDA), to characterize the degree of human disturbance in and around a wetland biomonitoring station and document environmental stressors. More information about the MDEP wetlands assessment program is provided in the next section.

Although New Hampshire has not formally assessed wetlands that are attaining or not attaining (i.e., impaired) surface water quality standards for CWA reporting, the following work has been conducted in recent years to help guide development of criteria and methods that are defensible and useful for CWA wetland assessment purposes.

Since 2008, the New Hampshire Natural Heritage Bureau (NHB, now in the Department of Natural and Cultural Resources) has developed and applied the Ecological Integrity Assessment (EIA) method to evaluate wetland condition, as related to its mission to 1) determine protective measures and requirements necessary for the survival of native plant species in the state, 2) investigate the condition and degree of rarity of plant species, and 3) distribute information regarding the condition and protection of these species and their habitats. NHB also maintains information on rare wildlife in cooperation with the New Hampshire Fish and Game Department's Nongame and Endangered Wildlife Program, which has legal jurisdiction over New Hampshire wildlife.

To maximize monitoring effectiveness, the US Environmental Protection Agency (USEPA) recommends using a tiered approach for wetland monitoring and assessment, commonly referred to as Levels 1, 2 and 3 (USEPA, 2006).

- **Level 1** assessments use remote sensing and desktop analysis, typically with a geographic information system (GIS), to complete a landscape assessment. Land use data and the presence of specific stressors (such as roads) are considered in the analysis.
- **Level 2** assessments are rapid and field-based to provide information that can be observed only in the field, such as algal blooms, presence of invasive species, soil erosion and other local stressors on the landscape. A level 2 assessment should take about four field hours to complete, on average.
- **Level 3** assessments are intensive field surveys that include the collection of biological data or onsite sampling of water. These assessments may include the collection of data on multiple indicators, such as vegetation, amphibians, aquatic macroinvertebrates, birds, etc.

The resources required at each subsequent level increases as more intensive sampling and comprehensive field work associated with that monitoring and assessment “level” are conducted. Data collected at a higher more resource-intensive level (such as Level 3) are typically used to inform and validate less resource-intensive approaches (Level 1 or 2) (USEPA, 2006; Stein et al., 2009).

New Hampshire is using EPA’s three-tiered approach for wetland monitoring and assessment work. For example, in 2011, the New Hampshire Department of Environmental Services (NHDES) conducted Level

1 assessments of National Wetland Inventory (NWI) wetlands in the state; in 2012, the NH Natural Heritage Bureau (NHB) and NHDES applied four rapid methods at 32 sites in 2012, including the Ecological Integrity Assessment (EIA) (NHB, 2013); and in 2011 and 2016, NHDES participated in EPA's National Wetland Condition Assessments (Level 3). Although these efforts, which focused on using vegetation and other indicators, have contributed to an increased understanding about how well these methods represent wetland condition, more information is needed to support assessment decisions about aquatic life support for wetlands. Development of an assessment method, criteria or thresholds that link closely with aquatic life use support was identified as a "key need" at multi-stakeholder meetings on wetland-specific water quality standards (NHDES, 2015).

## 1.1 Project Objectives

There are an increasing number of wetland assessment techniques used for regulatory, management, and conservation purposes (Fennessy, 2004; DeBerry et al., 2015). In his 2006 paper, Jon Kusler (Kusler, 2006) provided recommendations for reconciling wetland assessment techniques. Among the general recommendation was to make better use of existing wetland assessment methods. To that end, the overall objective of this project was to assist the development of defensible methods, criteria, or thresholds for assessing New Hampshire wetlands for CWA and other condition assessment purposes (such as mitigation), by testing the applicability of four existing assessment methods on New Hampshire's wetlands, which are described in more detail in the following sections. Project objectives include the following:

1. Apply MDEP's wetland biomonitoring macroinvertebrate protocols to 24 wetlands in New Hampshire that represent a range of human disturbance, and evaluate the use of the MDEP macroinvertebrate-based linear discriminant model to inform New Hampshire's ability to assess the condition of wetlands, and more specifically support of aquatic life.

2. Apply two Level 2 rapid assessment methods, (EIA and MDEP's stressor-based WHDA).

3. Conduct vegetation surveys and apply floristic quality assessment (FQA) methods.

4. Collect and analyze water quality samples at each site for various parameters.

5. Conduct statistical analyses to identify any significant relationships between the various methods and water quality parameters.

6. Generate a report summarizing the activities, data, analyses, with a recommendation on the appropriateness of the MDEP model for New Hampshire.

# 2 Overview of Four Assessment Methods Applied and Evaluated

The following subsections provide background information about the methods applied: MDEP wetland biomonitoring assessment methods using a macroinvertebrate-based predictive model, two rapid assessment methods (EIA and MDEP's WHDA), and FQA.

## 2.1 Maine Wetland Biomonitoring Program

The MDEP Biological Monitoring Program has used a five-year basin rotation for sampling in freshwater wetlands (lacustrine and riverine fringe marshes) since 2000 (its wetland monitoring began as a pilot program in 1998-1999). Sampling occurs during June and July. Wetlands for sampling are chosen to represent a gradient of human disturbance. Site conditions range from reference sites nearly unaffected by human activity to severely degraded sites. Reference wetlands are chosen to include a range of wetland types and geographic regions. This broad reference set allows samples collected from human-impacted wetlands to be compared with reference wetlands of similar type to assess the degree of degradation occurring at impacted sites (MDEP, 2018). Taxonomic work is conducted by a taxonomist certified by the Society for Freshwater Science.

MDEP biologists have developed a linear discriminant model based on quantitative ecological attributes of the macroinvertebrate community to determine the strength of the association of a test community to any of Maine's legislatively assigned water quality classes (Maine Class A, B, or C). The model uses taxa and function-based variables (e.g., shredder), which reflect the diversity and sensitivity of the macroinvertebrate community, to determine the probabilities that a wetland attains one of three classes (A, B, or C) or is in non-attainment (NA) of the minimum criteria for any class. The model also may generate the result of Indeterminate (I), which is assigned to wetlands where a class-specific probability value is greater than 0.4 but less than 0.6, so that the conclusion of classification attainment for that class cannot be determined without further information. The indeterminate result also may be assigned where the minimum abundance or genera for the model is not met. The predictive model requires a minimum total abundance of 50 individuals and minimum genera of 15 among the three replicates collected at a site.

The model, developed initially for streams and rivers, has a provisional version for lacustrine and riverine fringe marshes. Information about the model is provided in the "Guidance for Understanding a Wetland Macroinvertebrate Life Classification Attainment report," (MDEP, undated, Appendix A; Davies et al., 2016).

The decision to test the application of the model in New Hampshire wetlands is based on the similar characteristics of the two states, especially because they share two ecoregions, the Northeastern Coastal Zone and the Northeastern Highlands (Figure 1). The geology and climate of the two states are alike as are many natural communities (Flanagan et al.,1999). The two ecoregions represent the entire state of New Hampshire and two of the three ecoregions present in Maine (Griffith et al., 2009).

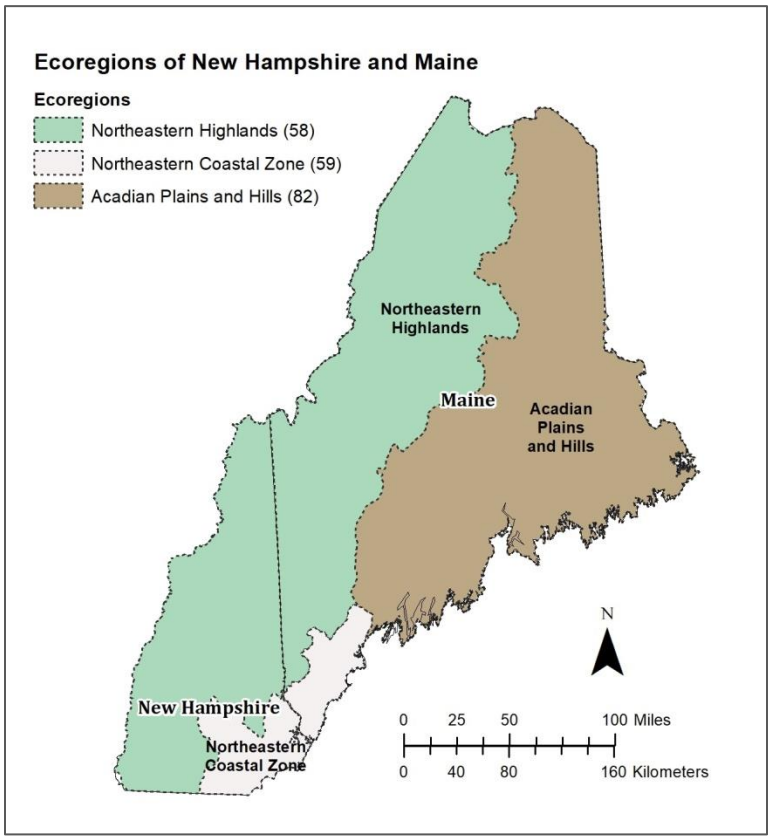



**Figure 1. Ecoregions of New Hampshire and Maine.**

The Northeastern Highlands ecoregion (#58) covers most of the northern and mountainous parts of New England as well as the Adirondacks in New York. It is characterized by hills and mountains, a predominantly forested land cover, nutrient-poor frigid and cryic soils (mostly spodosols), and numerous high-gradient streams and glacial lakes. Forest vegetation is somewhat transitional between the boreal regions to the north in Canada and the broadleaf deciduous forests to the south. Typical forest types include northern hardwoods (maple-beech-birch), northern hardwoods/spruce, and northeastern spruce-fir forests (Griffith et al., 2009).

The Northeastern Coastal Zone ecoregion (#59) includes plains with low to high hills and irregular plains. Appalachian oak forests and northeastern oak-pine forests are the natural vegetation types, with mostly mesic soils (inceptisols) (Griffith et al., 2009).

Both ecoregions contain relatively nutrient-poor soils and concentrations of continental glacial lakes, some of which are sensitive to acidification (Griffith et al., 2009). Warm and cold water streams and rivers are present in both ecoregions (Flanagan et al., 1999).

## 2.2 Rapid Assessment Methods

A Rapid Assessment Method (RAM) is a Level 2 protocol to assess wetland condition that requires one person a half day or less for pre-field preparation and post-field analysis and half a day or less collecting data in the field (Fennessy et al., 2004). This project included the application of two rapid assessment methods, the Ecological Integrity Assessment (EIA)(Faber-Langendoen and Nichols, 2014) and MDEP's stressor-based Wetland Human Disturbance Assessment (WHDA).

Originally developed by NatureServe to address condition for conservation planning purposes, the EIA is considered "...an assessment of the structure, composition, and function of an ecosystem as compared to reference ecosystems operating within the bounds of natural or historic disturbance regimes." To have ecological integrity, an ecosystem should be relatively unimpaired across a range of ecological attributes and spatial and temporal scales (Faber-Langendoen and Nichols, 2014).

The EIA relies on a general conceptual model that:

- Identifies the major ecological attributes – landscape context, size, vegetation, soil and hydrology.
- Provides a narrative description of declining integrity levels based on changes to ecological attributes.
- Uses a metrics-based approach to assess the levels of integrity.

The approach focuses on the observed condition rather than the presence of stressors. Completion of each topical section of the EIA Pre-Field and Field Metrics Form results in a rank of A though D (with pluses or minuses possible) and once all sections are addressed, the ranks are converted to numeric values (within the EIA spreadsheet) and are "rolled up" to generate a rank of A (highest) through D- (lowest) for each wetland assessed. For the EIA, a separate form, the Level 2 Stressor Checklist, is used to inform the assessment of condition indicators and does not involve the assignment of points or development of a numerical score.

The MDEP wetland biomonitoring program protocols include the application of a rapid assessment called the Wetland Human Disturbance Assessment (WHDA) to document environmental stressors and characterize the degree of human disturbance in and around a wetland sampling location. MDEP notes that the WHDA is not intended to serve as an impact assessment in the absence of biological data.

Information on stressors is valuable for diagnosing causes of any impairment and determining possible remediation measures. MDEP uses the WHDA scores to categorize pristine reference sites, minimally impacted sites, and highly disturbed sites (MDEP, 2013).

The WHDA assesses stressors in the wetland or watershed using four major categories: 1) hydrologic and vegetative modifications to the wetland, 2) evidence of chemical pollutants, 3) watershed characteristics, and 4) potential nonpoint source pollution impacts. The categories assessed and point values assigned by category are shown in Table 1. The area evaluated by the WHDA is comprised of "all sections of the wetland/waterbody observed by Biomonitoring staff while performing the standard sampling procedure," a 100-foot buffer around the assessment area, and the wetland's watershed (MDEP, 2013).

**Table 1. Categories assessed by Wetland Human Disturbance Assessment.**

| WHDA Section | Maximum Point Value |
|---|---|
| Hydrologic Modifications to Wetland | 25 points |
| Vegetative Modifications to Wetland | 30 points |
| Evidence of Chemical Pollutants (wetland and upstream) | 25 points |
| Watershed Characterization and Potential NPS Pollution Impacts (land use and observed evidence of erosion) | 40 points |
| **Total point value possible** | **120 points** |

A maximum of 120 points can be assigned, but the most degraded sites usually do not score much above 50 points (J. DiFranco, personal communication, undated).

## 2.3 Floristic Quality Assessment (FQA)

Multiple biological assemblages have been used to describe wetland biological integrity (Maginel et al., 2016; Lougheed et al., 2007; Rooney and Bayley, 2012; Justus et al., 2016; USEPA, 2002a; USEPA, 2002b). The advantages of having more than one biological assemblage include 1) having additional data that may reinforce the bioassessment findings for a single biological assemblage, and 2) a different assemblage may respond more strongly to certain stressors (USEPA, 2002a).

Vegetation is often one of the assemblages used for assessing wetland condition, because it:

- Is present in wetlands of multiple types (forested, marsh, etc.), and is one of the three components used to identify and delineate wetlands.
- Is less costly to identify and identification can be done primarily in the field.
- Has taxonomic richness (affects ability to identify metrics).
- Integrates effects over time.

- Is sensitive to nutrient enrichment, herbicides, hydroperiod alteration, and habitat alteration (USEPA, 2002a; U.S. Army Corps of Engineers, 1987).

Floristic Quality Assessment (FQA) is a vegetation-based ecological assessment protocol that was first developed by Swink and Wilhelm (1979) to assess floristic integrity and address the need for a standardized, reproducible, and objective assessment of ecological integrity.

FQA requires the pre-assignment of a coefficient of conservatism (CoC or C) to every vascular plant species in a regional or state flora, relying on the collective knowledge of a group of experts. The coefficient of conservatism is an integer from 0 to 10 that is assigned to each taxon in an ecological or geographic region based on its fidelity to specific habitats and tolerance for disturbance (Taft et al., 1997). A C value of 10 indicates a species is almost always restricted to a high quality "remnant" natural area. A C value of 0 is usually assigned to nonnative species.

In a USEPA-funded project that was completed in 2011, each New Hampshire vascular species was assigned a C value following the methodology and philosophy detailed in Swink and Wilhelm (1994) and Wilhelm and Masters (1995) and described in Bried et al. (2012). Table 2 provides the descriptive guidance provided to botanists as part of the original state-level coefficient of conservatism effort for New York and the New England states.

An effort to revise the C values for application on an ecoregional approach was undertaken by NatureServe (under a USEPA grant) for the ecoregions of New England states and most of New York (Faber-Langendoen, 2018). The ecoregional C values were not used in applying floristic quality metrics for this study as they became available after much of the FQA analyses were completed based on the New Hampshire-specific C values.

**Table 2. Guiding definitions for coefficients of conservatism (C values) assigned to the vascular flora of New York and New England (Bried et al., 2012).**

| CoC or C values | Criteria |
|---|---|
| 0 | Nonnative with wide range of ecological tolerances. Often these are opportunistic of intact undisturbed habitats |
| 1 to 2 | Native invasive or widespread native that is not typical of (or only marginally typical of) a particular plant community; tolerant of anthropogenic disturbance. |
| 3 to 5 | Native with an intermediate range of ecological tolerances and may typify a stable native community, but may also persist under some anthropogenic disturbance. |
| 6 to 8 | Native with a narrow range of ecological tolerances and typically associated with a stable community. |
| 9 to 10 | Native with a narrow range of ecological tolerances, high fidelity to particular habitat conditions, and sensitive to anthropogenic disturbance. |

Once C values are developed for a flora, they may be used in various floristic indices or metrics based on vascular inventory data recorded at a site (DeBerry et al., 2015). Where abundance data are collected they can be used in additional cover-weighted metrics. Common floristic quality metrics are described in section 3.3.4.1.

# 3 Methods for Site Selection, Sampling, and Analyses

Field surveys were conducted, vegetation was sampled, and macroinvertebrate and water samples were collected from a total of 24 wetlands in 2014 and 2015. Sampled wetlands were identified using a targeted approach via desktop review and field reconnaissance to confirm the wetland type and accessibility (landowner permission and physical access). Three NHDES staff (including a seasonal intern) comprised the sampling team. More specific information regarding site selection and sampling and analysis methods are provided in the following sections.

## 3.1 Selection of wetlands to sample

The target population for MDEP's wetland biomonitoring protocols is freshwater lacustrine and riverine fringe wetlands (MDEP, 2010). NHDES had no established universe of wetlands that met the target population or that reflected the range of human disturbance, so the identification of target wetlands involved a significant effort.

### 3.1.1 Classification

The wetlands in the sample frame were identified initially using digital National Wetland Inventory data. Potential target wetlands were identified from those classified by the Cowardin system (FGDC, 2013) as palustrine unconsolidated bottom (PUB), or palustrine aquatic bed (PAB), and palustrine emergent, (PEM). Relatively shallow ponds classified as lacustrine unconsolidated bottom (LUB) with large proportions of littoral areas, and backwater areas of flowing waters were also candidates for site reconnaissance. NHDES also reviewed New Hampshire Fish and Game Department (NHF&G) bathymetry maps of ponds to identify wetlands for sampling, as the maps also show access locations (Figure 2). Additional suggestions for wetlands to sample were sought from local stakeholders, including municipal Conservation Commissions and the New Hampshire Natural Heritage Bureau (NHB).

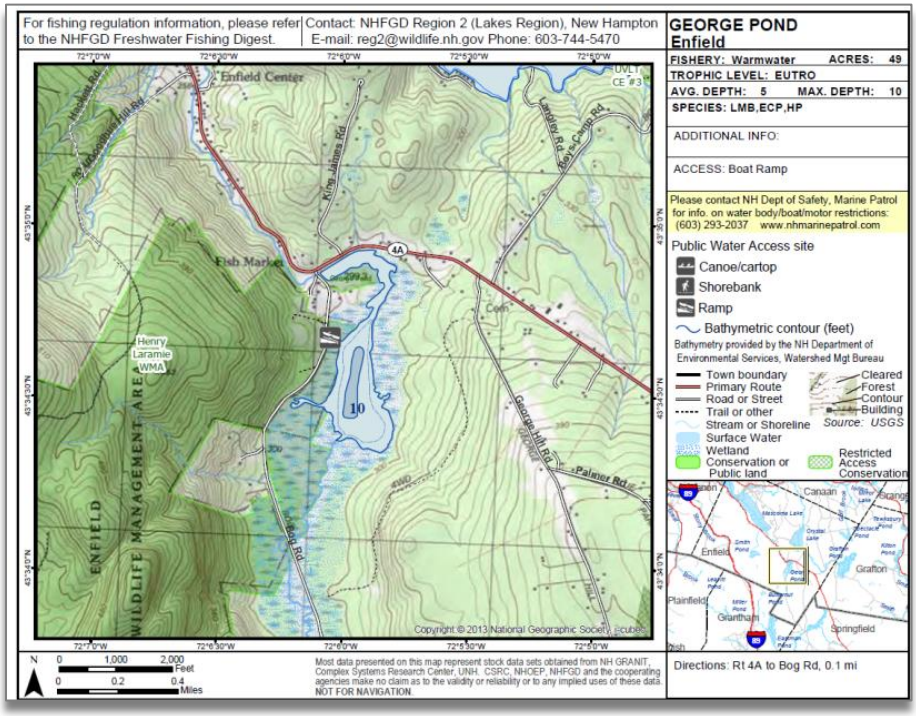



**Figure 2. Example of bathymetry map produced by the NH Fish and Game Department.**

### 3.1.2 Location

In 2013, the NHDES surface water monitoring program began a renewed effort to collect targeted water quality data using a rotating basin approach centered on the 10-digit hydrologic unit code (HUC 10; n=81) as a way to systematically generate statewide data on a watershed basis. By sampling at least one representative lake or pond and one representative river segment in 8 to 10 HUC 10s every year, a full statewide rotation of every HUC 10 watershed would be completed on a 10-year cycle. HUC 10s designated for sampling by NHDES staff in any given year are spatially distributed across the state and based on a predetermined schedule. This spatially balanced approach was selected to enable the tracking of effects of widespread natural events (such as drought) across the state (NHDES, 2016).

In 2014, wetlands were selected within the watersheds to be sampled that year as part of the rotating basin approach based on the Level 1 analysis and information derived from aerial imagery (NHDES, 2013a; Figure 3). However, after sampling six wetlands, it was apparent that they did not cover the desired range of the human disturbance gradient. When the watersheds targeted for sampling in 2015 were reviewed, none of the watersheds were in urbanized areas of the state where human disturbance would be greater than the sites that had been sampled in 2014. Therefore the priority in 2015 was to select wetlands that were located in areas of greater human disturbance. Three of the 18 sites sampled in 2015 were located within that year's watershed rotation. The remaining 15 sites were selected from

other locations of the state with an increased emphasis in the more urbanized southeastern part of the state (such as the cities of Nashua, Manchester, and Concord).

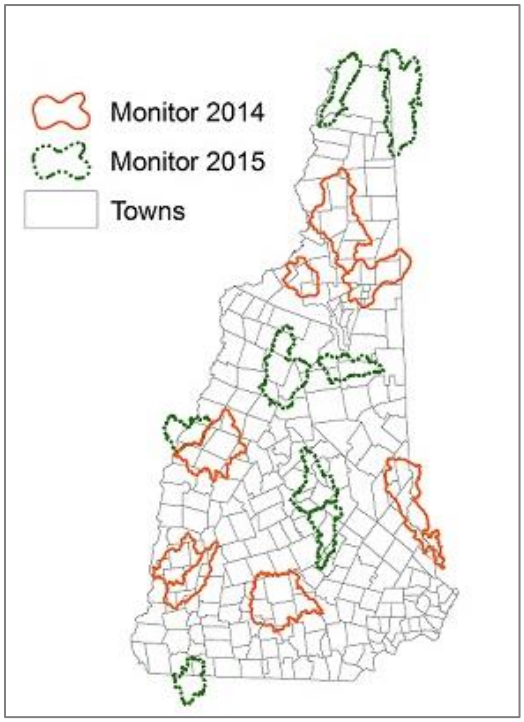



**Figure 3. Surface water monitoring rotation for 2014 and 2015.**

### 3.1.3 Landowner Contact

After specific wetlands were identified as a potential target type, NHDES conducted reconnaissance to confirm available access, such as a public boat ramp or other boat access (nine wetlands). Where no public access was present, NHDES sought to identify the landowner to seek permission (seven wetlands). In high visibility public areas, NHDES contacted the landowner to inform them of our interest in sampling the wetland (five wetlands). For access to other public lands, NHDES made arrangements to access areas that are accessible to the public only on foot or may have otherwise been restricted for certain purposes or sought permission as requested (three wetlands).

To seek access to privately owned land, NHDES attempted to contact the landowner by telephone. If contact with the landowner could not be made, a letter was mailed to the landowner of record to indicate NHDES' interest in sampling the wetland and request access to the landowner's property. In one instance, the landowner responded and denied NHDES access to the wetland. In another instance, landowner permission was requested by mail and no response was received by NHDES, so the site was dropped from consideration. Private landowners for six sites provided permission to access their properties or wetland.

## 3.2 Training

In June 2014, the MDEP wetland biomonitoring staff provided field training to the NHDES sampling team. Training included the identification of sampling locations, macroinvertebrate collection, such as the one-meter measured sweep to collect macroinvertebrates with the dip net. MDEP staff also provided training on applying the Wetland Human Disturbance Assessment (WHDA) method.

Training on the application of the Ecological Integrity Assessment was provided at workshops sponsored by the NHB in 2014 and 2015. Each member of the sampling team received training at one of those two workshops.

## 3.3 Field Sampling Methods

Our sampling period was from late June to mid-August to balance the ideal macroinvertebrate and ideal plant sampling dates. Macroinvertebrate sampling timeframes by MDEP tended to be earlier versus plant sampling which tends to be better later in season to improve plant identification as more plants are in flower or fruit.

Sites were sampled from a canoe (14 sites) or on foot with waders (10 sites). Some wetlands could be accessed only on foot because they were too difficult to carry in a canoe due to distance or presence of thick, woody vegetation.

### 3.3.1 Site documentation

A unique identifier was assigned to each wetland sampled and each location within a wetland where samples were collected. Geographic coordinates (latitude and longitude) were recorded with a GPS unit at each water sample location (for grab sample and field meter readings) and macroinvertebrate sample location (resulting in a minimum of three sets of coordinates). Coordinates were taken at additional locations, such as the access location or where other observations were made, such as presence of a floating mat or beaver dam.

A visual record of each station was created by taking digital photographs of the wetland in the (magnetic) north, east, south and west directions from a sampling location that provided the best representation or view of the wetland.

Data were recorded on the following forms (copies are provided in the Appendices):

- Wetland Bioassessment Field Data Sheet (Appendix B)
- Wetland Monitoring - Water Field Data Sheet (Appendix C)
- Wetland Human Disturbance Assessment (Appendix D)
- EIA forms:
    - Pre-Field and Field Metrics (Metric Form) (Appendix E)

- Stressor Checklist (Appendix F)
- Rapid Recon Form (Appendix G), or its simplified version to collect plant data, Wetland Assessment Plant Sampling Form (Appendix H)

### 3.3.2 Water Quality Sampling and Analysis

Water sampling was conducted to provide information about the water quality contemporaneous with the collection of biological data. In-situ measurements of dissolved oxygen (DO), specific conductance, temperature, turbidity, and pH were made using hand-held meters at each of the three macroinvertebrate sample locations before each sample was collected. MDEP protocols specify taking similar measurements with meters at only one location, the water grab sample location (MDEP, 2014b).

One water grab sample was collected at each wetland, distributed into the appropriate sample bottles, preserved as required by the analytical method, and placed in a cooler with ice for transport to the New Hampshire Public Health Lab - Water Analysis Laboratory for analysis. Water samples collected during the field survey were analyzed for Total Kjeldahl Nitrogen (TKN), Nitrite-Nitrate ($NO_2$-$NO_3$), total phosphorus (TP), chlorophyll-*a*, dissolved orthophosphorus (DOP), dissolved organic carbon (DOC), chloride, and alkalinity (as $CaCO_3$). Table 3 provides more specific information about the water quality parameters measured.

Water data (field meter measurements) and information about the site, weather, and meter calibration were recorded on the "NHDES Wetland Monitoring - Water Field Data Sheet" (Appendix C).

**Table 3. Water quality parameters sampled in the field or analyzed by the lab.**

| Water Quality Parameter | Frequency | Method |
|---|---|---|
| Dissolved Oxygen<br>Specific Conductance<br>Temperature | 3 measurements per site | Field meter:<br>YSI Pro 2030 |
| pH | 3 measurements per site | Field Meter:<br>Oakton pH 11 Meter |
| Turbidity | 3 measurements per site | Field Meter:<br>LaMotte 2020we |
| Dissolved Organic Carbon (DOC)<br>Nitrate+Nitrite ($NO_3$+$NO_2$)<br>Total Kjeldahl Nitrogen (TKN)<br>Dissolved Ortho Phosphorus (DOP)<br>Total Phosphorus (TP)<br>Total Alkalinity<br>Chlorophyll *a*<br>Chloride (Cl) | 1 per site | Lab analysis:<br>DOC: 415.3<br>$NO_3$+$NO_2$: 10-107-04-1-C<br>TKN: 10-107-06-2-E<br>DOP: 10-115-01-1-B<br>TP: 10-115-01-1-F<br>Total alkalinity: 2320-B<br>Chlorophyll-*a*, uncorrected: 10200-H MOD<br>Chloride: D512(C) |

### 3.3.3 Macroinvertebrate Sampling

Macroinvertebrates were sampled at three locations within the wetland, where the measured water depth was one meter or less. The three locations typically were distributed across the open water area of the wetland. Typical locations had floating-leaved or emergent vegetation. Each macroinvertebrate sample was collected using a standard D-frame dip net (600 µm) by performing a one-meter measured sweep (Appendix I). The contents of the net were placed into a 500 µm sieve bucket. The bucket and contents were then agitated in the water to rinse the fine material out of the sample. The bucket contents were gently transferred into one or more labeled one-liter wide-mouth Nalgene containers. The macroinvertebrate sampling described above was repeated at two additional locations in the wetland. At the end of the day, the samples were preserved with 95% ethyl alcohol to yield an approximately 70% solution of alcohol after dilution with sample water. Macroinvertebrate samples were provided to a contractor with a taxonomist certified by the Society for Freshwater Science, for sorting, identification, and enumeration.

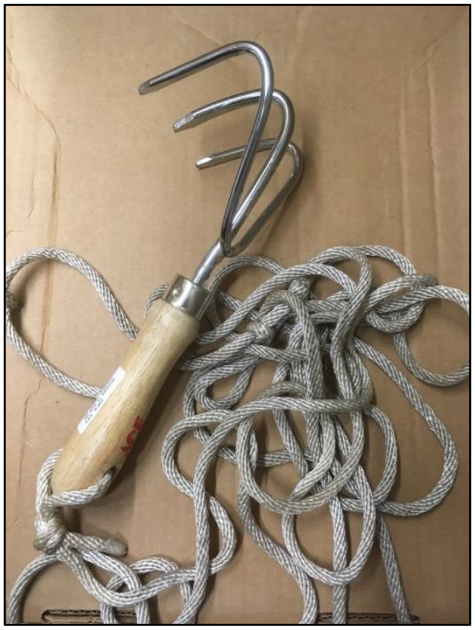
Macroinvertebrate-related data were recorded on the NHDES Wetland Bioassessment Field Data Sheet, modeled after MDEP's version (Appendix B). At macroinvertebrate sample locations, data were recorded for depth, number of bottles each macroinvertebrate sample comprised, habitat (open water, standing, flowing, presence of emergent or floating vegetation), dominant plant species, and substrate.

### 3.3.4 Vegetation Sampling

The Ecological Integrity Assessment (EIA) includes a survey of plant communities to enable evaluation of vegetation structure, invasive species cover, and native plant species composition. The assessment includes the creation of a species list for each site. The observation of species present assists in completing parts of the EIA, such as the Vegetation section, but the species list does not specifically contribute to the site rank. However, through the application of floristic quality assessment (FQA) the species presence and use of the individual C values can generate a floristic-based score reflective of wetland condition.

A modified hand cultivator was used to sample aquatic vegetation at the six sites sampled in 2014, based on the method described and used by Minnesota in its Rapid FQA protocol (MPCA, 2014a) (Figure 4a). At those six sites, few plants were retrieved as the cultivator would lose plants as it was being pulled to shore. Further, when the cultivator was tossed from a canoe, it would get caught on submergent vegetation, stems of floating leaved plants, or woody material. When attempting to retrieve it, the canoe would get pulled to the cultivator's stuck location if it wouldn't release and few if any plants remained caught in the claw.

In the second year of sampling (2015), a shrub rake was used to retrieve vegetation in a method similar to the one-meter sweep used for sampling macroinvertebrates. The lack of distance between the canoe and the sample to be retrieved, and the increased amount and type of tines, resulted in a successful retrieval of vegetation, as shown in Figure 4b.



**Figures 4a and 4b. Tools used to retrieve aquatic vegetation. 4a, Cultivator on a rope used in 2014; 4b, shrub rake used in 2015 to retrieve submergent aquatic vegetation, after the cultivator was deemed ineffective.**

Retrieved plant species were recorded. In addition to sampling the submergent aquatic vegetation, emergent and woody vegetation were recorded in close shoreline areas to the macroinvertebrate sampling locations, as well as vegetation observed when moving between the sampling locations and the access area. For additional information, see the description of the Floristic Quality Assessment method in the following section.

In place of the EIA Recon form to record vegetation data (Appendix G), NHDES developed the "Wetland Assessment - Plant Sampling Form" (Appendix H) for use in 2015 to improved documentation of data collected in aquatic communities, including data from the shrub-rake retrieval method. The EIA Recon form had fields that were not necessarily applicable (e.g., to record woody species and diameter breast height of trees) and minimal space to record information.

#### *3.3.4.1 Floristic Quality Assessment Method*

Plants were identified in the field to species to the extent possible or collected for subsequent identification. Plant taxa were recorded on field forms and subsequent identifications done in the lab. Once identifications were made using the taxonomy of Haines et al. (2011), the vascular plant taxonomy

(genus and species) were modified to be consistent with USDA PLANTS database (USDA, 2018) and entered into the universalfqa.org website using the New Hampshire 2013 coefficients of conservatism database (NEIWPCC, 2013) to generate several conservatism-based and FQA metrics described in Table 4.

**Table 4. Floristic Quality Metrics and Definitions.**

| Floristic quality metric | Formula or term | Description | Comments |
|---|---|---|---|
| Coefficient of Conservatism | *CoC* or *C* | Conservatism coefficient for species | Pre-assigned integer from 0 to 10 |
| Mean C<br><br>(or Total mean C) | $\overline{C_t} = \sum_{i=0}^{t} C_i \Big/ N_t$ | Mean conservation coefficient value for native and nonnative species | Based on presence/absence; Independent of species richness |
| Native Mean C | $\overline{C_n} = \sum_{i=0}^{n} C_i \Big/ N_n$ | Mean conservation coefficient value for native species | Based on presence/absence; Independent of native species richness |
| Total species richness | $N_t$ | Total number of species present (native and nonnative) | May be affected by sampling area |
| Native species richness | $N_n$ | Total number of native species present | May be affected by sampling area |
| Total FQI<br>(Aka FQI) | $I_t = \overline{C_t}\sqrt{N_t}$ | Floristic quality index: total mean C multiplied by the square root of the total species richness. | May be affected by sampling area but outperform CoC indices |
| Native FQI<br><br>aka FQAI (Miller and Wardrop, 2005) | $I_n = \overline{C_n}\sqrt{N_n}$ | Floristic quality index: native mean C multiplied by the square root of the native species richness. | May be affected by sampling area but outperforms CoC indices |
| Adjusted FQI<br>(also called Richness corrected FQI) | $I' = 100\left(\frac{\overline{C_n}}{10}\right)\left(\frac{\sqrt{N_n}}{\sqrt{N_t}}\right)$ | Adjusted floristic quality index: 100 multiplied by the native mean C divided by 10 and multiplied by the square root of the native species richness divided by total species richness. | Reduces sensitivity to species richness that are present in the FQAI and Native FQI. |
| Freyman et al., 2016; Bourdaghs et al., 2006; Miller and Wardrop, 2006 | | | |

### 3.3.5 Rapid Assessment Methods

Two rapid assessments were conducted for each wetland, New Hampshire's Ecological Integrity Assessment (EIA)(Faber-Langendoen and Nichols, 2014) and MDEP's Wetland Human Disturbance Assessment (WHDA)(MDEP, 2013) for each wetland.

### *3.3.5.1 Ecological Integrity Assessment (EIA) Method*

#### 3.3.5.1.1 Assessment Area

In accordance with the EIA method, the assessment area (AA) was defined as the wetland complex based on the National Wetlands Inventory data layer (using GIS) using distinct breakpoints where appropriate. Breakpoints included road crossings, constrictions, water control structures, or deep water habitats. Adjustments to the NWI-based wetland polygons were made to reflect existing conditions for the AA based on aerial imagery and field observations. For the study sites, the AA encompassed the open water area and shoreline that was sampled and surveyed in the field, as well as forested or scrub-shrub wetlands not field surveyed. While the wetlands included both "terrestrial" wetlands and aquatic communities, the main focus was on the aquatic community within the wetland, due to a lack of resources to field survey entire wetland complexes.

#### 3.3.5.1.2 Landscape Context

The EIA begins with a remote sensing approach using GIS to assess landscape context. The landscape context was first evaluated in the office and adjusted as necessary based on observations in the field. The EIA has three parts to the landscape context analysis: the Land Use Index, the wetland perimeter with buffer, and the average buffer width.

As described in the previous section, the AA typically includes the greater wetlands complex. Aerial imagery was used to evaluate intactness and evidence of human disturbance in buffers of 100 meters, 250 meters, and 500 meters beyond the AA.

The Land Use Index, which is essentially a Level 1 assessment, was calculated for each AA using a spatial analysis of the 2011 National Land Cover Database (Homer et al., 2015). The NLCD has 16 categories of land use that the EIA directs users to reclassify into four categories; developed, agriculture, cleared forest, and natural, which have assigned point values of 0, 4, 5, and 10, respectively. Following the land use reclassification, zonal statistics were calculated with ArcGIS based upon the NLCD land cover values within each buffer ring and weighting was applied to each buffer ring based on proximity to the assessment area (see Table 5) to generate a Land Use Index value from 0 to 10.

**Table 5. Buffer distances and weighting used in the EIA**

| Buffer Distance (meters) | Weighting |
|---|---|
| 0 - 100 | 0.6 |
| >100 - 250 | 0.25 |
| >250 - 500 | 0.15 |

An example of a sampled wetland with the reclassified NLCD land use, buffer rings and imagery is shown in Figure 5.

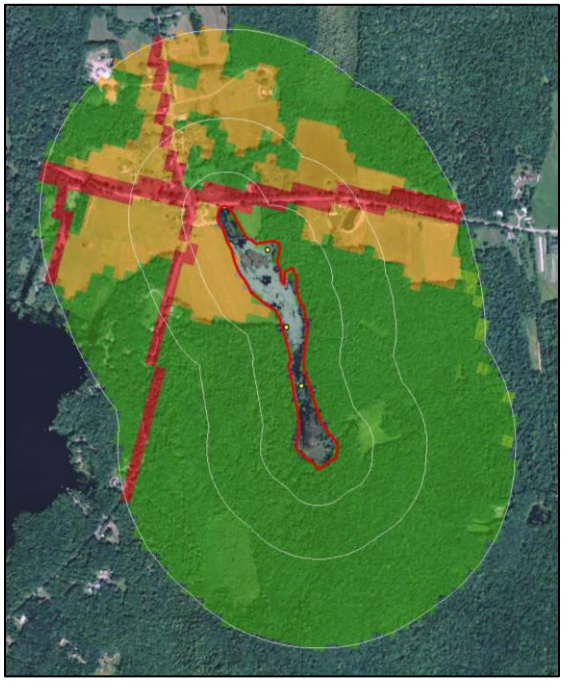


**Figure 5. Example of imagery and NLCD 2011 used with buffer rings to calculate the Land Use Index for EIA landscape context (ALS1). Buffer rings are 100 meters, 250 meters, and 500 meters beyond the assessment area outlined in red. NLCD land uses are red = developed, orange = agriculture, green = natural.**

The second part of the EIA landscape context uses a 10-meter buffer line around the assessment area to determine the proportion of wetland perimeter that is considered undisturbed land (called the "percent of perimeter having buffer"). The third part of the EIA landscape context evaluates the average buffer distance by placing eight radials or radiating lines or "spokes" extending out from the assessment area boundary for a distance of 100 meters (Figure 6). Along each relatively evenly distributed spoke, the distance away from the AA boundary until a disturbed area is reached was measured, up to a maximum distance of 100 meters. The lengths of the undisturbed distances for the eight spokes are summed and an "average buffer distance" is determined.

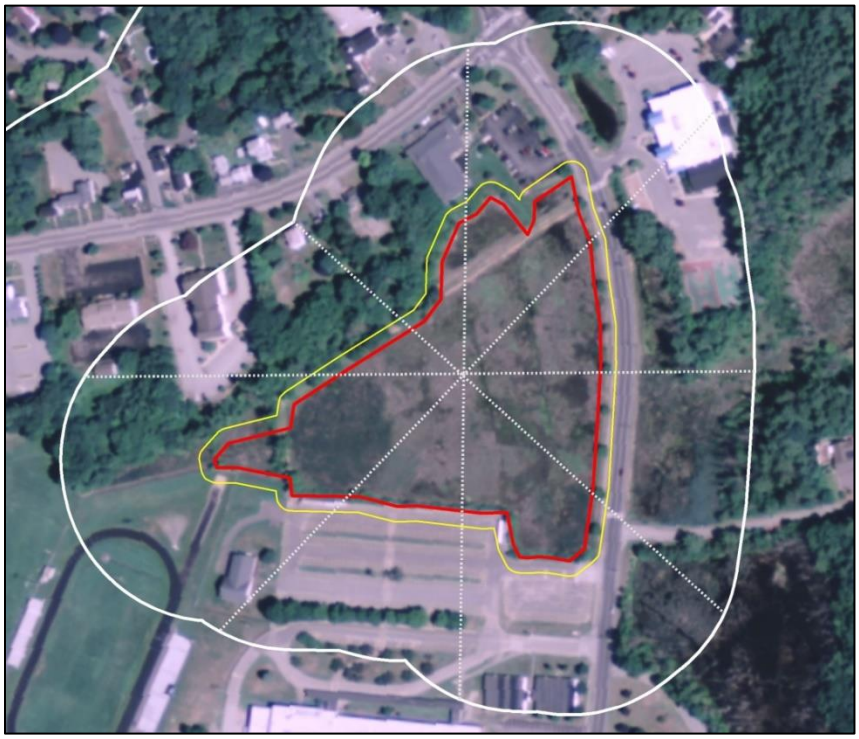


**Figure 6. Image of assessment area (outlined in red) with eight radiating spokes, 10-meter perimeter (yellow line) and 100-meter buffer (white line) to calculate Average Buffer Width for EIA Landscape Context (SAL2).**

**EIA - Assessment Area Size**

The EIA considers size by comparing the size of the wetland to a reference size of that wetland patch type (Faber-Langendoen and Nichols, 2014). For instance, a drainage marsh - shrub swamp is a medium to large patch community/system, where the following ranks for size would be assigned: A: >125 acres; B: 125–25 acres; C: 25 - 5 acres; D: <5 acres. This approach is based on NatureServe's methodology which integrates integrity and conservation values (Faber-Langendoen, 2012a). The larger the occurrence of a certain type of wetland, the greater the conservation value (when condition is equal).

Based on the NHB classification system, the open wetlands that were sampled were of multiple wetland and pond types, including drainage marsh - shrub swamp, medium level fen, peatland, oxbow pond, and eutrophic pond (Nichols, 2015b; 2015c). Because the focus of this study is on ecological integrity or condition rather than conservation value, wetland size was omitted from consideration in application of the EIA scoring. This is consistent with a more recent description of the EIA methodology, Faber-Langendoen et al. (2016) who state, "Size is not required for ecological integrity ratings."

#### 3.3.5.1.3 EIA - Vegetation

The EIA vegetation component focuses on the vegetation structure, invasive species and native plant species composition.

- **Structure -** Assesses the overall structural complexity of the vegetation layers and growth forms (vertical layers and horizontal patches) including woody regeneration; coarse woody debris, presence of multiple strata, age and structural complexity of canopy layer, and evidence of the effects of disease or mortality on structure. The metric notes that for non-forested wetlands, "marshes may naturally not have any woody vegetation or only scattered stunted individuals" (Faber-Langendoen and Nichols, 2014).
- **Invasive nonnative plant species cover -** Estimates the percent cover of invasive nonnative plant species. References the list of invasive species in the wetland system description (Nichols, 2015c) or from the Invasive Plant Atlas of New England (IPANE). (http://www.eddmaps.org/ipane/ipanespecies/ipanespecies.htm ).
- **Native plant species composition -** Assesses the overall native plant species composition and diversity, and evidence of species-specific diseases or mortality. Includes the identification of any native plant species that may be considered aggressive or weedy.

The EIA references the wetland system descriptions (Sperduto, 2011). At the start of this study, EIA rank specifications for wetland systems in New Hampshire were being developed, and became available for the drainage marsh - shrub swamp wetland systems early in 2015 (Nichols, 2015c). Most of the wetlands in the study were classified as drainage marsh - shrub-swamp systems (Table 15). See Appendix J for an example of the drainage marsh - shrub swamp EIA rank specifications.

**EIA - Hydrology**

The EIA hydrology component assesses three characteristics: the water source, hydroperiod, and connectivity.

- **Water source -** Nature of water inputs and diversion (quality focused; natural or anthropogenic sources).
- **Hydroperiod** - Assessment of the characteristic frequency and duration of inundation or saturation (quantity focused).
- **Hydrologic Connectivity -** Assessment of the ability of water to flow into or out of the wetland system, or to inundate adjacent areas, and if there is evidence of changes in pattern, erosion, inundation (due to obstructions or constrictions that affect movement of water).

**EIA - Soil condition** - Evidence of bare soil areas.

The EIA soil condition component assesses the extent and source of bare soil areas and to what extent they are caused by natural disturbance, such as game trails or sediment deposited by floods, or from

human disturbance rutting caused by off-road vehicles, livestock trampling, etc. Significant bare soil areas can contribute to increased erosion and may not be easily restored.

#### 3.3.5.1.4 Stressor Checklist

This EIA Stressor Checklist is used to inform completion of the *Field Metrics* part of the *Pre-Field and Field Metrics* form. The term "stressor" is defined as "the proximate (human) activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity and natural processes" (from Salafsky et al. 2008). The EIA restricts the focus to those stressors located within the 100-meter area that have caused or are causing impacts. For example, a stressor may be the presence of a road, mowing, or modifications to habitat. The term is synonymous with "stressors" as used by the USEPA (Young and Sanzone, 2002).

Stressors are characterized in terms of *scope* and *severity*. Scope is defined as the proportion of the wetland system or 100 meter zone adjacent to the system that can reasonably be expected to be affected by the stressor within 10 to 20 years. Descriptors range from small to pervasive. Severity reflects the potential for the stressor to degrade, reduce, or eliminate the occurrence, with descriptors ranging from slight to extreme. The threat impact calculated from scope and severity is determined using a matrix in the EIA manual. The threat impact informs metrics in the various categories (such as vegetation, hydrology, soils, etc.).

#### 3.3.5.1.5 Overall EIA scores, ranks and associated definitions

The Excel/VBA-based worksheet, developed by the NHB with embedded formulas that assign numerical values to letter ranks (Table 6), was used to calculate the rank categories.

**Table 6. Cutoff values for determining final EIA rank (A through D) from numeric scores assigned by Excel scoresheet.**

| Rank | Rank score | Upper limit |
|---|---|---|
| A | 4.00 | 4.17 |
| A- | 3.67 | 3.84 |
| B+ | 3.33 | 3.50 |
| B | 3.00 | 3.17 |
| B- | 2.67 | 2.84 |
| C+ | 2.33 | 2.50 |
| C | 2.00 | 2.17 |
| C- | 1.67 | 1.84 |
| D+ | 1.33 | 1.50 |

| | | |
|---|---|---|
| D | 1.00 | 1.17 |
| D- | 0.67 | 0.83 |

The final EIA condition category and narrative description for each rank is provided in Table 7.

**Table 7. EIA Ranks, condition category and narrative description (Faber-Langendoen and Nichols, 2014).**

| Rank | Condition Category | Description |
|---|---|---|
| A | Intact, excellent | Occurrence is believed to be, across the range of a type, among the highest quality examples with respect to key ecological attributes functioning within the bounds of natural disturbance regimes. Characteristics include: the landscape context contains natural habitats that are essentially unfragmented (reflective of intact ecological processes) and with little to no stressors; the size is very large or much larger than the minimum dynamic area; vegetation structure and composition, soil status, and hydrological function are well within natural ranges of variation, exotics (nonnatives) are essentially absent or have negligible negative impact; and, a comprehensive set of key plant and animal indicators are present. |
| B | minimally disturbed, good | Occurrence is not among the highest quality examples, but nevertheless exhibits favorable characteristics with respect to key ecological attributes functioning within the bounds of natural disturbance regimes. Characteristics include: the landscape context contains largely natural habitats that are minimally fragmented with few stressors; the size is large or above the minimum dynamic area, the vegetation structure and composition, soils, and hydrology are functioning within natural ranges of variation; invasives and exotics (nonnatives) are present in only minor amounts, or have or minor negative impact; and many key plant and animal indicators are present. |
| C | moderately disturbed, fair | Occurrence has a number of unfavorable characteristics with respect to the key ecological attributes, natural disturbance regimes. Characteristics include: the landscape context contains natural habitat that is moderately fragmented, with several stressors; the size is small or below, but near the minimum dynamic area; the vegetation structure and composition, soils, and hydrology are altered somewhat outside their natural range of variation; invasives and exotics (nonnatives) may be a sizeable minority of the species abundance, or have moderately negative impacts; and many key plant and animal indicators are absent. Some management is needed to maintain or restore these key ecological attributes. |
| D | severely disturbed, poor | Occurrence has severely altered characteristics (but still meets minimum criteria for the type), with respect to the key ecological attributes. Characteristics include: the landscape context contains little natural habitat and is very fragmented; size is very small or well below the minimum dynamic area; the vegetation structure and composition, soils, and hydrology are severely altered well beyond their natural range of variation; invasives or exotics (nonnatives) exert a strong negative impact, and most, if not all, key plant and animal indicators are absent. There may be little long-term conservation value without restoration, and such restoration may be difficult or uncertain. |

#### *3.3.5.2 MDEP Wetland Human Disturbance Assessment*

For each wetland, current aerial imagery was reviewed to identify evidence of disturbances not visible from within the wetland, within a 100-foot buffer distance, and within the watershed of the wetland (typically 2010/2011 leaf-off or 2011 National Agricultural Imagery Program [NAIP]).

For most of the wetlands, the watersheds were determined using the USGS online tool, called Stream Stats for New Hampshire (StreamStats), with manual modifications made in ArcGIS to the downloaded polygons as needed to represent existing conditions. Additional resources, such as Lidar data or permit application information, were used as needed to accurately define some watersheds.

Additionally other desktop information (e.g., presence of a dam, National Pollutant Discharge Elimination System (NPDES) discharge in the watershed) was reviewed using GIS and additional follow-up data (such as details of dam operation to determine its effect on wetland hydrology) as needed. For at least a few wetlands (CON1, MAN2, NAS2), additional information was obtained from local municipalities to further inform the drainage area delineation because of the likelihood that the watershed calculated by StreamStats did not reflect altered drainage of more developed areas. Each wetland's watershed was evaluated in terms of any land uses (such as roads) or structures that may modify drainage and thus the watershed boundary or size.

Information to complete the WHDA also was noted during site reconnaissance (such as an active gravel mining operation in watershed). Upon completion of field sampling (water, macroinvertebrate, vegetation), the field portion of the WHDA was conducted. Observations of stressors are documented in the following categories: Hydrologic and vegetative modifications to the wetland, evidence of chemical pollutants in the wetland and adjacent/upstream sources that may potentially impact the wetland, and watershed characterization and potential nonpoint source pollution impacts based on evidence of erosion and sedimentation, urban runoff, nutrient enrichment, etc. in the wetland's watershed.

### 3.3.6 Modifications of MDEP protocols

Some of MDEP's non-macroinvertebrate protocols were omitted due to cost and because they were beyond the scope of the grant and did not affect the application of the MDEP predictive model. Examples such as sampling and analysis for algae and diatoms, and related lab analyses such as such as silica, and silicon, and chlorophyll *a* - corrected for pheophytin (J. DiFranco, personal communication, May 28, 2013).

### 3.3.7 Decontamination

Standard Operating Protocols (SOPs) were developed and followed for decontamination of biomonitoring sampling equipment (including waders and canoe) to prevent the introduction or spread of disease pathogens and invasive algal, plant, or animal species (NHDES, 2014).

## 3.4 Quality Assurance

A Quality Assurance Project Plan (QAPP) was prepared, approved by the USEPA on July 21, 2014 (NHDES, 2014) and implemented. The QAPP specified field meter calibration and accuracy checks, quality assurance (QA) samples for 10% of the site water samples, multiple field samples (three per site) for macroinvertebrates, and macroinvertebrate processing and taxonomy conducted by a contractor with Society for Freshwater Science certifications. Additional reviews of plant specimen identifications were provided by the New Hampshire state botanist, Bill Nichols of the Natural Heritage Bureau (NHB).

## 3.5 Data Analysis

This project involved the preparation of our sampling data and provision to MDEP biomonitoring staff to run the predictive model on the New Hampshire macroinvertebrate data. An overview of the steps in the process for collecting data, then preparing and submitting it for entry into MDEP's database for analysis with the predictive model are provided in Table 8.

**Table 8. Process and general timeline of sampling, data processing and exchange**

| Month | Task |
|---|---|
| June-July | NHDES identifies wetlands to sample. |
| Late June-August 15 | NHDES conducts sampling, preserves macroinvertebrate samples, and submits water samples to NH lab for analysis. |
| October | NHDES obtains the current Pre-EDD (electronic data deliverable) form from MDEP (Appendix K). NHDES completes Pre-EDD forms with site info, field meter measurements, plant data (from bioassessment form), and geographic coordinates for all sampled wetlands and submits completed forms to MDEP. |
| October-November | NHDES provides macroinvertebrate samples to taxonomic contractor for sorting, identification and enumeration. |
| January | NHDES obtains current EDD template form from MDEP and provides to taxonomic contractor to enter macroinvertebrate data (Appendix L). |
| March | Taxonomic contractor adds identification and enumeration data to EDD forms and submits to NHDES. |
| April | NHDES reviews taxonomic data, ensures additional site data have been added, and submits completed EDD forms to MDEP. |
| April-May | MDEP reviews and runs NH data through the MDEP provisional wetlands model. |
| May | MDEP provides Wetland Aquatic Life Classification Attainment Reports to NHDES. |

**Statistical Analyses**

Descriptive statistics were calculated (for mean, median, 25th and 75th percentiles) for parameters grouped by predicted attainment class or indeterminate status to prepare box and whisker plots.

We ran a one-way analysis of variance (ANOVA) on the water quality, macroinvertebrate, vegetation and rapid assessment parameters grouped by the predicted attainment classes and measured parameters for significance at $p<0.05$. The null hypothesis for the one-way ANOVA is that the means of the measurement variable are the same for the different categories of data; the alternate hypothesis is that they are not all the same. For those ANOVA results that were significant, we conducted post hoc analyses with Bonferroni's method to determine significance between pairs. "The Bonferroni method is a simple method that allows many comparison statements to be made (or confidence intervals to be constructed) while still assuring an overall confidence coefficient is maintained." The method applies to an ANOVA situation when a particular set of pairwise comparisons has been identified (NIST/ SEMATECH,2013).

Since the one-way ANOVA assumes normality and variation within the groups is equal. However, because of the relatively small sample sizes ($n<5$ in most cases) we could not be certain that this was the case.

We therefore also considered using the non-parametric, Kruskal-Wallis test, which does not assume normality. The null hypothesis for the Kruskal-Wallis test is that the mean ranks of the groups are the same, which is different from the null hypothesis of the one-way ANOVA. However, according to McDonald (2014), the one-way ANOVA is not very sensitive to deviations from normality, and for this reason, the Kruskal-Wallis test is *not* recommended as an alternative to the one-way ANOVA (McDonald, 2014). Further, because the Kruskal-Wallis test is performed on ranks instead of the actual values, it can be a somewhat less powerful test that the one-way ANOVA. For these reasons, the Kruskal-Wallis test was not used to analyze the data for this study.

We calculated the Spearman rank correlation between two variables for the rapid assessment methods and floristic quality metrics, mean C, adjusted FQI, nonnative species, with components of rapid assessments and FQA indices. For the EIA, in addition to the final ranks/scores, we examined components of the EIA, buffer width, and land use index with floristic metrics, mean C, nonnative species, and adjusted FQI. For the WHDA, in addition to the final scores, we compared WHDA to mean C, adjusted FQI and nonnative species. Linear regressions were calculated for chloride and specific conductance, chloride and land use, and EIA and WHDA

**Nonmetric Multidimensional Scaling Ordination**

To explore potential differences in macroinvertebrate community composition between Maine and New Hampshire wetlands, we performed ordination with nonmetric multidimensional scaling (NMDS).

Ordination analysis was conducted with PC-Ord v.6.08 to compare macroinvertebrate communities found at New Hampshire sampled wetlands with a subset of 30 Maine wetlands sampled between 2001 and 2015, representing the three ecoregions of Maine (Northeastern Coastal Zone=10, Northeastern Highlands = 9, and Acadian Plains and Hills =11) and all predicted attainment classes as well as indeterminate status (A=8; B= 7; C= 7; I=8) (Table 9). Seven Maine sites were considered reference (A=3, B=1, I=3) (DiFranco, personal communication, November 14, 2017).

**Table 9. Maine wetland used for comparison in NMDS analysis.**

| Maine site ID - year sampled | Attainment class | Ecoregion | Reference† |
|---|---|---|---|
| W049-10 | A | Coastal zone | N |
| W070-02 | A* | Acadian Plains | N |
| W109-08 | A | Highlands | N |
| W211-09 | A | Highlands | N |
| W225-10 | A | Highlands | Y |
| W235-11 | A | Acadian Plains | N |
| W048-05 | A | Highlands | Y |
| W149-11 | A | Acadian Plains | Y |
| W056-01 | B | Highlands | N |
| W219-10 | B | Coastal zone | N |
| W221-10 | B | Coastal zone | N |
| W035-10 | B | Highlands | N |
| W044-01 | B | Coastal zone | Y |
| W209-09 | B | Acadian Plains | N |
| W262-15 | B | Coastal zone | N |
| W053-10 | C | Coastal zone | N |
| W102-13 | C | Acadian Plains | N |
| W141-11 | C | Acadian Plains | N |
| W220-10 | C | Coastal zone | N |
| W230-11 | C | Acadian Plains | N |
| W043-05 | C | Coastal zone | N |
| W050-01 | C | Coastal zone | N |
| W057-01 | I | Highlands | N |
| W146-11 | I | Acadian Plains | N |
| W148-06 | I | Acadian Plains | N |
| W087-02 | I | Highlands | Y |
| W094-03 | I | Acadian Plains | N |
| W108-03 | I | Highlands | Y |
| W112-13 | I | Highlands | Y |
| W138-11 | I | Acadian Plains | N |

* Model generated attainment class was I, but based on the sensitive taxa present, in the review process the site was assigned an A.
† Reference is defined as 1) watershed land use 95% or greater of forest or wetland, and 2) total MDEP Wetland Human Disturbance Assessment score of 10 or less, with no single category above 5, and 3) specific conductance <100 µS.(DiFranco, personal communication, November 14, 2017).

Prior to the initial ordination analysis, taxa detected in fewer than five wetlands were excluded from the dataset. Taxa were converted from relative abundance (percent) to present/absent. Criterion for presence was that the species had to comprise ≥5% of the relative abundance at a site.

A second analysis (in R) was run on all taxa. Additionally, an indicator species analysis was run to examine genus abundance and frequency (T. Danielson, personal communication, April 19, 2018).

# 4 Results

The MDEP predictive model assigned the attainment classes of A (4), B (5), and C (5) to 14 sampled wetland. There were 10 wetlands for which attainment classes could not be assigned. For the 10 indeterminate wetlands, the thresholds for abundance (50 minimum per replicate) or generic richness (15 genera for a wetland's three replicates) were not met. A map with the locations of sampled wetlands and the predicted attainment classes or indeterminate status is provided (Figure 7). Wetland Aquatic Life Classification Attainment Reports for all 24 wetlands are provided in Appendix M (M-1 to M-24).

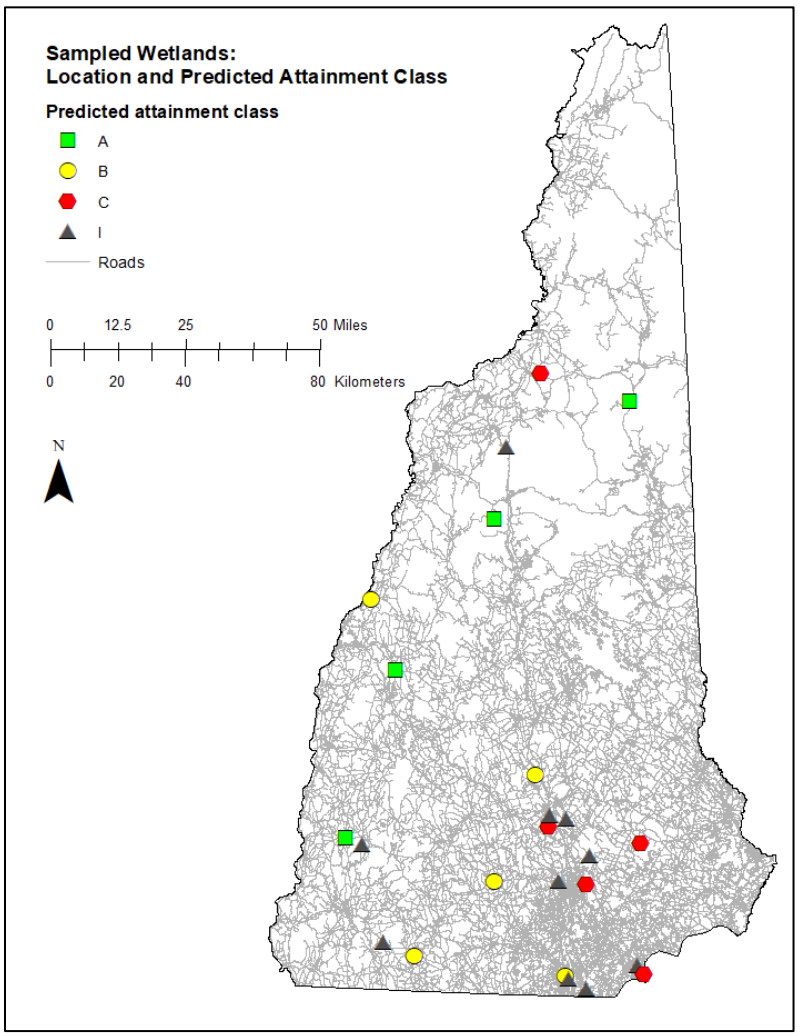



**Figure 7. Map of sampled wetlands showing predicted attainment classes or indeterminate status.**

Figure 8 plots the generic richness (y axis) and total mean abundance (x axis) counts for the 24 wetlands.

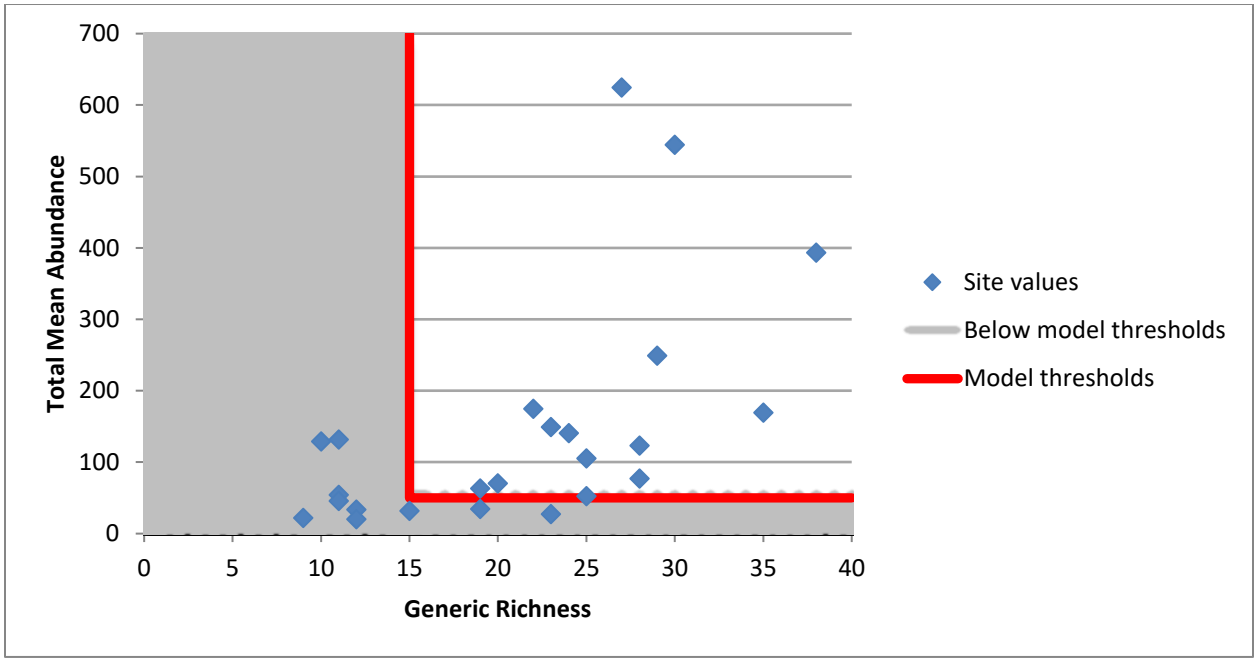



**Figure 8. Chart showing the generic richness and total abundance counts for the wetlands. The red vertical and horizontal lines illustrate the thresholds for minimum values for the MDEP predictive model to generate an attainment class (50 minimum abundance, 15 minimum genera).**

The predicted attainment class or indeterminate status, score and rank for the rapid assessment methods, the EIA-Land Use Index, and FQA mean C score for each sampled wetland, are shown in Table 10. The "Wetland Aquatic Life Classification Attainment Reports" produced by the MDEP for each wetland are provided in Appendix M (M1-M24).

**Table 10. Scores and ranks for assessment methods for each sampled wetland.**

| Wetland station ID | MDEP Protocols | | EIA | | FQA total mean C |
|---|---|---|---|---|---|
| | Predicted attainment class/ Indeterminate | WHDA | Rank | Land Use Index | |
| WOO1 | A | 2 | A | 10 | 4.8 |
| GRG1 | A | 3 | A - | 8.2 | 4.0 |
| ALS1 | A | 11 | B+ | 8.0 | 3.4 |
| ENF1 | A | 12 | B+ | 8.4 | 4.4 |
| NWB1 | B | 11 | B+ | 8.5 | 3.9 |
| CNT1 | B | 13 | B | 7.8 | 4.0 |
| JAF1 | B | 18 | B - | 4.5 | 3.8 |
| NAS2 | B | 24 | C+ | 5.3 | 3.6 |
| HNV1 | B | 26 | B - | 7.2 | 3.3 |
| DEE1 | C | 3 | A | 9.6 | 4.3 |
| SAL1 | C | 14 | B - | 3.5 | 4.1 |
| BOW1 | C | 22 | B | 8.3 | 4.1 |
| MAN1 | Cs | 25 | C+ | 5.8 | 3.7 |
| WHI1 | C | 21 | B | 8.4 | 3.9 |
| MLW1 | I | 3 | A | 9.6 | 4.3 |
| HKS1 | I | 6 | B+ | 8.4 | 4.7 |
| PEM1 | I | 8 | B | 8.7 | 3.7 |
| TRO1 | I | 8 | B+ | 8.9 | 4.6 |
| HUD1 | I | 13 | B+ | 7.2 | 4.3 |
| MAN2 | Is | 21 | C | 2.3 | 3.7 |
| FRN1 | I | 23 | C+ | 4.5 | 4.9 |
| NAS1 | Is | 27 | C+ | 0.8 | 3.7 |
| CON1 | Is | 34 | C | 2.5 | 3.2 |
| SAL2 | Is | 37 | C - | 1.1 | 3.1 |
| Note: Qualifier "s" refers to those samples that were subsampled due to the collection of excessive organic material. | | | | | |

A table summarizing the results of the one-way ANOVA and Bonferroni analyses is provided in Appendix N.

## 4.1 Assessment Area

The sampled wetlands represent several wetland system types, drainage marsh - shrub swamp, medium level fen wetland systems, and peatland; and two pond types, eutrophic and oxbow ponds (Sperduto,2011; Nichols, 2015). The assessment areas for our sampled wetlands included one or more of the following Cowardin classes of wetlands:

- Palustrine system: emergent, aquatic bed and forested.
- Lacustrine system: aquatic bed.

The assessment areas ranged in size from 0.22 acre (a small pond with limited wetlands) to more than 330 acres (wetland complex with an open water area of 39 acres). Open water accounted for the

majority of the areal extent of some wetlands while other wetlands had a very small proportion of open water compared to forested, scrub-shrub, or emergent communities in the wetland complex.

Our assessment area boundaries were based on the NWI polygons for the wetland complex that includes the open water area with the sampling locations. Where the wetland complex was very large and dissected by roads, existing breaks (such as a road or dam) were used to define the extent of the AA. Field assessment was generally limited to the open water and shoreline areas near macroinvertebrate sampling locations. The entire AAs were used in the level 1 analysis associated with the rapid assessment methods (EIA buffers, EIA land use index, and WHDA buffers) but were not field surveyed in their entirety.

The AA size by predicted attainment class or indeterminate status is displayed in the whisker and box plot (Figure 9). For this and other whisker and box plots by attainment class: A, n=4; B, n= 5; C, n=5; and for indeterminate status, I, n=10.

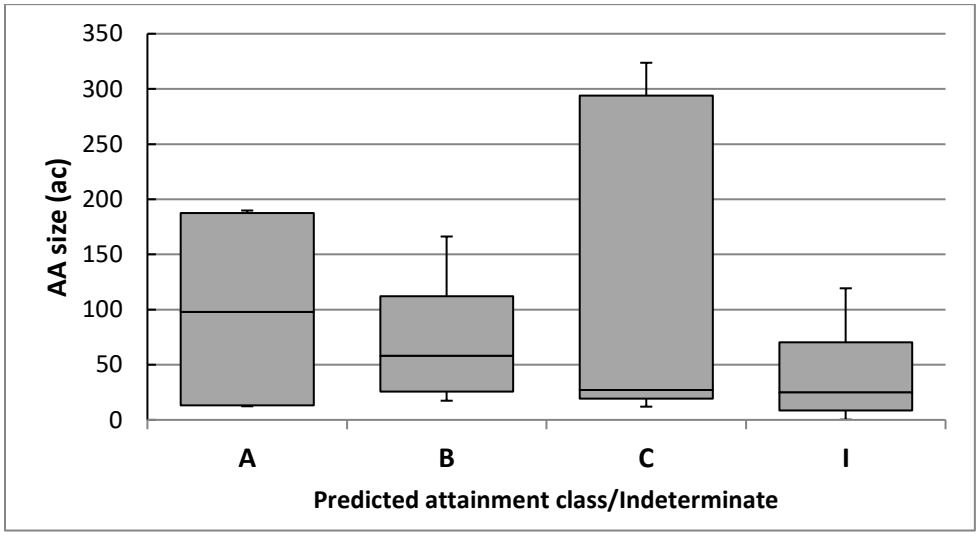



**Figure 9. Assessment area size by attainment class or indeterminate statu**s.

A one-way ANOVA showed that there were no significant differences in assessment area size between the predicted attainment classes, *p* =0.667.

## 4.2 Water

To characterize the wetlands, the range, median, and count are reported in Table 11.

**Table 11. Water parameters measured and the range of results for all wetlands.**

| Parameter | count | median | range | unit | reporting detection limit |
|---|---|---|---|---|---|
| **Field measurements** | **3/wetland** | | | | |
| pH | 72 | 5.89 | 4.32 - 9.81 | - | |
| Dissolved oxygen (DO) | 72 | 4.43 | 0.04 – 18.9 | mg/L | |
| Temperature | 72 | 23.3 | 16.3 - 29.1 | C | |
| Specific conductance | 71 | 138.1 | 11.7 - 1,688 | µS/cm | |
| Turbidity | 72 | 1.1 | 0.27 - 25.1 | NTU | |
| **Grab sample** | **1/wetland** | | | | |
| Alkalinity (gran acid neutralizing capacity) | 24 | 11.85 | 1.1 - 76.7 | mg/L | 1.0 |
| Dissolved organic carbon (DOC) | 24 | 6.4 | 1.6 - 17 | mg/L | 0.5 |
| Chloride | 23 | 15.0 | <3 - 430 | mg/L | 3.0 |
| $NO_2$-$NO_3$ | 24 | <0.05 | <0.05 - 0.51 | mg/L | 0.05 |
| Total Kjeldahl Nitrogen (TKN) | 24 | 0.65 | <0.25 - 1.8 | mg/L | 0.25 |
| Phosphorus (total) | 24 | 19.35 | <5 - 289.0 | µg/l | 5 |
| Ortho-phosphorus (dissolved) | 22 | <0.01 | <0.01 - 0.034 | mg/L | 0.01 |
| Chlorophyll-a | 23 | 3.25 | 0.69 - 219.77 | µg/L | 0.2 |

[1] Values less than 72 (for field measurements) or 24 (for water grab sample analyses) are a result of lab or field error or unknown error where the data were determined to be invalid.
[2] Three wetlands had detects for $NO_2$-$NO_3$
[3] Five wetlands had detects for dissolved orthophosphorus

Sampling water with field meters at three locations in the wetland revealed within-wetland variability (Table 12). The three in-situ measurements in wetlands with contiguous open areas of water, such as ponds or larger flowing waters (ENF1, JAF1, WOO1), showed less variation than measurements taken in wetlands where there was little to no contiguous open water between measurement locations (FRN1, MAN1, SAL2). The variation in several parameters, including specific conductance, dissolved oxygen, and pH, was likely due to microhabitats that may have different amounts of interaction with groundwater, soils, atmospheric oxygen, exposure to sunlight, or biological resources such as submergent plants or benthic algae.

**Table 12. Range of field meter values for water by wetland**

| Wetland ID | Year sampled | Range of field meter values at each wetland | | | |
|---|---|---|---|---|---|
| | | pH | DO (mg/L) | SpC (uS/cm) | Turbidity (NTU) |
| ALS1 | 2014 | 5.27 - 6.04 | 0.98 - 3.92 | 35.6 - 58.7 | 0.64 - 1.70 |
| BOW1 | 2015 | 5.90 - 6.09 | 5.70 - 7.90 | 214.6 - 220.7 | 0.69 - 1.04 |
| CNT1 | 2015 | 5.90 - 6.22 | 3.23 - 6.20 | 240.1 - 335.4 | 1.46 - 3.24 |
| CON1 | 2015 | 4.32 - 5.89 | 0.04 - 1.36 | 780 - 816 | 1.04 - 2.42 |
| DEE1 | 2015 | 5.61 - 5.74 | 0.23 - 2.87 | 19.9 - 64.7 | 0.62 - 25.1 |
| ENF1 | 2014 | 6.24 - 6.60 | 6.30 - 7.18 | 60.8 - 64.0 | 0.35 - 0.44 |
| FRN1 | 2015 | 5.55 - 6.16 | 4.45 - 11.2 | 159.6 - 583.0 | 0.31 - 0.91 |
| GRG1 | 2014 | 5.20 - 5.84 | 4.66 - 8.87 | 21.3 - 43.40 | 0.66 - 2.42 |
| HKS1 | 2015 | 4.33 - 4.85 | 4.27 - 4.32 | 32.9 - 39.2 | 0.27 - 0.59 |
| HNV1 | 2015 | 8.62 - 9.81 | 11.94 - 18.9 | 138.1 - 167.9 | 1.34 - 2.65 |
| HUD1 | 2015 | 5.59 - 5.84 | 1.12 - 3.81 | 112.6 - 145.2 | 0.59 - 1.38 |
| JAF1 | 2015 | 5.66 - 5.78 | 3.95 - 4.41 | 101.4 - 102.1 | 0.77 - 0.96 |
| MAN1 | 2015 | 5.92 - 6.37 | 1.52 - 3.37 | 382.5 - 523 | 2.66 - 8.00 |
| MAN2 | 2015 | 5.74 - 5.85 | 3.15 - 5.31 | 520 - 539 | 1.21 - 2.93 |
| MLW1 | 2014 | 5.50 - 5.61 | 7.11 - 8.32 | 11.7 - 13.4 | 0.79 - 1.28 |
| NAS1 | 2015 | 6.67 - 6.98 | 6.00 - 7.82 | 403.4 - 407.9 | 3.53 - 4.31 |
| NAS2 | 2015 | 6.54 - 7.38 | 9.51 - 10.33 | 555 - 624 | 0.77 - 1.83 |
| NWB1 | 2014 | 5.75 - 6.01 | 2.32 - 3.73 | 77.6 - 85.1 | 0.51 - 1.14 |
| PEM1 | 2015 | 5.98 - 6.00 | 3.79 - 4.30 | 193.7 - 195.6 | 0.86 - 1.77 |
| SAL1 | 2015 | 6.54 - 6.99 | 5.38 - 6.75 | 380.5 - 409.2 | 0.51 - 0.99 |
| SAL2 | 2015 | 5.74 - 6.02 | 0.03 - 0.19 | 557 - 1688 | 10.39 - 23.6 |
| TRO1 | 2015 | 5.14 - 5.51 | 1.86 - 4.10 | 25.6 - 47.8 | 0.65 - 1.73 |
| WHI1 | 2014 | 5.98 - 6.00 | 4.88 - 6.12 | 51.1 - 72.4 | 1.67 - 3.00 |
| WOO1 | 2015 | 4.22 - 4.54 | 5.27 - 6.84 | 12.2 - 15.8 | 0.46 - 0.97 |

The results of the lab analysis of the water grab sample from each wetland is provided in Table 13.

**Table 13. Results of water grab sample analyses by wetland**

| Site ID | Organic carbon, dissolved (mg/L) | NO2 + NO3 (mg/L) | Total Kjeldahl nitrogen (mg/L) | Ortho-phosphorus, dissolved (mg/L) | Total phosphorus (µg/L) | Gran acid neutralizing capacity (mg/L) | Chlorophyll-*a*, uncorrected (µg/L) | Chloride (mg/L) |
|---|---|---|---|---|---|---|---|---|
| ALS1 | 9.2 | < 0.05 | 0.65 | <0.01 | 35.6 | 9.7 | 8.8 | 11 |
| BOW1 | 6.2 | < 0.05 | 0.98 | <0.01 | 21.1 | 7.5 | 7.5 | 55 |
| CNT1 | 6.4 | < 0.05 | 0.89 | <0.01 | 26.4 | 15.7 | 2.9 | 53 |
| CON1 | 6.7 | < 0.05 | 1.30 | <0.01 | 45.3 | 31.2 | 33.5 | 240 |
| DEE1 | 7.1 | < 0.05 | 0.65 | <0.01 | 16.7 | 15.6 | 3.2 | 3.0 |
| ENF1 | 11 | < 0.05 | 0.36 | <0.01 | 9.34 | 11.7 | 1.5 | 6.9 |
| FRN1 | 1.6 | 0.51 | 0.25 | ----- | < 5.0 | 12 | 1.0 | 29 |
| GRG1 | 3.8 | < 0.05 | < 0.25 | <0.01 | 14.5 | 4.8 | 1.6 | 7.4 |
| HKS1 | 9.1 | < 0.05 | 0.97 | <0.01 | 18.5 | 1.4 | 3.3 | 4.2 |
| HNV1 | 4 | < 0.05 | 0.58 | ----- | 14.2 | 45.5 | 2.6 | 15.0 |
| HUD1 | 9.4 | < 0.05 | 1.20 | <0.01 | 20.2 | 14.5 | ---- | ---- |
| JAF1 | 6 | < 0.05 | 0.88 | <0.01 | 14.2 | 5.4 | 0.7 | 25 |
| MAN1 | 5.4 | 0.095 | 1.20 | 0.034 | 196.0 | 76.7 | 15.3 | 85 |

| Site ID | Organic carbon, dissolved (mg/L) | NO2 + NO3 (mg/L) | Total Kjeldahl nitrogen (mg/L) | Ortho-phosphorus, dissolved (mg/L) | Total phosphorus (µg/L) | Gran acid neutralizing capacity (mg/L) | Chlorophyll-*a*, uncorrected (µg/L) | Chloride (mg/L) |
|---|---|---|---|---|---|---|---|---|
| MAN2 | 4.3 | < 0.05 | 0.53 | <0.01 | 17.8 | 6.7 | 6.7 | 170 |
| MLW1 | 8.1 | < 0.05 | 0.44 | <0.01 | 22.3 | 1.1 | 3.4 | < 3 |
| NAS1 | 5 | 0.2 | 0.75 | <0.01 | 35.9 | 39.2 | 2.0 | 90 |
| NAS2 | 2.5 | < 0.05 | 0.62 | <0.01 | 16.2 | 35.2 | 8.9 | 130 |
| NWB1 | 6.3 | < 0.05 | 0.33 | <0.01 | 14.3 | 6.2 | 2.2 | 14 |
| PEM1 | 4.6 | < 0.05 | 0.46 | <0.01 | 23.0 | 14.1 | 8.6 | 44 |
| SAL1 | 17 | < 0.05 | 1.80 | 0.014 | 32.0 | 28.4 | 10.5 | 88 |
| SAL2 | 8.2 | < 0.05 | 3.20 | <0.01 | 289.0 | 24.3 | 219.8 | 430 |
| TRO1 | 6.4 | < 0.05 | 0.47 | 0.017 | 21.5 | 5.2 | 3.2 | 7 |
| WHI1 | 11 | < 0.05 | 0.46 | <0.01 | 20.7 | 9.6 | 4.1 | 10 |
| WOO1 | 9.8 | < 0.05 | 0.84 | <0.01 | 12.4 | 2.2 | 2.8 | < 3 |
| --- = Data were determined to be invalid due to lab or unknown error. | | | | | | | | |

Boxplots showing the medians, quartiles and spread of the values related to data tables 11 and 12 are provided below in Figures 10 -13 and 15 - 19. The analysis of the attainment class data was limited by the small number of wetlands for which a predicted attainment class was generated (14) and thus the observations in each predicted attainment class and indeterminate status (A, n=4; B, n=5; C, n=5; and I, n=10).

**pH and alkalinity**

The pH of surface water is affected by a variety of biogeochemical characteristics and processes. The source(s) of water–ground water, surface water, or precipitation–will affect the pH of the wetland. Photosynthesis will raise pH as carbon dioxide is consumed during daylight periods, such as when sampling was conducted. Some vegetation, such as the bryophyte *Sphagnum*, will lower pH as it pumps hydrogen ions into its environment (Mitsch and Gosselink, 2015). Most of the sampled wetlands had pH values in the acidic range; with a median pH of 5.89. The medians by attainment class and indeterminate status are: A: 5.48, B: 6.01, C: 6.03, I: 5.79 (Figure 10).

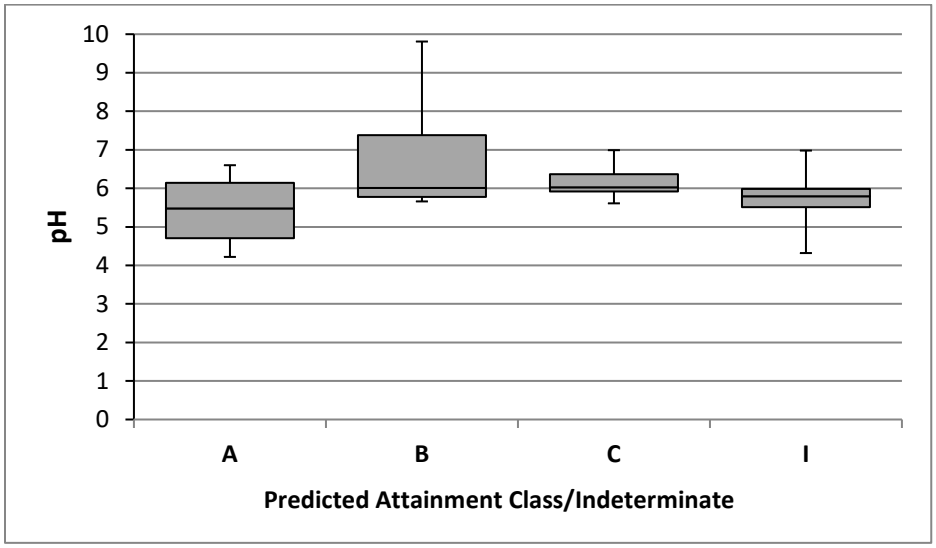



**Figure 10. pH by attainment class or indeterminate status.**

A one-way ANOVA detected significant differences in pH between predicted attainment classes A and B, *p*=0.004. A Bonferroni post hoc analysis showed that there was a significant difference between predicted attainment classes A and B, *p*=0.003.

The median values for alkalinity by attainment class and indeterminate status are: A,7.25 mg/L; B, 15.7 mg/L; C, 15.6 mg/L; I, 13.05 mg/L. The median of all samples was 11.85 mg/L (Figure 11).

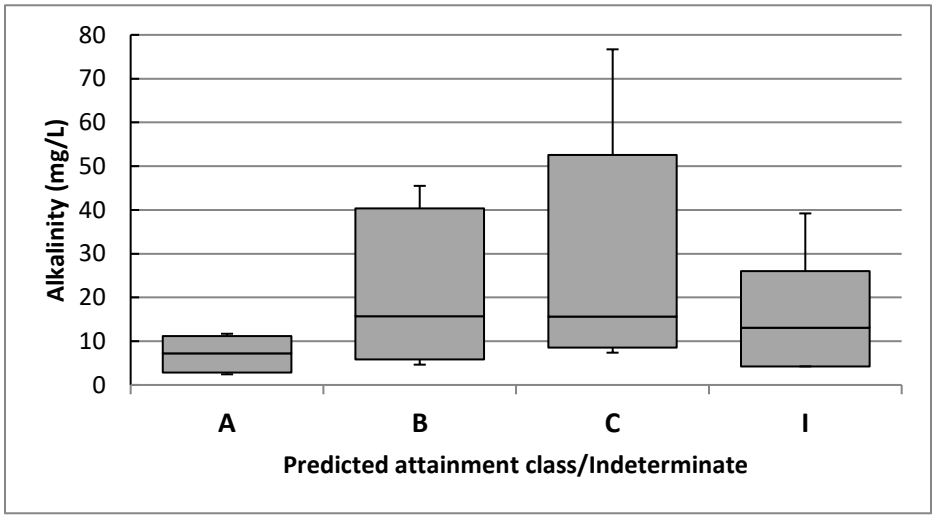



**Figure 11. Alkalinity by attainment class or indeterminate status.**

A one-way ANOVA detected no significant difference in alkalinity between the predicted attainment classes, *p*=0.354.

**Specific Conductance**

Specific conductance is a measure of the ability of an aqueous solution to conduct an electric current and is customarily reported in microSiemens per centimeter (µS/cm) or micromhos per centimeter

(µmhos/cm) at 25°C. It correlates with the sum of dissolved major-ion concentrations in water and often with a single dissolved ion concentration (USGS,1988). For the sampled wetlands, it appears that this single dissolved ion was often chloride. See additional discussion below and Figure 14.

The range of specific conductance was measured at 12.8 to 1,569 uS/cm, with a median of 138.1 uS/cm. The range in values reflects the large range of anthropogenic impacts associated with the wetlands. Figure 12 illustrates the low values and narrow range in specific conductance for wetlands that received a predicted attainment class of A (median 39 uS/cm). Median values of specific conductance for the other predicted attainment classes or indeterminate status ranged from 167 uS/cm (attainment class B) to 215 uS/cm (attainment class C).

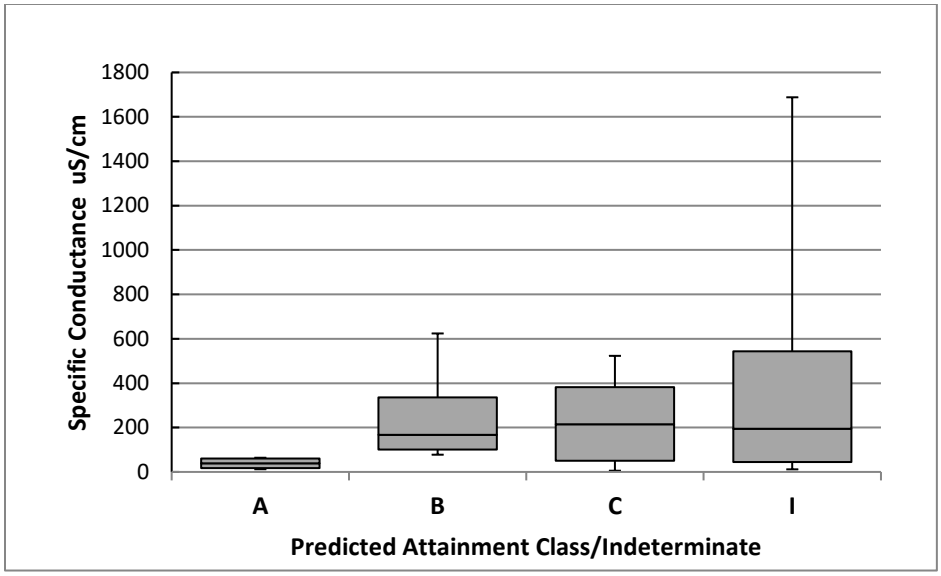



**Figure 12. Specific conductance by predicted attainment class or indeterminate status.**

A one-way ANOVA showed that there were significant differences in specific conductance between the predicted attainment classes, $p$ =0.0038. A Bonferroni post hoc analysis showed significant differences between predicted attainment classes A and B, $p$ = 0.0052, and between A and C, $p$=0.018.

**Chloride**

Chloride is the parameter that, in general, most closely correlates with the range of human disturbance (CWP, 2003). The median of all samples was 25.0 and the medians by attainment class or indeterminate status are: A, 7.15 mg/L; B, 15 mg/L; C, 55 mg/L; I, 44 mg/L.

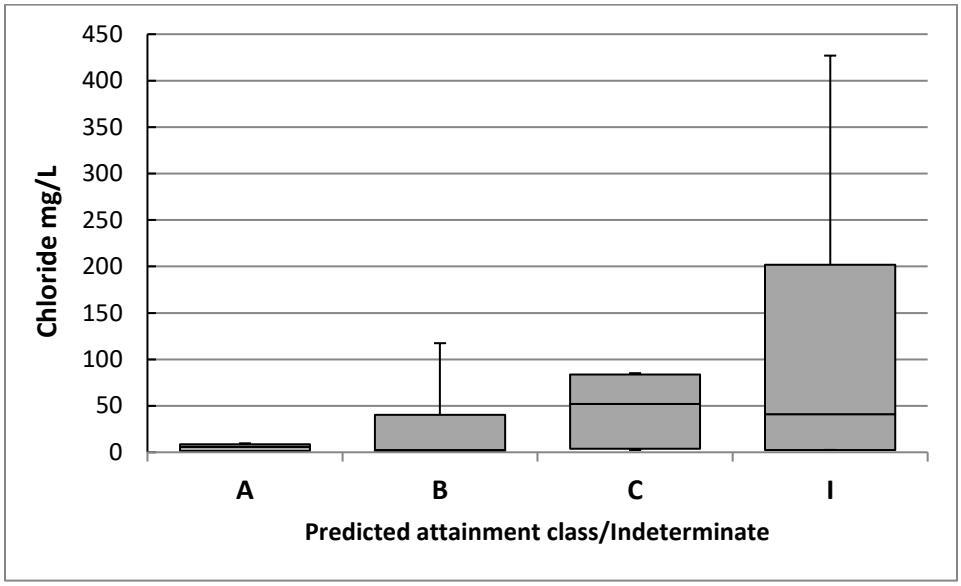



**Figure 13. Chloride by predicted attainment class and indeterminate status.**

A one-way ANOVA detected no significant difference in chloride between the predicted attainment classes, *p*=0.24.

Figure 14 illustrates the very strong correlation between specific conductance and chloride for the sampled wetlands ($R^2$=0.9732).

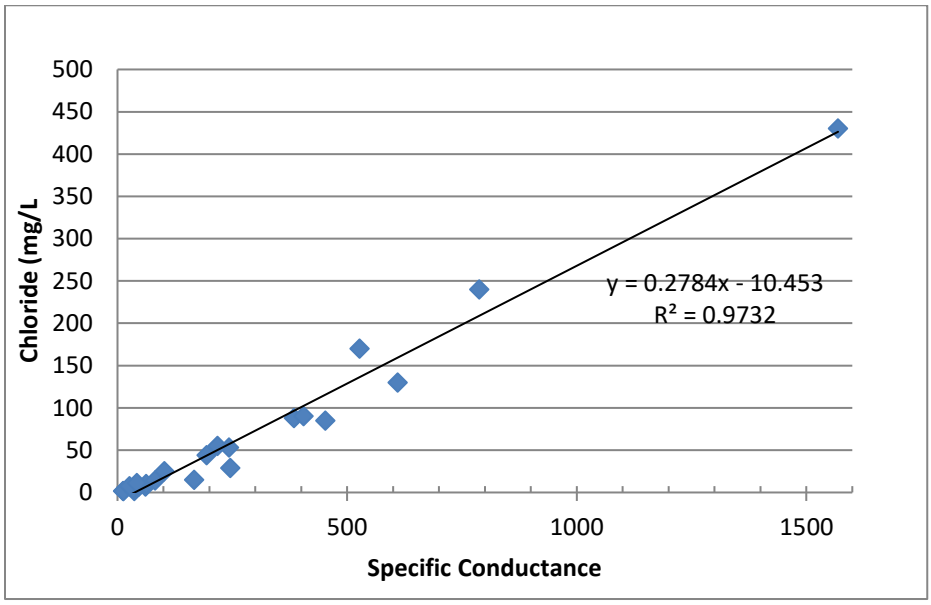



**Figure 14. Correlation of specific conductance and chloride.**

### Dissolved Oxygen

Water bodies, including open water areas of wetlands, receive oxygen from the atmosphere and submergent plants and algae when photosynthesis dominates during daylight hours. Dissolved oxygen

saturation ranged from 0.2 percent (SAL2) (0.3mg/L) to 240 percent (HNV1) (18.9 mg/L). The lowest DO values were recorded in cattail (*Typha* spp.) marsh communities (Table 12; CON1, DEE1, SAL2). The two highest DO saturation values were recorded in, 1) the pond that had the highest pH, likely due to the abundance of the photosynthesizing macroalga (*Chara*) present (HNV1) and high alkalinity (45.5 mg/L), and 2) a sedge-meadow wetland with very shallow water (13 cm), where the DO probe had to be positioned horizontally to take the measurement (FRN1). With a low chlorophyll-a concentration at FRN1 (1.0 ug/L), supersaturated dissolved oxygen may be the result of photosynthesis by benthic algae (Rober, 2012). The results for dissolved oxygen by attainment class are shown in Figure 15.

The median dissolved oxygen concentration was the highest for wetlands with a predicted attainment class of A (6.5 mg/L). The median dissolved oxygen concentration for all wetlands was 4.43 mg/L and the medians by predicted attainment class and indeterminate status were A, 6.49 mg/L; B, 5.06 mg/L; C, 5.38 mg/L; I, 4.27mg/L. The median dissolved oxygen saturation of all samples was 54.6 % and the median DO saturation for the predicted attainment classes and indeterminate status were A, 72.85%; B, 73.9%, C, 62%; I, 46.35%.

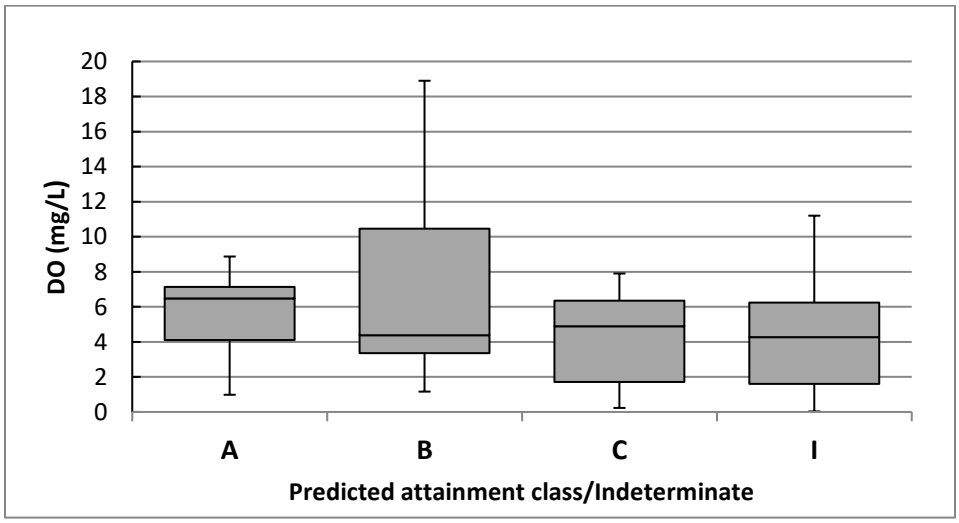



**Figure 15. Dissolved oxygen by attainment class or indeterminate status.**

A one-way ANOVA showed that there was no significant difference in dissolved oxygen (mg/L) between the predicted attainment classes, $p = 0.088$.

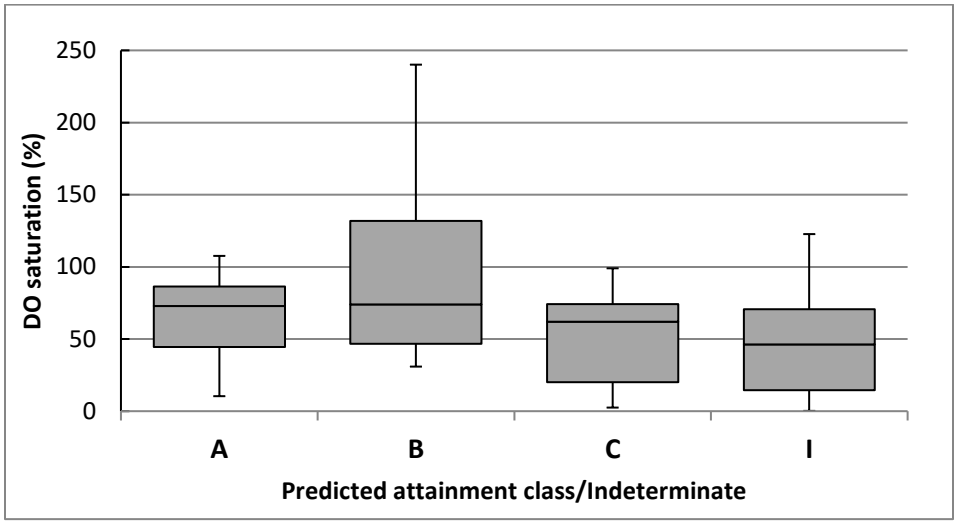



**Figure 16. Dissolved oxygen saturation by predicted attainment class or indeterminate status.**

A one-way ANOVA showed that there were significant differences in dissolved oxygen saturation between the predicted attainment classes, $p = 0.039$. A Bonferroni post hoc analysis showed that there was a significant difference between predicted attainment classes B and C, $p = 0.0457$.

**Nitrogen**

Nitrogen occurs in many forms, which reflects a variety of conditions including oxygen availability and microbial communities present (Mitsch and Gosselink, 2015). The median TKN for all wetlands was 650 ug/L and increased by attainment class (A, 505 µg/L; B, 620 µg/L; C, 980 µg/L) (Figure 17).

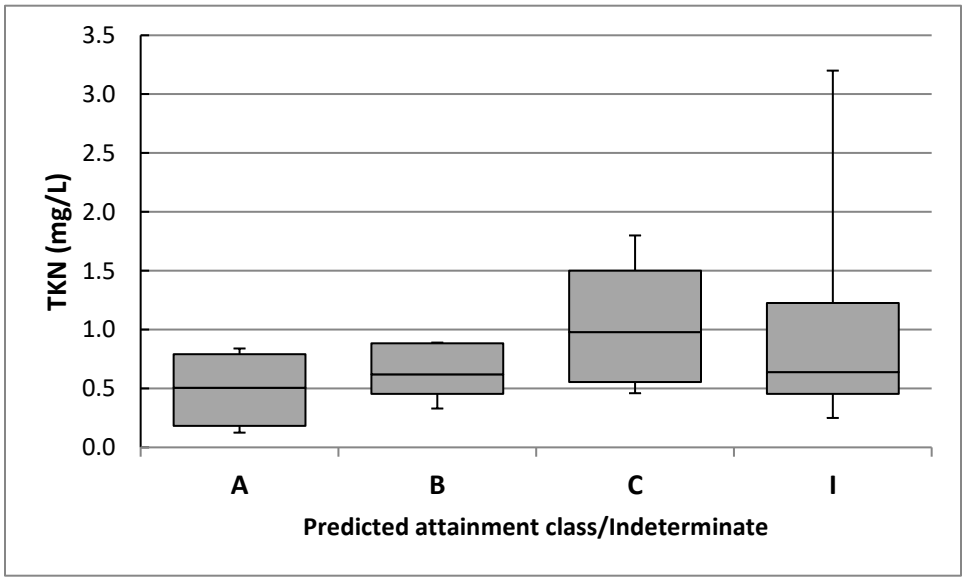



**Figure 17. TKN by predicted attainment class or indeterminate status.**

A one-way ANOVA showed that there was no significant difference in total Kjeldahl nitrogen between the predicted attainment classes, $p = 0.144$.

Only three wetlands had detectable levels of $NO_2$+$NO_3$, which ranged from 0.095 (MAN1) to 0.2 (NAS1), to 0.51 mg/L (FRN1). One wetland with a predicted attainment class of C (MAN1); the other two wetlands were given an indeterminate status.

**Phosphorus**

Phosphorus was measured in two forms, total phosphorus (TP) and dissolved orthophosphorus. TP was significantly elevated in three wetlands that receive stormwater runoff (CON1, 45 ug/L; MAN1, 196 ug/L; SAL2, 289 ug/L). The median TP for all wetlands was 20.45 ug/L and by attainment class, TP increased (A, 13 µg/L; B, 15 µg/L; C, 21 µg/L). The median TP for the wetlands with an indeterminate status was 22.65 ug/L.

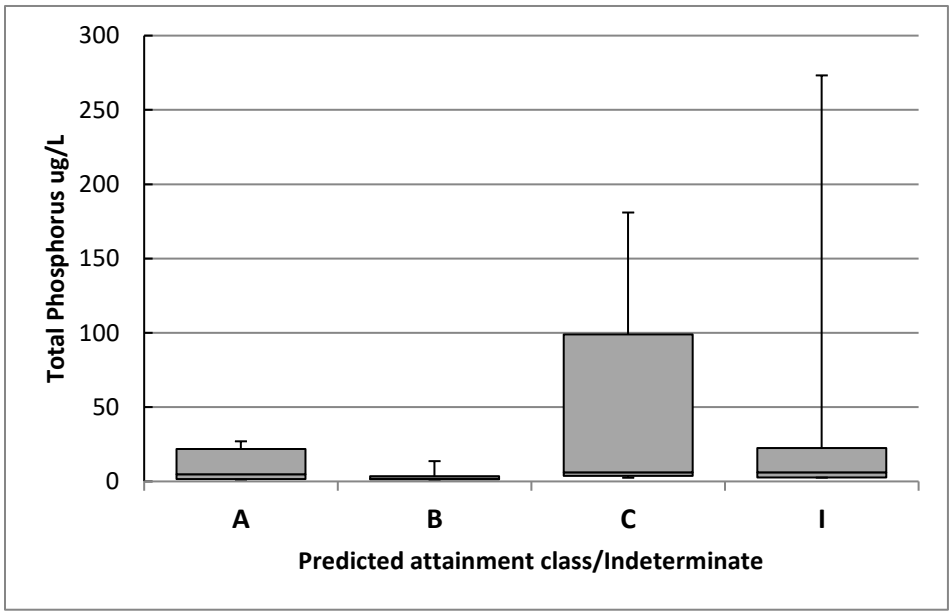



**Figure 18. Total phosphorus (TP) by predicted attainment class or indeterminate status.**

A one-way ANOVA showed that there was no significant difference in total phosphorus between the predicted attainment classes, $p$=0.638.

Only three wetlands had reportable levels of dissolved orthophosphorus (> 0.01 mg/L); SAL1, 0.014 mg/L; MAN1, 0.34 mg/L, attainment class C; and TRO1, 0.017 mg/L, indeterminate status.

**Chlorophyll *a***

Chlorophyll *a* provides an indication of phytoplankton abundance. The median chlorophyll *a* for all wetlands was 3.25 ug/L. The medians by attainment class or indeterminate status were: A, 2.2 µg/L; B, 2.6 µg/L; C, 7.5 µg/L; I, 3.4 µg/L. The wetlands with the three highest concentrations of chlorophyll *a* are in developed areas and receive stormwater runoff: MAN1, 15.3 ug/L; CON1, 33.5 ug/L; SAL2, 219.8 ug/L. The same three wetlands also had the highest total phosphorus results.

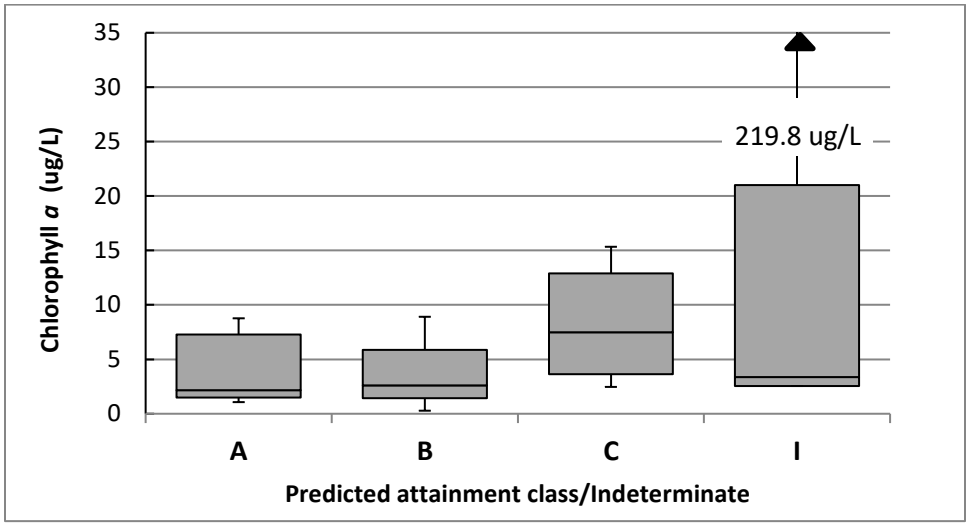



**Figure 19. Chlorophyll-*a* by attainment class and indeterminate status.**

A one-way ANOVA showed that there was no significant difference in chlorophyll *a* between the predicted attainment classes, $p$=0.167.

## 4.3 Macroinvertebrates

More than 10,000 macroinvertebrates were collected at the wetlands sampled (72 sample locations). The taxa that represent the top 50 percent of the macroinvertebrates found in the sampled wetlands are shown in Figure 20. The amphipod *Hyalella* accounts for almost 46 percent of the macroinvertebrates found and occurred at 92 percent of wetlands. The total mean abundance of macroinvertebrates per replicate sample ranged from 20 to 624, with a median of 91. The generic richness per wetland (three replicates) ranged from 9 to 38, with a median of 23. Figure 20 also provides the percent of sampled wetlands where the top taxa were found, the percent of the taxa compared to the total number of macroinvertebrates found, and the Maine Tolerance Index assigned to the sampled wetland (a component of the MDEP predictive model for wetlands).

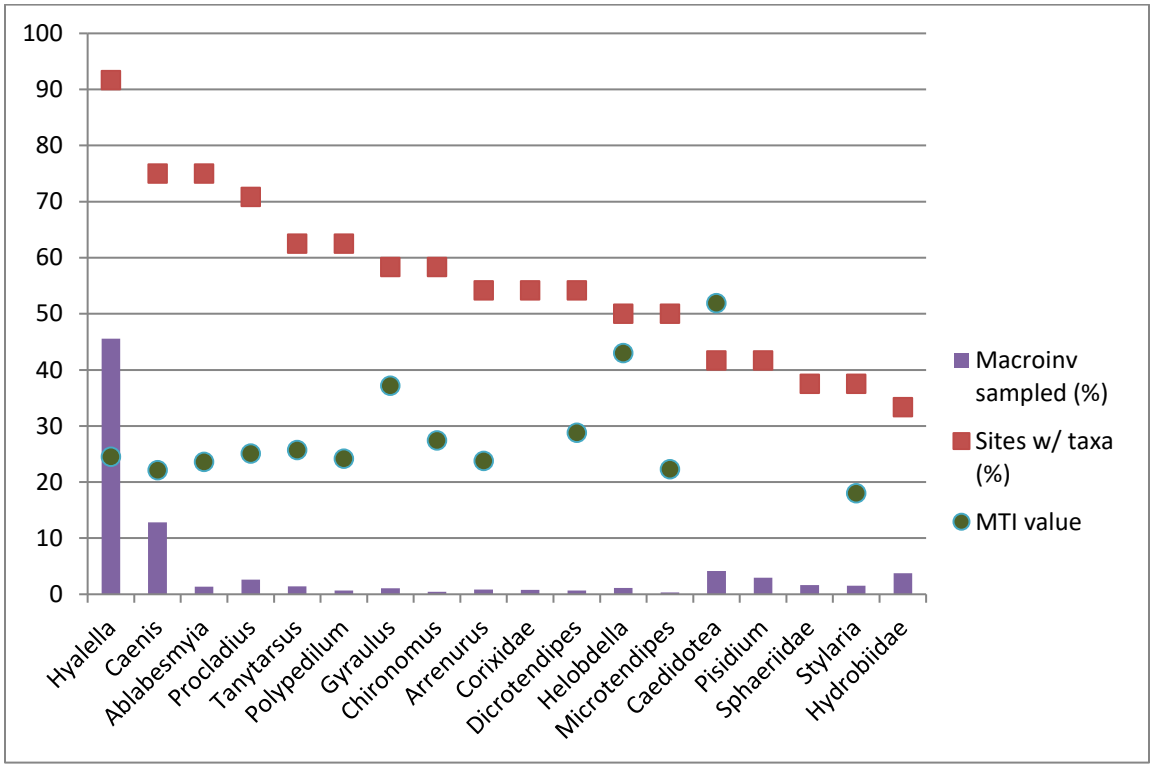



**Figure 20. The macroinvertebrate taxa that comprise the top 50 percent of macroinvertebrates found.**

In the first year of sampling (2014), NHDES collected excessive amounts of organic material (10 bottles) with the macroinvertebrate sample at one of the six wetlands. After discussing with MDEP, staff noted that this situation happens occasionally. It was not until excessive amounts of material were collected at six of the 18 wetlands sampled in 2015 (as many as 27 bottles) that this was recognized as occurring at a higher frequency than typically occurred and therefore may be indicative of a different sampling technique. When sampling macroinvertebrates in wetlands that have a very soft organic substrate, MDEP modifies its sampling protocol to minimize the collection of excessive organic material by moving to a different location in the wetland or using the dip net at a depth that is not quite fully to the bottom of the soft benthic substrate (J. DiFranco, personal communication). The MDEP average number of partially filled macroinvertebrate sample bottles for three sampling locations at a site was close to four bottles per site (3.88 for the total of all three replicates) (Beth Connors, personal communication, October 9, 2015).

Based on the information from MDEP and the samples collected, NHDES defined samples with more than five partially filled one-liter sample bottles of bulky organic material as ”excessive organic material.” For the six wetlands with a quantity in excess of the five bottles, our taxonomic contractor subsampled those replicate samples. Five of those six wetlands received an indeterminate attainment class due to low generic richness or low abundances. One wetland for which the macroinvertebrate

sample was subsampled had sufficient generic richness and abundance to result in a predicted attainment class of C (MAN1).

One of the five wetlands with an Indeterminate status had been selected for sampling because the NHB, the state's natural heritage program, had identified it as a reference wetland with a cattail marsh community. This wetland could potentially serve as a reference wetland to two other cattail marsh wetlands sampled and where there was significant human disturbance (CON1, SAL2). Because the generic richness (13) of the subsampled macroinvertebrate sample was below, but close to, the threshold for the model (15), the entire 19-bottle sample was subsequently sorted, identified, and enumerated. MDEP reran the updated macroinvertebrate data through the model, and the reference wetland (DEE1) was given a predicted attainment class of C.

Among MDEPs macroinvertebrate metrics is the Maine Tolerance Index (MTI). The MTI is a weighted average of tolerance values of the organisms found in the macroinvertebrate sample (consisting of the three replicates). Tolerance values for individual taxa are calculated using species optima (the predicted "preferred" environmental conditions for each taxon), on a scale from 1-100. Organisms with a tolerance value less than or equal to 22.0 are considered sensitive taxa. Organisms with a tolerance value between 22.1 and 42.9 are considered Intermediate taxa. Organisms with a tolerance value equal to or greater than 43.0 are considered Eurytopic taxa (taxa that occur across a wide range of environmental conditions) (MDEP, undated; Appendix A).

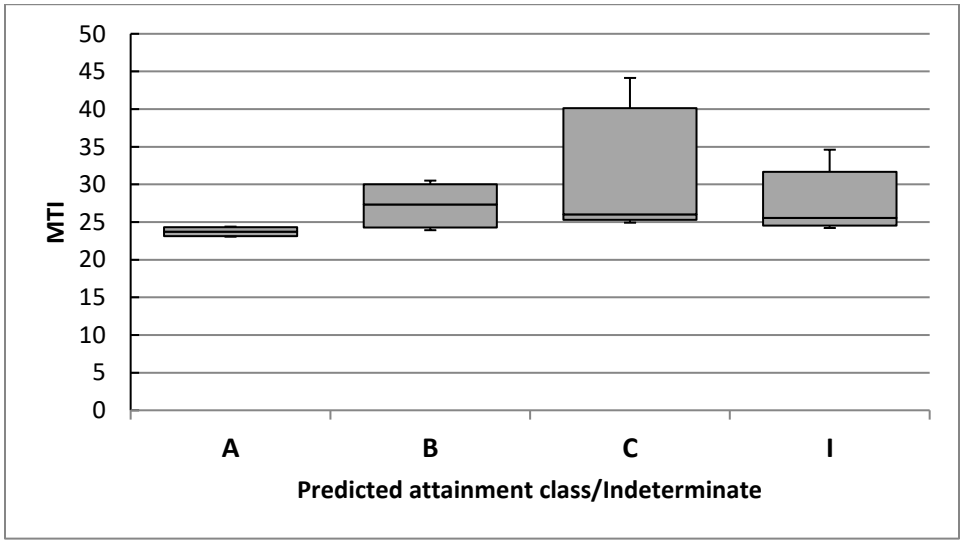



**Figure 21. Maine Tolerance Index (MTI) by attainment class or indeterminate status.**

A one-way ANOVA showed that there was no significant difference in the MTI between the predicted attainment classes, $p$=0.152.

We evaluated the depths of the water at which the macroinvertebrate samples were collected as compared with the attainment class or indeterminate status assigned (Figure 22).

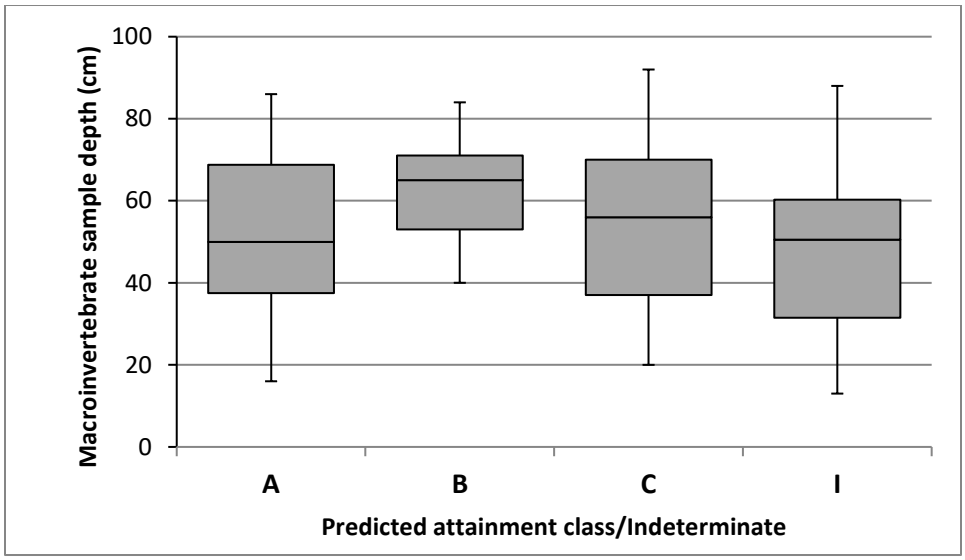



**Figure 22. Macroinvertebrate sample depth by predicted attainment class or indeterminate status.**

A one-way ANOVA showed that there was no significant difference in macroinvertebrate sampled depth between the predicted attainment classes, $p$=0.23.

**Comparison of macroinvertebrate communities**

The macroinvertebrate data for the 24 sampled New Hampshire wetlands and 30 Maine wetlands were analyzed with nonmetric multidimensional scaling analysis (NMDS). Using presence/absence and plotting the ordination revealed that there was almost no overlap between the two macroinvertebrate communities (Figure 23). The variables of ecoregion, pH, or disturbance rating did not result in useful groupings in ordination space (D. Neils, personal communication, 2017).

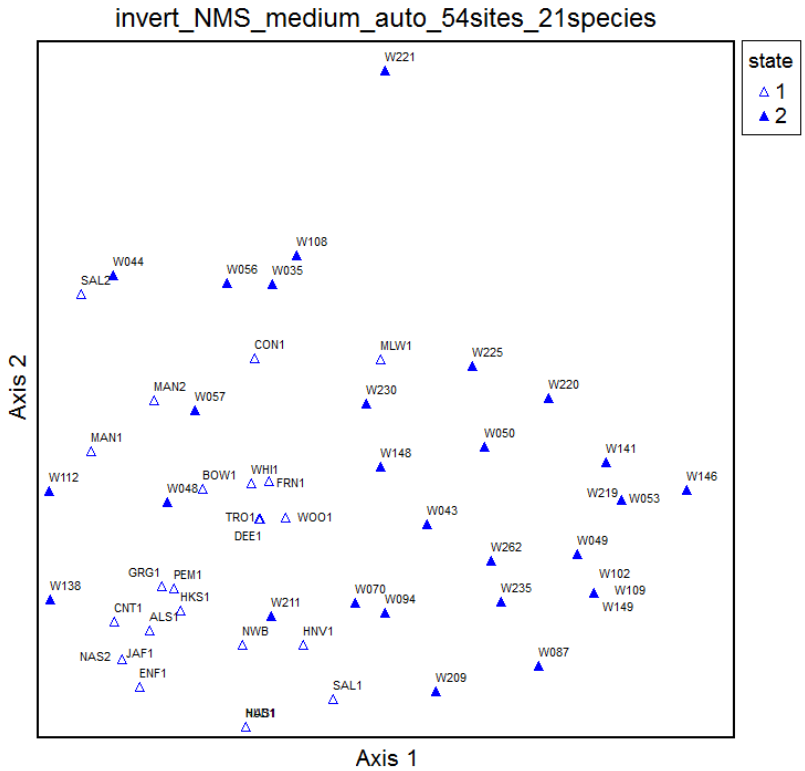



**Figure 23. Nonmetric multidimensional scaling (NMDS) plot of macroinvertebrates from 24 New Hampshire wetlands and 30 Maine wetlands. New Hampshire wetland IDs with the open triangle symbol begin with three characters (state 1). Maine is state 2, with the solid triangles.**

An indicator species analysis was conducted to look at genus abundance and frequency in one state versus the other state. It found 24 genera were found mostly in Maine wetland samples and found rarely in New Hampshire samples, and three genera that are associated with New Hampshire wetland samples (T. Danielson, personal communication, April 19, 2018).

## 4.4 Vegetation

More than 235 plant taxa were observed at the wetlands sampled (retrieved and surveyed), including two state-listed (S1) endangered species, *Lemna trisulca* and *Potamogeton zosteriformis.* More than 860 taxa-wetland observations were made.

Table 14 provides the plant taxa that were observed at 50 percent or greater of the wetlands.

**Table 14. Most common vascular species observed, percentage of wetlands where present, habit, wetland indicator status, and NH C value.**

| Species (Haines) | Common Name | Percent of sites | Habit | Wetland Indicator status[1] | NH C value[2] |
|---|---|---|---|---|---|
| *Acer rubrum* | Red maple | 92 | Woody | FAC | 3 |
| *Triadenum virginicum* | Marsh St. Johnswort | 88 | Emergent | OBL | 4 |
| *Sparganium americanum* | American burr-reed | 75 | Emergent | OBL | 3 |
| *Lysimachia terrestris* | Swamp candles | 67 | Emergent | OBL | 4 |
| *Calamagrostis canadensis* | Blue joint grass | 67 | Emergent | OBL | 2 |
| *Utricularia vulgaris* | Common bladderwort | 58 | Submergent | OBL | 6 |
| *Typha latifolia* | Broad-leaved cattail | 58 | Emergent | OBL | 2 |
| *Spiraea alba* | Meadowsweet | 58 | Woody | FACW | 3 |
| *Onoclea sensibilis* | Sensitive fern | 58 | Emergent | FACW | 2 |
| *Nymphaea odorata* | White water lily | 58 | Floating-leaved rooted | OBL | 4 |
| *Dulichium arundinaceum* | Three-way sedge | 58 | Emergent | OBL | 5 |
| *Spiraea tomentosa* | Steeplebush | 50 | Woody | FACW | 4 |
| *Pontederia cordata* | Pickerelweed | 50 | Emergent | OBL | 3 |
| *Lythrum salicaria* | Purple loosestrife | 50 | Emergent | OBL | 0 |
| *Alnus incana* | Speckled alder | 50 | Woody | FACW | 3 |

**Key:** [1]OBL= obligate wetland plant, almost always is a hydrophyte, rarely in uplands; FACW= facultative wetland plant, usually is a hydrophyte but occasionally found in uplands; FAC = facultative plant, commonly occurs as either a hydrophyte or nonhydrophyte (Lichvar et al., 2012; US Army Corps of Engineers, 2016); [2]NEIWPCC (2013).

The wetlands sampled varied in their vegetation composition as illustrated in Figure 24. Sampled wetlands ranged from lacking submergent vegetation (left side of chart) to it comprising almost 30 percent of recorded taxa (right side of chart).

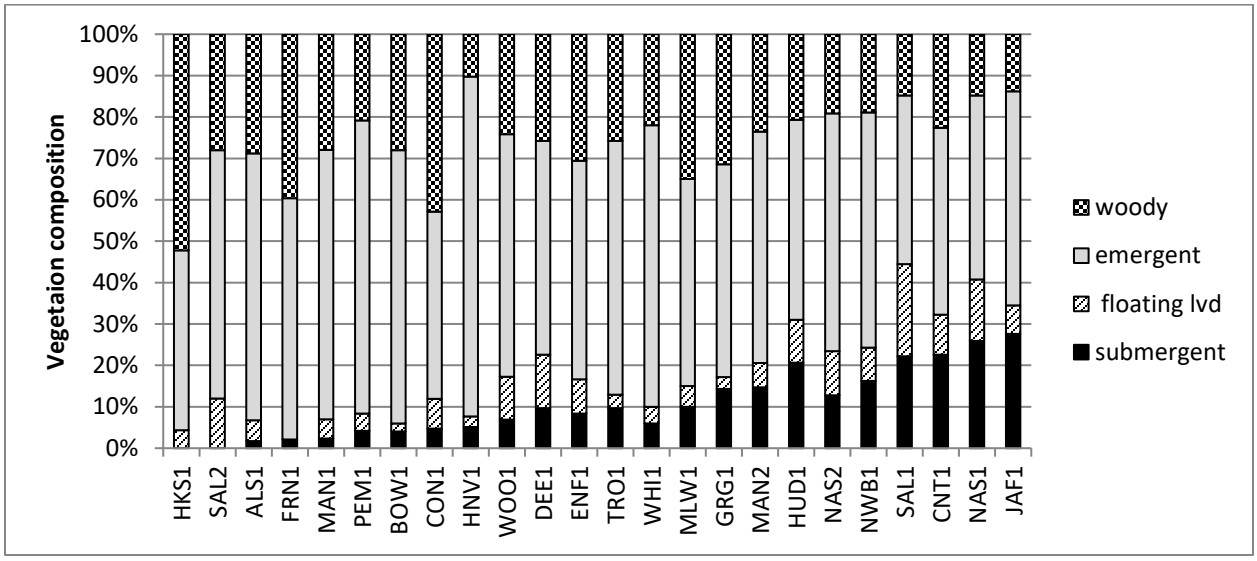



**Figure 24. Chart showing vegetation structure of sampled wetlands.**

### Floristic Quality Assessment

Sampled wetlands had an average of 35 species and average native species richness of 33. A majority (75%) of the wetlands had at least one nonnative or invasive taxon. The median value for Total FQI was 24, and for total mean C was 4.0. The values for conservatism indices and floristic quality metrics by site are provided in Table 15.

**Table 15. FQA conservatism and metric values for wetlands.**

| Site | Year sampled | Native FQI | Total FQI | Adjusted FQI | Total Mean C | Native Mean C | Species Richness | Nonnative or invasive taxa (#) | Wetland or pond type[1] |
|---|---|---|---|---|---|---|---|---|---|
| ALS1 | 2014 | 27.2 | 26.1 | 35.4 | 3.4 | 3.7 | 59 | 5 | DMSS |
| BOW1 | 2014 | 29.0 | 29.0 | 41.0 | 4.1 | 4.1 | 50 | 0 | DMSS |
| CNT1 | 2015 | 22.6 | 22.3 | 40.6 | 4.0 | 4.2 | 31 | 2 | Oxbow |
| CON1 | 2015 | 23.3 | 20.7 | 36.0 | 3.2 | 4.0 | 42 | 8 | DMSS |
| DEE1 | 2015 | 23.9 | 23.9 | 43.0 | 4.3 | 4.3 | 31 | 0 | DMSS |
| ENF1 | 2015 | 27.2 | 26.4 | 45.4 | 4.4 | 4.6 | 36 | 0 | Fen |
| FRN1 | 2014 | 33.6 | 33.3 | 48.5 | 4.8 | 4.8 | 48 | 0 | DMSS |
| GRG1 | 2015 | 23.7 | 23.7 | 40.0 | 4.0 | 4.0 | 35 | 0 | DMSS |
| HKS1 | 2014 | 22.5 | 22.5 | 47.0 | 4.7 | 4.7 | 23 | 0 | DMSS/Fen |
| HNV1 | 2015 | 21.6 | 20.6 | 34.6 | 3.3 | 3.6 | 39 | 3 | DMSS |
| HUD1 | 2015 | 23.9 | 23.2 | 44.4 | 4.3 | 4.7 | 29 | 2 | DMSS |
| JAF1 | 2015 | 21.5 | 19.9 | 39.9 | 3.7 | 4.3 | 29 | 4 | DMSS |
| MAN1 | 2015 | 25.0 | 24.3 | 38.1 | 3.7 | 3.9 | 43 | 2 | DMSS |
| MAN2 | 2015 | 23.0 | 21.6 | 39.5 | 3.7 | 4.2 | 34 | 4 | Eut. Pond |
| MLW1 | 2015 | 27.2 | 27.2 | 43.0 | 4.3 | 4.3 | 40 | 0 | DMSS |
| NAS1 | 2014 | 20.1 | 19.2 | 38.7 | 3.7 | 4.1 | 27 | 3 | DMSS |
| NAS2 | 2015 | 26.2 | 24.7 | 38.3 | 3.6 | 4.0 | 47 | 4 | Oxbow |
| NWB1 | 2015 | 24.0 | 23.7 | 39.5 | 3.9 | 4.0 | 37 | 1 | DMSS |
| PEM1 | 2014 | 18.2 | 18.1 | 37.2 | 3.7 | 3.8 | 24 | 1 | Eut Pond |

| Site | Year sampled | Native FQI | Total FQI | Adjusted FQI | Total Mean C | Native Mean C | Species Richness | Nonnative or invasive taxa (#) | Wetland or pond type[1] |
|---|---|---|---|---|---|---|---|---|---|
| SAL1 | 2015 | 21.9 | 21.3 | 42.2 | 4.1 | 4.3 | 27 | 1 | Peatland |
| SAL2 | 2015 | 16.3 | 15.5 | 32.6 | 3.1 | 3.4 | 25 | 2 | DMSS |
| TRO1 | 2015 | 25.7 | 25.6 | 46.2 | 4.6 | 4.7 | 31 | 1 | DMSS |
| WHI1 | 2015 | 27.3 | 27.6 | 38.6 | 3.9 | 3.9 | 50 | 1 | DMSS |
| WOO1 | 2014 | 25.8 | 25.8 | 48.0 | 4.8 | 4.8 | 29 | 0 | Fen |

[1] Key: DMSS: drainage marsh-shrub swamp; Eut. Pond: Eutrophic pond, Fen: medium level fen; Oxbow: Oxbow pond (Nichols, 2015a, 2015b)

The following whisker and box plots display conservatism values and floristic quality indices values by attainment class.

The value for total mean C is the average of C values for all species in a sampled wetland.

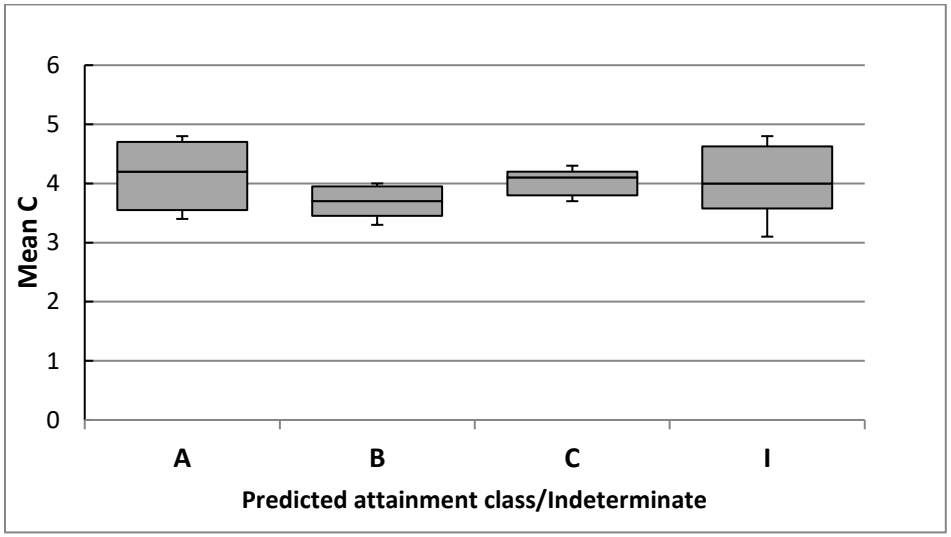



**Figure 25. Total Mean C by predicted attainment class or indeterminate status.**

A one-way ANOVA showed that there was no significant difference in mean C between the predicted attainment classes, $p$=0.22.

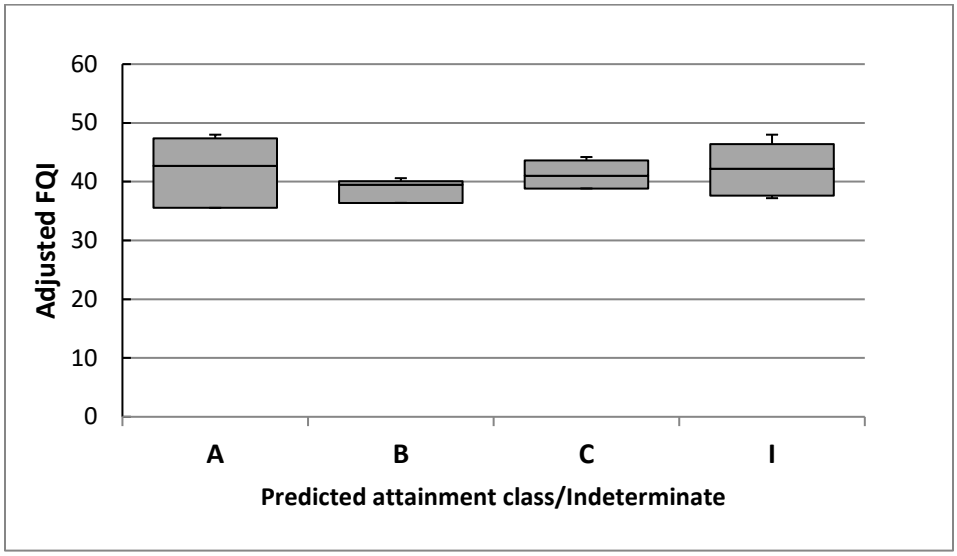



**Figure 26. Adjusted FQI by attainment class or indeterminate status.**

A one-way ANOVA showed that there was no significant difference in adjusted FQI between the predicted attainment classes, $p$=0.34.

We applied Spearman's rank correlation analyses to the conservatism values, FQA metrics, and both rapid assessments (Table 16). The strongest correlations were found between the number of nonnative species and the EIA-Land Use Index, and between the number of nonnative species and the EIA rank/score. The number of nonnative species also showed a strong correlation to the WHDA score and the EIA-buffer width metric.

Mean C had a strong correlation with both rapid assessments, EIA and WHDA. Applying Spearman's correlation to the Adjusted FQI and EIA, and Adjusted FQI and WHDA revealed a moderate relationship.

**Table 16. Spearman's rank correlation values.**

| Parameters or indices compared (n=24) | Rho ($r_s$) | p Value |
|---|---|---|
| Mean C to EIA | 0.63 | 0.0009 |
| Adjusted FQI to EIA | 0.55 | 0.0055 |
| Mean C to Buffer width | 0.59 | 0.0027 |
| Nonnative species to EIA | -0.69 | 0.0002 |
| Nonnative species to Land Use Index | -0.73 | 0.00006 |
| Nonnative species to buffer width | -0.59 | 0.0023 |
| Adjusted FQI to Land Use Index | 0.46 | 0.0226 |
| Mean C to WHDA | -0.63 | 0.0011 |
| Adjusted FQI to WHDA | -0.57 | 0.0038 |
| Nonnative species to WHDA | 0.66 | 0.0004 |

Previous studies applying floristic quality approaches and using C values in other metrics have categorized tolerant and sensitive taxa based on ranges of C values (Andreas and Lichvar, 1995; Brittenham, 2009; USEPA, 2016). Taxa considered tolerant or indicative of disturbed condition have been defined as having C values of 1 - 3 (Andreas and Lichvar; Freyman et al., 2016), 0 - 2 (Brittenham, 2009), and 0 - 4 (USEPA, 2016). Similarly, taxa identified as highly sensitive or fidelity to a narrow range have been defined in various studies as 8 - 10 (Brittenham), 9 - 10 (Andreas and Lichvar), and 7 - 10 (Freyman et al., 2016; Faber Langendoen, 2018). The 2011 USEPA National Wetland Condition Assessment also considered "sensitive species" in metric development but did not include that category in the final version of the Vegetation Multi-Metric Index (VMMI). In development of the universal FQA tool and website, taxa composition for an assessment are grouped in the following categories, 0, 1 - 3, 4 - 6, and 7 - 10. The universal FQA categories were developed based on feedback provided to the website and tools creator, Will Freyman (Freyman, personal communication, May 23, 2018). Given the variation in approaches described above, this study used 0 - 3 for invasive/tolerant and 7 - 10 for sensitive species.

Rothrock et al. (2008) considered the least-impaired lacustrine wetland as those with less than 30% tolerant species (C= 0 - 2) and more than 20% sensitive species (C= 8 - 10), based on the C values list that was created for Indiana**.** Based on the New Hampshire C values developed in 2012, the New Hampshire flora had a lower mean C value when compared with other New England states and New York (Bried et al., 2012). DeBerry et al (2015) have noted that C values and resulting thresholds may not be comparable across state lines or ecoregions.

The taxa composition of each wetland by range of C values, including sensitive species (C = 7 - 10) and tolerant species (C= 0 - 3) is shown in Figure 27. Sites are ordered from those with the highest percentage of tolerant tax to those with the lowest percentage of tolerant taxa.

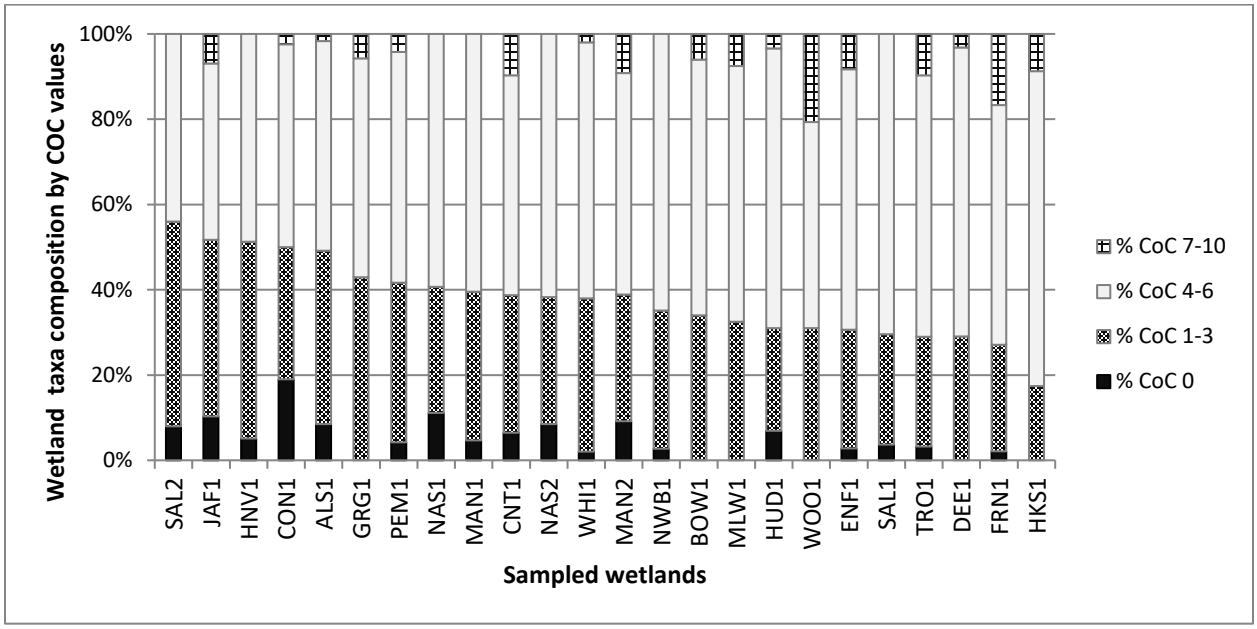



**Figure 27. Wetland composition by percent tolerant and invasive taxa (C values of 0-3).**

## 4.5 Rapid Assessments

The results of applying two rapid assessment methods provide information on the characteristics of wetland, wetland buffer and watershed, and the potential validity of the other condition assessment methods applied.

### 4.5.1 Wetland Human Disturbance Assessment (WHDA)

The WHDA uses an open-ended scale with the most disturbed wetlands having a possible maximum point value of 120, although most wetlands score less than 50 (DiFranco, personal communication). The WHDA scores for the wetlands ranged from 2 to 37, with a median of 14.

Figure 28 illustrates the WHDA results as grouped by predicted attainment class or indeterminate status.

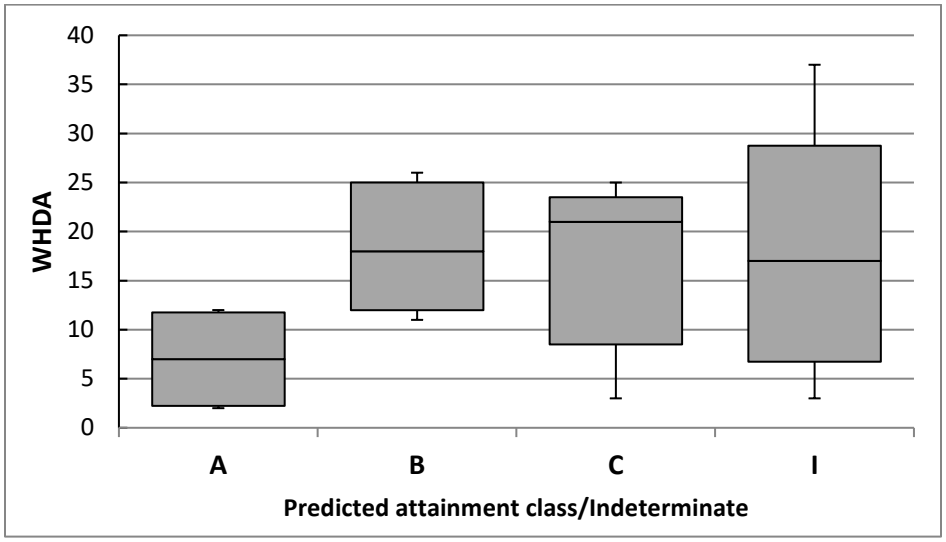



**Figure 28. WHDA by attainment class or indeterminate status.**

A one-way ANOVA detected no difference in WHDA between the predicted attainment classes at p=0.05. However, there may be a moderate relationship between the stressors reflected in the WHDA scores and the attainment classes, especially between attainment class A and attainment classes B or C.

### 4.5.2 Ecological Integrity Assessment

The EIA ranks for the wetlands range from A to C-. Average rank was a B. Numerical scores may be shown based on the values used in the spreadsheet with embedded equations.

#### *4.5.2.1 Landscape Context: Land Use Index*

The Land Use Index metric reflects the wide range of human disturbance that was the intention as wetlands were selected for sampling. The Land Use Index values for the wetlands range from a maximum of 10 (undeveloped area) to a minimum of 0.79, with a median of 7.9 and a mean of 6.55.

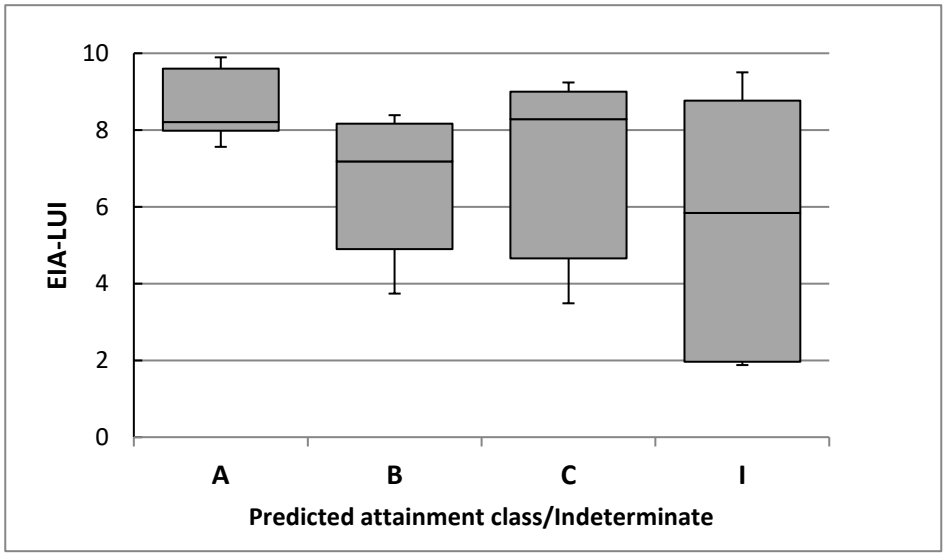



**Figure 29. EIA Land Use Index for wetlands by predicted attainment class or indeterminate status.**

A one-way ANOVA detected no significant difference in the EIA-Land Use Index between the predicted attainment classes, *p* =0.299.

Increased chloride concentrations are correlated with cover by impervious surfaces, such as roads, the land use most common in the buffers of almost all sampled wetlands (Wallace and Biastoch, 2016; Mullaney et al., 2009). A correlation between land use index and chloride concentration was moderately strong ($R^2$=0.57)(Figure 30).

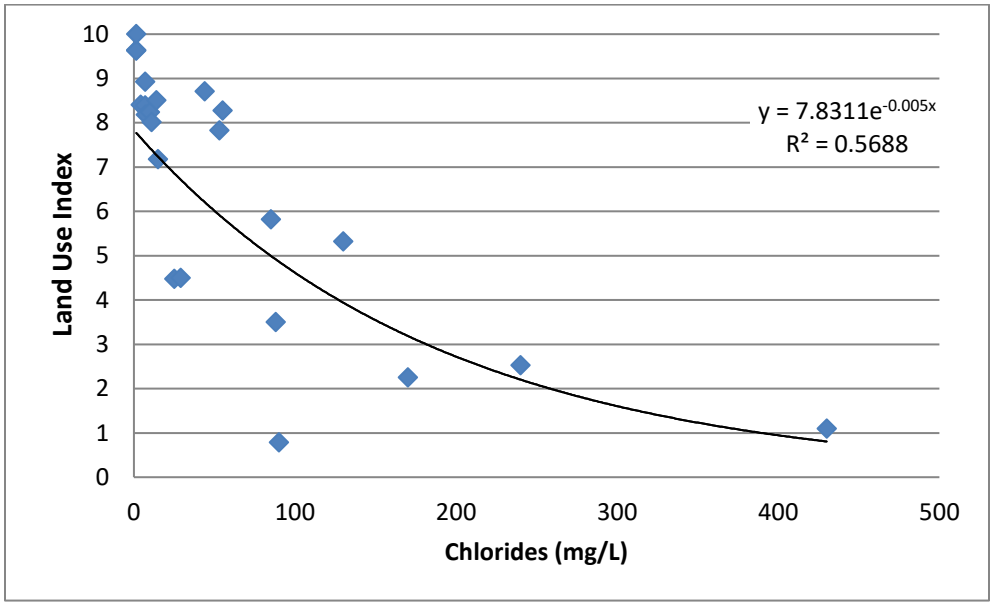



**Figure 30. Correlation of chloride values against EIA - Land Use Index.**

**Buffers**

The average buffer widths of the wetlands ranged in size from zero to the maximum of 100 meters (393.7 feet), as measured using the EIA method, and had a median size of 56 meters (184 feet).

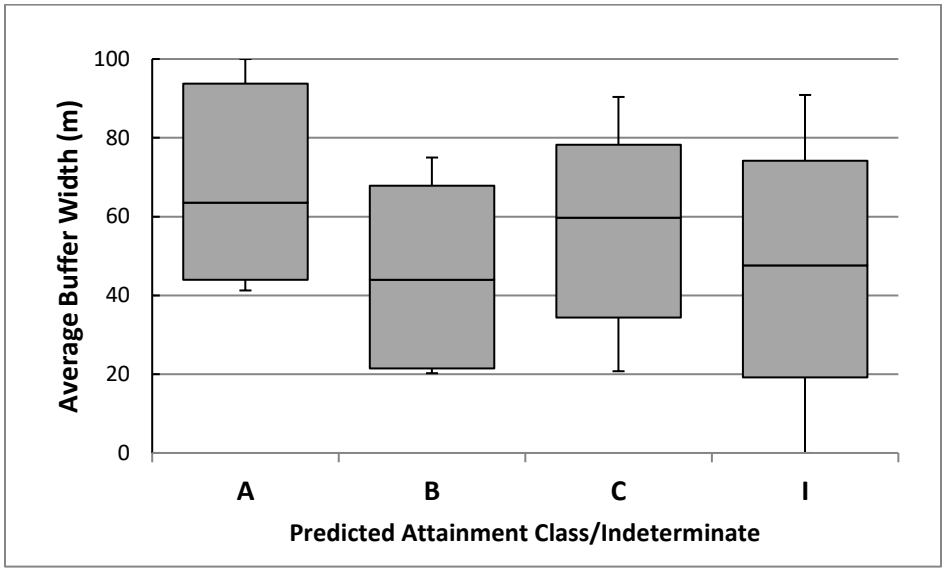



**Figure 31. Average buffer width for wetlands grouped by the predicted attainment class or indeterminate status. Buffers are measured to a maximum distance of 100 meters (for the EIA).**

A one-way ANOVA showed that there was no significant difference in average buffer width between the predicted attainment classes, *p*=0.43 (Figure 31).

A Spearman's rank correlation showed a moderate/strong positive correlation (rho=0.585; p= 0.0027). between buffer width and total mean C.

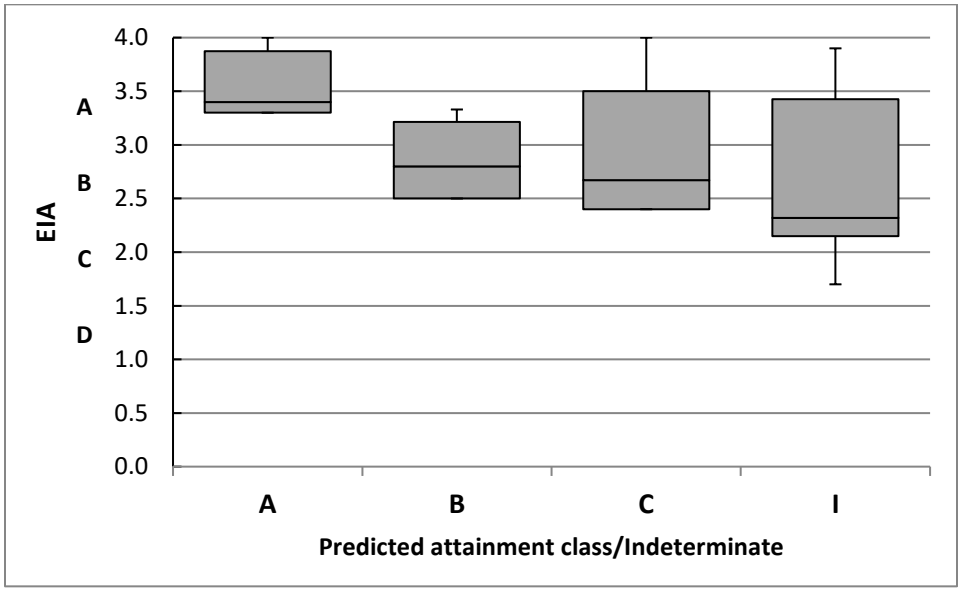



**Figure 32. EIA scores/ranks by attainment class or indeterminate status. Letter-based EIA ranks used numeric scores from EIA Excel score sheet.**

A one-way ANOVA detected no significant difference between EIA and predicted attainment classes, *p*=0.134.

There was a strong correlation between the results of the two rapid assessments, the EIA and WHDA ($r^2$= 0.858; p=4.46E-06) (Figure 33). The WHDA totals values for all the stressors that are observed in the wetland, 100-foot buffer, and watershed. The EIA assesses the observed condition and applies a land use analysis based on the impacts within buffers up to 500m beyond the assessment area.

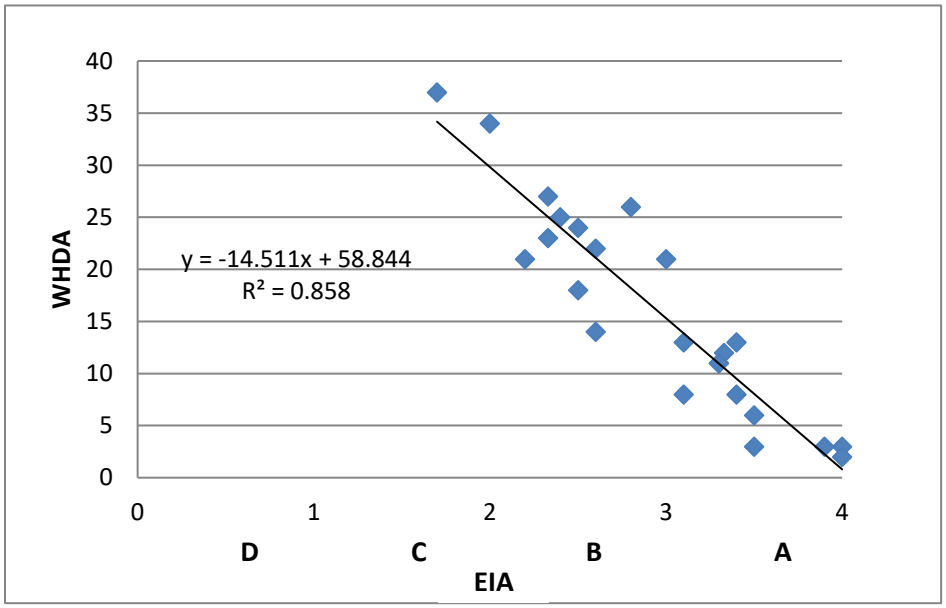



**Figure 33. Correlation between two rapid assessment methods applied, the EIA and the WHDA.**

## 4.6 Additional Observations

During the field surveys we made additional observations during sampling specific wetlands. Below the more notable ones are presented.

Cyanobacteria are often discussed in terms of presence in waters with anthropogenic nutrient enrichment (Pearl, 2018). The cyanobacteria *Nostoc* can form ball-shaped gelatinous colonies. These were observed in a cattail marsh (DEE1) (Figure 34). The levels of nutrients in the water sample were not high relative to the other wetlands. Phosphorus was measured as 16.7 ug/L (below the median of 20.45 ug/L for all wetlands) and at the median for TKN (0.65 mg/L).

**Figure 34. The gelatinous balls made by cyanobacteria *Nostoc* (DEE1).**

Rober (2012) reported that in the rich fen and two marsh environments studied, *Nostoc* and other cyanobacteria increased in abundance as the growing season progressed and nutrient concentrations and water table position decreased. According to Solheim et al. (2006), the ability for these taxa to fix atmospheric nitrogen enables them to survive in low nutrient environments and has been described as the most important source of nitrogen to many arctic and boreal regions, contributing as much as 80% of total annual ecosystem nitrogen.

As part of the vegetation sampling, the presence of invasive and nonnative plant species was noted and discussed earlier (Section 4.4). For invasive animal species, the shell of a Chinese mystery snail (*Cipangopaludina chinensis)* was observed at one wetland (MAN1). In another wetland, a goldfish (*Carassius auratus)* was observed swimming in the water (MAN2).

Freshwater sponges (*Spongilla sp*.) were observed in two wetlands (CNT1, WOO1).

# 5 Discussion

With only slightly more than half of the sampled wetlands able to be assigned a predicted attainment class by the MDEP model, this reduced the ability to evaluate the model performance and compare with other results. However, application of two rapid assessment methods and sampling of water and vegetation provided additional data to inform the use of and identify questions about the MDEP predictive model and indicators to assess wetland condition.

## 5.1 Application of the Macroinvertebrate-based Predictive Model

### 5.1.1 Statistically Significant Results

Three independent parameters sampled with field meters, specific conductance, dissolved oxygen percent saturation, and pH, were the only parameters that were significant between two or more attainment classes.

- Specific conductance was significantly lower for wetlands assigned attainment class A when compared with wetlands assigned attainment classes B and C.
- Dissolved oxygen saturation at wetlands assigned attainment class C was significantly lower than the wetlands assigned attainment class B.
- The pH at wetlands assigned attainment class A was significantly lower when compared with wetlands assigned attainment class B.

The use of field meters with three measurements at each wetland provided more data for analysis than the single measurement parameters. This improved the ability to compare results with predicted attainment classes for 14 wetlands.

### 5.1.2 Lack of attainment classes for 14 wetlands

The high number of wetlands that had insufficient generic diversity or abundance to generate an attainment class raises some questions as to why the proportion of wetlands with this low abundance or generic diversity was larger than Maine DEP has experienced (B. Connors, personal communication, October 26, 2016). MDEP has sampled wetlands that had a low abundance or generic diversity of macroinvertebrates and at a subsequent sampling event (years later) had sufficient abundance and generic diversity to produce a predicted attainment class.

There are two groups of wetlands for which the macroinvertebrate samples were insufficient to produce a predicted attainment class: 1) wetlands that had low abundance or generic richness but the volume of sample material collected was comparable to most other sampled wetlands (FRN1, HKS1, HUD1, PEM1, and

TRO1), and 2) those samples for which the macroinvertebrate sampling resulted in the collection of large amounts of organic material (MLW1, NAS2, MAN2, SAL2, CON1). The assigned indeterminate status does not appear to be related to wetland condition, as these wetlands represent a broad range of anthropogenic disturbance using the EIA Land Use Index values 0.8 to 9.6 (undisturbed is 10), EIA ranks C- to A, or WHDA scores 3 to 37 (0 is undisturbed).

The results of the analysis of the macroinvertebrates with NMDS also raise questions about why the New Hampshire sites do not appear to be comparable to the Maine sites. The following describes observations from applying the protocols and methods at the24 wetlands:

- **Similarity of New Hampshire's sampled wetlands when compared with those sampled by MDEP.** The sampled wetlands, primarily lacustrine and riverine backwater wetlands with freshwater emergent and aquatic bed communities, appeared to meet the criteria used by MDEP for its established stations. The median pH value of the water in the sampled wetlands was 5.9 and 6.3 for the Maine wetlands used as a comparison. Included in the universe of sampled wetlands were those specifically targeted for sampling based on proximity to human disturbance. Given these similarities, the NMDS analyses indicate otherwise, which may be related to the additional observations noted below.

- **Habitat differences within wetlands.**
  MDEP (2014b) directs that "Locations selected for all replicate samples collected at a site must be as similar to each other as possible with regard to water depth, vegetative community structure and substrate type." We found that locating sampling areas with similar substrates within a wetland can be challenging and in some wetlands near to impossible. Similar locations based on surface appearances (such as similar plants or comparable distance to more solid shoreline) may reveal different depths or benthic substrates. Some wetland plants can form a root mat that creates an almost impenetrable surface under water and may seem like a benthic substrate when sampling with a dip net, until one pokes through it with a narrow object and finds additional water depth below it.
  Depending on the variety of vegetation growing in the wetland, sampling specific locations within a wetland (i.e., variety of habitats) may have a significant effect on the macroinvertebrates present and sampled due to microhabitats. Rose and Crumpton (1996) reported "striking differences in plant materials and water column characteristics of open water and emergent stands with stand margins that were intermediate in character." The observed large variation in parameters included total phosphorus, soluble reactive phosphorus, and ammonium, and plant taxa were a mixed cattail

stand (*Typha* spp.) and *Scirpus fluviatilis*. Sites within the mixed cattail stands had extremely low oxygen concentrations (0.2 mg/L) and were almost continuously anoxic. The presence of macroinvertebrates in such environments would likely result in the macroinvertebrate taxa being considered "tolerant" or eurytopic, even if such conditions represent a wetland not subject to anthropogenic disturbance. Shading by floating-leaved and emergent vegetation also can contribute to low DO by reducing light available for photosynthesis (Batzer et al., 1999). This is a possible reason why the reference wetland sampled received a predicted attainment class of C (DEE1). Gleason et al. (2018) also reported significant differences in macroinvertebrate richness and evenness between water column and vegetation sample types nested within the habitat zone of open water and emergent habitats in prairie pothole region wetlands of Alberta, Canada.

- **Temporal differences of sampling**

  Our sampling period mostly overlapped with that used by MDEP, which samples its wetlands in June to July. MDEP samples in this time frame because:

  - Aquatic invertebrate taxa of interest have developed sufficiently to be identified.
  - Wetlands are less likely to dry down during this period compared with later in the summer.
  - Overlap with stream algae and stream macroinvertebrate sampling is minimized (MDEP, 2014b).

  The NHDES sampling period was from late June to mid-August to provide more time for plants to mature for improved identification.

  It is unclear if any variation in timing of macroinvertebrate sampling affects the attainment class predicted by the MDEP model. MDEP has not sampled the same location in the same season more than once to test for temporal differences in sampling on predicted attainment class (J. DiFranco, personal communication, March 8, 2016).

- **Different sampling method in soft substrate conditions**

  After completing sampling in 2015, during which excessive organic material was collected with our macroinvertebrate samples at six wetlands, MDEP brought to our attention the modification of their protocol for sampling wetlands with very soft organic substrates. After this was identified, MDEP provided additional training for sampling efforts that were part of a subsequent grant workplan. With a modified protocol (which might result in sampling at a shallower depth), it is possible that the macroinvertebrates would be different than those we sampled in soft substrate conditions.

- **Subsampling of macroinvertebrate samples**

  As a result of the large amount of bulky organic material collected during the macroinvertebrate sampling at the six wetlands, one or more replicates from each wetland was subsampled. One of the six wetlands (MAN1) received a predicted attainment class based on the subsampled results; however, the remaining five wetlands were below the model thresholds for abundance or generic richness (CON1, MAN2, MLW1, NAS1, SAL2). The macroinvertebrate sample for one of the five wetlands lacking an attainment class (but with subsampled numbers close to the model threshold), was subsequently fully sorted, identified, and enumerated (exceeding the model threshold for generic diversity and total abundance) and the results were rerun through the MDEP model. The wetland (DEE1) received a predicted attainment class of C. Any effect of sampling in areas that may have been inconsistent with the way MDEP samples was likely further exacerbated by the subsampling of samples with low abundance and generic richness to start.

- **Sorting (picking) or taxonomic differences**

  Consistent with the QAPP, our sorting and taxonomic identification contractor had genus-level taxonomic certifications from the Society of Freshwater Science. Quality control review of the picking process and identifications were conducted as described in the QAPP (NHDES, 2014) and results were within guidelines set.

- **Level of experience**

  MDEP has been sampling wetlands using these or similar protocols for 20 years. The NHDES sampling team had limited macroinvertebrate sampling experience and this was the first effort to sample wetlands for macroinvertebrates, and apply protocols that had not been employed within the state.

Some of the observations may warrant testing to address factors possibly affecting or contributing to the inability to assign an attainment class for some wetlands or the perceived difference in assessment results when compared with other methods.

## 5.2 Indicators of Human Disturbance/ Wetland Condition

Development was the primary type of human disturbance in the vicinity of the sampled wetlands. One or more of these stressors–roads, culverts, parking lots, stormwater inputs, or water withdrawals– were present to varying degrees and documented at a majority of the wetlands. Limited areas of agricultural land uses surrounded few sampled wetlands, minimizing nutrients inputs from agricultural sources.

In the northeast, deicing treatments in the winter are associated with development-related land uses and impervious surfaces, and contribute to sources of chlorides in surface and ground waters (NHDES, 2011). Two wetlands (CON1 and SAL2) had chloride levels that exceed the chronic freshwater quality criterion of 230 mg/L for chloride; they also were among wetlands with the lowest scores for the EIA-Land Use Index (CON1, 2.5; SAL2, 1.1). The correlation between the EIA-Land Use Index scores and chloride levels provides strong support for the potential to use the Land Use Index alone as a screening level tool before considering field sampling. Additional verification and calibration of the screening tool should be considered.

**Floristic quality metrics and EIA**

The two rapid assessments applied (EIA and WHDA) show a strong correlation with floristic quality metrics, mean C and EIA ranks/scores (rho= 0.63; p=0.00089), and mean C and the WHDA (rho= -0.63; p=0.0011). These results are consistent with Bell et al. (2017), who found that for forested wetlands, mean C was significantly correlated with EIA ranks for red maple-*Sphagnum* basin swamps in New Hampshire (rho=0.61; p=0.047) and red maple swamps in Maine (rho=0.61; P=0.013). The correlation of mean C with EIA was especially notable as the universe of wetlands sampled was not restricted to one system type. Further study of this observation should be considered.

Sampling of submergent vegetation in the first year may have missed some taxa with the use of the less effective cultivator tool to sample aquatic vegetation. Wetlands with submergent or aquatic bed vegetation not visible near the surface would be most affected by the change in sampling tool. Considering our experience using the shrub rake for the second year, it is likely that the number of taxa missed would be a very small number (no more than one to three) of the taxa documented.

Studies applying floristic quality methods in lacustrine wetlands in Indiana found that a plant index of biotic integrity (PIBI) that included the attributes of species richness and composition, species tolerance, guild structure, and vegetation abundance correlated well with independent measures of habitat quality. (Rothrock et al., 2008). Use of floristic data to assess wetland condition for similar wetlands may involve broader metrics than the standard FQA metrics presented. FQA has focused predominantly on an area's vascular flora. For lacustrine wetlands or lakes, it has been suggested that a condition assessment should consider macrophytic algae such as charophytes, which comprise a significant amount of biomass in such habitats (Alix and Scribailo, 2006). In one of the sampled wetlands (HNV1), photosynthesizing *Chara* sp. contributed to the supersaturation of dissolved oxygen.

**Defining Reference**

MDEP has used the following remote, rapid assessment and field meter-based water quality criteria to identify reference wetlands for its analysis of differences in scores by ecoregion or wetland type (lacustrine vs. riverine) (DiFranco, personal communication, November 14, 2017):

- Watershed land use 95% or greater of forest or wetland.
- Total MDEP Wetland Human Disturbance Assessment score of 10 or less; no single category above 5.
- Specific conductance <100 µS.

Using these criteria, six wetlands would be considered reference. The predicted attainment classes (or indeterminate statuses) that were generated based on the MDEP model are:

- Attainment class A: GRG1, WOO1
- Attainment class C: DEE1
- Indeterminate status: HKS1, MLW1, TRO1

Two of four wetlands that received a predicted attainment class of A (ALS1, ENF1) by the model would not qualify as reference using the above criteria due to WHDA scores slightly above 10 (ALS1=11, ENF1=12).

Nichols (2018) recently completed development of FQA thresholds for 14 New Hampshire wetland system types, including drainage marsh - shrub swamps and medium level fens; both systems are represented among the sampled wetlands (Table 15). Nichols determined threshold values for weighted mean C of minimally impacted wetland systems based on plot data. For drainage marsh - shrub swamp systems, the threshold for weighted mean C is 2.90 (median) and 3.26 (mean). For medium level fen systems, the threshold for weighted mean C is 5.04 (mean and median).

For the 16 sampled drainage marsh - shrub swamp wetlands, the mean C is 3.9 (median); for the two medium level fens, the mean C is 4.6 (median). The drainage marsh - shrub swamp median for the 16 wetlands may be higher than the minimally impacted threshold (Nichols, 2018) because of the difference in calculation (the threshold is based on an area-weighted approach) and the limited survey for this study (the plant communities in the swamp part of the drainage marsh-shrub swamp systems were not surveyed). The threshold value is based on plots by community type and area-weighted within the wetland system. Our mean C value is based on sampling taxa in the aquatic and emergent portions of the systems, without abundance data or aggregation by community type.

The two fens sampled had a mean C (4.7) that is lower than the minimally impacted threshold value (5.04)

(Nichols, 2018). In addition to potentially reflecting differences in condition, the difference between actual and threshold scores for these wetlands also may reflect variations in sampling protocols used (e.g., plots within community type and threshold value based on the proportion of the communities in the system, vs. general vegetation survey).

**Buffers**

The positive effects of vegetated buffers on water quality are well documented (Houlahan and Findlay, 2004; Wilkerson et al., 2006). Assessment of wetland buffers related to wetland condition is typically conducted with GIS. However, buffers can appear intact even where stormwater is being transported through the vegetated buffer or into a wetland from outside the assessed area. A field survey is essential to document the presence of a culvert or stormwater discharge to a wetland and its potential effects on wetland condition. Additionally, the effect of a stormwater discharge on wetland condition may be greater than reflected by some rapid assessments. The effects of stormwater are not specifically accounted for quantitatively in the EIA and are modestly accounted for in the WHDA (a maximum of 5 points of 25 for Hydrologic Modifications to Wetland and a maximum of 5 points of 25 in the Evidence of Chemical Pollutants section). Field assessment with water sampling may be necessary to assess wetland condition where open water is present. Other means, besides the buffer, may be necessary to consider stormwater impacts to wetland condition.

Miller et al. (2009) reported on the potential for vegetated riparian habitat to serve as a predictor of the health of the adjacent stream community. There was no consistent relationship between floristic indicators (FQAI) and aquatic metrics (habitat, taxa richness and EPT taxa). The difference in response was attributed to it being scale dependent. That is, floristic quality reflects local changes in condition, while instream metrics reflect the condition of the watershed as a whole. It is unknown how this may apply to lacustrine wetlands.

Although the relationship between buffer width and predicted attainment class was not significant (Figure 31), the amount of developed land uses within 500m of the wetland (EIA-Land Use Index) was strongly correlated with chloride concentrations (Figure 30).

## 5.3 Model Application and Transferability of Methods

**MDEP Wetland Model and WHDA**

The low number of wetlands in each attainment class provided limited data to analyze the results. Fortunately, under a subsequent grant we have collected another two field seasons of data for an additional 20 wetland sampling events (including the resampling of two wetlands for which an attainment

class could not be generated). When combined with the data from this study, the additional data will strengthen our ability to identify significant relationships.

MDEP has developed significant institutional knowledge in its biomonitoring program. To ensure the consistent application of protocols in support of the MDEP model, and for potential use beyond MDEP, the following suggestions and questions are offered for consideration by MDEP and others.

- Address within site variability.
    - Provide guidance for how to select locations with similar substrates within wetlands (we found this very challenging), or what to do when similar substrates cannot be found for the three replicate locations (if anything other than recording the different substrate type).
    - Add the collection of field meter data at each location where macroinvertebrate sampling is conducted. Based on the within-site variability we observed, this could provide valuable information.
    - Does within-site variability (such as substrate) affect the ability to determine an attainment class? Does the distance between replicate samples have an effect on the attainment class?
- Provide specific instructions to accompany the forms, such as guidance on determining “dominant plants” relative to vegetation present. A percentage threshold? Provide a definition for each substrate listed on the macroinvertebrate form.
- Provide detailed guidance about defining assessment areas; this would be useful for consistent application of the WHDA.
- Are there wetland types for which the model produces an attainment class that doesn’t represent condition appropriately?
- Is the assignment of attainment classes affected by temporal differences in sampling?

It is likely that some of the above ideas or questions have surfaced in the application of protocols and the model .

# 6 Conclusion

This study represents NHDES' initial efforts to collect macroinvertebrate and water quality data specifically in wetlands. This study has started to fill a gap in our knowledge of New Hampshire's wetlands.

The lack of predicted attainment classes for ten wetlands reduced the ability to analyze the data, relative to the predicated attainment class and macroinvertebrate community. Further analysis will be conducted on these data with the addition of two additional years of sampling and results from sampling of 20 additional wetlands (in 2016 and 2017).

The successful application of two rapid assessments and floristic quality assessment metrics has provided useful information about indicators of disturbance that can continue to be used, and perhaps refined as needed in future work. Further testing of the EIA- Land Use Index and relationship with chloride and other parameters would be valuable.

Efforts to develop wetland-specific water quality standards can be summed up by Rothrock et al. (2008) who writing about assessing condition of lacustrine wetlands noted, "The complexity of lacustrine systems dictates that a variety of indicators, capturing multiple organizational and temporal scales be employed."

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# 8 Abbreviations

| | |
|---|---|
| AA | Assessment area |
| ASWM | Association of State Wetland Managers |
| C value | Coefficient of conservatism |
| CoC | Coefficient of conservatism |
| DEM | Digital elevation model |
| EDD | Electronic Data Deliverable (Excel-based form) |
| EIA | Ecological Integrity Assessment |
| FQA | Floristic Quality Assessment |
| FQI | Floristic Quality Index |
| GIS | Geographic Information System |
| IPANE | Invasive Plant Atlas of New England |
| LUB | Lacustrine unconsolidated bottom |
| MDEP | Maine Department of Environmental Protection |
| MTI | Maine Tolerance Index |
| NHB | New Hampshire Natural Heritage Bureau (NHB) |
| NHDES | New Hampshire Department of Environmental Services |
| NLCD | National Land Cover Database |
| NMDS | Non-metric multi-dimensional scaling |
| NWI | National Wetland Inventory |
| PAB | Palustrine aquatic bed |
| Pre-EDD | Pre- Electronic Data Deliverable (form) |
| PUB | Palustrine unconsolidated bottom |
| PIBI | Plant Index of Biological Integrity |
| QAPP | Quality Assurance Project Plan |
| QC | Quality control |
| USEPA | US Environmental Protection Agency |
| VBA | Visual Basic for Applications |
| WHDA | Wetland Human Disturbance Assessment |
| WPDG | Wetland Program Development Grant |

# 9 Appendices

A. Maine DEP - Wetland Key Report Guidance
B. Wetland Bioassessment Field Data Sheet
C. Wetland Monitoring - Water Field Data Sheet
D. Wetland Human Disturbance Assessment Form
E. EIA Pre-Field and Field Metrics Form
F. EIA Stressor Checklist
G. EIA Recon Form
H. Wetland Assessment - Plant Sampling Form
I. Collecting Macroinvertebrates Using a Dip Net Measured Sweep
J. NHB Drainage Marsh - Shrub Swamp wetland specs (Nichols, 2015c)
K. Pre-EDD form
L. EDD form
M. (M-1 to M-24) Maine DEP - Biological Monitoring Program - Wetland Aquatic Life Classification Attainment Reports

| | | |
|---|---|---|
| M- 1 | ALS1 | Fuller wetland, Alstead |
| M- 2 | BOW1 | Town Pond, Bow |
| M- 3 | CNT1 | Oxbow Pond, Canterbury |
| M- 4 | CON1 | South End Marsh, Concord |
| M- 5 | DEE1 | Pawtuckaway Marsh, Deerfield |
| M- 6 | ENF1 | George Pond, Enfield |
| M- 7 | FRN1 | Echo Lake wetland, Franconia |
| M- 8 | GRG1 | White Mountain National Forest (Tributary to Peabody River), Green's Grant |
| M- 9 | HKS1 | Clay Pond, Hooksett |
| M-10 | HNV1 | Mulherrin Farm Road wetland, Hanover |
| M-11 | HUD1 | Musquash Pond, Hudson |
| M-12 | JAF1 | Contoocook River wetland, Jaffrey |
| M-13 | MAN1 | Rail Trail marsh, Manchester |
| M-14 | MAN2 | Joseph Street Pond, Manchester |
| M-15 | MLW1 | Gregg wetland, Marlow |
| M-16 | NAS1 | Field Grove – Salmon Brook, Nashua |
| M-17 | NAS2 | The Cove, Nashua |
| M-18 | NWB1 | Great Meadow, New Boston |
| M-19 | PEM1 | Brickett Hill Road pond (Butterfield??), Pembroke |
| M-20 | SAL1 | World End Pond, Salem |
| M-21 | SAL2 | Salem (HS) High School wetland, Salem |
| M-22 | TRO1 | Perkins Pond - Upper, Troy/Jaffrey |
| M-23 | WHI1 | Johns River, Whitefield |
| M-24 | WOO1 | Elbow Pond, Woodstock |

N. Statistical analyses - Table of *p* values

# Guidance for Understanding a Biomonitoring Wetland Macroinvertebrate Aquatic Life Classification Attainment Report

The ME DEP Biological Monitoring Program generates a Macroinvertebrate Aquatic Life Classification Attainment Report for each wetland 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**
**Wetland Aquatic Life Classification Attainment Report**

**Station Information**

| | | | |
|---|---|---|---|
| **Station Number:** | **W-142** | Trip ID 2006-142 | DEP Drainage: Penobscot |
| Waterbody: | FRENCH STREAM | | HUC8: 01020005 |
| Town: | Exeter | | HUC8 Name: Lower Penobscot |
| | | | Latitude: 44 57 8.65 N |
| | | | Longitude: 69 8 22.1 W |
| | | | Mitigation Monitoring Site: No |

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

- **Trip ID** – Unique identifier assigned to each site visit (year sampled – station number).
- **DEP Drainage:** This is the name of the 4-digit hydrologic unit code.
- **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.
- **Latitude** and **Longitude** are projected in NAD83, meters.
- **Mitigation Monitoring Site** – Indicates if the wetland has been created, restored, enhanced or preserved as part of a compensatory mitigation plan required by a DEP issued wetland alteration permit.

**Sample Information**

| | | | |
|---|---|---|---|
| **Sample ID:** | **DN-2006-142** | Type of Sample: DIPNET | Date Sampled: 6/20/2006 |
| Subsample Factor: X1 | | Replicates: 3 | |

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

- **Sample ID** – Unique identifier assigned to each biological sample, representing the sample method, the year sampled and the station number. “DN” Indicates that this macroinvertebrate sample was collected using the Dipnet measured sweep method.
- **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:** | **B** | **Final Determination:** | **A** | Date: 1/14/2013 |
| Model Result with P>.6: | A | **Reason for Determination:** | **Model** | |
| Date Last Calculated: | 12/3/2012 | Comments: | | |

The **Classification Attainment** section contains information about the statutory class, model results, and final determination

- **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.htm).
- **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 but 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 | | | |
|---|---|---|---|
| Class A: 0.90 | Class B: 0.10 | Class C: 0.00 | NA: 0.00 |

**Model Probabilities**
DEP uses a linear discriminant model 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). The model uses the variables 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.

The model may also come out with the model result Indeterminate (I)**. Indeterminate is** a term that describes a probability value for a class of greater than 0.4 but less than 0.6 so that the conclusion of classification attainment for that class cannot be determined without further information. In this case the DEP Biologist may use their best professional judgment in order to make a final determination.

| Model Variables | | | |
|---|---|---|---|
| Total Mean Abundance | 590 | MTI Sensitive Taxa Abundance | 127.67 |
| Ephemeroptera Abundance | 60.00 | MTI Sensitive Taxa Relative Abundance | 0.22 |
| Odonata Relative Abundance | 0.005 | MTI Sensitive Taxa Richness | 11 |
| Trichoptera Relative Abundance | 0.002 | MTI Intermediate Taxa Relative Abundance | 0.76 |
| Shredder Taxa Relative Abundance | 0.01 | MTI Intermediate Taxa Richness | 23 |
| Non-insect Taxa Relative Richness | 0.24 | Ratio of MTI Sensitve to Eurytopic Taxa Abundance | 11.61 |

| Other Variables | |
|---|---|
| Generic Richness: | 51 |
| Hilsenhoff Biotic Index: | 7.08 |
| Shannon-Weiner Diversity: | 3.56 |
| Maine Tolerance Index: | 25.18 |

| Five Most Dominant Taxa | | |
|---|---|---|
| Rank | Taxon Name | Percent |
| 1 | *Tanytarsus* | 34.01 |
| 2 | *Amnicola* | 9.94 |
| 3 | *Paratendipes* | 9.49 |
| 4 | *Caenis* | 8.76 |
| 5 | *Procladius* | 7.57 |

**Model Variables and Other Variables**

- **Total Mean Abundance** – The mean number of individuals in a sample, usually based on 3 replicates. It is used as a basic measure of community structure.
- **Relative Abundance**– The mean number of individuals from one taxonomic grouping divided by the total mean abundance for the whole sample
- **Generic Richness** – Generic richness is the total number of unique genera in a sample. In the example above, the total Generic Richness for the sample is 51. Generic Richness is a good measure of water quality, it will decline as water quality declines.
- **Relative Richness** – This is calculated by dividing a taxonomic group's richness by the sample's total generic richness.
- **Ephemeroptera Abundance**- Total number of Ephemeroptera (Mayfly) individuals. Mayflies are intolerant of many pollutants, so abundances are distinctly lower for nonattainment samples than the other classes.
- **Odonata Relative Abundance**- The relative abundance of organisms in the Odanata (dragonfly/damselfly) order.
- **Trichoptera Relative Abundance**- The relative abundance of organisms in the Trichoptera (Caddisfly) order. Many Trichoptera are intolerant of low water quality.

- **Shredder Taxa Relative Abundance**- The relative abundance of taxa in the functional feeding group shredders.
- **Non-Insect Taxa Relative Richness**- The relative richness of non-insect taxa.
- **MTI Sensitive Taxa Abundance**- The total number of sensitive taxa. Sensitive taxa determined using the Maine Tolerance Index (MTI).
- **MTI Sensitive Taxa Relative Abundance**- The relative abundance of sensitive taxa.
- **MTI Sensitive Taxa Richness**- the richness of sensitive taxa.
- **MTI Intermediate Taxa Relative Abundance**- The relative abundance of intermediate taxa. Intermediate taxa determined using the MTI.
- **MTI Intermediate Taxa Richness**- The richness of intermediate taxa.
- **Ratio of MTI Sensitive to Eurytopic Taxa Abundance**- The ratio of sensitive taxa to eurytopic taxa based on individual taxa tolerance values calculated for the MTI.
- **Hilsenhoff Biotic Index** (Hilsenhoff 1987.) – The Hilsenhoff 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).
- **Shannon–Wiener Diversity** (Shannon and Weaver 1963.) – Shannon-Wiener Diversity is composed of a richness factor and an eveness factor. As both diversity and richness decline, the stability of most natural communities usually declines. Generally, the lower the number, the less stable the community is. Values can range from 0 to 4.6 but are usually between 1.5 and 3.5.
- **Maine Tolerance Index (MTI)** – Tolerance values for individual taxa are calculated using species optima (the predicted "preferred" environmental conditions for each taxon), on a scale from 1-100. Organisms with a tolerance value less than or equal to 22.0 are considered sensitive taxa. Organisms with a tolerance value between 22.1 and 42.9 are considered Intermediate taxa. And organisms with a tolerance value equal to or greater than 43.0 are considered Eurytopic taxa (taxa that occur across a wide range of environmental conditions). The MTI is a weighted average of tolerance values of the organisms found in the sample.

For more information about the specific macroinvertebrates and their ecology, see the Benthic Macroinvertebrate page of the Biomonitoring website. (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.

| Sample Collection and Processing Information | |
|---|---|
| Sampling Organization: | BIOMONITORING UNIT |
| Taxonomist: | LOTIC INC. |

**Sample Collection and Processing Information**

- **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 quality

management plan provided to, and approved by, the department. 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. This field shows the name of the organization performing the taxonomy for the sample.

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

**Water Chemistry**

**Sample Date:** 6/20/2006 12:45:00 PM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | Grab Sample | Chlorophyll A | 0.0027 | mg/l | |
| Surface Water | Grab Sample | Chlorophyll A - Phaeophytin | 0.0024 | mg/l | |
| Surface Water | Grab Sample | Dissolved Organic Carbon | 4.6 | mg/l | |
| Surface Water | Grab Sample | Nitrate+nitrite As N | 0.22 | mg/l | |
| Surface Water | Grab Sample | pH | 7.9 | | |
| Surface Water | Grab Sample | Silica | 2.6 | mg/l | |
| Surface Water | Grab Sample | Soluble Reactive Phosphorus | 0.001 | mg/l | |
| Surface Water | Grab Sample | Specific Conductance | 194 | us/cm | |
| Surface Water | Grab Sample | Total Alkalinity | 84 | mg/l | |
| Surface Water | Grab Sample | Total Kjeldahl Nitrogen | 0.5 | mg/l | |
| Surface Water | Grab Sample | Total Phosphorus | 0.017 | mg/l | |
| Surface Water | Grab Sample | True Color | 24 | unit | |
| Surface Water | In-situ | Dissolved Oxygen | 7.5 | mg/l | |
| Surface Water | In-situ | pH | 7.55 | | |
| Surface Water | In-situ | Specific Conductance | 176 | us/cm | |
| Surface Water | In-situ | Temperature | 24.1 | deg c | |

Physical/chemical characteristics of the water body including temperature, dissolved oxygen, pH and specific conductance are measured in the field at the time macroinvertebrate sampling is performed. Water grab samples are also collected and analyzed for a suite of water quality parameters by an outside laboratory. Common qualifiers are: J= Associated value is estimated, U= Not detected above the associated quantitation limit, NAN= Not analyzed.
See SOPs for procedures:
(http://www.maine.gov/dep/water/monitoring/biomonitoring/material.html#QAandSOPs)

| Summary of Habitat Characteristics | | | | | |
|---|---|---|---|---|---|
| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting | |
| Total Score: | 10 | System: | PALUSTRINE | Landscape Position | LOTIC STREAM |
| Hydrologic Modifications: | 2 | Subsystem | | Lotic Gradient: | DAMMED REACH |
| Vegetative Modifications: | 0 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: | THROUGHFLOW |
| Chemical Contaminants: | 0 | Subclass 1 | MUD | Land Form: | FRINGE |
| Impervious Surface: | 4 | Class 2: | UNCONSOLIDATED BOTTOM | Land Form Type: | LOTIC STREAM FRINGE POND |
| Non-point Sources: | 4 | Subclass 2 | ORGANIC | Waterbody Type: | POND |
| | | Class 3: | | Waterbody Subtype | DAMMED/IMPOUNDED |
| | | Subclass 3: | | Comments: | |
| Dominant Plant Species: | PICKERELWEED, YELLOW WATER LILY, POTAMOGETON SP., BULL RUSH, VALLISNERIA | | | | |
| Habitat Classification: | | | Substrate Classification: | | |
| EMERGENT NON-PERSISTENT VEGETATION | | | DETRITUS SUBSTRATE | | |
| | | | SILT/MUCK SUBSTRATE | | |

**Summary of Habitat Characteristics** contains information about the area surrounding the sample station.

- **Human Disturbance** – A field based stressor assessment based on the five categories listed above. A lower score indicates less human disturbance, and higher score indicative of more disturbance.

The ME DEP uses two wetland classification systems, both developed by the US Fish and Wildlife Service's National Wetland Inventory (NWI) Program, to characterize the wetland area surrounding our sampling station from a landscape level perspective. Please note that the wetland classification for the actual location sampled is recorded in the field, and often varies from the landscape classification due to differences in scale.

- **Landscape–level Cowardin Classification** – Characterization of the site using the Cowardin wetland classification system. This system uses vegetation, substrate and hydrology to describe wetland types for inventory purposes. (Cowardin et. al., 1979)
- **Hydrogeomorphic (HGM) Setting** – The US Army Corp of Engineers (ACOE) has developed a HGM classification system (Brinson, 1993) which uses the wetland's watershed position, its sources of water and its hydrodynamics to evaluate its functions. The NWI program has developed a HGM–type coding system (Tiner, 2003) to complement the Cowardin classification, which is the system used by the MEDEP.
  **Dominant Plant Species** – General overview of the dominant and/or commonly observed plants seen at the station, not a comprehensive list of all species present.
- **Habitat Classification** – Type of habitat immediately surrounding where macroinvertebrate samples were collected. See Wetland field sheet for the list of possible habitat types (http://www.maine.gov/dep/water/monitoring/biomonitoring/materials/fieldsheet_wetlands.pdf).
- **Substrate Classification** – Type of substrate found where macroinvertebrate samples were collected. See Wetland field sheet for the list of possible substrate types (http://www.maine.gov/dep/water/monitoring/biomonitoring/materials/fieldsheet_wetlands.pdf).

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**Landcover Summary - 2004 Data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total Area (ac) | 10381 | High Int. Dev. % | 0.0 | Water % | 0.4 | Non-vegetated % | 0.0 |
| | | Med Int. Dev. % | 0.1 | Wetland % | 4.3 | Tilled Agriculture % | 13.3 |
| | | Low Int. Dev. % | 3.6 | Upland Woody % | 73.0 | Grassland % | 5.2 |
| | | Development % | 3.7 | Natural % | 77.5 | Human Altered % | 22.1 |
| | | | | | | Impervious % | 1.8 |
| Total Land (ac) | 10339 | High Int. Dev. % | 0.0 | Water % | N/A | Non-vegetated % | N/A |
| | | Med Int. Dev. % | 0.1 | Wetland % | 4.4 | Tilled Agriculture % | 13.4 |
| | | Low Int. Dev. % | 3.6 | Upland Woody % | 73.3 | Grassland % | 5.2 |
| | | Development % | 3.7 | Natural % | 77.8 | Human Altered % | 22.2 |
| | | | | | | Impervious % | 1.8 |

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 Area**– includes land, open water, and mudflats
- **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.

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**Additional Summary Variables**

**Station Number:** **W-142** Waterbody: FRENCH STREAM Town: Exeter

**Log Number:** **DN-2006-142** Subsample Factor: X1 Replicates: 3 Calculated: 12/3/2012

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 64.00 | 0.108 | 12 | 0.24 |
| EPT Taxa: | 61.33 | 0.104 | 8 | 0.16 |
| Insects: | 459.00 | 0.778 | 39 | 0.76 |
| Non-Insects: | 131.00 | 0.222 | 12 | 0.24 |
| Leeches: | 4.33 | 0.007 | 1 | 0.02 |
| Oligochaetes: | 1.33 | 0.002 | 1 | 0.02 |
| Snails: | 89.33 | 0.151 | 6 | 0.12 |
| Bivalves: | 1.00 | 0.002 | 1 | 0.02 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 34.33 | 0.058 | 1 | 0.02 |
| Mites: | 0.67 | 0.001 | 2 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 60.00 | 0.102 | 5 | 0.10 |
| Odonates: | 2.67 | 0.005 | 4 | 0.08 |
| Caddisflies: | 1.33 | 0.002 | 3 | 0.06 |
| Diptera: | 390.67 | 0.662 | 22 | 0.43 |
| Hemiptera: | 2.67 | 0.005 | 1 | 0.02 |
| Beetles: | 1.67 | 0.003 | 4 | 0.08 |
| Chironomids: | 383.33 | 0.650 | 18 | 0.35 |
| Tanypodinae Tribe: | 70.67 | 0.120 | 4 | 0.08 |
| Chironomiinae Tribe: | 306.00 | 0.519 | 11 | 0.22 |
| Orthoclodiinae Tribe: | 6.67 | 0.011 | 3 | 0.06 |
| Collector-Filterers: | 203.00 | 0.344 | 3 | 0.06 |
| Collector-Gatherers: | 187.33 | 0.318 | 12 | 0.24 |
| Predators: | 82.67 | 0.140 | 9 | 0.18 |
| Piercers: | 1.33 | 0.002 | 2 | 0.04 |
| Shredders: | 8.67 | 0.015 | 4 | 0.08 |
| Scrapers: | 86.91 | 0.147 | 4 | 0.08 |
| Maine Tolerance: | | | | |
| Sensitive: | 127.67 | 0.221 | 11 | 0.28 |
| Intermediate: | 439.67 | 0.760 | 23 | 0.59 |
| Eurytopic: | 11.00 | 0.019 | 5 | 0.13 |
| Ratio of MTI Sensitive to Eurytopic | 11.61 | 11.606 | 2.20 | 2.20 |

The **Additional Summary Variables** section contains abundance, relative abundance, richness and relative richness information for a variety of taxonomic and functional feeding groups.

**EOT Taxa**- The total number of individuals in the orders Ephemeroptera (E), Odonata (O), and Trichoptera (T).
**EPT Taxa**- The total number of individuals in the orders Ephemeroptera (E), Plecoptera (P), and Trichoptera (T). These orders are usually poorly represented in communities where water quality is poor.
**MTI** –Maine tolerance Index (see definition in Model Variable and Other Variables section)

**Ratio of MTI Sensitive to Eurytopic**- See definition in Model Variable and Other Variables section

For more information about the specific macroinvertebrates and their ecology, see the Benthic Macroinvertebrate page of the Biomonitoring website:
http://www.maine.gov/dep/water/monitoring/biomonitoring/sampling/bugs/index.htm

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**Aquatic Life Taxonomic Inventory Report**

**Station Number: W-142** Waterbody: FRENCH STREAM Town: Exeter
**Log Number: DN-2006-142** Subsample Factor: X1 Replicates: 3 Calculated: 12/3/2012

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Lumbriculus* | 08020101002 | 1.33 | 1.33 | -- | CG | 35 | -- | Worm |
| *Helobdella* | 08030101005 | 0.00 | 4.33 | -- | -- | 43 | -- | Leech |
| *Helobdella elongata* | 08030101005001 | 0.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Helobdella stagnalis* | 08030101005004 | 3.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Hyalella* | 09010203006 | 34.33 | 34.33 | 8 | CG | 24.5 | -- | Amphipod |
| Aeshnidae | 09020301 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damsefly |
| Libellulidae | 09020306 | 1.67 | 1.67 | -- | -- | -- | -- | Dragonfly/damsefly |
| *Libellula* | 09020306035 | 0.33 | 0.33 | 9 | PR | 15 | -- | Dragonfly/damsefly |
| *Ischnura* | 09020309052 | 0.33 | 0.33 | 9 | PR | 14.6 | -- | Dragonfly/damsefly |
| *Callibaetis* | 09020401002 | 4.67 | 4.67 | 9 | CG | 40.5 | -- | Mayfly |
| *Procloeon* | 09020401010 | 3.00 | 3.00 | -- | CG | 21 | -- | Mayfly |

The **Aquatic Life Taxonomic Inventory Report** section is a list of all taxa found in the sample with some additional information described below.

- **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 three individuals of *Helobdella elongata* in the three samplers, which makes the actual count 0.67 [(0+ 2 + 0) / 3 = 0.67]. 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 Helobdella. The mean abundance counts for *Helobdella elongata* and *Helobdella stagnalis* were 0.67 and 3.67. The species counts were adjusted to genus by adding them together [0.67+3.67=4.33]. 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.
- **Tribe** – One or more genera that share certain characteristics are placed into tribes. One or more genera that share certain characteristics are placed into tribes. In the MDEP taxa list, usually only members of the Chironomidae family have their tribes noted. 'T' indicates that the corresponding taxa is in the Tanypodinae tribe,'O' for the Orthocladiinae Tribe, 'C' for the Chironominae-Chironomini Tribe, 'D' for the Diamesinae Tribe, 'P' for the Podonominae Tribe, 'R' for the Prodiamesinae Tribe, 'Y' for the Chironominae-Tanytarsini Tribe, 'S' for the Chironominae-Pseudochironomini Tribe, and 'H' for the Chironominae Tribe.
- **Taxa Group-** Group common name

References

Brinson, M.M. 1993. A Hydrogeomorphic Classification for Wetlands. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS, USA. Technical Report WRP- DE-4.

Cowardin, L.M., Carter, V., Golet, F.C., and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31.

Tiner, R. 2003. Dichotomous Keys and Mapping Codes for Wetland Landscape Position, Landform, Water Flow Path, and Waterbody Type Descriptors. U.S. Fish and Wildlife Service, National Wetlands Inventory Program, Northeast Region, Hadley MA. 44 pp.

# NHDES Wetland Bioassessment Field Data Sheet

**Station Information** (Note: some of this information is filled in back at the office)

Station ID:_____ Date:_____ Crew_____

AUID: _____ Wetland/water body:_____ Town:_____

GPS Waypoint Name: _____ GPS accuracy: _____ Latitude: _____ Longitude: _____

Sample Access (boat, wading): _____ Ecoregion:_____ HUC 8_____ HUC 10 _____

Photos(Magnetic North) ☐ N ☐ E ☐ S ☐ W Visible Flow: ☐ Y ☐ N_____

Watershed Characteristics: ☐ flat _ ☐ rolling ☐ hilly ☐ mountains_____

Detailed directions and description of sampling station/sites **(mark sample locations on attached map):** _____

_____

_____

_____

**Macroinvertebrate Samples:** Record the following information for each habitat sampled. (Use habitat and substrate codes below.)

| Habitat Code | Site # | Waypoint # | Time | # of bottles | Water Depth(m) | Substrate Code(s) | Dominant Plant Species (continue on back if necessary) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Habitat Codes
01. Open water – standing (ponds, marshes)
02. Open water – flowing (river/stream channels)
03 Aquatic macrophyte bed (floating/submerged vegetation dominant)
04. Emergent - non-persistent vegetation dominant (non-woody species not visible at certain seasons, such as pickerelweed)
05. Emergent - persistent vegetation dominant (non-woody species that remain standing until the beginning of the next growing season, such as grasses, cattails)
06. Scrub-shrub (dominated by woody vegetation < 6m tall)
07. Peatland (emergents, shrubs and trees < 30% cover)
08. Forested (dominated by woody vegetation > 6m tall)
09. Vernal pool
10. Other_____

Cowardin code: _____

Substrate Codes
1. sand (<1/8")
2. gravel (1/8" – 3")
3. rubble (3" – 10")
4. silt/muck
5. clay
6. organic soil (well decomposed)
7. peat
8. boulders (>10")
9. bedrock
10. detritus

**Physical/Chemical parameters:** See NHDES Wetland Monitoring Water Field Data Sheet

**Water Samples Collected:** Water samples (#): _____ Sample Storage Method: _____

Notes/comments: _____

_____

_____

_____

# NHDES Wetland Monitoring - Water Field Data Sheet

**Station ID:** _____ **Date:** _____ **Grab Samples:** Site #: **1** ☐ **2** ☐ **3** ☐ Time: _____

**Wetland/water body**: _____ **Town**:_____ **AUID**: _____

**Latitude:** _____ **Longitude:** _____ **Crew:** _____

**Weather:** ☐ Clear ☐ Cloudy w/o rain ☐ Cloudy w/intermittent rain ☐ Cloudy w/rain ☐ Rain in the past three days ☐ Calm ☐ Breezy ☐ Windy
**Temp:** ☐ 50s ☐ 60s ☐ 70s ☐ 80s ☐ 90s

Time DO Meter turned ON: _____ Time of DO calibration: _____

| **Field Measurements** ☐ Boat ☐ Wading | | | |
|---|---|---|---|
| **Parameter** | **Results** Site 1 WP_____ | Site 2 WP_____ | Site 3 WP_____ |
| Time | | | |
| Temperature ºC | | | |
| Dissolved Oxygen (mg/L) | | | |
| Dissolved Oxygen (%) | | | |
| pH | | | |
| Conductivity (µS/cm) | | | |
| Specific Conductance (µS/cm) | | | |
| Turbidity (NTU) | | | |

| **Lab Parameters** | | | |
|---|---|---|---|
| **Public Health Lab (PHL)** | | | |
| $(NO_2 + NO_3)$ | | DOP | |
| TKN | | TP | |
| DOC | | | |
| **Limnology Lab (JCLC)** | | | |
| Chlor-a | | Alkalinity | |
| Chloride | | True Color | |

| **Field Meter Documentation** | | |
|---|---|---|
| **Make/Model** | **Serial Number** | **Parameter(s) Measured** |
| YSI Pro 2030 | 14D101021 | Temperature, DO % and mg/L, Conductance |
| Oakland pH 11 Meter | 2160347 | pH |
| LaMotte 2020we | 4292 | Turbidity |

Field Data Validated: _____ By: _____
Lab Data Validated: _____ By:_____
Data Entered in EMD: _____ By: _____
EMD Data Entry Checked: _____ By: _____

Appendix C

**On-Site Hand-held Meter Calibration / Meter Check Records – Complete for Every Sample**

| Dissolved Oxygen | | Specific Conductance | pH | Turbidity | | |
|---|---|---|---|---|---|---|
| DO Calibration Value (%) | DO% Saturation Chamber Reading | 2,000 µS/cm std. (+/- 20%) | Calibration Slope (95%-105%) | Initial 1.0 NTU Reading (+/- 0.25 NTU) | Needs Calibration **Y** **N** | **If Yes:** After Calibration 1.0 NTU Reading |
| | | | | | | |

| Meter Precision Check<br>First Station of Sampling Day | | | |
|---|---|---|---|
| | Location (Site #) | Time | Result |
| Turbidity DI Blank (+/- 0.25 NTU) | 1 | | |
| pH 6.0 std. (+/- 0.3 units) | 1 | | |
| Spec. Cond. 100 µS/cm (+/- 20 µS/cm) | 1 | | |
| Meter precision check results should be filled in for all data sheets for each day of sampling. | | | |
| **Meter Precision Check<br>Last Station of Sampling Day** | | | |
| Turbidity DI Blank (+/- 0.25 NTU) | 3 | | |
| pH 6.0 std. (+/- 0.3 units) | 3 | | |
| Spec. Cond. 100 µS/cm (+/- 20 µS/cm) | | | |

**Field Notes:**

# NHDES Wetland Human Disturbance Assessment (WHDA)

Name of wetland / associated waterbodies: _____ Town: _____

Station #:_____ Date: _____ Evaluator(s): _____

The purpose of this assessment is to characterize the degree of human disturbance in and around a wetland Biomonitoring station and to document environmental stressors. Note that this human disturbance assessment is a stressor identification tool and not a direct measure of biological condition. See *Protocols for Completing the Biological Monitoring Wetland Human Disturbance Assessment* for scoring procedures and guidance.

For each wetland station assessed, score all factors in each section below using the following scale:

| Severity | Severity Description | Rank |
|---|---|---|
| **Not Observed or Unknown** | The stressor is not observed or has no detrimental impact on wetland condition. | **0** |
| **Observed; Minimal Disturbance** | The stressor is present and appears to have negligible impacts on wetland condition. | **1** |
| **Low Disturbance** | The stressor is present and appears to have minor impacts on wetland condition. | **2** |
| **Moderate Disturbance** | The stressor is present and appears to moderately impact wetland condition. | **3** |
| **High Disturbance** | The stressor is present and appears to significantly impact wetland condition. | **4** |
| **Severe Disturbance** | The stressor is present and appears to have major impacts on wetland condition. | **5** |

| **Section 1. Hydrologic Modifications to Wetland** | Check if present | Score 0 to 5 |
|---|---|---|
| **Impoundment structures** | | |
| dams | | |
| dikes | | |
| man-made berms | | |
| tide gates | | |
| Other: | | |
| **Other structures that impede water flow** | | |
| causeways/roads | | |
| railroad beds | | |
| bridge abutments (and associated structures) | | |
| inadequate, hanging or obstructed culverts (and associated structures) | | |
| additional retaining walls/riprap (not included above) | | |
| Other: | | |
| **Draining/Dewatering** | | |
| ditching | | |
| drain tiles | | |
| agricultural water withdrawal | | |
| non-agricultural water withdrawal (fire hydrant, intake pipe) | | |
| Other: | | |
| **Unnatural inputs of water** | | |
| stormwater drain/discharge | | |
| combined sewer overflow | | |
| municipal/industrial point source discharge | | |
| agricultural irrigation | | |
| spray irrigation (non-agricultural, waste discharge, etc.) | | |
| Other: | | |
| **Filling and excavation** | | |
| fill – recent and/or ongoing | | |
| fill – older, stabilized | | |
| grading or bulldozing (elimination of micro-topography) | | |
| plowing/tilling | | |
| excavated farm pond | | |
| other excavated pond | | |
| excavated area associated with culvert or bridge | | |
| channelization | | |
| Other: | | |

| Section 1. Hydrologic Modifications to Wetland (continued) | Check if present | Score 0 to 5 |
|---|---|---|
| **Natural hydrologic modifications** (specify but do not score) | | |
| beaver activity | | |
| debris dams | | |
| land slide | | |
| major flooding/storm damage | | |
| Other: | | |
| **Section 1 Comments:** | **Section Score** | |

| Section 2. Vegetative Modifications to Wetland<br>Score based on vegetation impacts directly in the wetland, not in the buffer or watershed. | Check if present | Score 0 to 5 |
|---|---|---|
| **Clearing/removal of vegetation** | | |
| roads | | |
| recreation trails (atv, hiking, snowmobile, etc.) | | |
| utility lines | | |
| buildings, structures, parking lots, etc. | | |
| mowing (in the wetland, not a lawn) | | |
| brush hogging | | |
| intentional/controlled burning | | |
| human-caused accidental/arson fires | | |
| chemical removal (herbicides, etc.) | | |
| Other: | | |
| **Clearing/removal of wetland vegetation – forestry activities** | | |
| clear cut | | |
| selective cut | | |
| logging roads | | |
| skidder trails/staging areas | | |
| replacement of wetland vegetation by tree plantation | | |
| Other: | | |
| **Clearing/removal of wetland vegetation - agricultural activities** | | |
| plowing/conversion to cropland | | |
| pasture/grazing | | |
| hayfield | | |
| farm roads | | |
| Other: | | |
| **Wetland vegetation changes due to other human activities (hydrological alterations, nutrient inputs, etc.)** | | |
| dead or dying vegetation due to inundation or flooding | | |
| dead or dying vegetation due to desiccation (draining, water withdrawal, water diversion, upstream dam, etc.) | | |
| replacement of natural plant community (excessive Typha sp., etc.) | | |
| change in historic wetland class (conversion from PFO to PEM, etc.) | | |
| Other: | | |
| **Presence of Non-aquatic Invasive Plants** (total cover, all known species) | | |
| Estimate total percent cover of non-aquatic invasive species in the assessment area using cover classes below and score accordingly. Check appropriate box if presence unknown and/or not assessed. | | |
| **1** (**< 5%** ☐, **5-10%** ☐) \| **2** (**11-25%** ☐) \| **3** (**26-50%** ☐) \| **4** (**51-75%** ☐) \| **5** (**76-100%** ☐) \| **unknown/not assessed** ☐ | | |
| purple loosestrife | | |
| Phragmites | | |
| Other(s): | | |

| **Section 2. Vegetative Modifications to Wetland (continued)**<br>Score based on vegetation impacts directly in the wetland, not in the buffer or watershed. | Check if present | Score 0 to 5 |
|---|---|---|
| **Presence of Aquatic Invasive plants** (check if present): ☐ unknown/not assessed | | |
| For aquatic invasive plants (floating or submerged), indicate if observed (positive ID) or known to be present through signs or other means. Check appropriate box if presence unknown and/or not assessed. | | |
| Eurasian water- milfoil | | |
| Variable water-milfoil | | |
| Hydrilla | | |
| Other(s) | | |
| **Natural vegetative modifications** (specify but do not score) | | |
| herbivory (insect damage, animal browsing, beavers, etc.) | | |
| fires | | |
| floods | | |
| storm damage (blow downs, etc.) | | |
| Other: | | |
| **Section 2 Comments:** | **Section Score** | |

| **Section 3. Evidence of Chemical Pollutants**<br>Score based on observations in the wetland and adjacent/upstream sources that may potentially impact the wetland. | Check if present | Score 0 to 5 |
|---|---|---|
| **Direct discharge present** | | |
| stormwater | | |
| industrial discharge | | |
| treatment plant | | |
| combined sewer overflow | | |
| leachate plume | | |
| fish hatchery | | |
| Other: | | |
| **Other evidence of contaminants** | | |
| documented previous oil/chemical spill | | |
| free oil, petroleum, chemicals observed on site | | |
| unusual water color/turbidity | | |
| sheen (not from natural causes) | | |
| soil staining (not from natural causes) | | |
| foam (not from natural causes) | | |
| chemical odor present | | |
| sewage odor present | | |
| evidence of CSO discharge (solids) | | |
| sewage fungus present | | |
| Other: | | |
| **Herbicide, pesticide and fertilizer application** | | |
| utility line maintenance | | |
| agricultural application | | |
| forestry application | | |
| insect pest control (specify): | | |
| invasive species management (plants, fish, etc.); Only score impacts to non-target species | | |
| Other: | | |
| **Solid Waste** | | |
| municipal dump/landfill | | |
| sludge spreading | | |
| household trash/dumping | | |
| petroleum, chemical containers, drums, etc. | | |
| abandoned vehicles, tires, etc. | | |
| demolition debris | | |
| stump dump | | |
| litter | | |
| Other: | | |

| Section 3. Evidence of Chemical Pollutants (continued) | Check if present | Score 0 to 5 |
|---|---|---|
| **Evidence of toxic effects to vegetation, aquatic life or wildlife in wetland** | | |
| dead, dying or stressed vegetation (no apparent natural causes) | | |
| dead or dying fish, amphibians or other aquatic life/wildlife (no other apparent natural causes) | | |
| Other: | | |
| **Section 3 Comments:** | **Section Score** | |

| Section 4. Watershed Characterization and Potential NPS Pollution Impacts<br>Score based on potential for erosion and sedimentation, urban runoff, nutrient enrichment, etc. in the wetland watershed. | Check if present | Score 0 to 5 |
|---|---|---|
| **Residential Development in watershed (including homes, lawns, residential roads)** | | |
| low density | | |
| medium density | | |
| high density | | |
| **Commercial/Industrial/Municipal Development in watershed (including associated roads, paved areas)** | | |
| stores/businesses/office buildings | | |
| schools, universities | | |
| landfills/transfer stations | | |
| sewage treatment plants | | |
| power generation facility | | |
| composting facility | | |
| manufacturing plants/factories | | |
| gravel pits/mining | | |
| airports | | |
| railroads (tracks, rail yards, etc.) | | |
| military facilities | | |
| additional parking lots/ pavement (not associated with any of the above) | | |
| Other: | | |
| **Recreation facilities in watershed** | | |
| lawn/park/picnic areas | | |
| ball fields, tennis courts, basketball courts, etc. | | |
| campgrounds | | |
| boat launches | | |
| piers/docks | | |
| golf course | | |
| trails (atv, hiking, snowmobile, etc.) | | |
| boardwalks | | |
| Wildlife Management Area (ME IF&W, US F&WS) | | |
| Other: | | |
| **Additional Roads in watershed** (not associated with any of the above) | | |
| gravel, small, low usage | | |
| gravel, large, more heavily used (the Golden Road) | | |
| 1 or 2 lane, paved | | |
| >2 lane, paved | | |
| Other: | | |
| **Forestry activities in watershed** | | |
| clear cut, recent/ongoing | | |
| selective cut, recent/ongoing | | |
| clear cut, older/recovering | | |
| selective cut, older/recovering | | |
| tree farm/plantation | | |
| mixed or unknown type(s) | | |
| Other: | | |
| **Agriculture in watershed** | | |
| pasture | | |
| livestock | | |
| feedlots | | |
| manure piles/spreading | | |

| **Section 4. Watershed Characterization and Potential NPS Pollution Impacts (continued)** | Check if present | Score 0 to 5 |
|---|---|---|
| row crops | | |
| hayfield | | |
| fallow field | | |
| commercial blueberry operations | | |
| commercial cranberry operations | | |
| commercial nursery | | |
| commercial orchard | | |
| sod farm | | |
| mixed or unknown type(s) | | |
| Other: | | |
| **Evidence of erosion, sedimentation and nutrient enrichment** | | |
| unstable soil in a position to wash into wetland or associated water body | | |
| erosional gullies or washed out areas | | |
| excess accumulated sediment | | |
| sediment plume in water | | |
| unnatural turbidity | | |
| nuisance algae bloom | | |
| presence of excessive duckweed (Lemna sp.) | | |
| unusually heavy growth of epiphytic algae | | |
| unusually dense or large growth habit of aquatic macrophytes or other vegetation | | |
| Other: | | |
| **Alterations to wetland buffer (within 100 feet of wetland edge)** | | |
| Estimate total percent of buffer altered using cover classes below and score accordingly:<br>**1** **2** **3** **4** **5**<br>**< 5%** ☐ **5-10%** ☐ **11-25%** ☐ **26-50%** ☐ **51-75%** ☐ **76-100%** ☐ | | |
| **Section 4 Comments:** | **Section Score** | |

Section 1 total: _____ (Hydrological Modifications to Wetland)

Section 2 total: _____ (Vegetative Modifications to Wetland)

Section 3 total: _____ (Evidence of Chemical Pollutants)

Section 4 total: _____ (Watershed Characterization and Potential NPS Pollution Impacts)

**Total Wetland Human Disturbance Score (WHDS) _____**

Additional Comments:

_____

_____

_____

_____

_____

_____

_____

This form is based on the Wetland Human Disturbance Assessment (WHDA) form created by the Biomonitoring Program of the Maine Department of Environmental Protection. 6/10/2014

# *PRE-FIELD METRICS*

**Site Name:** **Site Code:** **Date** (yyyy-mm-dd)**:**
**System:** **Primary Surveyor:**
**Overall EIA Rank:**

## LANDSCAPE CONTEXT

### LAND USE INDEX

Calculate Land Use Index score using Landsat land cover data in a GIS (or calculate manually) following guidelines in manual; convert score to appropriate A–D rank.

| Land Use Index Score | 10–9.5 | 9.4–8 | 7.9–4 | <4 |
|---|---|---|---|---|
| Land Use Index Rank | **A** ☐ | **B** ☐ | **C** ☐ | **D** ☐ |

Explain rank if adjusted:

| **PERCENT OF PERIMETER HAVING BUFFER** **[estimate using 10 m minimum buffer width and length]** | | **AVERAGE BUFFER WIDTH** **[average width measured along 8 spokes in 100 m zone surrounding wetland]** | |
|---|---|---|---|
| Natural buffer is ≥90% | **A** ☐ | Average natural buffer width is ≥90 m | **A** ☐ |
| Natural buffer is 75–89% | **B** ☐ | Average natural buffer width is 75–89 m | **B** ☐ |
| Natural buffer is 25–74% | **C** ☐ | Average natural buffer width is 25–74 m | **C** ☐ |
| Natural buffer is <25% | **D** ☐ | Average natural buffer width is <25 m | **D** ☐ |
| Explain rank if adjusted: | | Explain rank if adjusted: | |

## SIZE

| **COMPARATIVE SIZE** ***SEE WETLAND SYSTEM DESCRIPTION*** | | **CHANGE IN SIZE** | |
|---|---|---|---|
| Largest 10% based on current and historical sizes (very large compared to other examples of the same type); see Comparative Size Rank Table | **A** ☐ | Occurrence is at or only minimally reduced (<3%) from its original natural extent due to human activity | **A** ☐ |
| Within 10-30% of current and historical sizes (large compared to other examples of the same type); see Comparative Size Rank Table | **B** ☐ | Occurrence is somewhat modestly reduced (3-10%) from its original natural extent | **B** ☐ |
| Within 30-70% of current and historical sizes (medium to small compared to other examples of the same type); see Comparative Size Rank Table | **C** ☐ | Occurrence is modestly reduced (10-30%) from its original natural extent | **C** ☐ |
| Smallest 30% of current and historical sizes (small to very small compared to other examples of the same type); see Comparative Size Rank Table | **D** ☐ | Occurrence is substantially reduced (>30%) from its original natural extent | **D** ☐ |
| Explain rank if adjusted from one given in Comparative Size Rank Table: | | Explain rank if B, C, or D: | |

Site Name: _____ Date: _____

# VEGETATION

## VEGETATION STRUCTURE *SEE WETLAND SYSTEM DESCRIPTION* [vertical layers and horizontal patches]

| FORESTED FLOODPLAIN & SWAMP | | NON-FORESTED WETLAND | |
|---|---|---|---|
| Canopy a mosaic of patches of different ages or sizes; gap sizes also vary; # of live tree stems 12-20" and >20" dbh well within expected range; very wide size-class diversity of downed logs and standing snags; characteristic woody species regenerating with expected abundance and diversity, so no human-related degradation to vegetation structure evident | A ☐ | Characteristic woody species regenerating with expected abundance and diversity, so no human-related degradation to vegetation structure evident; some very wet peatlands or marshes may naturally not have any woody vegetation or only scattered stunted individuals; standing tree snags, dead shrubs, downed woody debris, and litter due to natural factors | A ☐ |
| Canopy largely heterogeneous in age or size; # of live tree stems of medium and large size slightly below expected range; wide size-class diversity of downed logs and standing snags; characteristic woody species regenerating but present in somewhat lower abundance and/or diversity than expected due to human-related factors, so slight degradation to vegetation structure evident (e.g., low levels of cutting, browsing, and/or grazing) | B ☐ | Characteristic woody species regeneration somewhat lower in abundance and/or diversity than expected due to human-related factors, so slight degradation to vegetation structure evident (e.g., low levels of cutting, browsing, grazing, and/or mowing); standing tree snags, dead shrubs, downed woody debris, and/or litter with minor alterations from human disturbances | B ☐ |
| Canopy somewhat homogeneous in age or size; # of live tree stems of medium and large size moderately below expected range; moderate size-class diversity of downed logs and standing snags; characteristic woody species with noticeably reduced regeneration, abundance, and/or diversity than expected due to human-related factors, so moderate degradation to vegetation structure evident (e.g., intermediate levels of cutting, browsing, and/or grazing) | C ☐ | Characteristic woody species regeneration moderately lower in abundance and/or diversity than expected due to human-related factors, so moderate degradation to vegetation structure evident (e.g., intermediate levels of cutting, browsing, grazing, and/or mowing); standing tree snags, dead shrubs, downed woody debris, and/or litter with moderate alterations from human disturbances | C ☐ |
| Canopy very homogeneous in age or size; # of live tree stems of medium and large size substantially below expected range; low size-class diversity of downed logs and standing snags (or absent); characteristic woody species with severely reduced regeneration, abundance, or diversity than expected due to human-related factors, so substantial degradation to vegetation structure evident (e.g., high levels of cutting, browsing, or grazing) | D ☐ | Characteristic woody species regeneration strongly altered in abundance or diversity than expected due to human-related factors, so substantial degradation to vegetation structure evident (e.g., high levels of cutting, browsing, grazing, or mowing); standing tree snags, dead shrubs, downed woody debris, or litter with substantial alterations from human disturbances | D ☐ |

Explain rank if B, C, or D:

## INVASIVE NON-NATIVE PLANT SPECIES COVER *SEE WETLAND SYSTEM DESCRIPTION*

| | |
|---|---|
| Invasive plant species absent | A ☐ |
| Cover of invasive plant species <1–4% | B ☐ |
| Cover of invasive plant species 5–20% | C ☐ |
| Cover of invasive plant species >20% | D ☐ |

Explain rank if B, C, or D:

## NATIVE PLANT SPECIES COMPOSITION *SEE WETLAND SYSTEM DESCRIPTION*

| | |
|---|---|
| Native vegetation composition with expected species abundance and diversity:<br>• Typical range of native diagnostic species present, including those native species sensitive to anthropogenic degradation, and<br>• Native species indicative of anthropogenic disturbance (aggressive and weedy natives) absent to minor | A ☐ |
| Native vegetation composition (species abundance and diversity) slightly altered from expected due to human factors:<br>• Some native diagnostic species absent or substantially reduced in abundance, and/or<br>• Some native species indicative of anthropogenic disturbance (aggressive and weedy natives) are present but minor in abundance | B ☐ |
| Native vegetation composition (species abundance and diversity) moderately altered from expected due to human factors:<br>• Many native diagnostic species absent or substantially reduced in abundance, and/or<br>• Species are still largely native and characteristic of the type, but they also include aggressive and weedy natives | C ☐ |
| Native vegetation composition (species abundance and diversity) substantially altered from expected due to human factors:<br>• Most or all native diagnostic species absent, a few may remain in very low abundance, or<br>• Native species from entire strata may be absent or vegetation is dominated by weedy species, or comprised of planted stands of non-characteristic species, or unnaturally dominated by single species (aggressive natives) | D ☐ |

Explain rank if B, C, or D:

Site Name: _____ Date: _____

# HYDROLOGY

## WATER SOURCE *SEE WETLAND SYSTEM DESCRIPTION* [nature of water inputs and diversions]

| Non-Tidal | | Tidal | |
|---|---|---|---|
| Water source is natural; hydrology is dominated by precipitation, groundwater, natural runoff, and/or overbank flow; there is no indication of direct artificial water sources; land use in the wetland's local drainage area is primarily open space or low density, passive uses | A ☐ | Tidal and non-tidal water sources are natural with no artificial alterations to natural salinity; no indication of direct artificial water sources (e.g., land use in the local drainage area of the wetland is primarily open space or low density, passive uses); lacks point source discharges into or adjacent to the wetland | A ☐ |
| Water source contains slight amounts of inflow from anthropogenic sources; indications of anthropogenic input include developed land (<20%) in the immediate drainage area of the wetland, some road runoff, small storm drains, and/or minor point source discharges into or adjacent to the wetland | B ☐ | Tidal and non-tidal water sources are slightly altered by human impacts; wetland directly receives slight amounts of inflow from anthropogenic sources; indications of anthropogenic input include developed land (<20%) in the immediate drainage area of the wetland, some road runoff, small storm drains and/or minor point source discharges into or adjacent to the wetland | B ☐ |
| Water source contains moderate amounts of inflow from anthropogenic sources; indications of anthropogenic input include 20-60% developed land adjacent to the wetland, moderate amounts of road runoff, moderately-sized storm drains, and/or moderate point source discharges into or adjacent to the wetland | C ☐ | Tidal and non-tidal water sources are moderately altered by human impacts; wetland directly receives moderate amounts of inflow from anthropogenic sources; indications of anthropogenic input include 20-60% developed land adjacent to the wetland, moderate amounts of road runoff, moderately-sized storm drains, and/or moderate point source discharges into or adjacent to the wetland | C ☐ |
| Water source contains substantial amounts of inflow from anthropogenic sources; indications of anthropogenic input include >60% developed land adjacent to the wetland, large amounts of road runoff, large-sized storm drains, or major point source discharges into or adjacent to the wetland | D ☐ | Tidal and non-tidal water sources are substantially altered by human impacts; wetland directly receives substantial amounts of inflow from anthropogenic sources; indications of anthropogenic input include >60% developed land adjacent to the wetland, large amounts of road runoff, large-sized storm drains, or major point source discharges into or adjacent to the wetland | D ☐ |
| Explain rank if B, C, or D: | | | |

Site Name: _____ Date: _____

# HYDROLOGY

## HYDROPERIOD

***SEE WETLAND SYSTEM DESCRIPTION***

**[assessment of the characteristic frequency, duration, intensity, and/or timing of inundation, saturation, and/or drawdown]**
**[includes assessment of the effects dams may have on wetland system hydroperiod even when the dam is located a considerable distance up- or downstream from the wetland]**

| **Riverine/Lacustrine** [channels, open & forested floodplains, shores] | | **Non-Riverine Enriched** [rich swamps, medium & rich fens, drainage marshes] | | **Nutrient-Poor Isolated Wetlands** [bogs & poor fens, poor swamps, basin marshes] | | **Tidal** [salt & brackish marshes, tidal flats, subtidal] | |
|---|---|---|---|---|---|---|---|
| Natural patterns of flood frequency, duration, intensity, and/or timing; stressors that impact the natural hydroperiod absent; channel/riparian zone characterized by equilibrium conditions, with no evidence of severe aggradation or degradation (see field indicators in manual) | **A** ☐ | Natural patterns of inundation & drawdown, saturation, and/or seepage discharge; stressors that impact the natural hydroperiod absent | **A** ☐ | Naturally stable and saturated hydrology, or natural cycles of saturation and partial drying; stressors that impact the natural hydroperiod absent | **A** ☐ | Full natural tidal prism, with two daily tidal minima and maxima; storm tides, tidal river flooding, and onshore wind-maintained high tides causing short-term changes in tidal amplitude are within the expected norm | **A** ☐ |
| Flood frequency, duration, intensity, and/or timing deviate slightly from natural conditions due to stressors (e.g., flood control dams upstream or downstream slightly effect hydroperiod, small ditches/diversions, berms or roads near grade, minor pugging, and/or minor flow additions); outlets may be slightly constricted; if managed water levels, they closely mimic natural patterns (very unusual for artificial wetland to be rated here); some aggradation or degradation of shore/bank, none of which is severe | **B** ☐ | Deviates slightly from natural patterns of inundation & drawdown, saturation, and/or seepage discharge due to stressors (e.g., small ditches/diversions, berms or roads near grade, minor pugging, and/or minor flow additions); outlets may be slightly constricted | **B** ☐ | Deviates slightly from naturally stable and saturated hydrology, or natural cycles of saturation and partial drying due to stressors (e.g., small ditches/diversions, berms or roads near grade, minor pugging, and/or minor flow additions) | **B** ☐ | Slightly muted tidal prism, although two daily minima and maxima are observed, and/or slightly inadequate drainage such that a small part of the marsh remains flooded during low tide | **B** ☐ |
| Flood frequency, duration, intensity, and/or timing deviate moderately from natural conditions due to stressors (e.g., flood control dams upstream or downstream moderately effect hydroperiod, ditches/diversions 1–3 ft. deep, two lane roads, culverts adequate for base stream flow but not flood flow, moderate pugging, and/or moderate flow additions); outlets may be moderately constricted, but flow still possible; if managed water levels, they less closely mimic natural patterns; moderate to severe aggradation or degradation of shore/bank | **C** ☐ | Deviates moderately from natural patterns of inundation & drawdown, saturation, and/or seepage discharge due to stressors (e.g., ditches/diversions 1–3 ft. deep, two lane roads, culverts adequate for base stream flow but not flood flow, moderate pugging, and/or moderate flow additions); outlets may be moderately constricted, but flow still possible | **C** ☐ | Deviates moderately from naturally stable and saturated hydrology, or natural cycles of saturation and partial drying due to stressors (e.g., ditches/diversions 1–3 ft. deep, two lane roads, culverts adequate for base flow but not flood flow, moderate pugging, and/or moderate flow additions) | **C** ☐ | Moderately muted tidal prism and/or moderately inadequate drainage such that a significant portion of the marsh remains flooded during low tide | **C** ☐ |
| Flood frequency, duration, intensity, and/or timing deviate substantially from natural conditions due to stressors (e.g., flood control dams upstream or downstream substantially effect hydroperiod, 4-lane highway, large dikes, diversions >3 ft. deep that withdraw a significant portion of flow, large amounts of fill, significant artificial groundwater pumping, or heavy flow additions); outlets may be significantly constricted, blocking most flow; if managed water levels, they are not connected to natural seasonal fluctuations; shore/bank is concrete or artificially hardened or with severe aggradation or degradation | **D** ☐ | Deviates substantially from natural patterns of inundation & drawdown, saturation, and/or seepage discharge due to stressors (e.g., 4-lane highway, large dikes/diversions >3 ft. deep that withdraw a significant portion of flow, large amounts of fill, significant artificial groundwater pumping, or heavy flow additions); outlets may be significantly constricted, blocking most flow | **D** ☐ | Deviates substantially from naturally stable and saturated hydrology, or natural cycles of saturation and partial drying due to stressors (e.g., 4-lane highway, large dikes/diversions >3 ft. deep that withdraw a significant portion of flow, large amounts of fill, significant artificial groundwater pumping, or heavy flow additions) | **D** ☐ | Substantially muted tidal prism or inadequate drainage such that most or all of the marsh remains flooded during low tide | **D** ☐ |

Explain rank if B, C, or D:

Site Name: _____ Date: _____

# HYDROLOGY

## HYDROLOGIC CONNECTIVITY [ability of water to naturally flow into or out of the wetland, or to inundate adjacent areas]

| **Riverine/Lacustrine** [channels, open & forested floodplains, shores] | | **Non-Riverine Enriched** [rich swamps, medium & rich fens, drainage marshes] | | **Nutrient-Poor Isolated Wetlands** [bogs & poor fens, poor swamps, basin marshes] | | **Tidal** [salt & brackish marshes, tidal flats, subtidal] | |
|---|---|---|---|---|---|---|---|
| River or lake is completely connected to floodplain/shore, backwater sloughs, and channels; no geomorphic modifications made to contemporary floodplain/shore; channel is not unnaturally entrenched | **A** ☐ | No unnatural obstructions to lateral and vertical movement of ground or surface water; rising water in the wetland has unrestricted access to adjacent upland, without obstructions to the lateral movement of flood flows; if perched water table then impermeable soil layer intact | **A** ☐ | No unnatural barriers restricting water movement into or out of wetland from adjacent areas | **A** ☐ | Tidal channel sinuosity reflects natural processes; unimpeded tidal flooding; total absence of tide gates, flaps, dikes, culverts, and human-made channels | **A** ☐ |
| River or lake is slightly disconnected from floodplain/shore, backwater sloughs, and channels (<25% of banks affected) due to dikes, tide gates, rip rap, and/or elevated culverts; channel is slightly entrenched (overbank flow occurs during most floods) | **B** ☐ | Slight restrictions (impacting <25% of the wetland) to the lateral and/or vertical movement of ground or surface waters by unnatural features (e.g., levees and/or excessively high banks); restrictions may be intermittent along the wetland, or the restrictions may occur only along one bank or shore; flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment; if perched then impermeable soil layer slightly disturbed (e.g., by drilling or blasting) | **B** ☐ | Surrounding land use slightly restricts water movement into or out of wetland | **B** ☐ | Tidal channel sinuosity slightly altered; tidal flooding is slightly impeded by tide gates, flaps, dikes, culverts, and/or human-made channels | **B** ☐ |
| River or lake is moderately disconnected from floodplain/shore, backwater sloughs, and channels (25-75% of banks affected) due to dikes, tide gates, rip rap, and/or elevated culverts; channel is moderately entrenched (overbank flow only occurs during moderate to severe floods) | **C** ☐ | Moderate restrictions (impacting 25-75% of the wetland) to the lateral and/or vertical movement of ground or surface waters by unnatural features (e.g., levees and/or excessively high banks); flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment; if perched then impermeable soil layer moderately disturbed (e.g., by drilling or blasting) | **C** ☐ | Surrounding land use moderately restricts water movement into or out of wetland | **C** ☐ | Tidal channel sinuosity moderately altered; tidal flooding is moderately impeded by tide gates, flaps, dikes, culverts, and/or human-made channels | **C** ☐ |
| River or lake is substantially disconnected from floodplain/shore, backwater sloughs, and channels (>75% of banks affected) due to dikes, tide gates, rip rap, or elevated culverts; channel is substantially entrenched (overbank flow never occurs or only during severe floods) | **D** ☐ | Substantial restrictions (impacting >75% of the wetland) to the lateral or vertical movement of ground or surface waters by unnatural features (e.g., levees or excessively high banks); most or all water stages are contained within the obstructions; if perched then impermeable soil layer substantially disturbed (e.g., by drilling or blasting) | **D** ☐ | Surrounding land use substantially restricts water movement into or out of wetland | **D** ☐ | Tidal channel sinuosity substantially altered; tidal flooding is substantially impeded by tide gates, flaps, dikes, culverts, or human-made channels | **D** ☐ |

Explain rank if B, C, or D:

Site Name: _____ Date: _____

# SOIL

## SOIL CONDITION

| Non-Tidal | | Tidal | |
|---|---|---|---|
| Bare soil areas are limited to naturally caused disturbances such as flood deposition or game trails | **A** ☐ | Excluding mud flats, bare soils are naturally occurring and largely limited to salt pannes | **A** ☐ |
| Slight amounts of bare soil areas due to human causes (e.g., soil trampling by livestock or ruts by off-road-vehicles shallow; slight amounts of unnatural ponding or channeling of water) | **B** ☐ | Small amounts of bare soil areas caused by rafts of anthropogenic debris (killing marsh vegetation and creating artificial pannes), ditch spoils impounding water and forming artificial pannes, trampling by livestock, and/or erosion of marsh and channel banks due to excavation by marine traffic or altered current/tidal patterns resulting from deficient culverts (leading to erosion) | **B** ☐ |
| Moderate amounts of bare soil areas due to human causes (e.g., soil trampling by livestock or ruts by off-road-vehicles moderately deep; moderate amounts of unnatural ponding or channeling of water) | **C** ☐ | Moderate amounts of bare soil areas caused by rafts of anthropogenic debris (killing marsh vegetation and creating artificial pannes), ditch spoils impounding water and forming artificial pannes, trampling by livestock, and/or erosion of marsh and channel banks due to excavation by marine traffic or altered current/tidal patterns resulting from deficient culverts (leading to erosion) | **C** ☐ |
| Substantial amounts of bare soil areas due to human causes (e.g., soil trampling by livestock or ruts by off-road-vehicles substantially deep; substantial amounts of unnatural ponding or channeling of water contributing to altered hydrology or other long-lasting impacts) | **D** ☐ | Substantial amounts of bare soil areas caused by rafts of anthropogenic debris (killing marsh vegetation and creating artificial pannes), ditch spoils impounding water and forming artificial pannes, trampling by livestock, or erosion of marsh and channel banks due to excavation by marine traffic or altered current/tidal patterns resulting from deficient culverts (leading to erosion) | **D** ☐ |
| Explain rank if B, C, or D: | | Explain rank if B, C, or D: | |

# LEVEL 2 STRESSOR CHECKLIST

| Site Name: | | Site Code: | | Last Obs (yyyy-mm-dd): | |
|---|---|---|---|---|---|
| System: | | | | Surveyor: | |

**Stressors**: human activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity and natural processes (e.g., ditching, logging, exotic pest diseases, septic tanks, or pesticide spray). Altered disturbance regime may be stressor (e.g., flooding, fire, or browse).

**Some Important Points about the Stressor Checklist.**

1. Stressor checklist must be completed for Landscape Context (LC), Vegetation, Soil, and Hydrology.
2. Assessment of LC is here limited to stressors found from system perimeter out to 100 m (not for stressors beyond 100 m or the degree to which LC stressors may impact the wetland system being evaluated).
3. Stressors for Vegetation, Soil, and Hydrology are assessed for the very same area for which the Level2 metrics ratings are applied (i.e., to the **wetland system [WS]**).
4. Threat impact is calculated considering only present observed or inferred stressors (if inferred, the reason for the inference should be clearly stated)
5. If two stressors conceptually overlap as applied at a particular site, choose only one and note the overlap.

| SCOPE of threat: percent of LC or system affected [Assess for up to next 10 years] | |
|---|---|
| 1 = Small | Affects a small (1-10%) proportion of the total occurrence |
| 2 = Restricted | Affects some (11-30%) of the total occurrence |
| 3 = Large | Affects much (31-70%) of the total occurrence |
| 4 = Pervasive | Affects all or most (71-100%) of total occurrence |
| **SEVERITY of degradation in scope [Assess for up to next 10 years]** | |
| 1 = Slight | Likely to only slightly degrade/reduce occurrence |
| 2 = Moderate | Likely to moderately degrade/reduce occurrence |
| 3 = Serious | Likely to seriously degrade/reduce occurrence |
| 4 = Extreme | Likely to extremely degrade/destroy or eliminate occurrence |

| | | LC [100 m] | | | Vegetation [WS] | | | Soil [WS] | | | Hydrology [WS] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STRESSOR CHECKLIST | Scope | Severity | Impact | Scope | Severity | Impact | Scope | Severity | Impact | Scope | Severity | Impact | Comments [LC=LandCon, V=Veg, S=Soil, H=Hydro] |
| DEVLOP | Residential | | | | | | | | | | | | | |
| | Industrial, commercial, military | | | | | | | | | | | | | |
| | Sports field, golf course, urban parkland, lawn | | | | | | | | | | | | | |
| | Row-crop agriculture, orchard/nursery | | | | | | | | | | | | | |
| | Hay field | | | | | | | | | | | | | |
| | Roads [gravel, paved, highway], railroad | | | | | | | | | | | | | |
| | Livestock, grazing, excessive herbivory | | | | | | | | | | | | | |
| | Utility/powerline corridor | | | | | | | | | | | | | |
| | Other [specify]: | | | | | | | | | | | | | |
| REC | Passive recreation [bird, hike, trample, camp] | | | | | | | | | | | | | |
| | Active recreation [ATV, mt bike, hunt, fish, boat] | | | | | | | | | | | | | |
| | Other [specify]: | | | | | | | | | | | | | |
| VEG | Woody resource extraction: logs, shrub cuts, debris | | | | | | | | | | | | | |
| | Vegetation management: cutting, mowing | | | | | | | | | | | | | |
| | Excessive animal herbivory or insect damage | | | | | | | | | | | | | |
| | Invasive exotic plant species | | | | | | | | | | | | | |
| | Aggressive native plant species | | | | | | | | | | | | | |
| | Herb-Pesticide, vector control, chemicals [give evidence] | | | | | | | | | | | | | |
| | Other [specify]: | | | | | | | | | | | | | |
| ND | Altered natural disturb regime [specify expected regime] | | | | | | | | | | | | | |
| | Other [specify]: | | | | | | | | | | | | | |
| SOIL | Incr sediment/org debris, erosion, gully [logged sites] | | | | | | | | | | | | | |
| | Filling, spoils, excavation | | | | | | | | | | | | | |
| | Soil disturbance: trampling, vehicle, pugging, skidding | | | | | | | | | | | | | |
| | Grading, compaction, plowing, discing | | | | | | | | | | | | | |
| | Physical resource extraction: rock, sand, gravel, etc | | | | | | | | | | | | | |
| | Trash or refuse dumping | | | | | | | | | | | | | |
| | Other [specify]: | | | | | | | | | | | | | |
| HYDROLOGY | Dam, ditch, diversion, dike, levee, unnat inflow, reservoir | | | | | | | | | | | | | |
| | Water extraction [lake/groundwater; water table lowered] | | | | | | | | | | | | | |
| | Flow obstructions [culverts, paved stream crossings] | | | | | | | | | | | | | |
| | Engineered channel [riprap, armored bank, bed] | | | | | | | | | | | | | |
| | Actively managed hydrology [controlled lake level] | | | | | | | | | | | | | |
| | Tide gate, weir/drop structure, dredged inlet/channel | | | | | | | | | | | | | |
| | PS Discharge: treatment water, non-storm discharg, septic | | | | | | | | | | | | | |
| | NPS Discharge: urban runoff, farm drainage | | | | | | | | | | | | | |
| | Other [specify]: | | | | | | | | | | | | | |

**NH NATURAL HERITAGE - Rapid Recon Form**

| **NH NATURAL HERITAGE - Rapid Recon Form** | Site Code: | Date (yyyy-mm-dd): |
|---|---|---|
| Site Name: | | |
| Surveyor(s): | | Town: |
| Directions (if not clear on map): | | |

| Status | **SITE SUMMARY** | | |
|---|---|---|---|
| | Wetland System: | | |
| | | | |
| | Interesting Features Associated with System | % in sys | WPs |
| | | | |

General Comments (as needed):

Diagram (as needed):

| **NC or Veg Zone:** | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
| | | | | | |
| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |

| **NC or Veg Zone:** | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
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| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |

| **NC or Veg Zone:** | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
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| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |



Stand age est: <60; 60-120; 120-150; 150-200; >200

| NC or Veg Zone: | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |

| NC or Veg Zone: | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |

| NC or Veg Zone: | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |

| NC or Veg Zone: | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |

| NC or Veg Zone: | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |

| NC or Veg Zone: | | | | WP: | Comments: |
|---|---|---|---|---|---|
| **Woody Species** | Tree strata | Shrub strata | **Herb Species** | | |
| | | | NonVasc | | |

| Stand Profile (swamps only) | | |
|---|---|---|
| Avg canopy dbh | | in. |
| Canopy dbh rang. | | in. |
| Avg canopy ht | | ft. |
| Est stand age | | yrs. |



Stand age est: <60; 60-120; 120-150; 150-200; >200

# Wetland Assessment - Plant Sampling Form - page 1

(Plant retrievals and observations from aquatic sampling)

**Station ID:**_____ Date:_____ Crew_____

Wetland/water body:_____ Town:_____

AUID: _____

| Site # | Way point # | Time | Water Depth (m) | Plant tag # | Retrieved / Observed (R/ O) | Plant Species (Aquatic/submergent/emergent) Full species list and vouchers collected... | F-floating S-submergent E-emergent W-woody |
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DRAFT

**Wetland Assessment - Plant Sampling Form – *page 2***

(Plant retrievals and observations from aquatic sampling)

**Station ID:**_____ Date:_____ Crew_____

Wetland/water body:_____ Town:_____

| Site # | Way point # | Time (once/ site #) | Water Depth (m) | Plant tag # | Retrieved / Observed (R/ O) | Plant Species (Aquatic/submergent/emergent) Full species list and vouchers collected... | F-floating S-submergent E-emergent W-woody |
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Comments: _____

# Collecting Macroinvertebrates Using a Dip Net Measured Sweep

**Sampling Season:** mid-June to mid-August

**Macroinvertebrate Collection**

- Collect from areas not disturbed by other sampling.
- Complete all sweeps in areas of emergent vegetation or macrophyte beds having a similar habitat that is representative of the overall site (station).
- Three macroinvertebrate samples should be collected per site (station).

**Dip Net Measured Sweep:**

- Using a 600 micron D-frame (dip) net, sweep through the water for a 1-meter measured sweep. (A meter-wide mark may be placed on the boat gunnel to assist in standardizing the measurement)
- Bump net against bottom substrate 3 times (beginning, middle, end), to dislodge and collect organisms from the sediment.
- Keep the net submerged during the entire sweep.
- Complete sweep in approximately 3 seconds.
- At the end of the sweep, turn net so the opening is facing the surface of the water and lift the net quickly out of the water - so no organisms are lost out of the opening.
- If net becomes clogged or if it was prevented from thoroughly contacting the bottom substrate - discard the sample and start again in an undisturbed location.
- For plants that hang over the rim of the net, retain the part within the net rim, and discard any part of the plant that extends outside the rim.
- Transfer all material collected in the net into a 500 micron sieve bucket by placing the bucket halfway into the water and turning the net inside out into the bucket.
- Visually inspect the net and remove any clinging organisms.
- Examine, wash, and discard any large pieces of vegetation, woody debris, and stones – remove and retain any aquatic macroinvertebrates observed.
- Retain fine plant material and detritus.
- Drain water out of sieve bucket and transfer all material collected into a 1 liter container(s). None of the containers should be more than half full. The amount of water that is associated with the macroinvertebrate samples and debris placed in the 1 liter container(s) should be minimized.
- Preserve samples in 95% ethyl alcohol for later sorting and taxonomic analysis in the laboratory.
- Repeat process to collect a total of three replicate samples.

Other information collected at each macroinvertebrate sampling location:

- Physical/chemical water characteristics using hand-held meters.
  Water grab samples from the first macroinvertebrate sampling location, for analysis at the lab.

Adapted from : Wetland Sampling Steps to Success: Collecting Macroinvertebrates Using a Dip Net Measured Sweep. DEP-LW0877

Adapted from: Wetland Sampling Steps to Success: Collecting Macroinvertebrates Using a Dip Net Measured Sweep. Maine DEP-LW0877

## Drainage marsh - shrub swamp system (S5)

**Landscape Settings:** Along small, low-gradient, seasonally flooded streams (mostly first- and second-order) and in open basins with outlet streams.

**Distribution:** Widespread throughout New Hampshire.

**NatureServe Ecological System Crosswalk:** Laurentian-Acadian freshwater marsh; Laurentian-Acadian wet meadow/shrub swamp.

**Soils:** Sandy and silty mineral materials and/or well decomposed muck (often shallow organics over mineral soil).

**Nutrient Status:** Moderately to strongly minerotrophic; pHs mostly in 5s and 6s.

**Spatial Pattern:** Medium (to large) patch; extensive broad-linear shape with inlets and outlets; irregular or linear zonation (parallel to stream corridors and pond/lake margins).

***Comparative Size:*** A (>125 ac); B (125–25 ac); C (25–5 ac); D (<5 ac).

***Vegetation Structure (vertical & horizontal):*** Aquatic bed, herbaceous emergent and meadow marsh, medium and tall shrubland and shrub thicket, woodland swamp; often a patchwork of shrubs and herbs.

There is considerable variation among examples of this system in terms of diversity of communities, flood regimes, and successional states present, but there is relatively little geographic variation across the state. Periodic beaver activity sets successional states back towards deeper water communities (pond, aquatic beds, and/or emergent marsh), while beaver dam abandonment and subsequent pond drainage shifts the successional track back towards meadow marsh and more wooded states. Some abandoned beaver meadows consist of sedge meadow marshes characterized by minerotrophic peat mosses and marsh herbs on well decomposed muck and often with standing snags indicative of raised water levels. These peaty marshes likely succeed to shrub or swamp states with continued drainage. Medium fen communities are occasionally associated with this system, particularly along sluggish drainages or within inlets away from the influence of streams. Marsh and aquatic bed communities in this system also occur along lower energy sections of rivers and major streams (see low gradient silty-sandy riverbank system), ponds, and lakes.

***Diagnostic natural communities***:

Aquatic beds and marshes
Aquatic bed (S4S5)
Bayonet rush emergent marsh (S2)
Cattail marsh (S4)
Emergent marsh (S5)
Herbaceous seepage marsh (S3)
Lake sedge seepage marsh (S3)
Sedge meadow marsh (S4)
Short graminoid - forb meadow marsh/mudflat (S4)
Tall graminoid meadow marsh (S4)

Shrublands, shrub thickets, and woodland swamps
Alder alluvial shrubland (S3)
Alder - dogwood - arrowwood alluvial thicket (S4)
Buttonbush shrubland (S4)
Highbush blueberry - winterberry shrub thicket (S4)
Meadowsweet alluvial thicket (S3S4)
Mixed alluvial shrubland (S4)
Mixed tall graminoid - scrub-shrub marsh (S4S5)
Seasonally flooded red maple swamp (S4S5)

***Associated systems:*** The drainage marsh - shrub swamp system can occur with the medium level fen system and is sometimes transition to oligotrophic peat swamp or minerotrophic swamp systems.

***Invasive Non-Native Plant Species Cover:*** Listed below are invasive species recorded in the Invasive Plant Atlas of New England (IPANE) that occur within this system in New Hampshire:

Aquatics
*Cabomba caroliniana* (fanwort)
*Egeria densa* (Brazilian water-weed)
*Marsilea quadrifolia* (European water-clover)
*Myriophyllum heterophyllum* (variable-leaf watermilfoil)
*Myriophyllum spicatum* (Eurasian watermilfoil)
*Najas minor* (brittle waternymph)
*Potamogeton crispus* (curly pondweed)
*Trapa natans* (water chestnut)

Marshes and shrublands
*Alnus glutinosa* (European black alder)
*Cirsium palustre* (marsh thistle)
*Epilobium hirsutum* (hairy willow-herb)
*Frangula alnus* (glossy false buckthorn)
*Iris pseudacorus* (yellow flag)
*Lychnis flos-cuculi* (ragged robin lychnis)
*Lysimachia nummularia* (moneywort)
*Lythrum salicaria* (purple loosestrife)
*Myosotis scorpioides* (forget-me-not)
*Nasturtium officinale* (two-rowed water-cress)
*Persicaria longiseta* (Oriental lady's-thumb smartweed)
*Phalaris arundinacea* (reed canary grass)
*Phragmites australis* (common reed)
*Ranunculus repens* (creeping buttercup)
*Solanum dulcamara* (climbing nightshade)

***Native Plant Species Composition:*** Community composition is influenced to some extent by stream and soil characteristics (i.e., mineral vs. organic soils) and geography, although many of the natural communities in this system have wide geographic ranges. Most of the variation among examples relates to diversity of flood regime conditions and effects of beaver activity on community composition. Characteristic species composition by vegetation zone is listed below.

Aquatic bed species:
*Brasenia schreberi* (water-shield)
*Lemna minor* (common duckweed)
*Myriophyllum* spp. (water-milfoils)
*Nuphar variegata* (bullhead pond-lily)
*Nymphaea odorata* (white water-lily)
*Persicaria hydropiperoides* (false water-pepper smartweed)
*Potamogeton* spp. (pondweeds)

*Utricularia vulgaris* ssp. *macrorhiza* (greater bladderwort)
*Vallisneria americana* (tape-grass)
*Wolffia* spp. (water-meals)

Emergent marsh species:
*Eleocharis palustris* (common spikesedge)
*Juncus militaris* (bayonet rush)
*Peltandra virginica* (green arrow-arum)
*Pontederia cordata* (pickerelweed)
*Sagittaria latifolia* (common arrowhead)
*Schoenoplectus* spp. (bulrushes)
*Sparganium americanum* (American bur-reed)
*Typha latifolia* (broad-leaved cat-tail)

Meadow marsh species:
*Calamagrostis canadensis* (bluejoint)
*Carex stricta* (tussock sedge)
*Carex utriculata* (swollen-beaked sedge)
*Glyceria canadensis* (rattlesnake manna grass)
*Juncus* spp. (rushes)
*Leersia* spp. (cut grasses)
*Lysimachia terrestris* (swamp yellow-loosestrife)
*Scirpus cyperinus* (woolly bulrush)
*Triadenum virginicum* (marsh-St. John's-wort)

Shrubland and woodland swamp species:
*Acer rubrum* (red maple)
*Alnus incana* ssp. *rugosa* (speckled alder)
*Cephalanthus occidentalis* (common buttonbush)
*Ilex verticillata* (common winterberry)
*Myrica gale* (sweet gale)
*Salix* spp. (willows)
*Spiraea* spp. (meadowsweets)
*Swida* spp. (dogwoods)
*Vaccinium corymbosum* (highbush blueberry)
*Viburnum* spp. (viburnums)

Seepage marsh species:
*Alnus incana* ssp. *rugosa* (speckled alder)
*Carex lacustris* (lake sedge)
*Carex scabrata* (eastern rough sedge)
*Carex stipata* (awl-fruited sedge)
*Chrysosplenium americanum* (golden-saxifrage)
*Equisetum sylvaticum* (wood horsetail)
*Eutrochium maculatum* (spotted Joe-Pye weed)
*Hydrocotyle americana* (American marsh-pennywort)
*Impatiens capensis* (spotted touch-me-not)
*Onoclea sensibilis* (sensitive fern)
*Osmunda regalis* var. *spectabilis* (royal fern)
*Symphyotrichum puniceum* (purple-stemmed American-aster)
*Symplocarpus foetidus* (skunk-cabbage)
*Toxicodendron vernix* (poison-sumac)

Native species that can be indicative of anthropogenic disturbance when appearing aggressive or weedy (typically with a CoC of 1, 2, or 3):
*Equisetum arvense* (field horsetail)
*Juncus tenuis* (path rush)
*Lemna* spp. (duckweeds)
*Muhlenbergia frondosa* (wire-stemmed muhly)
*Muhlenbergia schreberi* (nimblewill muhly)
*Panicum capillare* (witch panicgrass)
*Panicum dichotomiflorum* (fall panicgrass)
*Parthenocissus quinquefolia* (Virginia-creeper)
*Persicaria pensylvanica* (Pennsylvania smartweed)
*Phalaris arundinacea* (reed canary grass)
Note: Because *Phalaris arundinacea* can be invasive in wetlands with a history of human disturbance, it is possible the taxon represents a mixture of native and introduced genotypes in New England (Haines 2011)
*Solidago canadensis* (Canada goldenrod)
*Toxicodendron radicans* (poison-ivy)
*Typha latifolia* (broad-leaved cat-tail)
Note: *Typha latifolia* can be an aggressive native in settings with unnatural water level fluctuations & nutrient inputs
*Wolffia* spp. (water-meals)
*Viola sororia* (woolly blue violet)

Native species sensitive to anthropogenic disturbance (typically a species that is "anthropogenically sensitive" with CoC of 7, 8, 9, or 10):
Very few native species found in this system fall into this category. Possibilities include *Carex bullata*, *Carex exilis*, *Carex lasiocarpa*, and *Lathyrus palustris*.

***Water Source:*** Primarily influenced by lake, pond, or stream water (limnogenous); secondarily surface runoff (topogenous) and groundwater seepage (soligenous).

***Hydroperiod:*** Most examples exhibit a broad flood regime gradient from permanently flooded or intermittently exposed (aquatic beds) to semi-permanently flooded (emergent marshes) to seasonally flooded conditions (meadow marshes, shrublands, and wooded swamps); very poorly to poorly drained.

**Stressors:** Historic and contemporary land use practices have impacted hydrologic, geomorphic, and biotic structure and function of many marshes. Direct alteration of hydrology (i.e., channeling, draining, damming) or indirect alteration (i.e., roading or removing vegetation on adjacent slopes) results in changes in amount and pattern of herbaceous wetland habitat. If the alteration is long term, wetland systems may reestablish to reflect new hydrology and composition (e.g., cat-tail can be an aggressive invader). Human land uses both within the marshes as well as in adjacent upland areas can reduce connectivity between wetland patches and upland areas. Reservoirs, water diversions, ditches, roads, and human land uses in the contributing watershed can also have a substantial impact on wetland condition. For example, land uses in the watershed have the potential to contribute excess nutrients into the system which could lead to the establishment of non-native species and/or dominance of native disturbance-increasing species. Combinations of different types of stressors together with their scope, severity, and duration determine the degree to which a system's ecological integrity shifts from a natural condition (A rank) toward more degraded conditions (B, C, or D ranks).

**Reference Condition Examples (A–AB Ranked):** Broad Brook Headwaters (Pisgah State Park, Chesterfield); Mountain Brook (Pawtuckaway State Park, Deerfield & Nottingham).

# Guidance for Completing Biomonitoring Wetland Field Data Entry Form

**Revised 8/24/2015.**

1) **When beginning to enter field data from a new field season, request a new version of this file from the data manager. Prior to entering all field data, load one completed test file to make sure everything works correctly.**

2) Please do not alter any fields that are not color-coded, i.e. white or blue. They may contain important scripting information or are autofill. Please do not insert cells, rows or columns. If you need additional space, let the data manager know.

3) Let the data manager know if you need additional options in items with a pull-down list or more/different fields under an item.

4) The pre-EDD will allow cells to be empty if some items were not collected or not available at the time the field data is being entered.

Note that for all items below only the points that need explanation are annotated.

5) Site/Sample event info block
a) Station: add the 3 digit biomonitoring station number with the 'W-' (e.g., W-119).
b) Time: enter as military time or followed by an AM or PM.
c) Town and Waterbody Name: add the relevant information; exact form or accuracy are not required - these fields are not used for loading data.
d) Trip ID: do not enter anything into this cell, the Trip ID is automatically calculated from information entered in other cells of the pre-EDD.
d) Sampled By: select from drop-down list (is generally Biomonitoring Unit).
e) Sample Location: select from drop-down list (is generally boat or wading).
f) Terrain: select from drop-down list.

6) Macroinvertebrate Block
a) Sampling Method: select from drop-down list (is generally Dipnet).
b) Macro Sample ID: do not enter anything into this cell, the sample ID is automatically calculated from information entered in other cells of the pre-EDD.
c) Sample depths are not actually loaded into EGAD from this pre-EDD, but enter them anyway so that this pre-EDD will serve as a complete electronic record of the field sheet information.
d) Habitat and Substrate codes: recorded per site and not for each replicate. Enter each unique code only once.

7) Physical/Chemical Parameters
a) DO Meter # and SPC/pH Meter #: select from the dropdown list the meter type and number corresponding to the meter number written on the field sheet.
b) DO Meter calibrated and SPC/pH Meter calibrated?: these fields should be filled in with 'yes' if SOPs were followed. Sometimes this does not get noted on the field sheet - enquire with field crew if that is the case.
c) HETL #: This number is also called the Folder number, it is written on the field sheet and is on the HETL chain of custody. Enter the number for the inorganic parameters with suffix ’001’ and organic parameters with suffix ‘002’.

8) Additional plant community observations
a) use this field to enter plants that are identified at a high taxonomic level ("grasses", "sedges", "rushes"), and to enter comments about unknown plants ("Unknown submerged plant common").

b) Also, use this field for descriptions of the plant community surrounding the area sampled for macroinvertebrates ("pond surrounded by ring of cattails").
c) Enter the list of known taxa observed within the area actually sampled in the Common Plants Observed section at the bottom of the pre-EDD.
d) For example: "unknown submerged plants dominant, cattails around edge of pond" would be entered here, but "yellow water lilies, potomogeton" would be entered below with their scientific name and taxonomic code.

9) Comments
a) enter all comments written in the Notes/comments at the bottom of the field sheet. It may be necessary or appropriate to reword or reorganize the comments so they make sense to someone who wasn't present at the time of sampling.

10) Human Disturbance Ranking
a) Comments: combine all comments for each subsection, if necessary. Paraphrase as necessary to indicate which subsection the comment is referencing. For example, if for filling or bulldozing under section 1. Hydrologic Modifications to Wetland, the comment says "road", something like "some filling for the road" should be entered into the pre-EDD rather that just "road".
b) Total Human Disturbance: do not enter anything into this cell, it is automatically calculated from the scores for each section.

11) Epiphytic/Phytoplankton Algae Samples
a) Bottle Numbers: this needs to be assigned after the field season by Beth Connors. Do not load data to EGAD without this number!
b) Surface Area: Needs to be calculated after field season. Do not load data into EGAD without this
c) Epiphytic/Phytoplankton Algae Samples IDs: do not enter anything into these cells, the sample IDs are automatically calculated from information entered in other cells of the pre-EDD.
d) Phytoplankton volume: this is assumed to correspond to the volume of the container that the sample was collected in, e.g. a sample in a 1L bottle is assumed to have a volume of 1000ml.
e) starting in 2013 we collected 2 samples for phytoplankton and assigned them the same numeric bottle number. Enter the numeric part of the bottle number (e.g. 1420. NOT 1420-d or 1420-s.) and combine the volumes (e.g. 1000 ml plus 500 ml equals a total phytoplankton sample volume of 1500 ml).

12) Cowardin Classification/USFWS NWI Supplemental Descriptors
a) This information will be determined by Jeanne DiFranco or Beth Connors after field season. The pre-EDD can be loaded without this data if necessary. Check with Jeanne or Beth to check the status before loading without it.

13) Common Plants Observed
a) Enter the scientific name of the species observed by using the drop down list (see comment in sheet). The Maine taxon code and common name will be automatically populated.
b) Check the Taxa_List tab for correct scientific names.
c) Notify Biomonitoring staff if a species is not found on the Taxa_List tab

# Pre-EDD for Wetlands Field Data

| | | | | | |
|---|---|---|---|---|---|
| **Station Information** | | | | | |
| Station Number | | Precede with 'W-' | | | |
| Date | | | | | |
| Time | | | | | |
| Town | | | | | |
| Waterbody Name | | | | | |
| Trip ID | 1900- | *Auto Field* | | | |
| Sampled By | | *List* | | | |
| Sample Location | | *List* | | | |
| Terrain | | *List* | | | |
| GPS Accuracy | | | | | |
| | | | | | |
| **Macroinvertebrate Samples** | | | **Comment** | | |
| Habitat Code 1 | | *List* | | | |
| Habitat Code 2 | | *List* | | | |
| Habitat Code 3 | | *List* | | | |
| Sampling Method | | *List* | | | |
| Macro Sample ID | -1900- | *Auto field* | | | |
| Depth 1 | | cm | | | |
| Depth 2 | | cm | | | |
| Depth 3 | | cm | | | |
| Substrate Code 1 | | *List* | | | |
| Substrate Code 2 | | *List* | | | |
| Substrate Code 3 | | *List* | | | |
| Substrate Code 4 | | *List* | | | |
| Substrate - general comment | | | | | |
| | | | | | |
| | | | | | |
| **Physical/Chemical Parameters** | Value | Unit | | | |
| Dissolved Oxygen | | mg/L | | | |
| Temperature | | Deg C | | | |
| Conductivity | | uS/cm | | | |
| pH | | STU | | | |
| DO Meter # | | *List* | | | |
| DO meter Calibrated? | | *List* | | | |
| SPC/pH Meter # | | *List* | | | |
| SPC/pH Meter Calibrated? | | *List* | | | |
| HETL Kit # - Inorganics | | | | | |
| HETL Kit # - Organics | | | | | |
| HETL Kit # - Inorganics DUP | | | | | |
| HETL Kit # - Organics DUP | | | | | |
| Visible Flow? | | *List* | | | |
| Rain last 24 hours? | | *List* | | | |
| | | | | | |
| **Additional plant community observations** | | | | | |
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| **Comments** | | | | | |
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| **Human Disturbance Ranking** | Score | | Comment | | |

| | | | | | |
|---|---|---|---|---|---|
| Hydrologic Modifications to Wetland | | | | | |
| Vegetative Modifications to Wetland | | | | | |
| Evidence of Chemical Pollutants | | | | | |
| Watershed Characterization and Potential NPS Pollution Impacts | | | | | |
| Total Human Disturbance | | | | | |
| Disturbance - general comment | | | | | |
| | | | | | |
| | | | | | |
| **Epiphytic Algae Sample** | Value - normal sample | Unit | Field Duplicate | | |
| Epiphyte Sample ID - Auto field | WA--1900E | | WA--1900ED | | |
| Bottle Number | | | | | |
| Volume | | ml | | ml | |
| Surface Area | | sq cm | | sq cm | |
| | | | | | |
| **Phytoplankton Algae Sample** | Value - normal sample | Unit | Field Duplicate | | |
| Phytoplankton Sample ID - Auto field | WA--1900Y | | WA--1900YD | | |
| Bottle Number | | | | | |
| Volume | | ml | | ml | |
| | | | | | |
| | | | | | |
| **Cowardin Classification** | | | | | |
| System | | *List* | | | |
| Subsystem | | *List* | | | |
| Class 1 | | *List* | | | |
| Subclass 1 | | *List* | | | |
| Class 2 | | *List* | | | |
| Subclass 2 | | *List* | | | |
| Class 3 | | *List* | | | |
| Subclass 3 | | *List* | | | |
| | | | | | |
| **USFWS NWI Supplemental Descriptors** | | | **Modifiers** | | |
| Landscape Position | | *List* | | | |
| Water Flow Path | | *List* | | | |
| Lotic Gradient | | *List* | | | |
| Inland Landform | | *List* | | | |
| Inland Landform Type | | | | | |
| Waterbody Type | | *List* | | | |
| Waterbody Subtype | | | | | |
| Notes and Additional modifiers | | | | | |
| | | | | | |
| **Common Plants Observed** | | | | | |
| **Maine taxon code** | **Taxon scientific name** | | **Taxon common name** | **Comment** | |
| | | *List* | | | |
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| | | *List* | | | |

# Notes on completing the taxa ID worksheet

4/10/2014

The New Hampshire DES will be providing this data for use with the Maine DEP's wetlands macroinvertebrate linear discriminant model. To ensure that the data are formatted appropriately to make the process work smoothly, certain pieces of information need to be found in certain fields. Please read the brief instructions below to complete the taxa ID worksheet ('TEMPLATE') correctly. **Please also use a separate Excel file for each sample with one to three replicates** (i.e. please don't combine multiple sites into one file)**.** Thank you very much for your consideration!

1) Please enter the taxonomist's or company name in field B4 (tan) only. This is a required field.

2) Please provide 'Sample Log No.', 'Station No.' and 'Time of Collection' (yellow cells B6, B7 and B11) if you have the information. Please precede a wetlands log number with 'DN-' and a wetlands station number with 'W-'.

3) The fields 'Waterbody Name' through 'Sampler Type' (except for 'Time of Collection'; tan cells B 8 to B14) are required. Please make sure to provide this information.

4) The fields 'Subsample Factor' and 'Sampler Type' are required; both have pull down menus (tan cells B13 and 14) - please select the appropriate option in each field.

5) Enter taxon name and count information as before (note the Comment in field B19). If you need space for additional records, please insert entire rows (Insert > Rows).

6) Please note that there is now a separate column (C) to indicate the stage of an organism - please put a 'P' (or 'p') in this column if the organism identified is a pupa and an 'A' (or 'a') if it is an adult; the default will be larva and does not require an entry in the Stage column. If you identify different stages of an organism, please enter them as separate records with their own counts and an P or A in the Stage column for the pupal/adult record.

7) Enter information on 'Chironomidae Subsample Effort' (cells E8 to G11) as before.

8) The fields 'Depth 1', 'Depth 2', 'Depth 3' (grey cells E17 to G17) are mostly for DEP internal use - please ignore unless you have the information. If you do, please enter the values and add the depth unit (usually 'cm') in field D17.

Maine Department of Environmental Protection
Logsheet for Benthic Macroinvertebrates Identified
**Please see the Read Me worksheet**

Taxonomist:

| | |
|---|---|
| Sample Log No.: | |
| Station No.: | |
| Waterbody Name: | |
| Town Name: | |
| Date of Collection: | |
| Time of Collection: | |
| Collected By: | |
| Subsample Factor: | |
| Sampler Type: | |

| Chironomidae Subsample (SS) Effort | | | |
|---|---|---|---|
| Level of SS Effort | none | none | none |
| No. Chir SSed | | | |
| No. Chir in SS | | | |
| Misc. Chir not SSed | | | |
| TChir | 0 | 0 | 0 |

| | | | Retrieval Depth Unit | Depth 1 | Depth 2 | Depth 3 |
|---|---|---|---|---|---|---|
| | | | | | | |
| | Taxon | | | No. identified from sample | | |
| Maine Code | Taxon Name | Stage | Comment | Rep 1 | Rep 2 | Rep 3 |
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| | Taxon | | | No. identified from sample | | |
|---|---|---|---|---|---|---|
| Maine Code | Taxon Name | Stage | Comment | Rep 1 | Rep 2 | Rep 3 |
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|---|---|---|---|
| **Total Benthos** | **0** | **0** | **0** |
| **Total OTUs** | **0** | **0** | **0** |
| **Total spp.** | | | |

**Tribes and Genus Groups included in Chironomidae 09021011 basket counts**

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

### Station Information

**Station Number: W-264** Trip ID: 2014-264-WET-ALS-1 River Basin: Connecticut
Waterbody: FULLER WETLAND (NH) HUC8 Name:
Town: Not Designated Latitude: 43 7 22.23 N
Mitigation Monitoring Site: No Longitude: 72 16 35.15 W

### Sample Information

**Sample ID: DN-2014-264-WET-ALS-1** Type of Sample: DIPNET Date Sampled: 8/7/2014
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: A** Date: 2/9/2016
Model Result with P≥0.6: A **Reason for Determination: Model**
Date Last Calculated: 2/8/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 1.00 | Class C: | 0.00 |
| Class B: | 0.00 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 1.00 |
| Class C or Non-Attainment | 0.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 1.00 |
| Class B or C or Non-Attainment | 0.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 123 | < 787 |
| Ephemeroptera Abundance | 55.67 | most > 35 |
| Odonata Relative Abundance | 0.195 | most > 0.04 |
| Trichoptera Relative Abundance | 0.079 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.04 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.14 | < 0.4 |
| MTI Sensitive Taxa Abundance | 10.71 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.10 | most > 0.05 |
| MTI Sensitive Taxa Richness | 7 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.90 | > 0.5 |
| MTI Intermediate Taxa Richness | 13 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 10.71 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 28 |
| Hilsenhoff Biotic Index: | 7.39 |
| Shannon-Weiner Diversity: | 3.06 |
| Maine Tolerance Index: | 23.30 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Caenis* | 45.26 |
| 2 | *Enallagma* | 17.89 |
| 3 | *Hyalella azteca* | 5.69 |
| 4 | *Oxyethira* | 3.25 |
| 5 | *Banksiola* | 2.98 |

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

## Sample Collection and Processing Information

Sampling Organization: NHDES
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/7/2014 10:45:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 0.98 | mg/l | |
| Surface Water | In-situ | pH | 5.27 | | |
| Surface Water | In-situ | Specific Conductance | 52.2 | us/cm | |
| Surface Water | In-situ | Temperature | 22.6 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 10 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 4 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 1 | Class 1: | EMERGENT | Flow Path: |
| Chemical Pollutants: | 0 | Subclass 1: | NON-PERSISTENT | Land Form: |
| Watershed Characterization and Non-point Sources: | 5 | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: COULD NOT REACH FLOATING MAT ISLAND IN THE MIDDLE OF THE LOWER PART OF THE WETLAND. PLANT LIST IS NOT COMPREHENSIVE.

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
EMERGENT PERSISTENT VEGETATION

Substrate Classification:
ORGANIC SOIL SUBSTRATE
SILT/MUCK SUBSTRATE

Average Depth: 39 cm Visible Flow: No Rain In Previous 24 Hours: No

Sample Comments: BEAVER DAM LOCATED BETWEEN SITES 2 AND 3. SITE 1 IS THE MOST DOWNSTREAM SAMPLING POINT. MACROSITES 2&3 WERE SAMPLED ON 8/11 DUE TO THREATENING THUNDERSTORM ON 8/7

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Glyceria canadensis* | Rattlesnake mannagrass | LW-34010502036003 | 4 | OBL | GRAMINOID |
| *Eupatorium perfoliatum* | Common boneset | LW-34020501032001 | 4 | FACW | FORB/HERB |
| *Utricularia* | | LW-34022305002 | | | |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Eleocharis* | | LW-34010501006 | | | |
| *Phalaris arundinacea* | Reed canarygrass | LW-34010502054001 | 1 | FACW | GRAMINOID |
| *Sagittaria* | | LW-34011401002 | | | |
| *Alnus incana ssp. rugosa* | Speckled alder | LW-34021701001002 | 2 | FACW | TREE, SHRUB |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Carex lurida* | Shallow sedge | LW-34010501002089 | 2 | OBL | GRAMINOID |
| *Impatiens capensis* | Jewelweed | LW-34021901001001 | 2 | FACW | FORB/HERB |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Carex* | | LW-34010501002 | | | |
| *Sparganium americanum* | American bur-reed | LW-34011301001001 | 5 | OBL | FORB/HERB |

## Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Rosa multiflora* | Multiflora rose | LW-34024202020010 | 0 | FACU | VINE, SUBSHRUB |
| *Spiraea tomentosa* | Steeplebush | LW-34024202026005 | 3 | FACW | SHRUB |

## Additional Summary Variables

**Station Number: W-264** Waterbody: FULLER WETLAND (NH) Town: Not Designated

**Log Number: DN-2014-264-WET-ALS-1** Subsample Factor: X1 Replicates: 3 Calculated: 2/8/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 89.33 | 0.726 | 9 | 0.32 |
| EPT Taxa: | 65.33 | 0.531 | 7 | 0.25 |
| Insects: | 111.00 | 0.902 | 24 | 0.86 |
| Non-Insects: | 12.00 | 0.098 | 4 | 0.14 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 3.33 | 0.027 | 1 | 0.04 |
| Snails: | 0.33 | 0.003 | 1 | 0.04 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 7.00 | 0.057 | 1 | 0.04 |
| Mites: | 1.33 | 0.011 | 1 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 55.67 | 0.453 | 1 | 0.04 |
| Odonates: | 24.00 | 0.195 | 2 | 0.07 |
| Caddisflies: | 9.67 | 0.079 | 6 | 0.21 |
| Diptera: | 14.33 | 0.117 | 11 | 0.39 |
| Hemiptera: | 4.67 | 0.038 | 2 | 0.07 |
| Beetles: | 2.67 | 0.022 | 2 | 0.07 |
| Chironomids: | 14.33 | 0.117 | 11 | 0.39 |
| Tanypodinae Tribe: | 5.12 | 0.042 | 4 | 0.14 |
| Chironomiinae Tribe: | 8.87 | 0.072 | 6 | 0.21 |
| Orthoclodiinae Tribe: | 0.34 | 0.003 | 1 | 0.04 |
| Collector-Filterers: | 3.41 | 0.028 | 2 | 0.07 |
| Collector-Gatherers: | 67.79 | 0.551 | 6 | 0.21 |
| Predators: | 35.79 | 0.291 | 11 | 0.39 |
| Piercers: | 4.00 | 0.033 | 1 | 0.04 |
| Shredders: | 4.68 | 0.038 | 3 | 0.11 |
| Scrapers: | 0.33 | 0.003 | 1 | 0.04 |
| Maine Tolerance: | | | | |
| Sensitive: | 10.71 | 0.098 | 7 | 0.35 |
| Intermediate: | 98.60 | 0.902 | 13 | 0.65 |
| Eurytopic: | 0.00 | 0.000 | 0 | 0.00 |
| Ratio of MTI Sensitive to Eurytopic | 10.71 | 9.801 | 7.00 | 35.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-264** Waterbody: FULLER WETLAND (NH) Town: Not Designated

**Log Number: DN-2014-264-WET-ALS-1** Subsample Factor: X1 Replicates: 3 Calculated: 2/8/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Naididae | 08020202 | 3.33 | 3.33 | -- | -- | -- | -- | Worm |
| *Hyalella* | 09010203006 | 0.00 | 7.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 7.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| Odonata | 090203 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Sympetrum* | 09020306041 | 1.67 | 1.67 | 10 | PR | 37-I | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 22.00 | 22.00 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 55.67 | 55.67 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 1.33 | 1.33 | -- | -- | -- | -- | True Bug |
| *Notonecta* | 09020505015 | 3.33 | 3.33 | -- | PR | -- | -- | True Bug |
| *Polycentropus* | 09020603010 | 0.67 | 0.67 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Oxyethira* | 09020607028 | 4.00 | 4.00 | 3 | P | 22-S | -- | Caddisfly |
| Phryganeidae | 09020608 | 0.67 | 0.67 | -- | -- | -- | -- | Caddisfly |
| *Banksiola* | 09020608036 | 3.67 | 3.67 | -- | SH | 14.9-S | -- | Caddisfly |
| *Lepidostoma* | 09020611064 | 0.33 | 0.33 | 1 | SH | -- | -- | Caddisfly |
| *Oecetis* | 09020618078 | 0.33 | 0.33 | 8 | PR | 16.3-S | -- | Caddisfly |
| Chironomidae | 09021011 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 3.00 | 3.07 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Labrundinia* | 09021011008 | 1.00 | 1.02 | 7 | PR | 18.1-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 0.33 | 0.34 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Thienemannimyia* | 09021011020 | 0.00 | 0.68 | 3 | PR | -- | T | Fly: Midge |
| *Thienemannimyia group* | 09021011020041 | 0.67 | 0.00 | -- | -- | -- | T | Fly: Midge |
| *Psectrocladius* | 09021011056 | 0.33 | 0.34 | 8 | CG | 22-S | -- | Fly: Midge |
| *Tanytarsus* | 09021011076 | 1.67 | 1.71 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 2.00 | 2.05 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 2.00 | 2.05 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 1.67 | 1.71 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.67 | 0.68 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Tribelos* | 09021011107 | 0.00 | 0.68 | 5 | CG | 9.3-S | C | Fly: Midge |
| *Tribelos jucundus* | 09021011107198 | 0.67 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Hydrovatus* | 09021103007 | 2.33 | 2.33 | -- | PR | -- | -- | Beetle |
| *Celina* | 09021103012 | 0.33 | 0.33 | -- | PR | -- | -- | Beetle |
| Arachnida | 0903 | 1.00 | 1.00 | -- | -- | -- | -- | Arachnid |
| *Arrenurus* | 09030111001 | 0.33 | 0.33 | -- | -- | 23.8-I | -- | Mite |
| *Helisoma* | 10010203030 | 0.33 | 0.33 | -- | SC | 42.8-I | -- | Snail |

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

### Station Information

**Station Number: W-270** Trip ID: 2015-270-WET-BOW-1 River Basin: Merrimack
Waterbody: TOWN POND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 43 9 13.2 N
Mitigation Monitoring Site: No Longitude: 71 32 7.16 W

### Sample Information

**Sample ID: DN-2015-270-WET-BOW-1** Type of Sample: DIPNET Date Sampled: 6/25/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: C** Date: 10/25/2016
Model Result with P≥0.6: C **Reason for Determination: Model**
Date Last Calculated: 8/24/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.01 | Class C: | 0.74 |
| Class B: | 0.25 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.26 |
| Class C or Non-Attainment | 0.74 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.01 |
| Class B or C or Non-Attainment | 0.99 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 175 | < 787 |
| Ephemeroptera Abundance | 0.67 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.011 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.00 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.23 | < 0.4 |
| MTI Sensitive Taxa Abundance | 2.02 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.01 | most > 0.05 |
| MTI Sensitive Taxa Richness | 3 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.98 | > 0.5 |
| MTI Intermediate Taxa Richness | 13 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 1.99 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 22 |
| Hilsenhoff Biotic Index: | 8.08 |
| Shannon-Weiner Diversity: | 1.78 |
| Maine Tolerance Index: | 24.91 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 70.80 |
| 2 | *Hydrobiidae* | 7.82 |
| 3 | *Procladius* | 7.06 |
| 4 | *Sphaeriidae* | 5.53 |
| 5 | *Ablabesmyia* | 1.53 |

## Sample Collection and Processing Information

Sampling Organization: SJC, SDM
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 6/25/2015 12:40:00 PM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 7.9 | mg/l | |
| Surface Water | In-situ | pH | 6.03 | | |
| Surface Water | In-situ | Specific Conductance | 228.5 | us/cm | |
| Surface Water | In-situ | Temperature | 28.3 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 22 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 5 | Subsystem: | LITTORAL | Lotic Gradient: |
| Vegetative Modifications: | 3 | Class 1: | EMERGENT | Flow Path: |
| Chemical Pollutants: | 0 | Subclass 1: | PERSISTENT | Land Form: |
| Watershed Characterization and Non-point Sources: | 14 | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | AQUATIC BED | Waterbody Subtype: |
| | | Subclass 3: | ROOTED VASCULAR | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: TYPHA LATIFOLIA GROWTH IS MOST DENSE ON THE E SIDE OF POND, BELOW RESIDENTIAL DEVELOPMENT

Habitat Classification:
AQUATIC MACROPHYTE BED

Substrate Classification:
ORGANIC SOIL SUBSTRATE
SAND SUBSTRATE

Average Depth: 43 cm  Visible Flow: Yes  Rain In Previous 24 Hours: Yes

Sample Comments: THE STREAM THROUGH A DRAINAGE MARSH-SHRUB SWAMP SYSTEM WAS IMPOUNDED/ DREDGED C. 1955 TO CREATE A WATER SOURCE FOR FIRE PROTECTION PURPOSES.

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Typha* | | LW-34011301002 | | | |
| *Vaccinium* | | LW-34021302023 | | | |
| *Spiraea* | | LW-34024202026 | | | |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |
| *Juncus* | | LW-34010801001 | | | |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Carex* | | LW-34010501002 | | | |
| *Utricularia* | | LW-34022305002 | | | |
| *Triadenum* | | LW-34022601002 | | | |
| *Juncus effusus* | Common rush | LW-34010801001016 | 2 | OBL | GRAMINOID |
| *Rubus* | | LW-34024202021 | | | |
| *Glyceria* | | LW-34010502036 | | | |
| *Eleocharis* | | LW-34010501006 | | | |
| *Eupatorium perfoliatum* | Common boneset | LW-34020501032001 | 4 | FACW | FORB/HERB |
| *Schoenoplectus tabernaemontani* | Softstem bulrush | LW-34010501011011 | 5 | OBL | GRAMINOID |

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

### Additional Summary Variables

**Station Number: W-270** Waterbody: TOWN POND (NH) Town: Not Designated

**Log Number: DN-2015-270-WET-BOW-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/24/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 2.67 | 0.015 | 4 | 0.18 |
| EPT Taxa: | 2.67 | 0.015 | 4 | 0.18 |
| Insects: | 26.67 | 0.153 | 17 | 0.77 |
| Non-Insects: | 148.00 | 0.847 | 5 | 0.23 |
| Leeches: | 0.33 | 0.002 | 1 | 0.05 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 13.67 | 0.078 | 1 | 0.05 |
| Bivalves: | 9.67 | 0.055 | 1 | 0.05 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 123.67 | 0.708 | 1 | 0.05 |
| Mites: | 0.67 | 0.004 | 1 | 0.05 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.67 | 0.004 | 2 | 0.09 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 2.00 | 0.011 | 2 | 0.09 |
| Diptera: | 23.00 | 0.132 | 11 | 0.50 |
| Hemiptera: | 0.00 | 0.000 | 0 | 0.00 |
| Beetles: | 1.00 | 0.006 | 2 | 0.09 |
| Chironomids: | 21.00 | 0.120 | 10 | 0.45 |
| Tanypodinae Tribe: | 15.92 | 0.091 | 3 | 0.14 |
| Chironomiinae Tribe: | 4.74 | 0.027 | 6 | 0.27 |
| Orthoclodiinae Tribe: | 0.34 | 0.002 | 1 | 0.05 |
| Collector-Filterers: | 11.02 | 0.063 | 2 | 0.09 |
| Collector-Gatherers: | 125.69 | 0.720 | 5 | 0.23 |
| Predators: | 20.94 | 0.120 | 9 | 0.41 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 0.00 | 0.000 | 0 | 0.00 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 2.02 | 0.013 | 3 | 0.17 |
| Intermediate: | 146.97 | 0.980 | 13 | 0.72 |
| Eurytopic: | 1.01 | 0.007 | 2 | 0.11 |
| Ratio of MTI Sensitive to Eurytopic | 1.99 | 1.995 | 1.50 | 1.50 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-270** Waterbody: TOWN POND (NH) Town: Not Designated

**Log Number: DN-2015-270-WET-BOW-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/24/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Helobdella* | 08030101005 | 0.00 | 0.33 | -- | -- | 43-E | -- | Leech |
| *Helobdella modesta* | 08030101005004 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Hyalella* | 09010203006 | 0.00 | 123.67 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 123.67 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Callibaetis* | 09020401002 | 0.33 | 0.33 | 9 | CG | 40.5-I | -- | Mayfly |
| *Caenis* | 09020412040 | 0.33 | 0.33 | 7 | CG | 22.1-I | -- | Mayfly |
| *Polycentropus* | 09020603010 | 1.00 | 1.00 | 6 | PR | 15.4-S | -- | Caddisfly |
| Phryganeidae | 09020608 | 1.00 | 1.00 | -- | -- | -- | -- | Caddisfly |
| *Culicoides* | 09021010037 | 2.00 | 2.00 | 10 | PR | 42.1-I | -- | Fly: Biting Midge |
| Chironomidae | 09021011 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 2.67 | 2.71 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Clinotanypus* | 09021011002 | 0.00 | 0.68 | 8 | PR | 30.3-I | T | Fly: Midge |
| *Clinotanypus pinguis* | 09021011002008 | 0.67 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Procladius* | 09021011015 | 12.33 | 12.53 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Psectrocladius* | 09021011056 | 0.33 | 0.34 | 8 | CG | 22-S | -- | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 0.67 | 0.68 | 6 | -- | 43-E | Y | Fly: Midge |
| *Tanytarsus* | 09021011076 | 1.33 | 1.35 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Cladopelma* | 09021011081 | 1.00 | 1.02 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Cryptochironomus* | 09021011082 | 0.33 | 0.34 | 8 | PR | 31.3-I | C | Fly: Midge |
| *Cryptotendipes* | 09021011083 | 0.67 | 0.68 | 6 | -- | 7.1-S | C | Fly: Midge |
| *Parachironomus* | 09021011097 | 0.67 | 0.68 | 10 | PR | 28.6-I | C | Fly: Midge |
| *Agabus* | 09021103016 | 0.67 | 0.67 | -- | PR | 34.5-I | -- | Beetle |
| *Rhantus* | 09021103026 | 0.33 | 0.33 | -- | PR | -- | -- | Beetle |
| *Arrenurus* | 09030111001 | 0.67 | 0.67 | -- | -- | 23.8-I | -- | Mite |
| Hydrobiidae | 10010104 | 13.67 | 13.67 | -- | -- | -- | -- | Snail |
| Sphaeriidae | 10020201 | 9.67 | 9.67 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-271** Trip ID: 2015-271-WET-CNT-1 River Basin: Merrimack
Waterbody: OXBOW POND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 43 17 39.12 N
Mitigation Monitoring Site: No Longitude: 71 34 59.36 W

### Sample Information

**Sample ID: DN-2015-271-WET-CNT-1** Type of Sample: DIPNET Date Sampled: 7/7/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: B** Date: 10/25/2016
Model Result with P≥0.6: B **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.22 | Class C: | 0.01 |
| Class B: | 0.77 | NA: | 0.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.99 |
| Class C or Non-Attainment | 0.01 |

A Model

| | |
|---|---|
| Class A | 0.22 |
| Class B or C or Non-Attainment | 0.78 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 544 | < 787 |
| Ephemeroptera Abundance | 261.33 | most > 35 |
| Odonata Relative Abundance | 0.018 | most > 0.04 |
| Trichoptera Relative Abundance | 0.023 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.02 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.40 | < 0.4 |
| MTI Sensitive Taxa Abundance | 26.67 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.05 | most > 0.05 |
| MTI Sensitive Taxa Richness | 6 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.93 | > 0.5 |
| MTI Intermediate Taxa Richness | 15 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 2.66 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 30 |
| Hilsenhoff Biotic Index: | 7.39 |
| Shannon-Weiner Diversity: | 2.54 |
| Maine Tolerance Index: | 23.92 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Caenis* | 48.01 |
| 2 | *Hyalella azteca* | 27.31 |
| 3 | *Hydrobiidae* | 5.14 |
| 4 | *Stylaria* | 2.33 |
| 5 | *Procladius* | 1.78 |

## Sample Collection and Processing Information

Sampling Organization: SC, JP, SM
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/7/2015 10:45:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 6.2 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 73.9 | % | |
| Surface Water | In-situ | pH | 6.22 | | |
| Surface Water | In-situ | Specific Conductance | 235.5 | us/cm | |
| Surface Water | In-situ | Temperature | 23.6 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 13 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 0 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 4 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 0 | | | |
| Watershed Characterization and Non-point Sources: | 9 | Subclass 1: | NON-PERSISTENT | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | PERSISTENT | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: CATTAIL COMMUNITY DOMINATES MARSH, WHICH HAS BEEN SUBJECT TO IMPACTS HISTORICALLY. WOOD PILINGS OF UNKNOWN ORIGIN WERE OBSERVED IN WETLAND. UPLAND IS DOMINATED BY INVASIVES, SUCH AS BITTERSWEET, AND TRAVELING THROUGH IT WAS EXTEREMELY DIFFICULT.

| Habitat Classification: | Substrate Classification: |
|---|---|
| AQUATIC MACROPHYTE BED | SAND SUBSTRATE |
| EMERGENT NON-PERSISTENT VEGETATION | SILT/MUCK SUBSTRATE |
| OPEN WATER STANDING | |

Average Depth: 67 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |
| *Juncus effusus* | Common rush | LW-34010801001016 | 2 | OBL | GRAMINOID |
| *Rosa multiflora* | Multiflora rose | LW-34024202020010 | 0 | FACU | VINE, SUBSHRUB |
| *Lemna* | | LW-34010201002 | | | |
| *Utricularia* | | LW-34022305002 | | | |
| *Carex* | | LW-34010501002 | | | |
| *Schoenoplectus subterminalis* | Swaying bulrush | LW-34010501011010 | 6 | OBL | GRAMINOID |
| *Potamogeton* | | LW-34011101001 | | | |
| *Celastrus orbiculatus* | Oriental bittersweet | LW-34020901001001 | 0 | UPL | VINE |
| *Poaceae* | | LW-34010502 | | | |
| *Sparganium* | | LW-34011301001 | | | |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Polygonum amphibium* | Water knotweed | LW-34023701005002 | 5 | OBL | FORB/HERB |

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

### Additional Summary Variables

**Station Number: W-271** Waterbody: OXBOW POND (NH) Town: Not Designated

**Log Number: DN-2015-271-WET-CNT-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 283.67 | 0.521 | 9 | 0.30 |
| EPT Taxa: | 274.00 | 0.503 | 5 | 0.17 |
| Insects: | 310.67 | 0.571 | 18 | 0.60 |
| Non-Insects: | 233.67 | 0.429 | 12 | 0.40 |
| Leeches: | 0.67 | 0.001 | 1 | 0.03 |
| Oligochaetes: | 12.67 | 0.023 | 1 | 0.03 |
| Snails: | 45.33 | 0.083 | 5 | 0.17 |
| Bivalves: | 4.67 | 0.009 | 2 | 0.07 |
| Isopods: | 8.67 | 0.016 | 1 | 0.03 |
| Amphipods: | 148.67 | 0.273 | 1 | 0.03 |
| Mites: | 13.00 | 0.024 | 1 | 0.03 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 261.33 | 0.480 | 1 | 0.03 |
| Odonates: | 9.67 | 0.018 | 4 | 0.13 |
| Caddisflies: | 12.67 | 0.023 | 4 | 0.13 |
| Diptera: | 24.00 | 0.044 | 5 | 0.17 |
| Hemiptera: | 2.00 | 0.004 | 2 | 0.07 |
| Beetles: | 1.00 | 0.002 | 2 | 0.07 |
| Chironomids: | 19.33 | 0.036 | 4 | 0.13 |
| Tanypodinae Tribe: | 16.62 | 0.031 | 2 | 0.07 |
| Chironomiinae Tribe: | 2.71 | 0.005 | 2 | 0.07 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 4.67 | 0.009 | 2 | 0.07 |
| Collector-Gatherers: | 424.02 | 0.779 | 4 | 0.13 |
| Predators: | 37.62 | 0.069 | 10 | 0.33 |
| Piercers: | 3.00 | 0.006 | 1 | 0.03 |
| Shredders: | 9.67 | 0.018 | 2 | 0.07 |
| Scrapers: | 14.67 | 0.027 | 3 | 0.10 |
| Maine Tolerance: | | | | |
| Sensitive: | 26.67 | 0.054 | 6 | 0.26 |
| Intermediate: | 459.64 | 0.926 | 15 | 0.65 |
| Eurytopic: | 10.02 | 0.020 | 2 | 0.09 |
| Ratio of MTI Sensitive to Eurytopic | 2.66 | 2.660 | 3.00 | 3.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-271** Waterbody: OXBOW POND (NH) Town: Not Designated

**Log Number: DN-2015-271-WET-CNT-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Stylaria* | 08020202014 | 12.67 | 12.67 | -- | CG | 18-S | -- | Worm |
| *Erpobdella* | 08030203002 | 0.00 | 0.67 | -- | -- | 36.4-I | -- | Leech |
| *Erpobdella punctata* | 08030203002001 | 0.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Caecidotea* | 09010101001 | 0.00 | 8.67 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 8.67 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 148.67 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 148.67 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Aeshna* | 09020301001 | 0.33 | 0.33 | 5 | PR | 27.9-I | -- | Dragonfly/damselfly |
| Libellulidae | 09020306 | 3.33 | 3.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Sympetrum* | 09020306041 | 1.33 | 1.33 | 10 | PR | 37-I | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 4.67 | 4.67 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 261.33 | 261.33 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 1.00 | 1.00 | -- | -- | -- | -- | True Bug |
| *Neoplea* | 09020512016 | 1.00 | 1.00 | -- | PR | 35.5-I | -- | True Bug |
| *Polycentropus* | 09020603010 | 4.00 | 4.00 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Oxyethira* | 09020607028 | 3.00 | 3.00 | 3 | P | 22-S | -- | Caddisfly |
| *Banksiola* | 09020608036 | 1.00 | 1.00 | -- | SH | 14.9-S | -- | Caddisfly |
| *Oecetis* | 09020618078 | 4.67 | 4.67 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Bezzia/palpomyia* | 09021010043 | 4.67 | 4.67 | 6 | PR | 26.9-I | -- | Fly: Biting Midge |
| Chironomidae | 09021011 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 6.67 | 6.78 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Procladius* | 09021011015 | 9.67 | 9.84 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 1.33 | 1.36 | 6 | -- | 43-E | Y | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 1.33 | 1.36 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Agabus* | 09021103016 | 0.33 | 0.33 | -- | PR | 34.5-I | -- | Beetle |
| Chrysomelidae | 09021114 | 0.67 | 0.67 | -- | -- | -- | -- | Beetle |
| Arachnida | 0903 | 7.67 | 7.67 | -- | -- | -- | -- | Arachnid |
| *Arrenurus* | 09030111001 | 5.33 | 5.33 | -- | -- | 23.8-I | -- | Mite |
| Hydrobiidae | 10010104 | 28.00 | 28.00 | -- | -- | -- | -- | Snail |
| *Amnicola* | 10010104013 | 1.33 | 1.33 | -- | SC | 18.7-S | -- | Snail |
| Lymnaeidae | 10010201 | 2.67 | 2.67 | -- | -- | -- | -- | Snail |
| *Gyraulus* | 10010203029 | 0.00 | 8.33 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 6.67 | 0.00 | -- | -- | -- | -- | Snail |
| *Gyraulus parvus* | 10010203029057 | 1.67 | 0.00 | -- | -- | -- | -- | Snail |
| *Helisoma* | 10010203030 | 5.00 | 5.00 | -- | SC | 42.8-I | -- | Snail |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-271** Waterbody: OXBOW POND (NH) Town: Not Designated

**Log Number: DN-2015-271-WET-CNT-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Sphaeriidae | 10020201 | 0.33 | 0.33 | -- | CF | -- | -- | Clam |
| *Pisidium* | 10020201002 | 4.33 | 4.33 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-272** Trip ID: 2015-272-WET-CON-1 River Basin: Merrimack
Waterbody: SOUTH END MARSH (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 43 11 7.56 N
Mitigation Monitoring Site: No Longitude: 71 31 46.98 W

### Sample Information

**Sample ID: DN-2015-272-WET-CON-1** Type of Sample: DIPNET Date Sampled: 7/27/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments: Minimum provisions for Total Mean Abundance not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 1.00 |
| Class B: | 0.00 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.00 |
| Class C or Non-Attainment | 1.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 32 | < 787 |
| Ephemeroptera Abundance | 0.00 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.000 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.03 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.53 | < 0.4 |
| MTI Sensitive Taxa Abundance | 1.00 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.04 | most > 0.05 |
| MTI Sensitive Taxa Richness | 1 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.81 | > 0.5 |
| MTI Intermediate Taxa Richness | 8 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.25 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 15 |
| Hilsenhoff Biotic Index: | 7.20 |
| Shannon-Weiner Diversity: | 3.56 |
| Maine Tolerance Index: | 31.22 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Tanytarsus* | 20.00 |
| 2 | *Gyraulus* | 16.84 |
| 3 | *Dicrotendipes* | 9.47 |
| 3 | *Naididae* | 9.47 |
| 4 | *Chironomus* | 6.32 |
| 4 | *Lumbriculidae* | 6.32 |
| 4 | *Paratanytarsus* | 6.32 |

| | | |
|---|---|---|
| 5 | *Ablabesmyia* | 3.16 |
| 5 | *Bezzia/palpomyia* | 3.16 |
| 5 | *Caecidotea communis* | 3.16 |
| 5 | *Chaoborus* | 3.16 |
| 5 | *Helobdella modesta* | 3.16 |
| 5 | *Hyalella azteca* | 3.16 |
| 5 | *Sphaeriidae* | 3.16 |
| 5 | *Stylaria* | 3.16 |

## Sample Collection and Processing Information

Sampling Organization: JP
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/27/2015 12:30:00 PM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 1.36 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 15.3 | % | |
| Surface Water | In-situ | pH | 5.89 | | |
| Surface Water | In-situ | Specific Conductance | 737 | us/cm | |
| Surface Water | In-situ | Temperature | 21.4 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 34 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 8 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 6 | Class 1: | EMERGENT | Flow Path: |
| Chemical Pollutants: | 5 | Subclass 1: | PERSISTENT | Land Form: |
| Watershed Characterization and Non-point Sources: | 15 | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
EMERGENT NON-PERSISTENT VEGETATION
EMERGENT PERSISTENT VEGETATION

Substrate Classification:
ORGANIC SOIL SUBSTRATE
SAND SUBSTRATE
SILT/MUCK SUBSTRATE

Average Depth: 53 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Alnus* | | LW-34021701001 | | | |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Spiraea* | | LW-34024202026 | | | |
| *Carex comosa* | Longhair sedge | LW-34010501002039 | 6 | OBL | GRAMINOID |
| *Eleocharis* | | LW-34010501006 | | | |
| *Typha latifolia* | Broadleaf cattail | LW-34011301002002 | 2 | OBL | FORB/HERB |
| *Triadenum* | | LW-34022601002 | | | |
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |
| *Lemna* | | LW-34010201002 | | | |
| *Impatiens capensis* | Jewelweed | LW-34021901001001 | 2 | FACW | FORB/HERB |
| *Utricularia macrorhiza* | Common bladderwort | LW-34022305002005 | 3 | OBL | FORB/HERB |
| *Celastrus orbiculatus* | Oriental bittersweet | LW-34020901001001 | 0 | UPL | VINE |

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

### Additional Summary Variables

**Station Number: W-272** Waterbody: SOUTH END MARSH (NH) Town: Not Designated

**Log Number: DN-2015-272-WET-CON-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 0.00 | 0.000 | 0 | 0.00 |
| EPT Taxa: | 0.00 | 0.000 | 0 | 0.00 |
| Insects: | 16.33 | 0.516 | 7 | 0.47 |
| Non-Insects: | 15.33 | 0.484 | 8 | 0.53 |
| Leeches: | 1.00 | 0.032 | 1 | 0.07 |
| Oligochaetes: | 6.00 | 0.189 | 3 | 0.20 |
| Snails: | 5.33 | 0.168 | 1 | 0.07 |
| Bivalves: | 1.00 | 0.032 | 1 | 0.07 |
| Isopods: | 1.00 | 0.032 | 1 | 0.07 |
| Amphipods: | 1.00 | 0.032 | 1 | 0.07 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.00 | 0.000 | 0 | 0.00 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 0.00 | 0.000 | 0 | 0.00 |
| Diptera: | 16.33 | 0.516 | 7 | 0.47 |
| Hemiptera: | 0.00 | 0.000 | 0 | 0.00 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 14.33 | 0.453 | 5 | 0.33 |
| Tanypodinae Tribe: | 1.00 | 0.032 | 1 | 0.07 |
| Chironomiinae Tribe: | 13.33 | 0.421 | 4 | 0.27 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 7.33 | 0.232 | 2 | 0.13 |
| Collector-Gatherers: | 7.00 | 0.221 | 4 | 0.27 |
| Predators: | 3.00 | 0.095 | 3 | 0.20 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 1.00 | 0.032 | 1 | 0.07 |
| Scrapers: | 5.33 | 0.168 | 1 | 0.07 |
| Maine Tolerance: | | | | |
| Sensitive: | 1.00 | 0.039 | 1 | 0.08 |
| Intermediate: | 20.67 | 0.805 | 8 | 0.67 |
| Eurytopic: | 4.00 | 0.156 | 3 | 0.25 |
| Ratio of MTI Sensitive to Eurytopic | 0.25 | 0.250 | 0.33 | 0.33 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-272** Waterbody: SOUTH END MARSH (NH) Town: Not Designated

**Log Number: DN-2015-272-WET-CON-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Lumbriculidae | 08020101 | 2.00 | 2.00 | -- | -- | -- | -- | Worm |
| Naididae | 08020202 | 3.00 | 3.00 | -- | -- | -- | -- | Worm |
| *Stylaria* | 08020202014 | 1.00 | 1.00 | -- | CG | 18-S | -- | Worm |
| *Helobdella* | 08030101005 | 0.00 | 1.00 | -- | -- | 43-E | -- | Leech |
| *Helobdella modesta* | 08030101005004 | 1.00 | 0.00 | -- | -- | -- | -- | Leech |
| *Caecidotea* | 09010101001 | 0.00 | 1.00 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 1.00 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 1.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 1.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Chaoborus* | 09021007025 | 1.00 | 1.00 | 8 | PR | 25-I | -- | Fly: Phantom Midge |
| *Bezzia/palpomyia* | 09021010043 | 1.00 | 1.00 | 6 | PR | 26.9-I | -- | Fly: Biting Midge |
| *Ablabesmyia* | 09021011001 | 1.00 | 1.00 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 2.00 | 2.00 | 6 | -- | 43-E | Y | Fly: Midge |
| *Tanytarsus* | 09021011076 | 6.33 | 6.33 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 2.00 | 2.00 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 3.00 | 3.00 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Gyraulus* | 10010203029 | 5.33 | 5.33 | -- | SC | 37.2-I | -- | Snail |
| Sphaeriidae | 10020201 | 1.00 | 1.00 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-273** Trip ID: 2015-273-WET-DEE-1B River Basin: Saco
Waterbody: PAWTUCKAWAY MARSH (NH) HUC8 Name: Piscataqua-Salmon Falls
Town: Not Designated Latitude: 43 6 35.47 N
Mitigation Monitoring Site: No Longitude: 71 11 49.21 W

### Sample Information

**Sample ID: DN-2015-273-WET-DEE-1B** Type of Sample: DIPNET Date Sampled: 8/13/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: C** Date: 5/15/2017
Model Result with P≥0.6: C **Reason for Determination: Model**
Date Last Calculated: 5/12/2017 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.01 | Class C: | 0.68 |
| Class B: | 0.32 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.32 |
| Class C or Non-Attainment | 0.68 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.01 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 141 | < 787 |
| Ephemeroptera Abundance | 0.67 | most > 35 |
| Odonata Relative Abundance | 0.002 | most > 0.04 |
| Trichoptera Relative Abundance | 0.007 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.00 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.33 | < 0.4 |
| MTI Sensitive Taxa Abundance | 3.05 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.02 | most > 0.05 |
| MTI Sensitive Taxa Richness | 4 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.96 | > 0.5 |
| MTI Intermediate Taxa Richness | 14 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 1.28 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 24 |
| Hilsenhoff Biotic Index: | 8.09 |
| Shannon-Weiner Diversity: | 2.20 |
| Maine Tolerance Index: | 25.68 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 62.80 |
| 2 | *Procladius* | 13.03 |
| 3 | *Naididae* | 4.98 |
| 4 | *Sphaeriidae* | 4.03 |
| 5 | *Helisoma* | 2.61 |

## Sample Collection and Processing Information

Sampling Organization: JP, SC, AH
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/13/2015 1:55:00 PM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 1.03 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 11.1 | % | |
| Surface Water | In-situ | pH | 5.61 | | |
| Surface Water | In-situ | Specific Conductance | 32.7 | us/cm | |
| Surface Water | In-situ | Temperature | 19.5 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 3 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 1 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 0 | Class 1: | EMERGENT | Flow Path: |
| Chemical Pollutants: | 0 | Subclass 1: | PERSISTENT | Land Form: |
| Watershed Characterization and Non-point Sources: | 2 | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: THIS CATTAIL MARSH WAS SURVEYED AS IT HAD BEEN IDENTIFIED AS A REFERENCE WETLAND BASED ON AVAILABLE INFORMATION.

Habitat Classification:
EMERGENT PERSISTENT VEGETATION
OPEN WATER STANDING
SCRUB SHRUB

Substrate Classification:
ORGANIC SOIL SUBSTRATE
SILT/MUCK SUBSTRATE

Average Depth: 53 cm Visible Flow: No Rain In Previous 24 Hours: No

Sample Comments: NOSTOC SP. BALLS SUSPENDED IN THE WATER COLUMN

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Typha* | | LW-34011301002 | | | |
| *Lemna* | | LW-34010201002 | | | |
| *Sparganium* | | LW-34011301001 | | | |
| *Carex stricta* | Upright sedge | LW-34010501002139 | 4 | OBL | GRAMINOID |
| *Myricaceae* | | LW-34022801 | | | |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Carex comosa* | Longhair sedge | LW-34010501002039 | 6 | OBL | GRAMINOID |
| *Bidens* | | LW-34020501012 | | | |
| *Vaccinium* | | LW-34021302023 | | | |
| *Triadenum* | | LW-34022601002 | | | |
| *Haloragaceae* | | LW-34022001 | | | |
| *Spiraea* | | LW-34024202026 | | | |

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

### Additional Summary Variables

**Station Number: W-273** Waterbody: PAWTUCKAWAY MARSH (NH) Town: Not Designated

**Log Number: DN-2015-273-WET-DEE-1B** Subsample Factor: X1 Replicates: 3 Calculated: 5/12/2017

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 2.00 | 0.014 | 3 | 0.13 |
| EPT Taxa: | 1.67 | 0.012 | 2 | 0.08 |
| Insects: | 32.67 | 0.232 | 16 | 0.67 |
| Non-Insects: | 108.00 | 0.768 | 8 | 0.33 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 7.00 | 0.050 | 1 | 0.04 |
| Snails: | 4.00 | 0.028 | 2 | 0.08 |
| Bivalves: | 7.00 | 0.050 | 2 | 0.08 |
| Isopods: | 0.67 | 0.005 | 1 | 0.04 |
| Amphipods: | 88.33 | 0.628 | 1 | 0.04 |
| Mites: | 1.00 | 0.007 | 1 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.67 | 0.005 | 1 | 0.04 |
| Odonates: | 0.33 | 0.002 | 1 | 0.04 |
| Caddisflies: | 1.00 | 0.007 | 1 | 0.04 |
| Diptera: | 30.00 | 0.213 | 12 | 0.50 |
| Hemiptera: | 0.67 | 0.005 | 1 | 0.04 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 25.33 | 0.180 | 10 | 0.42 |
| Tanypodinae Tribe: | 21.91 | 0.156 | 4 | 0.17 |
| Chironomiinae Tribe: | 3.42 | 0.024 | 6 | 0.25 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 7.34 | 0.052 | 3 | 0.13 |
| Collector-Gatherers: | 90.37 | 0.642 | 5 | 0.21 |
| Predators: | 24.58 | 0.175 | 7 | 0.29 |
| Piercers: | 1.00 | 0.007 | 1 | 0.04 |
| Shredders: | 0.67 | 0.005 | 1 | 0.04 |
| Scrapers: | 4.34 | 0.031 | 3 | 0.13 |
| Maine Tolerance: | | | | |
| Sensitive: | 3.05 | 0.024 | 4 | 0.19 |
| Intermediate: | 119.57 | 0.957 | 14 | 0.67 |
| Eurytopic: | 2.38 | 0.019 | 3 | 0.14 |
| Ratio of MTI Sensitive to Eurytopic | 1.28 | 1.284 | 1.33 | 1.33 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-273** Waterbody: PAWTUCKAWAY MARSH (NH) Town: Not Designated

**Log Number: DN-2015-273-WET-DEE-1B** Subsample Factor: X1 Replicates: 3 Calculated: 5/12/2017

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Naididae | 08020202 | 7.00 | 7.00 | -- | -- | -- | -- | Worm |
| *Caecidotea* | 09010101001 | 0.67 | 0.67 | 8 | SH | 51.9-E | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 88.33 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 88.33 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Lestes* | 09020308045 | 0.33 | 0.33 | 9 | PR | 32.6-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 0.67 | 0.67 | 7 | CG | 22.1-I | -- | Mayfly |
| *Pelocoris* | 09020504013 | 0.67 | 0.67 | -- | PR | 24.7-I | -- | True Bug |
| *Oxyethira* | 09020607028 | 1.00 | 1.00 | 3 | P | 22-S | -- | Caddisfly |
| Ceratopogonidae | 09021010 | 3.00 | 3.00 | -- | -- | -- | -- | Fly: Biting Midge |
| *Culicoides* | 09021010037 | 1.67 | 1.67 | 10 | PR | 42.1-I | -- | Fly: Biting Midge |
| Chironomidae | 09021011 | 0.67 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 1.33 | 1.37 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Guttipelopia* | 09021011006 | 0.67 | 0.68 | 5 | PR | 19.4-S | T | Fly: Midge |
| *Labrundinia* | 09021011008 | 1.00 | 1.03 | 7 | PR | 18.1-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 18.33 | 18.83 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Cladotanytarsus* | 09021011068 | 0.33 | 0.34 | 7 | CG | 22.2-I | Y | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 1.33 | 1.37 | 6 | -- | 43-E | Y | Fly: Midge |
| *Tanytarsus* | 09021011076 | 0.33 | 0.34 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 0.67 | 0.68 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Lauterborniella* | 09021011092 | 0.00 | 0.34 | -- | CG | 17.4-S | C | Fly: Midge |
| *Lauterborniella agrayloides* | 09021011092001 | 0.33 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Phaenopsectra* | 09021011101 | 0.33 | 0.34 | 7 | SC | 44.2-E | C | Fly: Midge |
| *Arrenurus* | 09030111001 | 1.00 | 1.00 | -- | -- | 23.8-I | -- | Mite |
| *Physa* | 10010202027 | 0.00 | 0.33 | -- | SC | 34-I | -- | Snail |
| *Physa acuta* | 10010202027053 | 0.33 | 0.00 | -- | -- | -- | -- | Snail |
| *Helisoma* | 10010203030 | 3.67 | 3.67 | -- | SC | 42.8-I | -- | Snail |
| Sphaeriidae | 10020201 | 5.67 | 5.67 | -- | CF | -- | -- | Clam |
| *Musculium* | 10020201001 | 1.33 | 1.33 | -- | CF | 24.8-I | -- | Clam |

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

### Station Information

| | | | |
|---|---|---|---|
| **Station Number: W-265** | Trip ID: 2014-265-WET-ENF-1 | River Basin: | Connecticut |
| Waterbody: | GEORGE POND (NH) | HUC8 Name: | |
| Town: | Not Designated | Latitude: | 43 34 22.61 N |
| Mitigation Monitoring Site: No | | Longitude: | 72 5 49.64 W |

### Sample Information

| | | |
|---|---|---|
| **Sample ID: DN-2014-265-WET-ENF-1** | Type of Sample: DIPNET | Date Sampled: 8/5/2014 |
| Subsample Factor: X1 | Replicates: 3 | |

### Classification Attainment

| | | | | |
|---|---|---|---|---|
| **Statutory Class:** | **A** | **Final Determination:** | **A** | Date: 2/9/2016 |
| Model Result with P≥0.6: | A | **Reason for Determination:** | **Model** | |
| Date Last Calculated: | 11/9/2015 | Comments: | | |

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.99 | Class C: | 0.00 |
| Class B: | 0.01 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 1.00 |
| Class C or Non-Attainment | 0.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.99 |
| Class B or C or Non-Attainment | 0.01 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 169 | < 787 |
| Ephemeroptera Abundance | 8.67 | most > 35 |
| Odonata Relative Abundance | 0.020 | most > 0.04 |
| Trichoptera Relative Abundance | 0.024 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.02 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.29 | < 0.4 |
| MTI Sensitive Taxa Abundance | 17.13 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.12 | most > 0.05 |
| MTI Sensitive Taxa Richness | 9 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.88 | > 0.5 |
| MTI Intermediate Taxa Richness | 18 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 25.20 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 35 |
| Hilsenhoff Biotic Index: | 7.81 |
| Shannon-Weiner Diversity: | 2.96 |
| Maine Tolerance Index: | 24.11 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 53.15 |
| 2 | *Hydrobiidae* | 10.43 |
| 3 | *Caenis* | 4.92 |
| 4 | *Procladius* | 3.74 |
| 5 | *Lauterborniella agrayloides* | 2.76 |

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

## Sample Collection and Processing Information

Sampling Organization: NHDES
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/5/2014 12:46:00 PM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 7.18 | mg/l | |
| Surface Water | In-situ | pH | 6.6 | | |
| Surface Water | In-situ | Specific Conductance | 61.3 | us/cm | |
| Surface Water | In-situ | Temperature | 25.5 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 12 | System: | LACUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 3 | Subsystem: | LITTORAL | Lotic Gradient: |
| Vegetative Modifications: | 1 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 0 | | | |
| Watershed Characterization and Non-point Sources: | 8 | Subclass 1: | FLOATING VASCULAR | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | NEEDLE-LEAVED DECIDUOUS | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: PLANT LIST IS NOT COMPREHENSIVE. THE WETLAND THAT SURROUNDS THE OPEN WATER IS A FEN.

Habitat Classification:
AQUATIC MACROPHYTE BED

Substrate Classification:
DETRITUS SUBSTRATE
ORGANIC SOIL SUBSTRATE
PEAT SUBSTRATE

Average Depth: 72 cm  Visible Flow: Yes  Rain In Previous 24 Hours: Yes

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Utricularia purpurea* | Eastern purple bladderwort | LW-34022305002007 | 5 | OBL | FORB/HERB |
| *Eriocaulon aquaticum* | Sevenangle pipewort | LW-34010601001001 | 7 | OBL | FORB/HERB |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |

## Additional Summary Variables

**Station Number: W-265** Waterbody: GEORGE POND (NH) Town: Not Designated

**Log Number: DN-2014-265-WET-ENF-1** Subsample Factor: X1 Replicates: 3 Calculated: 11/9/2015

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 16.00 | 0.094 | 9 | 0.26 |
| EPT Taxa: | 12.67 | 0.075 | 5 | 0.14 |
| Insects: | 50.67 | 0.299 | 25 | 0.71 |
| Non-Insects: | 118.67 | 0.701 | 10 | 0.29 |
| Leeches: | 0.33 | 0.002 | 1 | 0.03 |
| Oligochaetes: | 4.67 | 0.028 | 3 | 0.09 |
| Snails: | 19.33 | 0.114 | 2 | 0.06 |
| Bivalves: | 3.67 | 0.022 | 2 | 0.06 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 90.00 | 0.531 | 1 | 0.03 |
| Mites: | 0.67 | 0.004 | 1 | 0.03 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 8.67 | 0.051 | 2 | 0.06 |
| Odonates: | 3.33 | 0.020 | 4 | 0.11 |
| Caddisflies: | 4.00 | 0.024 | 3 | 0.09 |
| Diptera: | 34.67 | 0.205 | 16 | 0.46 |
| Hemiptera: | 0.00 | 0.000 | 0 | 0.00 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 34.67 | 0.205 | 16 | 0.46 |
| Tanypodinae Tribe: | 11.22 | 0.066 | 3 | 0.09 |
| Chironomiinae Tribe: | 20.39 | 0.120 | 11 | 0.31 |
| Orthoclodiinae Tribe: | 3.06 | 0.018 | 2 | 0.06 |
| Collector-Filterers: | 8.42 | 0.050 | 4 | 0.11 |
| Collector-Gatherers: | 116.90 | 0.690 | 11 | 0.31 |
| Predators: | 18.22 | 0.108 | 9 | 0.26 |
| Piercers: | 0.33 | 0.002 | 1 | 0.03 |
| Shredders: | 2.72 | 0.016 | 1 | 0.03 |
| Scrapers: | 1.67 | 0.010 | 1 | 0.03 |
| Maine Tolerance: | | | | |
| Sensitive: | 17.13 | 0.117 | 9 | 0.32 |
| Intermediate: | 128.47 | 0.878 | 18 | 0.64 |
| Eurytopic: | 0.68 | 0.005 | 1 | 0.04 |
| Ratio of MTI Sensitive to Eurytopic | 25.20 | 25.197 | 9.00 | 9.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-265** Waterbody: GEORGE POND (NH) Town: Not Designated

**Log Number: DN-2014-265-WET-ENF-1** Subsample Factor: X1 Replicates: 3 Calculated: 11/9/2015

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Enchytraeidae | 08020201 | 0.33 | 0.33 | -- | -- | -- | -- | Worm |
| Naididae | 08020202 | 2.33 | 0.00 | -- | -- | -- | -- | Worm |
| *Ripistes* | 08020202011 | 0.00 | 0.72 | -- | -- | -- | -- | Worm |
| *Ripistes parasita* | 08020202011001 | 0.33 | 0.00 | -- | -- | -- | -- | Worm |
| *Stylaria* | 08020202014 | 1.67 | 3.61 | -- | CG | 18-S | -- | Worm |
| *Erpobdella* | 08030203002 | 0.00 | 0.33 | -- | -- | 36.4-I | -- | Leech |
| *Erpobdella punctata* | 08030203002001 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Hyalella* | 09010203006 | 0.00 | 90.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 90.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Aeshna* | 09020301001 | 0.33 | 0.33 | 5 | PR | 27.9-I | -- | Dragonfly/damselfly |
| Libellulidae | 09020306 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Sympetrum* | 09020306041 | 0.33 | 0.33 | 10 | PR | 37-I | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 2.33 | 2.33 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| Leptophlebiidae | 09020406 | 0.33 | 0.33 | -- | -- | -- | -- | Mayfly |
| *Caenis* | 09020412040 | 8.33 | 8.33 | 7 | CG | 22.1-I | -- | Mayfly |
| *Polycentropus* | 09020603010 | 2.33 | 2.33 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Oxyethira* | 09020607028 | 0.33 | 0.33 | 3 | P | 22-S | -- | Caddisfly |
| *Oecetis* | 09020618078 | 1.33 | 1.33 | 8 | PR | 16.3-S | -- | Caddisfly |
| Chironomidae | 09021011 | 0.67 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 3.67 | 3.74 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Labrundinia* | 09021011008 | 1.00 | 1.02 | 7 | PR | 18.1-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 6.33 | 6.46 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Corynoneura* | 09021011036 | 2.00 | 2.04 | 7 | CG | 40.1-I | -- | Fly: Midge |
| *Psectrocladius* | 09021011056 | 1.00 | 1.02 | 8 | CG | 22-S | -- | Fly: Midge |
| *Tanytarsus* | 09021011076 | 4.33 | 4.42 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Pseudochironomus* | 09021011078 | 0.67 | 0.68 | 5 | CG | 47.7-E | S | Fly: Midge |
| *Chironomus* | 09021011080 | 2.67 | 2.72 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Cladopelma* | 09021011081 | 0.67 | 0.68 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 1.00 | 1.02 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Lauterborniella* | 09021011092 | 0.00 | 4.76 | -- | CG | 17.4-S | C | Fly: Midge |
| *Lauterborniella agrayloides* | 09021011092001 | 4.67 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 0.33 | 0.34 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Pagastiella* | 09021011096 | 0.67 | 0.68 | -- | -- | 11.8-S | C | Fly: Midge |
| *Parachironomus* | 09021011097 | 0.00 | 0.34 | 10 | PR | 28.6-I | C | Fly: Midge |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-265** Waterbody: GEORGE POND (NH) Town: Not Designated

**Log Number: DN-2014-265-WET-ENF-1** Subsample Factor: X1 Replicates: 3 Calculated: 11/9/2015

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Parachironomus chaetoalus complex* | 09021011097176 | 0.33 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 2.67 | 2.72 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Tribelos* | 09021011107 | 0.00 | 2.04 | 5 | CG | 9.3-S | C | Fly: Midge |
| *Tribelos jucundus* | 09021011107198 | 2.00 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Arrenurus* | 09030111001 | 0.67 | 0.67 | -- | -- | 23.8-I | -- | Mite |
| Hydrobiidae | 10010104 | 17.67 | 17.67 | -- | -- | -- | -- | Snail |
| *Gyraulus* | 10010203029 | 0.00 | 1.67 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 1.67 | 0.00 | -- | -- | -- | -- | Snail |
| Sphaeriidae | 10020201 | 3.33 | 3.33 | -- | CF | -- | -- | Clam |
| *Pisidium* | 10020201002 | 0.33 | 0.33 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-274** Trip ID: 2015-274-WET-FRN-1 River Basin: Connecticut
Waterbody: ECHO LAKE WETLAND (NH) HUC8 Name: Waits
Town: Not Designated Latitude: 44 10 20.97 N
Mitigation Monitoring Site: No Longitude: 71 41 20.66 W

### Sample Information

**Sample ID: DN-2015-274-WET-FRN-1** Type of Sample: DIPNET Date Sampled: 7/16/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments: Minimum provisions for Total Mean Abundance and Generic Richness not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.94 |
| Class B: | 0.06 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.06 |
| Class C or Non-Attainment | 0.94 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 22 | < 787 |
| Ephemeroptera Abundance | 0.00 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.000 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.02 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.33 | < 0.4 |
| MTI Sensitive Taxa Abundance | 1.39 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.07 | most > 0.05 |
| MTI Sensitive Taxa Richness | 1 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.91 | > 0.5 |
| MTI Intermediate Taxa Richness | 5 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 4.17 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 9 |
| Hilsenhoff Biotic Index: | 7.67 |
| Shannon-Weiner Diversity: | 2.23 |
| Maine Tolerance Index: | 25.11 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 50.00 |
| 2 | *Tanytarsus* | 16.67 |
| 3 | *Procladius* | 10.61 |
| 4 | *Naididae* | 9.09 |
| 5 | *Psectrocladius* | 6.06 |

## Sample Collection and Processing Information

Sampling Organization: JP, SC, SM
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/16/2015 11:36:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 11.2 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 122.7 | % | |
| Surface Water | In-situ | pH | 6.16 | | |
| Surface Water | In-situ | Specific Conductance | 145.4 | us/cm | |
| Surface Water | In-situ | Temperature | 20.4 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 23 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 9 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 5 | Class 1: | SCRUB SHRUB | Flow Path: |
| Chemical Pollutants: | 0 | Subclass 1: | PERSISTENT | Land Form: |
| Watershed Characterization and Non-point Sources: | 9 | Class 2: | | Land Form Type: |
| | | Subclass 2: | | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
SCRUB SHRUB

Substrate Classification:
ORGANIC SOIL SUBSTRATE
PEAT SUBSTRATE
SAND SUBSTRATE

Average Depth: 23 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Alnus* | | LW-34021701001 | | | |
| *Utricularia* | | LW-34022305002 | | | |
| *Carex* | | LW-34010501002 | | | |
| *Panicum* | | LW-34010502051 | | | |
| *Triadenum* | | LW-34022601002 | | | |
| *Juncus* | | LW-34010801001 | | | |
| *Betula populifolia* | Gray birch | LW-34021701002012 | 2 | FAC | TREE |
| *Myrica gale* | Sweetgale | LW-34022801003001 | 5 | OBL | SHRUB |
| *Solidago* | | LW-34020501071 | | | |
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |
| *Spiraea* | | LW-34024202026 | | | |
| *Salix* | | LW-34024401002 | | | |
| *Poaceae* | | LW-34010502 | | | |

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

### Additional Summary Variables

**Station Number: W-274** Waterbody: ECHO LAKE WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-274-WET-FRN-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 0.00 | 0.000 | 0 | 0.00 |
| EPT Taxa: | 0.00 | 0.000 | 0 | 0.00 |
| Insects: | 8.67 | 0.394 | 6 | 0.67 |
| Non-Insects: | 13.33 | 0.606 | 3 | 0.33 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 2.00 | 0.091 | 1 | 0.11 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 0.33 | 0.015 | 1 | 0.11 |
| Amphipods: | 11.00 | 0.500 | 1 | 0.11 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.00 | 0.000 | 0 | 0.00 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 0.00 | 0.000 | 0 | 0.00 |
| Diptera: | 8.33 | 0.379 | 5 | 0.56 |
| Hemiptera: | 0.00 | 0.000 | 0 | 0.00 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 8.33 | 0.379 | 5 | 0.56 |
| Tanypodinae Tribe: | 2.43 | 0.110 | 1 | 0.11 |
| Chironomiinae Tribe: | 4.51 | 0.205 | 3 | 0.33 |
| Orthoclodiinae Tribe: | 1.39 | 0.063 | 1 | 0.11 |
| Collector-Filterers: | 4.17 | 0.189 | 2 | 0.22 |
| Collector-Gatherers: | 12.74 | 0.579 | 3 | 0.33 |
| Predators: | 2.76 | 0.126 | 2 | 0.22 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 0.33 | 0.015 | 1 | 0.11 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 1.39 | 0.071 | 1 | 0.14 |
| Intermediate: | 17.94 | 0.912 | 5 | 0.71 |
| Eurytopic: | 0.33 | 0.017 | 1 | 0.14 |
| Ratio of MTI Sensitive to Eurytopic | 4.17 | 4.167 | 1.00 | 1.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-274** Waterbody: ECHO LAKE WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-274-WET-FRN-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Naididae | 08020202 | 2.00 | 2.00 | -- | -- | -- | -- | Worm |
| *Caecidotea* | 09010101001 | 0.00 | 0.33 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 0.33 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 11.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 11.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Sialis* | 09020702004 | 0.33 | 0.33 | 4 | PR | -- | -- | Alderfly |
| Chironomidae | 09021011 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Procladius* | 09021011015 | 2.33 | 2.43 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Psectrocladius* | 09021011056 | 1.33 | 1.39 | 8 | CG | 22-S | -- | Fly: Midge |
| *Tanytarsus* | 09021011076 | 3.67 | 3.82 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 0.33 | 0.35 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 0.33 | 0.35 | 6 | CF | 22.3-I | C | Fly: Midge |

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

### Station Information

**Station Number: W-266** Trip ID: 2014-266-WET-GRG-1 River Basin: Androscoggin
Waterbody: TRIBUTARY TO PEABODY RIVER (NH) HUC8 Name: Lower Androscoggin
Town: Not Designated Latitude: 44 17 37.95 N
Mitigation Monitoring Site: No Longitude: 71 13 41.65 W

### Sample Information

**Sample ID: DN-2014-266-WET-GRG-1** Type of Sample: DIPNET Date Sampled: 8/12/2014
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: A** Date: 2/9/2016
Model Result with P≥0.6: A **Reason for Determination: Model**
Date Last Calculated: 11/20/2015 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.97 | Class C: | 0.00 |
| Class B: | 0.03 | NA: | 0.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 1.00 |
| Class C or Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.97 |
| Class B or C or Non-Attainment | 0.03 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 52 | < 787 |
| Ephemeroptera Abundance | 20.67 | most > 35 |
| Odonata Relative Abundance | 0.038 | most > 0.04 |
| Trichoptera Relative Abundance | 0.032 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.01 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.08 | < 0.4 |
| MTI Sensitive Taxa Abundance | 3.67 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.14 | most > 0.05 |
| MTI Sensitive Taxa Richness | 3 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.85 | > 0.5 |
| MTI Intermediate Taxa Richness | 12 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 11.00 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 25 |
| Hilsenhoff Biotic Index: | 7.09 |
| Shannon-Weiner Diversity: | 3.60 |
| Maine Tolerance Index: | 23.06 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Leptophlebiidae* | 28.03 |
| 2 | *Pisidium* | 12.74 |
| 3 | *Caenis* | 11.46 |
| 4 | *Tanytarsus* | 7.64 |
| 5 | *Hyalella azteca* | 7.01 |

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

## Sample Collection and Processing Information

Sampling Organization: NHDES
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/12/2014 11:00:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 7.61 | mg/l | |
| Surface Water | In-situ | pH | 5.84 | | |
| Surface Water | In-situ | Specific Conductance | 40.8 | us/cm | |
| Surface Water | In-situ | Temperature | 21.9 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting | |
|---|---|---|---|---|
| Total Score: | System: | PALUSTRINE | Landscape Position: | |
| Hydrologic Modifications: | Subsystem: | | Lotic Gradient: | |
| Vegetative Modifications: | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: | THROUGHFLOW |
| Chemical Pollutants: | | | | |
| Watershed Characterization and Non-point Sources: | Subclass 1: | NON-PERSISTENT | Land Form: | |
| | Class 2: | EMERGENT | Land Form Type: | |
| | Subclass 2: | NON-PERSISTENT | Waterbody Type: | |
| | Class 3: | SCRUB SHRUB | Waterbody Subtype: | |
| | Subclass 3: | | | |
| | | | Comments: | |

Dominant Plant Species:

Additional Plant Community Observations: PLANT LIST IS NOT COMPREHENSIVE.

| Habitat Classification: | Substrate Classification: |
|---|---|
| EMERGENT NON-PERSISTENT VEGETATION | BEDROCK SUBSTRATE |
| OPEN WATER FLOWING | SAND SUBSTRATE |
| SCRUB SHRUB | SILT/MUCK SUBSTRATE |

Average Depth: 32 cm Visible Flow: Yes Rain In Previous 24 Hours: Yes

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Solidago* | | LW-34020501071 | | | |
| *Rubus hispidus* | Bristly dewberry | LW-34024202021010 | 2 | FACW | SUBSHRUB |
| *Eleocharis* | | LW-34010501006 | | | |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |
| *Carex* | | LW-34010501002 | | | |
| *Triadenum virginicum* | Virginia marsh St. Johnswort | LW-34022601002002 | 6 | OBL | FORB/HERB |
| *Ilex mucronata* | Catberry | LW-34020201001003 | 5 | OBL | SHRUB, TREE |
| *Alnus incana ssp. rugosa* | Speckled alder | LW-34021701001002 | 2 | FACW | TREE, SHRUB |
| *Spiraea tomentosa* | Steeplebush | LW-34024202026005 | 3 | FACW | SHRUB |

## Additional Summary Variables

**Station Number: W-266** Waterbody: TRIBUTARY TO PEABODY RIVER (NH) Town: Not Designated

**Log Number: DN-2014-266-WET-GRG-1** Subsample Factor: X1 Replicates: 3 Calculated: 11/20/2015

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 24.33 | 0.465 | 9 | 0.36 |
| EPT Taxa: | 22.33 | 0.427 | 6 | 0.24 |
| Insects: | 42.00 | 0.803 | 23 | 0.92 |
| Non-Insects: | 10.33 | 0.197 | 2 | 0.08 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 6.67 | 0.127 | 1 | 0.04 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 3.67 | 0.070 | 1 | 0.04 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 20.67 | 0.395 | 2 | 0.08 |
| Odonates: | 2.00 | 0.038 | 3 | 0.12 |
| Caddisflies: | 1.67 | 0.032 | 4 | 0.16 |
| Diptera: | 15.00 | 0.287 | 11 | 0.44 |
| Hemiptera: | 2.00 | 0.038 | 1 | 0.04 |
| Beetles: | 0.33 | 0.006 | 1 | 0.04 |
| Chironomids: | 15.00 | 0.287 | 11 | 0.44 |
| Tanypodinae Tribe: | 6.00 | 0.115 | 4 | 0.16 |
| Chironomiinae Tribe: | 9.00 | 0.172 | 7 | 0.28 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 11.33 | 0.217 | 3 | 0.12 |
| Collector-Gatherers: | 13.33 | 0.255 | 5 | 0.20 |
| Predators: | 8.67 | 0.166 | 10 | 0.40 |
| Piercers: | 0.33 | 0.006 | 1 | 0.04 |
| Shredders: | 0.33 | 0.006 | 1 | 0.04 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 3.67 | 0.139 | 3 | 0.19 |
| Intermediate: | 22.33 | 0.848 | 12 | 0.75 |
| Eurytopic: | 0.33 | 0.013 | 1 | 0.06 |
| Ratio of MTI Sensitive to Eurytopic | 11.00 | 11.000 | 3.00 | 3.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-266** Waterbody: TRIBUTARY TO PEABODY RIVER (NH) Town: Not Designated

**Log Number: DN-2014-266-WET-GRG-1** Subsample Factor: X1 Replicates: 3 Calculated: 11/20/2015

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Hyalella* | 09010203006 | 0.00 | 3.67 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 3.67 | 0.00 | -- | -- | -- | -- | Amphipod |
| Odonata | 090203 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Stylurus* | 09020302018 | 0.33 | 0.33 | 4 | PR | -- | -- | Dragonfly/damselfly |
| Corduliidae | 09020305 | 0.67 | 0.67 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Sympetrum* | 09020306041 | 0.67 | 0.67 | 10 | PR | 37-I | -- | Dragonfly/damselfly |
| Leptophlebiidae | 09020406 | 14.67 | 14.67 | -- | -- | -- | -- | Mayfly |
| *Caenis* | 09020412040 | 6.00 | 6.00 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 2.00 | 2.00 | -- | -- | -- | -- | True Bug |
| *Polycentropus* | 09020603010 | 0.33 | 0.33 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Hydroptila* | 09020607026 | 0.33 | 0.33 | 6 | P | -- | -- | Caddisfly |
| Phryganeidae | 09020608 | 0.33 | 0.33 | -- | -- | -- | -- | Caddisfly |
| *Oecetis* | 09020618078 | 0.67 | 0.67 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Sialis* | 09020702004 | 0.33 | 0.33 | 4 | PR | -- | -- | Fishfly |
| *Ablabesmyia* | 09021011001 | 2.67 | 2.67 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Clinotanypus* | 09021011002 | 0.00 | 0.33 | 8 | PR | 30.3-I | T | Fly: Midge |
| *Clinotanypus pinguis* | 09021011002008 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Procladius* | 09021011015 | 2.67 | 2.67 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Thienemannimyia* | 09021011020 | 0.00 | 0.33 | 3 | PR | -- | T | Fly: Midge |
| *Thienemannimyia group* | 09021011020041 | 0.33 | 0.00 | -- | -- | -- | T | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 0.33 | 0.33 | 6 | -- | 43-E | Y | Fly: Midge |
| *Tanytarsus* | 09021011076 | 4.00 | 4.00 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 0.33 | 0.33 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Cladopelma* | 09021011081 | 0.67 | 0.67 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 0.67 | 0.67 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.33 | 0.33 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Tribelos* | 09021011107 | 0.00 | 2.67 | 5 | CG | 9.3-S | C | Fly: Midge |
| *Tribelos jucundus* | 09021011107198 | 2.67 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Agabus* | 09021103016 | 0.33 | 0.33 | -- | PR | 34.5-I | -- | Beetle |
| *Pisidium* | 10020201002 | 6.67 | 6.67 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-275** Trip ID: 2015-275-WET-HKS-1 River Basin: Merrimack
Waterbody: CLAY POND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 43 4 36.8 N
Mitigation Monitoring Site: No Longitude: 71 23 7.05 W

### Sample Information

**Sample ID: DN-2015-275-WET-HKS-1** Type of Sample: DIPNET Date Sampled: 7/13/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments: Minimum Provisions for Total Mean Abundance and Generic Richness not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.20 | Class C: | 0.29 |
| Class B: | 0.51 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.71 |
| Class C or Non-Attainment | 0.29 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.20 |
| Class B or C or Non-Attainment | 0.80 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 33 | < 787 |
| Ephemeroptera Abundance | 2.00 | most > 35 |
| Odonata Relative Abundance | 0.070 | most > 0.04 |
| Trichoptera Relative Abundance | 0.030 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.00 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.25 | < 0.4 |
| MTI Sensitive Taxa Abundance | 2.00 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.06 | most > 0.05 |
| MTI Sensitive Taxa Richness | 3 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.94 | > 0.5 |
| MTI Intermediate Taxa Richness | 8 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 2.00 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 12 |
| Hilsenhoff Biotic Index: | 7.70 |
| Shannon-Weiner Diversity: | 1.85 |
| Maine Tolerance Index: | 24.21 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 69.00 |
| 2 | *Libellulidae* | 7.00 |
| 3 | *Caenis* | 6.00 |
| 4 | *Ablabesmyia* | 5.00 |
| 5 | *Oxyethira* | 3.00 |

## Sample Collection and Processing Information

Sampling Organization: SDM, SJC, JP
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/13/2015 11:45:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 4.3 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 53.2 | % | |
| Surface Water | In-situ | pH | 4.82 | | |
| Surface Water | In-situ | Specific Conductance | 35.5 | us/cm | |
| Surface Water | In-situ | Temperature | 27.8 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 6 | System: | LACUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 0 | Subsystem: | LIMNETIC | Lotic Gradient: |
| Vegetative Modifications: | 1 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 1 | | | |
| Watershed Characterization and Non-point Sources: | 4 | Subclass 1: | | Land Form: |
| | | Class 2: | SCRUB SHRUB | Land Form Type: |
| | | Subclass 2: | | Waterbody Type: |
| | | Class 3: | AQUATIC BED | Waterbody Subtype: |
| | | Subclass 3: | FLOATING VASCULAR | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
SCRUB SHRUB

Substrate Classification:
PEAT SUBSTRATE

Average Depth: 33 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments: POND SAMPLED IS PART OF A MUCH LARGER DrAiNage MARSH/SHRUB SWAMP.
POND SAMPLED IS PART OF A MUCH LARGER DIANGAE MARSH/SHRUB SWAMP.

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Decodon verticillatus* | Swamp loosestrife | LW-34022901001001 | 6 | OBL | SUBSHRUB, SHRUB |
| *Poaceae* | | LW-34010502 | | | |
| *Vaccinium* | | LW-34021302023 | | | |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Myrica gale* | Sweetgale | LW-34022801003001 | 5 | OBL | SHRUB |
| *Carex lasiocarpa* | Woollyfruit sedge | LW-34010501002078 | 6 | OBL | GRAMINOID |
| *Pinus strobus* | Eastern white pine | LW-31010102004005 | 2 | FACU | TREE |
| *Utricularia* | | LW-34022305002 | | | |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |

## Additional Summary Variables

**Station Number: W-275** Waterbody: CLAY POND (NH) Town: Not Designated

**Log Number: DN-2015-275-WET-HKS-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 5.33 | 0.160 | 3 | 0.25 |
| EPT Taxa: | 3.00 | 0.090 | 2 | 0.17 |
| Insects: | 9.00 | 0.270 | 9 | 0.75 |
| Non-Insects: | 24.33 | 0.730 | 3 | 0.25 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 0.67 | 0.020 | 1 | 0.08 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 23.00 | 0.690 | 1 | 0.08 |
| Mites: | 0.67 | 0.020 | 1 | 0.08 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 2.00 | 0.060 | 1 | 0.08 |
| Odonates: | 2.33 | 0.070 | 1 | 0.08 |
| Caddisflies: | 1.00 | 0.030 | 1 | 0.08 |
| Diptera: | 3.00 | 0.090 | 4 | 0.33 |
| Hemiptera: | 0.67 | 0.020 | 2 | 0.17 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 2.33 | 0.070 | 3 | 0.25 |
| Tanypodinae Tribe: | 2.00 | 0.060 | 2 | 0.17 |
| Chironomiinae Tribe: | 0.33 | 0.010 | 1 | 0.08 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Gatherers: | 26.00 | 0.780 | 4 | 0.33 |
| Predators: | 3.33 | 0.100 | 5 | 0.42 |
| Piercers: | 1.00 | 0.030 | 1 | 0.08 |
| Shredders: | 0.00 | 0.000 | 0 | 0.00 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 2.00 | 0.065 | 3 | 0.27 |
| Intermediate: | 29.00 | 0.935 | 8 | 0.73 |
| Eurytopic: | 0.00 | 0.000 | 0 | 0.00 |
| Ratio of MTI Sensitive to Eurytopic | 2.00 | 6.452 | 3.00 | 27.27 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-275** Waterbody: CLAY POND (NH) Town: Not Designated

**Log Number: DN-2015-275-WET-HKS-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Stylaria* | 08020202014 | 0.67 | 0.67 | -- | CG | 18-S | -- | Worm |
| *Hyalella* | 09010203006 | 0.00 | 23.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 23.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| Libellulidae | 09020306 | 2.33 | 2.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 2.00 | 2.00 | 7 | CG | 22.1-I | -- | Mayfly |
| *Pelocoris* | 09020504013 | 0.33 | 0.33 | -- | PR | 24.7-I | -- | True Bug |
| *Neoplea* | 09020512016 | 0.33 | 0.33 | -- | PR | 35.5-I | -- | True Bug |
| *Oxyethira* | 09020607028 | 1.00 | 1.00 | 3 | P | 22-S | -- | Caddisfly |
| *Bezzia/palpomyia* | 09021010043 | 0.67 | 0.67 | 6 | PR | 26.9-I | -- | Fly: Biting Midge |
| *Ablabesmyia* | 09021011001 | 1.67 | 1.67 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Guttipelopia* | 09021011006 | 0.33 | 0.33 | 5 | PR | 19.4-S | T | Fly: Midge |
| *Chironomus* | 09021011080 | 0.33 | 0.33 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Arrenurus* | 09030111001 | 0.67 | 0.67 | -- | -- | 23.8-I | -- | Mite |

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

### Station Information

**Station Number: W-276** Trip ID: 2015-276-WET-HNV-1 River Basin: Connecticut
Waterbody: MULHERRIN FARM RD WETLAND (NH) HUC8 Name:
Town: Not Designated Latitude: 43 45 49.83 N
Mitigation Monitoring Site: No Longitude: 72 11 27.76 W

### Sample Information

**Sample ID: DN-2015-276-WET-HNV-1** Type of Sample: DIPNET Date Sampled: 7/21/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: B** Date: 10/25/2016
Model Result with P≥0.6: B **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.30 | Class C: | 0.18 |
| Class B: | 0.52 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.82 |
| Class C or Non-Attainment | 0.18 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.30 |
| Class B or C or Non-Attainment | 0.70 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 105 | < 787 |
| Ephemeroptera Abundance | 24.33 | most > 35 |
| Odonata Relative Abundance | 0.019 | most > 0.04 |
| Trichoptera Relative Abundance | 0.022 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.00 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.24 | < 0.4 |
| MTI Sensitive Taxa Abundance | 2.97 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.03 | most > 0.05 |
| MTI Sensitive Taxa Richness | 3 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.96 | > 0.5 |
| MTI Intermediate Taxa Richness | 13 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 4.18 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 25 |
| Hilsenhoff Biotic Index: | 8.08 |
| Shannon-Weiner Diversity: | 3.62 |
| Maine Tolerance Index: | 30.50 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 18.41 |
| 2 | *Callibaetis* | 16.51 |
| 3 | *Helisoma* | 13.65 |
| 4 | *Arachnida* | 10.16 |
| 5 | *Arrenurus* | 8.89 |

## Sample Collection and Processing Information

Sampling Organization: SJC
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/21/2015 11:10:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 11.94 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 149.8 | % | |
| Surface Water | In-situ | pH | 8.62 | | |
| Surface Water | In-situ | Specific Conductance | 141.2 | us/cm | |
| Surface Water | In-situ | Temperature | 26.1 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 13 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 3 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 4 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 0 | | | |
| Watershed Characterization and Non-point Sources: | 6 | Subclass 1: | | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | PERSISTENT | Waterbody Type: |
| | | Class 3: | EMERGENT | Waterbody Subtype: |
| | | Subclass 3: | NON-PERSISTENT | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
OPEN WATER STANDING

Substrate Classification:
GRAVEL SUBSTRATE
SILT/MUCK SUBSTRATE

Average Depth: 59 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Potamogeton amplifolius* | Largeleaf pondweed | LW-34011101001002 | 6 | OBL | FORB/HERB |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Polygonum* | | LW-34023701005 | | | |
| *Carex lurida* | Shallow sedge | LW-34010501002089 | 2 | OBL | GRAMINOID |
| *Glyceria borealis* | Small floating mannagrass<br>Small floating mannagrass | LW-34010502036002 | 6 | OBL | GRAMINOID |
| *Alismataceae* | | LW-34011401 | | | |
| *Triadenum* | | LW-34022601002 | | | |
| *Schoenoplectus tabernaemontani* | Softstem bulrush | LW-34010501011011 | 5 | OBL | GRAMINOID |
| *Hypericum* | | LW-34022601001 | | | |
| *Phragmites australis* | Common reed | LW-34010502056001 | 0 | FACW | GRAMINOID |
| *Typha angustifolia* | Narrowleaf cattail | LW-34011301002001 | 0 | OBL | FORB/HERB |
| *Typha latifolia* | Broadleaf cattail | LW-34011301002002 | 2 | OBL | FORB/HERB |
| *Solidago* | | LW-34020501071 | | | |
| *Eupatorium perfoliatum* | Common boneset | LW-34020501032001 | 4 | FACW | FORB/HERB |
| *Eleocharis* | | LW-34010501006 | | | |
| *Alnus* | | LW-34021701001 | | | |

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

### Additional Summary Variables

**Station Number: W-276** Waterbody: MULHERRIN FARM RD WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-276-WET-HNV-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 28.67 | 0.273 | 8 | 0.32 |
| EPT Taxa: | 26.67 | 0.254 | 5 | 0.20 |
| Insects: | 46.67 | 0.444 | 19 | 0.76 |
| Non-Insects: | 58.33 | 0.556 | 6 | 0.24 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 3.33 | 0.032 | 2 | 0.08 |
| Snails: | 15.67 | 0.149 | 2 | 0.08 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 19.33 | 0.184 | 1 | 0.04 |
| Mites: | 20.00 | 0.190 | 1 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 24.33 | 0.232 | 2 | 0.08 |
| Odonates: | 2.00 | 0.019 | 3 | 0.12 |
| Caddisflies: | 2.33 | 0.022 | 3 | 0.12 |
| Diptera: | 17.67 | 0.168 | 10 | 0.40 |
| Hemiptera: | 0.33 | 0.003 | 1 | 0.04 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 17.33 | 0.165 | 9 | 0.36 |
| Tanypodinae Tribe: | 8.29 | 0.079 | 3 | 0.12 |
| Chironomiinae Tribe: | 8.67 | 0.083 | 5 | 0.20 |
| Orthoclodiinae Tribe: | 0.38 | 0.004 | 1 | 0.04 |
| Collector-Filterers: | 4.86 | 0.046 | 3 | 0.12 |
| Collector-Gatherers: | 47.81 | 0.455 | 6 | 0.24 |
| Predators: | 9.62 | 0.092 | 5 | 0.20 |
| Piercers: | 1.67 | 0.016 | 1 | 0.04 |
| Shredders: | 0.38 | 0.004 | 1 | 0.04 |
| Scrapers: | 15.67 | 0.149 | 2 | 0.08 |
| Maine Tolerance: | | | | |
| Sensitive: | 2.97 | 0.034 | 3 | 0.17 |
| Intermediate: | 83.99 | 0.958 | 13 | 0.72 |
| Eurytopic: | 0.71 | 0.008 | 2 | 0.11 |
| Ratio of MTI Sensitive to Eurytopic | 4.18 | 4.184 | 1.50 | 1.50 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-276** Waterbody: MULHERRIN FARM RD WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-276-WET-HNV-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Enchytraeidae | 08020201 | 0.33 | 0.33 | -- | -- | -- | -- | Worm |
| Naididae | 08020202 | 3.00 | 3.00 | -- | -- | -- | -- | Worm |
| *Hyalella* | 09010203006 | 0.00 | 19.33 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 19.33 | 0.00 | -- | -- | -- | -- | Amphipod |
| Aeshnidae | 09020301 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| Libellulidae | 09020306 | 0.67 | 0.67 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 1.00 | 1.00 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Callibaetis* | 09020401002 | 17.33 | 17.33 | 9 | CG | 40.5-I | -- | Mayfly |
| *Caenis* | 09020412040 | 7.00 | 7.00 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 0.33 | 0.33 | -- | -- | -- | -- | True Bug |
| *Orthotrichia* | 09020607031 | 1.67 | 1.67 | -- | P | -- | -- | Caddisfly |
| Leptoceridae | 09020618 | 0.33 | 0.33 | -- | -- | -- | -- | Caddisfly |
| *Oecetis* | 09020618078 | 0.33 | 0.33 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Anopheles* | 09021008028 | 0.33 | 0.33 | -- | CF | 43-E | -- | Fly: Mosquito |
| Chironomidae | 09021011 | 2.00 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 6.33 | 7.16 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Labrundinia* | 09021011008 | 0.33 | 0.38 | 7 | PR | 18.1-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 0.67 | 0.75 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Cricotopus* | 09021011037 | 0.00 | 0.38 | 7 | SH | 43-E | -- | Fly: Midge |
| *Cricotopus sylvestris group* | 09021011037079 | 0.33 | 0.00 | -- | SH | -- | -- | Fly: Midge |
| *Tanytarsus* | 09021011076 | 2.33 | 2.64 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 1.00 | 1.13 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 0.67 | 0.75 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Lauterborniella* | 09021011092 | 0.00 | 2.26 | -- | CG | 17.4-S | C | Fly: Midge |
| *Lauterborniella agrayloides* | 09021011092001 | 2.00 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 1.67 | 1.88 | 6 | CF | 22.3-I | C | Fly: Midge |
| Arachnida | 0903 | 10.67 | 10.67 | -- | -- | -- | -- | Arachnid |
| *Arrenurus* | 09030111001 | 9.33 | 9.33 | -- | -- | 23.8-I | -- | Mite |
| *Gyraulus* | 10010203029 | 0.00 | 1.33 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 1.33 | 0.00 | -- | -- | -- | -- | Snail |
| *Helisoma* | 10010203030 | 14.33 | 14.33 | -- | SC | 42.8-I | -- | Snail |

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

### Station Information

**Station Number: W-277** Trip ID: 2015-277-WET-HUD-1 River Basin: Merrimack
Waterbody: MUSQUASH POND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 42 43 10.72 N
Mitigation Monitoring Site: No Longitude: 71 23 46.01 W

### Sample Information

**Sample ID: DN-2015-277-WET-HUD-1** Type of Sample: DIPNET Date Sampled: 6/30/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments: Minimum provisions for Generic Richness not met, provisions for Total Mean Abundance barely met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.97 |
| Class B: | 0.03 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.03 |
| Class C or Non-Attainment | 0.97 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 54 | < 787 |
| Ephemeroptera Abundance | 0.00 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.148 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.36 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.27 | < 0.4 |
| MTI Sensitive Taxa Abundance | 8.33 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.16 | most > 0.05 |
| MTI Sensitive Taxa Richness | 2 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.43 | > 0.5 |
| MTI Intermediate Taxa Richness | 6 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.38 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 11 |
| Hilsenhoff Biotic Index: | 7.74 |
| Shannon-Weiner Diversity: | 2.32 |
| Maine Tolerance Index: | 34.61 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Caecidotea communis* | 33.95 |
| 1 | *Hyalella azteca* | 33.95 |
| 2 | *Polycentropus* | 14.81 |
| 3 | *Helobdella modesta* | 6.17 |
| 4 | *Culicoides* | 4.32 |
| 5 | *Polypedilum* | 1.85 |

## Sample Collection and Processing Information

Sampling Organization: SDM, SJC, JP
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 6/30/2015 11:07:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 1.16 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 12.7 | % | |
| Surface Water | In-situ | pH | 5.59 | | |
| Surface Water | In-situ | Specific Conductance | 112 | us/cm | |
| Surface Water | In-situ | Temperature | 20.1 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 13 | System: | LACUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 0 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 3 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 0 | | | |
| Watershed Characterization and Non-point Sources: | 10 | Subclass 1: | NON-PERSISTENT | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | PERSISTENT | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
OPEN WATER STANDING

Substrate Classification:
ORGANIC SOIL SUBSTRATE
PEAT SUBSTRATE

Average Depth: 72 cm  Visible Flow: No  Rain In Previous 24 Hours: Unknown

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Utricularia* | | LW-34022305002 | | | |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |
| *Eleocharis* | | LW-34010501006 | | | |
| *Schoenoplectus tabernaemontani* | Softstem bulrush | LW-34010501011011 | 5 | OBL | GRAMINOID |
| *Rosa palustris* | Swamp rose | LW-34024202020012 | 4 | OBL | SUBSHRUB |
| *Lemna* | | LW-34010201002 | | | |
| *Myrica gale* | Sweetgale | LW-34022801003001 | 5 | OBL | SHRUB |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Vaccinium macrocarpon* | Cranberry | LW-34021302023007 | 5 | OBL | SUBSHRUB, SHRUB |
| *Ceratophyllum demersum* | Coon's tail | LW-34023101001001 | 3 | OBL | FORB/HERB |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Typha latifolia* | Broadleaf cattail | LW-34011301002002 | 2 | OBL | FORB/HERB |
| *Potamogeton* | | LW-34011101001 | | | |

## Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Proserpinaca palustris* | Marsh mermaidweed | LW-34022001002001 | 5 | OBL | FORB/HERB |
| *Utricularia macrorhiza* | Common bladderwort | LW-34022305002005 | 3 | OBL | FORB/HERB |

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

### Additional Summary Variables

**Station Number: W-277** Waterbody: MUSQUASH POND (NH) Town: Not Designated

**Log Number: DN-2015-277-WET-HUD-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 8.00 | 0.148 | 1 | 0.09 |
| EPT Taxa: | 8.00 | 0.148 | 1 | 0.09 |
| Insects: | 13.67 | 0.253 | 8 | 0.73 |
| Non-Insects: | 40.33 | 0.747 | 3 | 0.27 |
| Leeches: | 3.67 | 0.068 | 1 | 0.09 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 18.33 | 0.340 | 1 | 0.09 |
| Amphipods: | 18.33 | 0.340 | 1 | 0.09 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.00 | 0.000 | 0 | 0.00 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 8.00 | 0.148 | 1 | 0.09 |
| Diptera: | 5.00 | 0.093 | 6 | 0.55 |
| Hemiptera: | 0.67 | 0.012 | 1 | 0.09 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 2.67 | 0.049 | 5 | 0.45 |
| Tanypodinae Tribe: | 1.00 | 0.019 | 3 | 0.27 |
| Chironomiinae Tribe: | 1.67 | 0.031 | 2 | 0.18 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Gatherers: | 18.33 | 0.340 | 1 | 0.09 |
| Predators: | 12.00 | 0.222 | 6 | 0.55 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 19.33 | 0.358 | 2 | 0.18 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 8.33 | 0.156 | 2 | 0.20 |
| Intermediate: | 23.00 | 0.431 | 6 | 0.60 |
| Eurytopic: | 22.00 | 0.413 | 2 | 0.20 |
| Ratio of MTI Sensitive to Eurytopic | 0.38 | 0.379 | 1.00 | 1.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-277** Waterbody: MUSQUASH POND (NH) Town: Not Designated

**Log Number: DN-2015-277-WET-HUD-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Helobdella* | 08030101005 | 0.00 | 3.67 | -- | -- | 43-E | -- | Leech |
| *Helobdella elongata* | 08030101005001 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Helobdella modesta* | 08030101005004 | 3.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Caecidotea* | 09010101001 | 0.00 | 18.33 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 18.33 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 18.33 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 18.33 | 0.00 | -- | -- | -- | -- | Amphipod |
| Corixidae | 09020501 | 0.67 | 0.67 | -- | -- | -- | -- | True Bug |
| *Polycentropus* | 09020603010 | 8.00 | 8.00 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Culicoides* | 09021010037 | 2.33 | 2.33 | 10 | PR | 42.1-I | -- | Fly: Biting Midge |
| *Ablabesmyia* | 09021011001 | 0.33 | 0.33 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Guttipelopia* | 09021011006 | 0.33 | 0.33 | 5 | PR | 19.4-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 0.33 | 0.33 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Parachironomus* | 09021011097 | 0.67 | 0.67 | 10 | PR | 28.6-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 1.00 | 1.00 | 6 | SH | 24.2-I | C | Fly: Midge |

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

### Station Information

**Station Number: W-278** Trip ID: 2015-278-WET-JAF-1 River Basin: Merrimack
Waterbody: CONTOOCOOK RIVER WETLAND (NH) HUC8 Name:
Town: Not Designated Latitude: 42 48 35.94 N
Mitigation Monitoring Site: No Longitude: 72 1 27.96 W

### Sample Information

**Sample ID: DN-2015-278-WET-JAF-1** Type of Sample: DIPNET Date Sampled: 7/22/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: B** Date: 10/25/2016
Model Result with P≥0.6: B **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.29 | Class C: | 0.00 |
| Class B: | 0.71 | NA: | 0.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 1.00 |
| Class C or Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.29 |
| Class B or C or Non-Attainment | 0.71 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 393 | < 787 |
| Ephemeroptera Abundance | 40.33 | most > 35 |
| Odonata Relative Abundance | 0.008 | most > 0.04 |
| Trichoptera Relative Abundance | 0.047 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.07 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.32 | < 0.4 |
| MTI Sensitive Taxa Abundance | 32.01 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.14 | most > 0.05 |
| MTI Sensitive Taxa Richness | 7 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.76 | > 0.5 |
| MTI Intermediate Taxa Richness | 21 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 1.25 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 38 |
| Hilsenhoff Biotic Index: | 7.37 |
| Shannon-Weiner Diversity: | 3.55 |
| Maine Tolerance Index: | 27.33 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 25.61 |
| 2 | *Pisidium* | 19.76 |
| 3 | *Hydrobiidae* | 14.08 |
| 4 | *Caenis* | 8.82 |
| 5 | *Caecidotea communis* | 6.45 |

## Sample Collection and Processing Information

Sampling Organization: SDM
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/22/2015 11:35:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 4.35 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 54.7 | % | |
| Surface Water | In-situ | pH | 5.78 | | |
| Surface Water | In-situ | Specific Conductance | 103.8 | us/cm | |
| Surface Water | In-situ | Temperature | 26.2 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 18 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 4 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 5 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 1 | | | |
| Watershed Characterization and Non-point Sources: | 8 | Subclass 1: | FLOATING VASCULAR | Land Form: |
| | | Class 2: | SCRUB SHRUB | Land Form Type: |
| | | Subclass 2: | | Waterbody Type: |
| | | Class 3: | EMERGENT | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
OPEN WATER FLOWING

Substrate Classification:
GRAVEL SUBSTRATE

Average Depth: 58 cm  Visible Flow: Yes  Rain In Previous 24 Hours: No

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Sparganium* | | LW-34011301001 | | | |
| *Myriophyllum heterophyllum* | Twoleaf watermilfoil | LW-34022001001003 | 0 | OBL | FORB/HERB |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Potamogeton* | | LW-34011101001 | | | |
| *Glyceria canadensis* | Rattlesnake mannagrass | LW-34010502036003 | 4 | OBL | GRAMINOID |
| *Utricularia purpurea* | Eastern purple bladderwort | LW-34022305002007 | 5 | OBL | FORB/HERB |
| *Utricularia macrorhiza* | Common bladderwort | LW-34022305002005 | 3 | OBL | FORB/HERB |
| *Acer saccharinum* | Silver maple | LW-34024603001008 | 6 | FACW | TREE |
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |
| *Juncus effusus* | Common rush | LW-34010801001016 | 2 | OBL | GRAMINOID |
| *Eleocharis* | | LW-34010501006 | | | |
| *Najas* | | LW-34010701003 | | | |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |

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

### Additional Summary Variables

**Station Number: W-278** Waterbody: CONTOOCOOK RIVER WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-278-WET-JAF-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 62.33 | 0.159 | 9 | 0.24 |
| EPT Taxa: | 59.00 | 0.150 | 5 | 0.13 |
| Insects: | 102.67 | 0.261 | 26 | 0.68 |
| Non-Insects: | 290.33 | 0.739 | 12 | 0.32 |
| Leeches: | 2.67 | 0.007 | 1 | 0.03 |
| Oligochaetes: | 6.33 | 0.016 | 1 | 0.03 |
| Snails: | 64.67 | 0.165 | 5 | 0.13 |
| Bivalves: | 83.33 | 0.212 | 2 | 0.05 |
| Isopods: | 25.33 | 0.064 | 1 | 0.03 |
| Amphipods: | 100.67 | 0.256 | 1 | 0.03 |
| Mites: | 7.33 | 0.019 | 1 | 0.03 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 40.33 | 0.103 | 2 | 0.05 |
| Odonates: | 3.33 | 0.008 | 4 | 0.11 |
| Caddisflies: | 18.67 | 0.047 | 3 | 0.08 |
| Diptera: | 24.33 | 0.062 | 10 | 0.26 |
| Hemiptera: | 9.00 | 0.023 | 3 | 0.08 |
| Beetles: | 6.67 | 0.017 | 3 | 0.08 |
| Chironomids: | 23.67 | 0.060 | 9 | 0.24 |
| Tanypodinae Tribe: | 6.86 | 0.017 | 3 | 0.08 |
| Chironomiinae Tribe: | 16.81 | 0.043 | 6 | 0.16 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 91.22 | 0.232 | 4 | 0.11 |
| Collector-Gatherers: | 153.51 | 0.391 | 7 | 0.18 |
| Predators: | 21.55 | 0.055 | 12 | 0.32 |
| Piercers: | 15.97 | 0.041 | 3 | 0.08 |
| Shredders: | 28.41 | 0.072 | 3 | 0.08 |
| Scrapers: | 6.00 | 0.015 | 3 | 0.08 |
| Maine Tolerance: | | | | |
| Sensitive: | 32.01 | 0.136 | 7 | 0.23 |
| Intermediate: | 178.32 | 0.756 | 21 | 0.70 |
| Eurytopic: | 25.67 | 0.109 | 2 | 0.07 |
| Ratio of MTI Sensitive to Eurytopic | 1.25 | 1.247 | 3.50 | 3.50 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-278** Waterbody: CONTOOCOOK RIVER WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-278-WET-JAF-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Stylaria* | 08020202014 | 6.33 | 6.33 | -- | CG | 18-S | -- | Worm |
| *Erpobdella* | 08030203002 | 0.00 | 2.67 | -- | -- | 36.4-I | -- | Leech |
| *Erpobdella punctata* | 08030203002001 | 2.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Caecidotea* | 09010101001 | 0.00 | 25.33 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 25.33 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 100.67 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 100.67 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Aeshna* | 09020301001 | 0.33 | 0.33 | 5 | PR | 27.9-I | -- | Dragonfly/damselfly |
| Libellulidae | 09020306 | 1.67 | 1.67 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Lestes* | 09020308045 | 0.33 | 0.33 | 9 | PR | 32.6-I | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 1.00 | 1.00 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Callibaetis* | 09020401002 | 5.67 | 5.67 | 9 | CG | 40.5-I | -- | Mayfly |
| *Caenis* | 09020412040 | 34.67 | 34.67 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 4.00 | 0.00 | -- | -- | -- | -- | True Bug |
| *Hesperocorixa* | 09020501004 | 0.33 | 0.64 | -- | P | -- | -- | True Bug |
| *Trichocorixa* | 09020501008 | 4.00 | 7.69 | -- | PR | -- | -- | True Bug |
| *Neoplea* | 09020512016 | 0.67 | 0.67 | -- | PR | 35.5-I | -- | True Bug |
| *Polycentropus* | 09020603010 | 2.00 | 2.00 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Oxyethira* | 09020607028 | 15.00 | 15.00 | 3 | P | 22-S | -- | Caddisfly |
| *Oecetis* | 09020618078 | 1.67 | 1.67 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Parapoynx* | 09020901002 | 0.33 | 0.33 | 5 | SH | -- | -- | Moth |
| *Bezzia/palpomyia* | 09021010043 | 0.67 | 0.67 | 6 | PR | 26.9-I | -- | Fly: Biting Midge |
| Chironomidae | 09021011 | 0.67 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 5.00 | 5.14 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Labrundinia* | 09021011008 | 0.33 | 0.34 | 7 | PR | 18.1-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 1.33 | 1.37 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Tanytarsus* | 09021011076 | 6.67 | 6.86 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 0.33 | 0.34 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Cladopelma* | 09021011081 | 4.67 | 4.80 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 1.00 | 1.03 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 1.00 | 1.03 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 2.67 | 2.74 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Peltodytes* | 09021101002 | 0.33 | 0.33 | -- | P | 56.2-E | -- | Beetle |
| *Agabus* | 09021103016 | 0.33 | 0.33 | -- | PR | 34.5-I | -- | Beetle |
| *Dubiraphia* | 09021113064 | 6.00 | 6.00 | 6 | -- | 10.4-S | -- | Beetle |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-278** Waterbody: CONTOOCOOK RIVER WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-278-WET-JAF-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Arachnida | 0903 | 4.67 | 4.67 | -- | -- | -- | -- | Arachnid |
| *Arrenurus* | 09030111001 | 2.67 | 2.67 | -- | -- | 23.8-I | -- | Mite |
| Hydrobiidae | 10010104 | 55.33 | 55.33 | -- | -- | -- | -- | Snail |
| *Amnicola* | 10010104013 | 0.67 | 0.67 | -- | SC | 18.7-S | -- | Snail |
| Lymnaeidae | 10010201 | 3.33 | 3.33 | -- | -- | -- | -- | Snail |
| *Gyraulus* | 10010203029 | 0.00 | 2.00 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 2.00 | 0.00 | -- | -- | -- | -- | Snail |
| *Helisoma* | 10010203030 | 3.33 | 3.33 | -- | SC | 42.8-I | -- | Snail |
| Sphaeriidae | 10020201 | 5.67 | 5.67 | -- | CF | -- | -- | Clam |
| *Pisidium* | 10020201002 | 77.67 | 77.67 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-279** Trip ID: 2015-279-WET-MAN-1 River Basin: Merrimack
Waterbody: RAIL TRAIL MARSH (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 42 59 58.08 N
Mitigation Monitoring Site: No Longitude: 71 23 48.12 W

### Sample Information

**Sample ID: DN-2015-279-WET-MAN-1** Type of Sample: DIPNET Date Sampled: 7/14/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: C** Date: 10/25/2016
Model Result with P≥0.6: C **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.60 |
| Class B: | 0.00 | NA: | 0.40 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 0.60 |
| Non-Attainment | 0.40 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.00 |
| Class C or Non-Attainment | 1.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 63 | < 787 |
| Ephemeroptera Abundance | 0.33 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.000 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.07 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.47 | < 0.4 |
| MTI Sensitive Taxa Abundance | 0.00 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.00 | most > 0.05 |
| MTI Sensitive Taxa Richness | 0 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.68 | > 0.5 |
| MTI Intermediate Taxa Richness | 7 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.00 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 19 |
| Hilsenhoff Biotic Index: | 9.29 |
| Shannon-Weiner Diversity: | 2.81 |
| Maine Tolerance Index: | 44.14 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Sphaeriidae* | 40.21 |
| 2 | *Culicoides* | 23.81 |
| 3 | *Caecidotea communis* | 7.41 |
| 4 | *Naididae* | 6.35 |
| 5 | *Lumbriculidae* | 4.23 |
| 5 | *Natarsia* | 4.23 |

## Sample Collection and Processing Information

Sampling Organization: SC, JP, SM
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/14/2015 11:18:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 1.52 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 17.3 | % | |
| Surface Water | In-situ | pH | 6.37 | | |
| Surface Water | In-situ | Specific Conductance | 492 | us/cm | |
| Surface Water | In-situ | Temperature | 21.9 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting | |
|---|---|---|---|---|---|
| Total Score: | 25 | System: | PALUSTRINE | Landscape Position: | |
| Hydrologic Modifications: | 7 | Subsystem: | | Lotic Gradient: | |
| Vegetative Modifications: | 4 | Class 1: | EMERGENT | Flow Path: | |
| Chemical Pollutants: | 2 | Subclass 1: | PERSISTENT | Land Form: | |
| Watershed Characterization and Non-point Sources: | 12 | Class 2: | EMERGENT | Land Form Type: | |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: | |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: | |
| | | Subclass 3: | | | |
| | | | | Comments: | |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
EMERGENT NON-PERSISTENT VEGETATION
EMERGENT PERSISTENT VEGETATION
OPEN WATER STANDING

Substrate Classification:
CLAY SUBSTRATE
ORGANIC SOIL SUBSTRATE
SAND SUBSTRATE
SILT/MUCK SUBSTRATE

Average Depth: 35 cm  Visible Flow: No  Rain In Previous 24 Hours: Yes

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Proserpinaca palustris* | Marsh mermaidweed | LW-34022001002001 | 5 | OBL | FORB/HERB |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |
| *Eleocharis* | | LW-34010501006 | | | |
| *Sagittaria* | | LW-34011401002 | | | |
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Asclepias* | | LW-34021801002 | | | |
| *Lemna* | | LW-34010201002 | | | |
| *Carex* | | LW-34010501002 | | | |
| *Sparganium* | | LW-34011301001 | | | |
| *Rosa palustris* | Swamp rose | LW-34024202020012 | 4 | OBL | SUBSHRUB |
| *Spiraea tomentosa* | Steeplebush | LW-34024202026005 | 3 | FACW | SHRUB |
| *Typha* | | LW-34011301002 | | | |
| *Cornus* | | LW-34021001001 | | | |
| *Alnus* | | LW-34021701001 | | | |
| *Carex comosa* | Longhair sedge | LW-34010501002039 | 6 | OBL | GRAMINOID |

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

### Additional Summary Variables

**Station Number: W-279** Waterbody: RAIL TRAIL MARSH (NH) Town: Not Designated

**Log Number: DN-2015-279-WET-MAN-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 0.33 | 0.005 | 1 | 0.05 |
| EPT Taxa: | 0.33 | 0.005 | 1 | 0.05 |
| Insects: | 23.00 | 0.365 | 10 | 0.53 |
| Non-Insects: | 40.00 | 0.635 | 9 | 0.47 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 6.67 | 0.106 | 2 | 0.11 |
| Snails: | 2.67 | 0.042 | 3 | 0.16 |
| Bivalves: | 25.33 | 0.402 | 1 | 0.05 |
| Isopods: | 4.67 | 0.074 | 1 | 0.05 |
| Amphipods: | 0.33 | 0.005 | 1 | 0.05 |
| Mites: | 0.33 | 0.005 | 1 | 0.05 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.33 | 0.005 | 1 | 0.05 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 0.00 | 0.000 | 0 | 0.00 |
| Diptera: | 18.67 | 0.296 | 4 | 0.21 |
| Hemiptera: | 0.00 | 0.000 | 0 | 0.00 |
| Beetles: | 4.00 | 0.063 | 5 | 0.26 |
| Chironomids: | 3.00 | 0.048 | 2 | 0.11 |
| Tanypodinae Tribe: | 2.67 | 0.042 | 1 | 0.05 |
| Chironomiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Orthoclodiinae Tribe: | 0.33 | 0.005 | 1 | 0.05 |
| Collector-Filterers: | 25.33 | 0.402 | 1 | 0.05 |
| Collector-Gatherers: | 2.00 | 0.032 | 5 | 0.26 |
| Predators: | 19.67 | 0.312 | 4 | 0.21 |
| Piercers: | 0.67 | 0.011 | 1 | 0.05 |
| Shredders: | 4.67 | 0.074 | 1 | 0.05 |
| Scrapers: | 0.33 | 0.005 | 1 | 0.05 |
| Maine Tolerance: | | | | |
| Sensitive: | 0.00 | 0.000 | 0 | 0.00 |
| Intermediate: | 17.33 | 0.684 | 7 | 0.70 |
| Eurytopic: | 8.00 | 0.316 | 3 | 0.30 |
| Ratio of MTI Sensitive to Eurytopic | 0.00 | 0.000 | 0.00 | 0.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-279** Waterbody: RAIL TRAIL MARSH (NH) Town: Not Designated

**Log Number: DN-2015-279-WET-MAN-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Lumbriculidae | 08020101 | 2.67 | 2.67 | -- | -- | -- | -- | Worm |
| Naididae | 08020202 | 4.00 | 4.00 | -- | -- | -- | -- | Worm |
| *Caecidotea* | 09010101001 | 0.00 | 4.67 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 4.67 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 0.33 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 0.33 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Callibaetis* | 09020401002 | 0.33 | 0.33 | 9 | CG | 40.5-I | -- | Mayfly |
| *Mansonia* | 09021008033 | 0.67 | 0.67 | -- | CG | 42.2-I | -- | Fly: Mosquito |
| *Culicoides* | 09021010037 | 15.00 | 15.00 | 10 | PR | 42.1-I | -- | Fly: Biting Midge |
| *Natarsia* | 09021011011 | 2.67 | 2.67 | 8 | PR | 43.6-E | T | Fly: Midge |
| *Corynoneura* | 09021011036 | 0.33 | 0.33 | 7 | CG | 40.1-I | -- | Fly: Midge |
| *Haliplus* | 09021101001 | 0.67 | 0.67 | -- | P | 67.1-E | -- | Beetle |
| *Hydrovatus* | 09021103007 | 1.33 | 1.33 | -- | PR | -- | -- | Beetle |
| *Celina* | 09021103012 | 0.67 | 0.67 | -- | PR | -- | -- | Beetle |
| *Enochrus* | 09021105044 | 0.33 | 0.33 | -- | CG | -- | -- | Beetle |
| Scirtidae | 09021107 | 1.00 | 1.00 | -- | -- | -- | -- | Beetle |
| *Arrenurus* | 09030111001 | 0.33 | 0.33 | -- | -- | 23.8-I | -- | Mite |
| Hydrobiidae | 10010104 | 0.67 | 0.67 | -- | -- | -- | -- | Snail |
| Lymnaeidae | 10010201 | 1.67 | 1.67 | -- | -- | -- | -- | Snail |
| *Gyraulus* | 10010203029 | 0.00 | 0.33 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 0.33 | 0.00 | -- | -- | -- | -- | Snail |
| Sphaeriidae | 10020201 | 25.33 | 25.33 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-280** Trip ID: 2015-280-WET-MAN-2 River Basin: Merrimack
Waterbody: JOSEPH STREET POND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 43 0 30.37 N
Mitigation Monitoring Site: No Longitude: 71 29 44.75 W

### Sample Information

**Sample ID: DN-2015-280-WET-MAN-2** Type of Sample: DIPNET Date Sampled: 7/30/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments: Minimum provisions for Total Mean Abundance and Generic Richness not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.99 |
| Class B: | 0.01 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.01 |
| Class C or Non-Attainment | 0.99 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 20 | < 787 |
| Ephemeroptera Abundance | 4.00 | most > 35 |
| Odonata Relative Abundance | 0.133 | most > 0.04 |
| Trichoptera Relative Abundance | 0.000 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.02 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.00 | < 0.4 |
| MTI Sensitive Taxa Abundance | 0.33 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.02 | most > 0.05 |
| MTI Sensitive Taxa Richness | 1 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.93 | > 0.5 |
| MTI Intermediate Taxa Richness | 10 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.33 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 12 |
| Hilsenhoff Biotic Index: | 7.75 |
| Shannon-Weiner Diversity: | 3.08 |
| Maine Tolerance Index: | 25.96 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Caenis* | 20.00 |
| 2 | *Procladius* | 16.67 |
| 2 | *Tanytarsus* | 16.67 |
| 3 | *Enallagma* | 13.33 |
| 4 | *Dicrotendipes* | 11.67 |
| 5 | *Chironomus* | 8.33 |

## Sample Collection and Processing Information

Sampling Organization: JP
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/30/2015 10:05:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 3.15 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 38.7 | % | |
| Surface Water | In-situ | pH | 5.74 | | |
| Surface Water | In-situ | Specific Conductance | 556 | us/cm | |
| Surface Water | In-situ | Temperature | 26.6 | deg c | |

## Landcover Summary - 2004 Data

## Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 19 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 3 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 3 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 6 | | | |
| Watershed Characterization and Non-point Sources: | 7 | Subclass 1: | FLOATING VASCULAR | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | NON-PERSISTENT | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: UPLAND BUFFER HAS INVASIVES

Habitat Classification:
AQUATIC MACROPHYTE BED
OPEN WATER STANDING

Substrate Classification:
SILT/MUCK SUBSTRATE

Average Depth: 65 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments: POND HAS NO SURFACE WATER INFLOW OR OUTLET; ONE GOLDFISH OBSERVED SWIMMING IN POND

## Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Sparganium* | | LW-34011301001 | | | |
| *Utricularia gibba* | Humped bladderwort | LW-34022305002003 | 6 | OBL | FORB/HERB |
| *Eleocharis obtusa* | Blunt spikerush | LW-34010501006010 | 2 | OBL | GRAMINOID |
| *Potamogeton* | | LW-34011101001 | | | |
| *Haloragaceae* | | LW-34022001 | | | |
| *Triadenum* | | LW-34022601002 | | | |
| *Carex* | | LW-34010501002 | | | |

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

### Additional Summary Variables

**Station Number: W-280** Waterbody: JOSEPH STREET POND (NH) Town: Not Designated

**Log Number: DN-2015-280-WET-MAN-2** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 6.67 | 0.333 | 2 | 0.17 |
| EPT Taxa: | 4.00 | 0.200 | 1 | 0.08 |
| Insects: | 20.00 | 1.000 | 12 | 1.00 |
| Non-Insects: | 0.00 | 0.000 | 0 | 0.00 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 0.00 | 0.000 | 0 | 0.00 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 4.00 | 0.200 | 1 | 0.08 |
| Odonates: | 2.67 | 0.133 | 1 | 0.08 |
| Caddisflies: | 0.00 | 0.000 | 0 | 0.00 |
| Diptera: | 13.33 | 0.667 | 10 | 0.83 |
| Hemiptera: | 0.00 | 0.000 | 0 | 0.00 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 13.33 | 0.667 | 10 | 0.83 |
| Tanypodinae Tribe: | 3.67 | 0.183 | 2 | 0.17 |
| Chironomiinae Tribe: | 9.67 | 0.483 | 8 | 0.67 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 3.33 | 0.167 | 1 | 0.08 |
| Collector-Gatherers: | 9.00 | 0.450 | 6 | 0.50 |
| Predators: | 6.33 | 0.317 | 3 | 0.25 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 0.33 | 0.017 | 1 | 0.08 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 0.33 | 0.017 | 1 | 0.08 |
| Intermediate: | 18.67 | 0.933 | 10 | 0.83 |
| Eurytopic: | 1.00 | 0.050 | 1 | 0.08 |
| Ratio of MTI Sensitive to Eurytopic | 0.33 | 0.333 | 1.00 | 1.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-280** Waterbody: JOSEPH STREET POND (NH) Town: Not Designated

**Log Number: DN-2015-280-WET-MAN-2** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Enallagma* | 09020309051 | 2.67 | 2.67 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 4.00 | 4.00 | 7 | CG | 22.1-I | -- | Mayfly |
| *Ablabesmyia* | 09021011001 | 0.33 | 0.33 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Procladius* | 09021011015 | 3.33 | 3.33 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Cladotanytarsus* | 09021011068 | 0.33 | 0.33 | 7 | CG | 22.2-I | Y | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 1.00 | 1.00 | 6 | -- | 43-E | Y | Fly: Midge |
| *Tanytarsus* | 09021011076 | 3.33 | 3.33 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 1.67 | 1.67 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Cladopelma* | 09021011081 | 0.33 | 0.33 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 2.33 | 2.33 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.00 | 0.33 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Polypedilum braseniae* | 09021011102196 | 0.33 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Tribelos* | 09021011107 | 0.33 | 0.33 | 5 | CG | 9.3-S | C | Fly: Midge |

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

### Station Information

**Station Number: W-267** Trip ID: 2014-267-WET-MLW-1 River Basin: Connecticut
Waterbody: GREGG WETLAND (NH) HUC8 Name:
Town: Not Designated Latitude: 43 6 22.22 N
Mitigation Monitoring Site: No Longitude: 72 13 3.18 W

### Sample Information

**Sample ID: DN-2014-267-WET-MLW-1** Type of Sample: DIPNET Date Sampled: 8/11/2014
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 2/9/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 2/8/2016 Comments: Minimum provisions for total abundance not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.97 | Class C: | 0.00 |
| Class B: | 0.03 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 1.00 |
| Class C or Non-Attainment | 0.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.97 |
| Class B or C or Non-Attainment | 0.03 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 27 | < 787 |
| Ephemeroptera Abundance | 0.67 | most > 35 |
| Odonata Relative Abundance | 0.025 | most > 0.04 |
| Trichoptera Relative Abundance | 0.012 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.09 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.13 | < 0.4 |
| MTI Sensitive Taxa Abundance | 7.53 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.34 | most > 0.05 |
| MTI Sensitive Taxa Richness | 7 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.66 | > 0.5 |
| MTI Intermediate Taxa Richness | 11 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 7.53 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 23 |
| Hilsenhoff Biotic Index: | 7.86 |
| Shannon-Weiner Diversity: | 4.11 |
| Maine Tolerance Index: | 24.56 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Tanypus* | 13.58 |
| 2 | *Naididae* | 12.35 |
| 3 | *Polypedilum* | 8.64 |
| 3 | *Procladius* | 8.64 |
| 4 | *Labrundinia* | 6.17 |
| 5 | *Cladopelma* | 4.94 |
| 5 | *Guttipelopia* | 4.94 |

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

## Sample Collection and Processing Information

Sampling Organization: NHDES
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/11/2014 11:32:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 7.11 | mg/l | |
| Surface Water | In-situ | pH | 5.61 | | |
| Surface Water | In-situ | Specific Conductance | 13 | us/cm | |
| Surface Water | In-situ | Temperature | 23.6 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 3 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 0 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 0 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 0 | | | |
| Watershed Characterization and Non-point Sources: | 3 | Subclass 1: | FLOATING VASCULAR | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: PLANT LIST IS NOT COMPREHENSIVE.

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
SCRUB SHRUB

Substrate Classification:
SILT/MUCK SUBSTRATE

Average Depth: 60 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Sagittaria* | | LW-34011401002 | | | |
| *Betulaceae* | | LW-34021701 | | | |
| *Spiraea* | | LW-34024202026 | | | |
| *Glyceria* | | LW-34010502036 | | | |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Ilex* | | LW-34020201001 | | | |
| *Utricularia* | | LW-34022305002 | | | |
| *Carex* | | LW-34010501002 | | | |
| *Juncus* | | LW-34010801001 | | | |
| *Gentianaceae* | | LW-34021802 | | | |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Carex lurida* | Shallow sedge | LW-34010501002089 | 2 | OBL | GRAMINOID |
| *Potamogeton* | | LW-34011101001 | | | |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |

## Additional Summary Variables

**Station Number: W-267** Waterbody: GREGG WETLAND (NH) Town: Not Designated

**Log Number: DN-2014-267-WET-MLW-1** Subsample Factor: X1 Replicates: 3 Calculated: 2/8/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 1.67 | 0.062 | 4 | 0.17 |
| EPT Taxa: | 1.00 | 0.037 | 2 | 0.09 |
| Insects: | 21.00 | 0.778 | 20 | 0.87 |
| Non-Insects: | 6.00 | 0.222 | 3 | 0.13 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 5.00 | 0.185 | 2 | 0.09 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 0.00 | 0.000 | 0 | 0.00 |
| Mites: | 1.00 | 0.037 | 1 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.67 | 0.025 | 1 | 0.04 |
| Odonates: | 0.67 | 0.025 | 2 | 0.09 |
| Caddisflies: | 0.33 | 0.012 | 1 | 0.04 |
| Diptera: | 19.00 | 0.704 | 15 | 0.65 |
| Hemiptera: | 0.33 | 0.012 | 1 | 0.04 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 19.00 | 0.704 | 15 | 0.65 |
| Tanypodinae Tribe: | 11.05 | 0.409 | 7 | 0.30 |
| Chironomiinae Tribe: | 7.25 | 0.269 | 7 | 0.30 |
| Orthoclodiinae Tribe: | 0.69 | 0.026 | 1 | 0.04 |
| Collector-Filterers: | 0.35 | 0.013 | 1 | 0.04 |
| Collector-Gatherers: | 6.47 | 0.240 | 6 | 0.26 |
| Predators: | 11.39 | 0.422 | 8 | 0.35 |
| Piercers: | 0.33 | 0.012 | 1 | 0.04 |
| Shredders: | 2.42 | 0.090 | 1 | 0.04 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 7.53 | 0.342 | 7 | 0.39 |
| Intermediate: | 14.47 | 0.658 | 11 | 0.61 |
| Eurytopic: | 0.00 | 0.000 | 0 | 0.00 |
| Ratio of MTI Sensitive to Eurytopic | 7.53 | 34.215 | 7.00 | 38.89 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-267** Waterbody: GREGG WETLAND (NH) Town: Not Designated

**Log Number: DN-2014-267-WET-MLW-1** Subsample Factor: X1 Replicates: 3 Calculated: 2/8/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Naididae | 08020202 | 3.33 | 0.00 | -- | -- | -- | -- | Worm |
| *Ripistes* | 08020202011 | 0.00 | 3.00 | -- | -- | -- | -- | Worm |
| *Ripistes parasita* | 08020202011001 | 1.00 | 0.00 | -- | -- | -- | -- | Worm |
| *Stylaria* | 08020202014 | 0.67 | 2.00 | -- | CG | 18-S | -- | Worm |
| Libellulidae | 09020306 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Sympetrum* | 09020306041 | 0.33 | 0.33 | 10 | PR | 37-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 0.67 | 0.67 | 7 | CG | 22.1-I | -- | Mayfly |
| *Hesperocorixa* | 09020501004 | 0.33 | 0.33 | -- | P | -- | -- | True Bug |
| Phryganeidae | 09020608 | 0.33 | 0.33 | -- | -- | -- | -- | Caddisfly |
| Chironomidae | 09021011 | 0.67 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 1.00 | 1.04 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Clinotanypus* | 09021011002 | 0.00 | 0.35 | 8 | PR | 30.3-I | T | Fly: Midge |
| *Clinotanypus pinguis* | 09021011002008 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Guttipelopia* | 09021011006 | 1.33 | 1.38 | 5 | PR | 19.4-S | T | Fly: Midge |
| *Labrundinia* | 09021011008 | 1.67 | 1.73 | 7 | PR | 18.1-S | T | Fly: Midge |
| *Larsia* | 09021011009 | 0.33 | 0.35 | 6 | PR | 15.6-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 2.33 | 2.42 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Tanypus* | 09021011018 | 3.67 | 3.80 | 10 | PR | 33.5-I | T | Fly: Midge |
| *Psectrocladius* | 09021011056 | 0.67 | 0.69 | 8 | CG | 22-S | -- | Fly: Midge |
| *Chironomus* | 09021011080 | 1.00 | 1.04 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Cladopelma* | 09021011081 | 1.33 | 1.38 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 0.67 | 0.69 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 0.33 | 0.35 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Nilothauma* | 09021011095 | 0.67 | 0.69 | 2 | -- | 11-S | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 2.33 | 2.42 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Zavreliella* | 09021011133 | 0.00 | 0.69 | -- | -- | 21.8-S | H | Fly: Midge |
| *Zavreliella marmorata* | 09021011133010 | 0.67 | 0.00 | -- | -- | -- | S | Fly: Midge |
| Arachnida | 0903 | 1.00 | 1.00 | -- | -- | -- | -- | Arachnid |

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

### Station Information

**Station Number: W-281** Trip ID: 2015-281-WET-NAS-1 River Basin: Merrimack
Waterbody: FIELDS GROVE - SALMON BROOOK (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 42 44 49.15 N
Mitigation Monitoring Site: No Longitude: 71 27 47.63 W

### Sample Information

**Sample ID: DN-2015-281-WET-NAS-1** Type of Sample: DIPNET Date Sampled: 7/9/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments: Minimum provisions for Generic Richness not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.20 |
| Class B: | 0.00 | NA: | 0.80 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 0.20 |
| Non-Attainment | 0.80 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.00 |
| Class C or Non-Attainment | 1.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 129 | < 787 |
| Ephemeroptera Abundance | 0.33 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.000 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.18 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.50 | < 0.4 |
| MTI Sensitive Taxa Abundance | 0.00 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.00 | most > 0.05 |
| MTI Sensitive Taxa Richness | 0 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.67 | > 0.5 |
| MTI Intermediate Taxa Richness | 7 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.00 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 10 |
| Hilsenhoff Biotic Index: | 7.91 |
| Shannon-Weiner Diversity: | 2.04 |
| Maine Tolerance Index: | 33.01 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 54.52 |
| 2 | *Caecidotea communis* | 17.57 |
| 3 | *Helobdella modesta* | 8.79 |
| 4 | *Helobdella elongata* | 6.20 |
| 5 | *Cryptochironomus* | 2.58 |

## Sample Collection and Processing Information

Sampling Organization: JP, SC, AH
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/9/2015 10:25:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 6 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 69.2 | % | |
| Surface Water | In-situ | pH | 6.69 | | |
| Surface Water | In-situ | Specific Conductance | 387 | us/cm | |
| Surface Water | In-situ | Temperature | 22.6 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 27 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 4 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 6 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 2 | | | |
| Watershed Characterization and Non-point Sources: | 15 | Subclass 1: | NON-PERSISTENT | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | PERSISTENT | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
OPEN WATER FLOWING

Substrate Classification:
ORGANIC SOIL SUBSTRATE
SILT/MUCK SUBSTRATE

Average Depth: 37 cm  Visible Flow: Yes  Rain In Previous 24 Hours: Unknown

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Potamogeton* | | LW-34011101001 | | | |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |
| *Peltandra virginica* | Green arrow arum | LW-34010201003001 | 7 | OBL | FORB/HERB |
| *Elodea* | | LW-34010701001 | | | |
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |
| *Lemna* | | LW-34010201002 | | | |

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

### Additional Summary Variables

**Station Number: W-281** Waterbody: FIELDS GROVE - SALMON BROOOK (NH) Town: Not Designated

**Log Number: DN-2015-281-WET-NAS-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 0.33 | 0.003 | 1 | 0.10 |
| EPT Taxa: | 0.33 | 0.003 | 1 | 0.10 |
| Insects: | 11.33 | 0.088 | 5 | 0.50 |
| Non-Insects: | 117.67 | 0.912 | 5 | 0.50 |
| Leeches: | 19.33 | 0.150 | 1 | 0.10 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 5.33 | 0.041 | 2 | 0.20 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 22.67 | 0.176 | 1 | 0.10 |
| Amphipods: | 70.33 | 0.545 | 1 | 0.10 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.33 | 0.003 | 1 | 0.10 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 0.00 | 0.000 | 0 | 0.00 |
| Diptera: | 9.33 | 0.072 | 3 | 0.30 |
| Hemiptera: | 1.67 | 0.013 | 1 | 0.10 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 9.33 | 0.072 | 3 | 0.30 |
| Tanypodinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomiinae Tribe: | 9.33 | 0.072 | 3 | 0.30 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 3.73 | 0.029 | 1 | 0.10 |
| Collector-Gatherers: | 70.67 | 0.548 | 2 | 0.20 |
| Predators: | 4.67 | 0.036 | 1 | 0.10 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 23.60 | 0.183 | 2 | 0.20 |
| Scrapers: | 5.33 | 0.041 | 2 | 0.20 |
| Maine Tolerance: | | | | |
| Sensitive: | 0.00 | 0.000 | 0 | 0.00 |
| Intermediate: | 85.33 | 0.670 | 7 | 0.78 |
| Eurytopic: | 42.00 | 0.330 | 2 | 0.22 |
| Ratio of MTI Sensitive to Eurytopic | 0.00 | 0.000 | 0.00 | 0.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-281** Waterbody: FIELDS GROVE - SALMON BROOOK (NH) Town: Not Designated

**Log Number: DN-2015-281-WET-NAS-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Helobdella* | 08030101005 | 0.00 | 19.33 | -- | -- | 43-E | -- | Leech |
| *Helobdella elongata* | 08030101005001 | 8.00 | 0.00 | -- | -- | -- | -- | Leech |
| *Helobdella modesta* | 08030101005004 | 11.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Caecidotea* | 09010101001 | 0.00 | 22.67 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 22.67 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 70.33 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 70.33 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Caenis* | 09020412040 | 0.33 | 0.33 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 1.67 | 1.67 | -- | -- | -- | -- | True Bug |
| Chironomidae | 09021011 | 2.67 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Cryptochironomus* | 09021011082 | 3.33 | 4.67 | 8 | PR | 31.3-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 2.67 | 3.73 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.67 | 0.93 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Gyraulus* | 10010203029 | 2.67 | 2.67 | -- | SC | 37.2-I | -- | Snail |
| *Helisoma* | 10010203030 | 2.67 | 2.67 | -- | SC | 42.8-I | -- | Snail |

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

### Station Information

**Station Number: W-282** Trip ID: 2015-282-WET-NAS-2 River Basin: Merrimack
Waterbody: THE COVE (NH) HUC8 Name:
Town: Not Designated Latitude: 42 45 24.29 N
Mitigation Monitoring Site: No Longitude: 71 28 32.92 W

### Sample Information

**Sample ID: DN-2015-282-WET-NAS-2** Type of Sample: DIPNET Date Sampled: 7/15/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: B** Date: 10/25/2016
Model Result with P≥0.6: B **Reason for Determination: Model**
Date Last Calculated: 8/26/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.01 | Class C: | 0.35 |
| Class B: | 0.64 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.65 |
| Class C or Non-Attainment | 0.35 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.01 |
| Class B or C or Non-Attainment | 0.99 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 249 | < 787 |
| Ephemeroptera Abundance | 52.33 | most > 35 |
| Odonata Relative Abundance | 0.033 | most > 0.04 |
| Trichoptera Relative Abundance | 0.029 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.14 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.41 | < 0.4 |
| MTI Sensitive Taxa Abundance | 12.67 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.06 | most > 0.05 |
| MTI Sensitive Taxa Richness | 5 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.75 | > 0.5 |
| MTI Intermediate Taxa Richness | 13 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.30 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 29 |
| Hilsenhoff Biotic Index: | 7.73 |
| Shannon-Weiner Diversity: | 3.10 |
| Maine Tolerance Index: | 29.53 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 35.21 |
| 2 | *Caenis* | 21.02 |
| 3 | *Caecidotea communis* | 14.46 |
| 4 | *Hydrobiidae* | 5.35 |
| 5 | *Erpobdella punctata* | 3.35 |

## Sample Collection and Processing Information

Sampling Organization: JP
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/15/2015 11:48:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 10.5 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 131.9 | % | |
| Surface Water | In-situ | Specific Conductance | 7.38 | us/cm | |
| Surface Water | In-situ | Temperature | 565 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 24 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 4 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 6 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 2 | | | |
| Watershed Characterization and Non-point Sources: | 12 | Subclass 1: | FLOATING VASCULAR | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: OXBOW POND IMPACTED BY AREA DEVELOPMENT AND LOSS OF FULL HYDROLOGIC CONNECTION TO NASHUA RIVER. UPLAND IS MORE THAN 50% INVASIVE SPECIES

| Habitat Classification: | Substrate Classification: |
|---|---|
| EMERGENT NON-PERSISTENT VEGETATION | GRAVEL SUBSTRATE |
| EMERGENT PERSISTENT VEGETATION | ORGANIC SOIL SUBSTRATE |
| OPEN WATER STANDING | SILT/MUCK SUBSTRATE |

Average Depth: 60 cm  Visible Flow: No  Rain In Previous 24 Hours: Unknown

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Schoenoplectus tabernaemontani* | Softstem bulrush | LW-34010501011011 | 5 | OBL | GRAMINOID |
| *Phragmites australis* | Common reed | LW-34010502056001 | 0 | FACW | GRAMINOID |
| *Typha* | | LW-34011301002 | | | |
| *Impatiens capensis* | Jewelweed | LW-34021901001001 | 2 | FACW | FORB/HERB |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Polygonum* | | LW-34023701005 | | | |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Sparganium* | | LW-34011301001 | | | |
| *Verbena hastata* | Swamp verbena | LW-34022312001002 | 4 | FACW | FORB/HERB |
| *Hypericum* | | LW-34022601001 | | | |
| *Lemna* | | LW-34010201002 | | | |

## Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Poaceae* | | LW-34010502 | | | |
| *Cyperus esculentus* | Yellow nutsedge | LW-34010501004005 | 2 | FACW | GRAMINOID |
| *Rorippa* | | LW-34020701029 | | | |

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

### Additional Summary Variables

**Station Number: W-282** Waterbody: THE COVE (NH) Town: Not Designated

**Log Number: DN-2015-282-WET-NAS-2** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 68.00 | 0.273 | 7 | 0.24 |
| EPT Taxa: | 59.67 | 0.240 | 3 | 0.10 |
| Insects: | 78.33 | 0.315 | 17 | 0.59 |
| Non-Insects: | 170.67 | 0.685 | 12 | 0.41 |
| Leeches: | 8.67 | 0.035 | 2 | 0.07 |
| Oligochaetes: | 9.33 | 0.037 | 2 | 0.07 |
| Snails: | 17.33 | 0.070 | 4 | 0.14 |
| Bivalves: | 7.67 | 0.031 | 1 | 0.03 |
| Isopods: | 36.00 | 0.145 | 1 | 0.03 |
| Amphipods: | 87.67 | 0.352 | 1 | 0.03 |
| Mites: | 4.00 | 0.016 | 1 | 0.03 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 52.33 | 0.210 | 1 | 0.03 |
| Odonates: | 8.33 | 0.033 | 4 | 0.14 |
| Caddisflies: | 7.33 | 0.029 | 2 | 0.07 |
| Diptera: | 7.33 | 0.029 | 7 | 0.24 |
| Hemiptera: | 3.00 | 0.012 | 3 | 0.10 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 7.00 | 0.028 | 6 | 0.21 |
| Tanypodinae Tribe: | 0.67 | 0.003 | 2 | 0.07 |
| Chironomiinae Tribe: | 6.33 | 0.025 | 4 | 0.14 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 8.67 | 0.035 | 2 | 0.07 |
| Collector-Gatherers: | 147.33 | 0.592 | 5 | 0.17 |
| Predators: | 14.67 | 0.059 | 9 | 0.31 |
| Piercers: | 2.67 | 0.011 | 1 | 0.03 |
| Shredders: | 36.00 | 0.145 | 1 | 0.03 |
| Scrapers: | 3.00 | 0.012 | 2 | 0.07 |
| Maine Tolerance: | | | | |
| Sensitive: | 12.67 | 0.058 | 5 | 0.23 |
| Intermediate: | 163.67 | 0.751 | 13 | 0.59 |
| Eurytopic: | 41.67 | 0.191 | 4 | 0.18 |
| Ratio of MTI Sensitive to Eurytopic | 0.30 | 0.304 | 1.25 | 1.25 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-282** Waterbody: THE COVE (NH) Town: Not Designated

**Log Number: DN-2015-282-WET-NAS-2** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Naididae | 08020202 | 2.67 | 2.67 | -- | -- | -- | -- | Worm |
| *Stylaria* | 08020202014 | 0.00 | 6.67 | -- | CG | 18-S | -- | Worm |
| *Stylaria lacustris* | 08020202014002 | 6.67 | 0.00 | -- | -- | -- | -- | Worm |
| *Helobdella* | 08030101005 | 0.00 | 0.33 | -- | -- | 43-E | -- | Leech |
| *Helobdella fusca* | 08030101005002 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Erpobdella* | 08030203002 | 0.00 | 8.33 | -- | -- | 36.4-I | -- | Leech |
| *Erpobdella punctata* | 08030203002001 | 8.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Caecidotea* | 09010101001 | 0.00 | 36.00 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 36.00 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 87.67 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 87.67 | 0.00 | -- | -- | -- | -- | Amphipod |
| Libellulidae | 09020306 | 1.33 | 1.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Sympetrum* | 09020306041 | 4.67 | 4.67 | 10 | PR | 37-I | -- | Dragonfly/damselfly |
| *Lestes* | 09020308045 | 0.33 | 0.33 | 9 | PR | 32.6-I | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 2.00 | 2.00 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 52.33 | 52.33 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 1.00 | 1.00 | -- | -- | -- | -- | True Bug |
| *Mesovelia* | 09020509024 | 0.67 | 0.67 | -- | PR | 60.6-E | -- | True Bug |
| *Neoplea* | 09020512016 | 1.33 | 1.33 | -- | PR | 35.5-I | -- | True Bug |
| *Orthotrichia* | 09020607031 | 2.67 | 2.67 | -- | P | -- | -- | Caddisfly |
| *Oecetis* | 09020618078 | 4.67 | 4.67 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Bezzia/palpomyia* | 09021010043 | 0.33 | 0.33 | 6 | PR | 26.9-I | -- | Fly: Biting Midge |
| *Ablabesmyia* | 09021011001 | 0.33 | 0.33 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Labrundinia* | 09021011008 | 0.33 | 0.33 | 7 | PR | 18.1-S | T | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 4.67 | 4.67 | 6 | -- | 43-E | Y | Fly: Midge |
| *Tanytarsus* | 09021011076 | 1.00 | 1.00 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Cladopelma* | 09021011081 | 0.33 | 0.33 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Lauterborniella* | 09021011092 | 0.00 | 0.33 | -- | CG | 17.4-S | C | Fly: Midge |
| *Lauterborniella agrayloides* | 09021011092001 | 0.33 | 0.00 | -- | -- | -- | C | Fly: Midge |
| Arachnida | 0903 | 1.33 | 1.33 | -- | -- | -- | -- | Arachnid |
| *Arrenurus* | 09030111001 | 2.67 | 2.67 | -- | -- | 23.8-I | -- | Mite |
| Hydrobiidae | 10010104 | 13.33 | 13.33 | -- | -- | -- | -- | Snail |
| *Amnicola* | 10010104013 | 0.67 | 0.67 | -- | SC | 18.7-S | -- | Snail |
| Lymnaeidae | 10010201 | 1.00 | 1.00 | -- | -- | -- | -- | Snail |
| *Gyraulus* | 10010203029 | 0.00 | 2.33 | -- | SC | 37.2-I | -- | Snail |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-282** Waterbody: THE COVE (NH) Town: Not Designated

**Log Number: DN-2015-282-WET-NAS-2** Subsample Factor: X1 Replicates: 3 Calculated: 8/26/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Gyraulus deflectus* | 10010203029056 | 1.67 | 0.00 | -- | -- | -- | -- | Snail |
| *Gyraulus parvus* | 10010203029057 | 0.67 | 0.00 | -- | -- | -- | -- | Snail |
| *Pisidium* | 10020201002 | 7.67 | 7.67 | -- | CF | -- | -- | Clam |

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

### Station Information

| | | | | | |
|---|---|---|---|---|---|
| **Station Number:** | **W-268** | Trip ID: | 2014-268-WET-NWB-1 | River Basin: | Merrimack |
| Waterbody: | GREAT MEADOW (NH) | | | HUC8 Name: | Merrimack River |
| Town: | Not Designated | | | Latitude: | 43 0 40.56 N |
| Mitigation Monitoring Site: | No | | | Longitude: | 71 44 13.65 W |

### Sample Information

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | **DN-2014-268-WET-NWB-1** | Type of Sample: | DIPNET | Date Sampled: | 8/4/2014 |
| Subsample Factor: | X1 | Replicates: | 3 | | |

### Classification Attainment

| | | | | | |
|---|---|---|---|---|---|
| **Statutory Class:** | **A** | **Final Determination:** | **B** | Date: | 2/9/2016 |
| Model Result with P≥0.6: | B | **Reason for Determination:** | **Model** | | |
| Date Last Calculated: | 10/19/2015 | Comments: | | | |

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.05 | Class C: | 0.27 |
| Class B: | 0.68 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.74 |
| Class C or Non-Attainment | 0.27 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.05 |
| Class B or C or Non-Attainment | 0.95 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 624 | < 787 |
| Ephemeroptera Abundance | 3.67 | most > 35 |
| Odonata Relative Abundance | 0.014 | most > 0.04 |
| Trichoptera Relative Abundance | 0.049 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.01 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.26 | < 0.4 |
| MTI Sensitive Taxa Abundance | 31.02 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.05 | most > 0.05 |
| MTI Sensitive Taxa Richness | 4 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.93 | > 0.5 |
| MTI Intermediate Taxa Richness | 16 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 3.00 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 27 |
| Hilsenhoff Biotic Index: | 7.89 |
| Shannon-Weiner Diversity: | 1.32 |
| Maine Tolerance Index: | 24.66 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 82.81 |
| 2 | *Polycentropus* | 4.43 |
| 3 | *Arachnida* | 2.08 |
| 4 | *Helobdella modesta* | 1.55 |
| 5 | *Enallagma* | 1.39 |

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

## Sample Collection and Processing Information

Sampling Organization: NHDES
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/4/2014 12:45:00 PM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 2.32 | mg/l | |
| Surface Water | In-situ | pH | 6.01 | | |
| Surface Water | In-situ | Specific Conductance | 75.3 | us/cm | |
| Surface Water | In-situ | Temperature | 23.6 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting | |
|---|---|---|---|---|---|
| Total Score: | 11 | System: | PALUSTRINE | Landscape Position: | |
| Hydrologic Modifications: | 1 | Subsystem: | | Lotic Gradient: | |
| Vegetative Modifications: | 1 | Class 1: | SCRUB SHRUB | Flow Path: | THROUGHFLOW |
| Chemical Pollutants: | 1 | Subclass 1: | BROAD-LEAVED DECIDUOUS | Land Form: | |
| Watershed Characterization and Non-point Sources: | 8 | Class 2: | EMERGENT | Land Form Type: | |
| | | Subclass 2: | PERSISTENT | Waterbody Type: | |
| | | Class 3: | | Waterbody Subtype: | |
| | | Subclass 3: | | | |
| | | | | Comments: | |

Dominant Plant Species:

Additional Plant Community Observations: FLOATING MAP AND NORTHEAST AREA OF WETLAND -- DOMINATED BY PROSERPINACA PALUSTRIS, BUT OVERALL VERY DIVERSE GRAMINOIDS AND FORBS. PLANT LIST IS NOT COMPREHENSIVE.

| Habitat Classification: | Substrate Classification: |
|---|---|
| AQUATIC MACROPHYTE BED | SAND SUBSTRATE |
| EMERGENT NON-PERSISTENT VEGETATION | SILT/MUCK SUBSTRATE |
| SCRUB SHRUB | |

Average Depth: 73 cm  Visible Flow: No  Rain In Previous 24 Hours: Yes

Sample Comments: HAD A RAIN SHOWER AFTER METER READINGS AT SITE 2.

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Utricularia intermedia* | Flatleaf bladderwort | LW-34022305002004 | 6 | OBL | FORB/HERB |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Potamogeton natans* | Floating pondweed | LW-34011101001009 | 5 | OBL | FORB/HERB |
| *Utricularia macrorhiza* | Common bladderwort | LW-34022305002005 | 3 | OBL | FORB/HERB |
| *Juncus* | | LW-34010801001 | | | |
| *Polygonum amphibium* | Water knotweed | LW-34023701005002 | 5 | OBL | FORB/HERB |
| *Potamogeton amplifolius* | Largeleaf pondweed | LW-34011101001002 | 6 | OBL | FORB/HERB |
| *Proserpinaca palustris* | Marsh mermaidweed | LW-34022001002001 | 5 | OBL | FORB/HERB |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Schoenoplectus tabernaemontani* | Softstem bulrush | LW-34010501011011 | 5 | OBL | GRAMINOID |
| *Sparganium americanum* | American bur-reed | LW-34011301001001 | 5 | OBL | FORB/HERB |
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Eleocharis* | | LW-34010501006 | | | |

## Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Sagittaria latifolia* | Broadleaf arrowhead | LW-34011401002005 | 5 | OBL | FORB/HERB |
| *Potamogeton* | | LW-34011101001 | | | |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Ilex verticillata* | Common winterberry | LW-34020201001005 | 3 | FACW | TREE, SHRUB |

## Additional Summary Variables

**Station Number: W-268** Waterbody: GREAT MEADOW (NH) Town: Not Designated

**Log Number: DN-2014-268-WET-NWB-1** Subsample Factor: X1 Replicates: 3 Calculated: 10/19/2015

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 43.00 | 0.069 | 7 | 0.26 |
| EPT Taxa: | 34.00 | 0.054 | 5 | 0.19 |
| Insects: | 71.00 | 0.114 | 20 | 0.74 |
| Non-Insects: | 553.33 | 0.886 | 7 | 0.26 |
| Leeches: | 13.00 | 0.021 | 2 | 0.07 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 6.67 | 0.011 | 1 | 0.04 |
| Bivalves: | 2.33 | 0.004 | 2 | 0.07 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 517.00 | 0.828 | 1 | 0.04 |
| Mites: | 13.00 | 0.021 | 1 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 3.67 | 0.006 | 2 | 0.07 |
| Odonates: | 9.00 | 0.014 | 2 | 0.07 |
| Caddisflies: | 30.33 | 0.049 | 3 | 0.11 |
| Diptera: | 15.33 | 0.025 | 8 | 0.30 |
| Hemiptera: | 12.00 | 0.019 | 4 | 0.15 |
| Beetles: | 0.67 | 0.001 | 1 | 0.04 |
| Chironomids: | 14.33 | 0.023 | 7 | 0.26 |
| Tanypodinae Tribe: | 4.78 | 0.008 | 2 | 0.07 |
| Chironomiinae Tribe: | 9.56 | 0.015 | 5 | 0.19 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 5.06 | 0.008 | 4 | 0.15 |
| Collector-Gatherers: | 523.06 | 0.838 | 5 | 0.19 |
| Predators: | 46.78 | 0.075 | 8 | 0.30 |
| Piercers: | 4.00 | 0.006 | 2 | 0.07 |
| Shredders: | 4.44 | 0.007 | 1 | 0.04 |
| Scrapers: | 6.67 | 0.011 | 1 | 0.04 |
| Maine Tolerance: | | | | |
| Sensitive: | 31.02 | 0.052 | 4 | 0.19 |
| Intermediate: | 556.65 | 0.931 | 16 | 0.76 |
| Eurytopic: | 10.33 | 0.017 | 1 | 0.05 |
| Ratio of MTI Sensitive to Eurytopic | 3.00 | 3.002 | 4.00 | 4.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-268** Waterbody: GREAT MEADOW (NH) Town: Not Designated

**Log Number: DN-2014-268-WET-NWB-1** Subsample Factor: X1 Replicates: 3 Calculated: 10/19/2015

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Helobdella* | 08030101005 | 0.00 | 10.33 | -- | -- | 43-E | -- | Leech |
| *Helobdella elongata* | 08030101005001 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Helobdella fusca* | 08030101005002 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Helobdella modesta* | 08030101005004 | 9.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Erpobdella* | 08030203002 | 0.00 | 2.67 | -- | -- | 36.4-I | -- | Leech |
| *Erpobdella punctata* | 08030203002001 | 2.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Hyalella* | 09010203006 | 0.00 | 517.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 517.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| Libellulidae | 09020306 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 8.67 | 8.67 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Callibaetis* | 09020401002 | 2.00 | 2.00 | 9 | CG | 40.5-I | -- | Mayfly |
| *Caenis* | 09020412040 | 1.67 | 1.67 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 6.00 | 6.00 | -- | -- | -- | -- | True Bug |
| *Hesperocorixa* | 09020501004 | 3.33 | 3.33 | -- | P | -- | -- | True Bug |
| *Pelocoris* | 09020504013 | 1.00 | 1.00 | -- | PR | 24.7-I | -- | True Bug |
| *Neoplea* | 09020512016 | 1.67 | 1.67 | -- | PR | 35.5-I | -- | True Bug |
| *Polycentropus* | 09020603010 | 27.67 | 27.67 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Oxyethira* | 09020607028 | 0.67 | 0.67 | 3 | P | 22-S | -- | Caddisfly |
| *Oecetis* | 09020618078 | 2.00 | 2.00 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Chaoborus* | 09021007025 | 1.00 | 1.00 | 8 | PR | 25-I | -- | Fly: Phantom Midge |
| Chironomidae | 09021011 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 4.00 | 4.10 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Guttipelopia* | 09021011006 | 0.67 | 0.68 | 5 | PR | 19.4-S | T | Fly: Midge |
| *Tanytarsus* | 09021011076 | 0.67 | 0.68 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 0.67 | 0.68 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 1.67 | 1.71 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 2.00 | 2.05 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 4.33 | 4.44 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Donacia* | 09021114071 | 0.67 | 0.67 | -- | -- | 25.1-I | -- | Beetle |
| Arachnida | 0903 | 13.00 | 13.00 | -- | -- | -- | -- | Arachnid |
| Mollusca | 10 | 1.33 | 1.33 | -- | -- | -- | -- | Mollusk |
| *Gyraulus* | 10010203029 | 0.00 | 6.67 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 6.67 | 0.00 | -- | -- | -- | -- | Snail |
| Sphaeriidae | 10020201 | 1.67 | 1.67 | -- | CF | -- | -- | Clam |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-268** Waterbody: GREAT MEADOW (NH) Town: Not Designated

**Log Number: DN-2014-268-WET-NWB-1** Subsample Factor: X1 Replicates: 3 Calculated: 10/19/2015

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Pisidium* | 10020201002 | 0.67 | 0.67 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-283** Trip ID: 2015-283-WET-PEM-1 River Basin: Merrimack
Waterbody: BRICKETT HILL ROAD POND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 43 10 27.61 N
Mitigation Monitoring Site: No Longitude: 71 28 4.6 W

### Sample Information

**Sample ID: DN-2015-283-WET-PEM-1** Type of Sample: DIPNET Date Sampled: 8/14/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/30/2016 Comments: Minimum provisions for Total Mean Abundance not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.97 |
| Class B: | 0.03 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.03 |
| Class C or Non-Attainment | 0.97 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 34 | < 787 |
| Ephemeroptera Abundance | 7.33 | most > 35 |
| Odonata Relative Abundance | 0.117 | most > 0.04 |
| Trichoptera Relative Abundance | 0.019 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.10 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.21 | < 0.4 |
| MTI Sensitive Taxa Abundance | 0.67 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.02 | most > 0.05 |
| MTI Sensitive Taxa Richness | 2 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.84 | > 0.5 |
| MTI Intermediate Taxa Richness | 10 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.14 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 19 |
| Hilsenhoff Biotic Index: | 7.50 |
| Shannon-Weiner Diversity: | 3.39 |
| Maine Tolerance Index: | 28.90 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Caenis* | 20.39 |
| 2 | *Hyalella azteca* | 18.45 |
| 3 | *Gyraulus deflectus* | 13.59 |
| 4 | *Enallagma* | 10.68 |
| 4 | *Paratanytarsus* | 10.68 |
| 5 | *Polypedilum braseniae* | 7.77 |

## Sample Collection and Processing Information

Sampling Organization: SC, TW, JP
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/14/2015 9:40:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 3.83 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 42.1 | % | |
| Surface Water | In-situ | pH | 5.98 | | |
| Surface Water | In-situ | Specific Conductance | 175.8 | us/cm | |
| Surface Water | In-situ | Temperature | 20.01 | deg c | |

## Landcover Summary - 2004 Data

## Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 7 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 2 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 1 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 0 | | | |
| Watershed Characterization and Non-point Sources: | 4 | Subclass 1: | | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
OPEN WATER STANDING

Substrate Classification:
BEDROCK SUBSTRATE
DETRITUS SUBSTRATE
SAND SUBSTRATE

Average Depth: 49 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments:

## Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Sparganium* | | LW-34011301001 | | | |
| *Ilex verticillata* | Common winterberry | LW-34020201001005 | 3 | FACW | TREE, SHRUB |
| *Glyceria canadensis* | Rattlesnake mannagrass | LW-34010502036003 | 4 | OBL | GRAMINOID |
| *Utricularia macrorhiza* | Common bladderwort | LW-34022305002005 | 3 | OBL | FORB/HERB |
| *Triadenum* | | LW-34022601002 | | | |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Carex comosa* | Longhair sedge | LW-34010501002039 | 6 | OBL | GRAMINOID |
| *Bidens* | | LW-34020501012 | | | |
| *Salix* | | LW-34024401002 | | | |
| *Vaccinium* | | LW-34021302023 | | | |

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

### Additional Summary Variables

**Station Number: W-283** Waterbody: BRICKETT HILL ROAD POND (NH) Town: Not Designated

**Log Number: DN-2015-283-WET-PEM-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 12.00 | 0.350 | 5 | 0.26 |
| EPT Taxa: | 8.00 | 0.233 | 3 | 0.16 |
| Insects: | 22.67 | 0.660 | 15 | 0.79 |
| Non-Insects: | 11.67 | 0.340 | 4 | 0.21 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 5.00 | 0.146 | 2 | 0.11 |
| Bivalves: | 0.00 | 0.000 | 0 | 0.00 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 6.33 | 0.184 | 1 | 0.05 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 7.33 | 0.214 | 2 | 0.11 |
| Odonates: | 4.00 | 0.117 | 2 | 0.11 |
| Caddisflies: | 0.67 | 0.019 | 1 | 0.05 |
| Diptera: | 10.33 | 0.301 | 9 | 0.47 |
| Hemiptera: | 0.33 | 0.010 | 1 | 0.05 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 10.33 | 0.301 | 9 | 0.47 |
| Tanypodinae Tribe: | 1.00 | 0.029 | 1 | 0.05 |
| Chironomiinae Tribe: | 9.33 | 0.272 | 8 | 0.42 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 0.33 | 0.010 | 1 | 0.05 |
| Collector-Gatherers: | 15.67 | 0.456 | 7 | 0.37 |
| Predators: | 5.00 | 0.146 | 3 | 0.16 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 3.33 | 0.097 | 2 | 0.11 |
| Scrapers: | 4.67 | 0.136 | 1 | 0.05 |
| Maine Tolerance: | | | | |
| Sensitive: | 0.67 | 0.020 | 2 | 0.13 |
| Intermediate: | 27.33 | 0.837 | 10 | 0.67 |
| Eurytopic: | 4.67 | 0.143 | 3 | 0.20 |
| Ratio of MTI Sensitive to Eurytopic | 0.14 | 0.143 | 0.67 | 0.67 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-283** Waterbody: BRICKETT HILL ROAD POND (NH) Town: Not Designated

**Log Number: DN-2015-283-WET-PEM-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Hyalella* | 09010203006 | 0.00 | 6.33 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 6.33 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Orconectes* | 09010301008 | 0.33 | 0.33 | -- | CG | -- | -- | Crayfish |
| Libellulidae | 09020306 | 0.33 | 0.33 | -- | -- | -- | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 3.67 | 3.67 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Callibaetis* | 09020401002 | 0.33 | 0.33 | 9 | CG | 40.5-I | -- | Mayfly |
| *Caenis* | 09020412040 | 7.00 | 7.00 | 7 | CG | 22.1-I | -- | Mayfly |
| *Mesovelia* | 09020509024 | 0.33 | 0.33 | -- | PR | 60.6-E | -- | True Bug |
| Phryganeidae | 09020608 | 0.67 | 0.67 | -- | -- | -- | -- | Caddisfly |
| *Procladius* | 09021011015 | 1.00 | 1.00 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 3.67 | 3.67 | 6 | -- | 43-E | Y | Fly: Midge |
| *Chironomus* | 09021011080 | 0.67 | 0.67 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 0.67 | 0.67 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Glyptotendipes* | 09021011088 | 0.67 | 0.67 | 10 | SH | 43-E | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 0.33 | 0.33 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.00 | 2.67 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Polypedilum braseniae* | 09021011102196 | 2.67 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Tribelos* | 09021011107 | 0.33 | 0.33 | 5 | CG | 9.3-S | C | Fly: Midge |
| *Omisus* | 09021011130 | 0.33 | 0.33 | -- | -- | 20.7-S | H | Fly: Midge |
| Lymnaeidae | 10010201 | 0.33 | 0.33 | -- | -- | -- | -- | Snail |
| *Gyraulus* | 10010203029 | 0.00 | 4.67 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 4.67 | 0.00 | -- | -- | -- | -- | Snail |

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

### Station Information

**Station Number: W-284** Trip ID: 2015-284-WET-SAL-1 River Basin: Merrimack
Waterbody: WORLD END POND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 42 45 22.03 N
Mitigation Monitoring Site: No Longitude: 71 11 20.07 W

### Sample Information

**Sample ID: DN-2015-284-WET-SAL-1** Type of Sample: DIPNET Date Sampled: 7/6/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: C** Date: 10/25/2016
Model Result with P≥0.6: C **Reason for Determination: Model**
Date Last Calculated: 8/30/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.99 |
| Class B: | 0.01 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.01 |
| Class C or Non-Attainment | 0.99 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 77 | < 787 |
| Ephemeroptera Abundance | 0.33 | most > 35 |
| Odonata Relative Abundance | 0.009 | most > 0.04 |
| Trichoptera Relative Abundance | 0.061 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.36 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.57 | < 0.4 |
| MTI Sensitive Taxa Abundance | 9.33 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.13 | most > 0.05 |
| MTI Sensitive Taxa Richness | 3 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.42 | > 0.5 |
| MTI Intermediate Taxa Richness | 14 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.29 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 28 |
| Hilsenhoff Biotic Index: | 7.86 |
| Shannon-Weiner Diversity: | 3.25 |
| Maine Tolerance Index: | 36.09 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Caecidotea communis* | 35.06 |
| 2 | *Hyalella azteca* | 22.08 |
| 3 | *Helobdella modesta* | 6.06 |
| 3 | *Polycentropus* | 6.06 |
| 4 | *Amnicola* | 5.63 |
| 5 | *Arrenurus* | 5.19 |

## Sample Collection and Processing Information

Sampling Organization: JP, SC, SM
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/6/2015 10:33:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 6.35 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 74.1 | % | |
| Surface Water | In-situ | pH | 6.72 | | |
| Surface Water | In-situ | Specific Conductance | 372 | us/cm | |
| Surface Water | In-situ | Temperature | 23.6 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 14 | System: | LACUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 2 | Subsystem: | LITTORAL | Lotic Gradient: |
| Vegetative Modifications: | 2 | Class 1: | AQUATIC BED | Flow Path: |
| Chemical Pollutants: | 1 | Subclass 1: | | Land Form: |
| Watershed Characterization and Non-point Sources: | 9 | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
EMERGENT PERSISTENT VEGETATION

Substrate Classification:
PEAT SUBSTRATE

Average Depth: 81 cm  Visible Flow: No  Rain In Previous 24 Hours: Unknown

Sample Comments:

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Utricularia intermedia* | Flatleaf bladderwort | LW-34022305002004 | 6 | OBL | FORB/HERB |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Typha* | | LW-34011301002 | | | |
| *Eleocharis* | | LW-34010501006 | | | |
| *Myrica gale* | Sweetgale | LW-34022801003001 | 5 | OBL | SHRUB |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Sparganium* | | LW-34011301001 | | | |
| *Proserpinaca palustris* | Marsh mermaidweed | LW-34022001002001 | 5 | OBL | FORB/HERB |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Lemna minor* | Common duckweed | LW-34010201002001 | 3 | OBL | FORB/HERB |
| *Lemna trisulca* | Star duckweed | LW-34010201002002 | 4 | OBL | FORB/HERB |
| *Utricularia* | | LW-34022305002 | | | |

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

### Additional Summary Variables

**Station Number: W-284** Waterbody: WORLD END POND (NH) Town: Not Designated

**Log Number: DN-2015-284-WET-SAL-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 5.67 | 0.074 | 3 | 0.11 |
| EPT Taxa: | 5.00 | 0.065 | 2 | 0.07 |
| Insects: | 12.67 | 0.165 | 12 | 0.43 |
| Non-Insects: | 64.33 | 0.835 | 16 | 0.57 |
| Leeches: | 6.33 | 0.082 | 4 | 0.14 |
| Oligochaetes: | 0.67 | 0.009 | 2 | 0.07 |
| Snails: | 8.00 | 0.104 | 5 | 0.18 |
| Bivalves: | 0.67 | 0.009 | 1 | 0.04 |
| Isopods: | 27.00 | 0.351 | 1 | 0.04 |
| Amphipods: | 17.00 | 0.221 | 1 | 0.04 |
| Mites: | 4.33 | 0.056 | 1 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.33 | 0.004 | 1 | 0.04 |
| Odonates: | 0.67 | 0.009 | 1 | 0.04 |
| Caddisflies: | 4.67 | 0.061 | 1 | 0.04 |
| Diptera: | 4.33 | 0.056 | 7 | 0.25 |
| Hemiptera: | 2.67 | 0.035 | 2 | 0.07 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 4.33 | 0.056 | 7 | 0.25 |
| Tanypodinae Tribe: | 0.67 | 0.009 | 2 | 0.07 |
| Chironomiinae Tribe: | 3.00 | 0.039 | 4 | 0.14 |
| Orthoclodiinae Tribe: | 0.67 | 0.009 | 1 | 0.04 |
| Collector-Filterers: | 0.67 | 0.009 | 1 | 0.04 |
| Collector-Gatherers: | 20.33 | 0.264 | 6 | 0.21 |
| Predators: | 8.00 | 0.104 | 5 | 0.18 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 27.67 | 0.359 | 2 | 0.07 |
| Scrapers: | 5.67 | 0.074 | 3 | 0.11 |
| Maine Tolerance: | | | | |
| Sensitive: | 9.33 | 0.131 | 3 | 0.15 |
| Intermediate: | 29.67 | 0.416 | 14 | 0.70 |
| Eurytopic: | 32.33 | 0.453 | 3 | 0.15 |
| Ratio of MTI Sensitive to Eurytopic | 0.29 | 0.289 | 1.00 | 1.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-284** Waterbody: WORLD END POND (NH) Town: Not Designated

**Log Number: DN-2015-284-WET-SAL-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Nematoda | 05 | 0.33 | 0.33 | -- | -- | -- | -- | Nematode |
| Naididae | 08020202 | 0.33 | 0.33 | -- | -- | -- | -- | Worm |
| *Stylaria* | 08020202014 | 0.33 | 0.33 | -- | CG | 18-S | -- | Worm |
| *Alboglossiphonia* | 08030101002 | 0.00 | 0.67 | -- | -- | -- | -- | Leech |
| *Alboglossiphonia heteroclita* | 08030101002001 | 0.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Glossiphonia* | 08030101004 | 0.33 | 0.33 | -- | -- | 55.3-E | -- | Leech |
| *Helobdella* | 08030101005 | 0.00 | 5.00 | -- | -- | 43-E | -- | Leech |
| *Helobdella papillata* | 08030101005003 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Helobdella modesta* | 08030101005004 | 4.67 | 0.00 | -- | -- | -- | -- | Leech |
| *Erpobdella* | 08030203002 | 0.00 | 0.33 | -- | -- | 36.4-I | -- | Leech |
| *Erpobdella punctata* | 08030203002001 | 0.33 | 0.00 | -- | -- | -- | -- | Leech |
| *Caecidotea* | 09010101001 | 0.00 | 27.00 | 8 | SH | 51.9-E | -- | Isopod |
| *Caecidotea communis* | 09010101001001 | 27.00 | 0.00 | -- | -- | -- | -- | Isopod |
| *Hyalella* | 09010203006 | 0.00 | 17.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 17.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Enallagma* | 09020309051 | 0.67 | 0.67 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 0.33 | 0.33 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 0.67 | 0.67 | -- | -- | -- | -- | True Bug |
| *Neoplea* | 09020512016 | 2.00 | 2.00 | -- | PR | 35.5-I | -- | True Bug |
| *Polycentropus* | 09020603010 | 4.67 | 4.67 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Ablabesmyia* | 09021011001 | 0.33 | 0.33 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Procladius* | 09021011015 | 0.33 | 0.33 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Corynoneura* | 09021011036 | 0.67 | 0.67 | 7 | CG | 40.1-I | -- | Fly: Midge |
| *Chironomus* | 09021011080 | 1.67 | 1.67 | 10 | CG | 27.4-I | C | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 0.33 | 0.33 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.67 | 0.67 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Hyporhygma* | 09021011129 | 0.00 | 0.33 | -- | -- | -- | H | Fly: Midge |
| *Hyporhygma quadripunctatus* | 09021011129001 | 0.33 | 0.00 | -- | -- | -- | H | Fly: Midge |
| Arachnida | 0903 | 0.33 | 0.33 | -- | -- | -- | -- | Arachnid |
| *Arrenurus* | 09030111001 | 4.00 | 4.00 | -- | -- | 23.8-I | -- | Mite |
| Hydrobiidae | 10010104 | 0.67 | 0.67 | -- | -- | -- | -- | Snail |
| *Amnicola* | 10010104013 | 4.33 | 4.33 | -- | SC | 18.7-S | -- | Snail |
| Lymnaeidae | 10010201 | 1.67 | 1.67 | -- | -- | -- | -- | Snail |
| *Physa* | 10010202027 | 0.00 | 1.00 | -- | SC | 34-I | -- | Snail |
| *Physa acuta* | 10010202027053 | 1.00 | 0.00 | -- | -- | -- | -- | Snail |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-284** Waterbody: WORLD END POND (NH) Town: Not Designated

**Log Number: DN-2015-284-WET-SAL-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Gyraulus* | 10010203029 | 0.33 | 0.33 | -- | SC | 37.2-I | -- | Snail |
| *Pisidium* | 10020201002 | 0.67 | 0.67 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-285** Trip ID: 2015-285-WET-SAL-2 River Basin: Merrimack
Waterbody: SALEM HS WETLAND (NH) HUC8 Name: Merrimack River
Town: Not Designated Latitude: 42 46 58.03 N
Mitigation Monitoring Site: No Longitude: 71 12 36.15 W

### Sample Information

**Sample ID: DN-2015-285-WET-SAL-2** Type of Sample: DIPNET Date Sampled: 7/20/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/30/2016 Comments: Minimum provisions for Total Mean Abundance and Generic Richness not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.01 |
| Class B: | 0.99 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.99 |
| Class C or Non-Attainment | 0.01 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 45 | < 787 |
| Ephemeroptera Abundance | 0.00 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.000 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.04 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.45 | < 0.4 |
| MTI Sensitive Taxa Abundance | 25.33 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.68 | most > 0.05 |
| MTI Sensitive Taxa Richness | 2 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.27 | > 0.5 |
| MTI Intermediate Taxa Richness | 5 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 12.67 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 11 |
| Hilsenhoff Biotic Index: | 6.80 |
| Shannon-Weiner Diversity: | 2.59 |
| Maine Tolerance Index: | 24.85 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Stylaria* | 51.47 |
| 2 | *Sphaeriidae* | 8.82 |
| 3 | *Bezzia/palpomyia* | 4.41 |
| 3 | *Erpobdella punctata* | 4.41 |
| 3 | *Hyalella azteca* | 4.41 |
| 3 | *Hydrovatus* | 4.41 |

| | | |
|---|---|---|
| 3 | *Lumbriculidae* | 4.41 |
| 3 | *Odontomyia* | 4.41 |
| 3 | *Polypedilum* | 4.41 |
| 3 | *Psectrocladius* | 4.41 |
| 3 | *Tanytarsus* | 4.41 |

## Sample Collection and Processing Information

Sampling Organization: SJC
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/20/2015 11:45:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 0.03 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 0.2 | % | |
| Surface Water | In-situ | pH | 5.93 | | |
| Surface Water | In-situ | Specific Conductance | 1700 | us/cm | |
| Surface Water | In-situ | Temperature | 25.6 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 37 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 8 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 6 | Class 1: | EMERGENT | Flow Path: |
| Chemical Pollutants: | 4 | Subclass 1: | PERSISTENT | Land Form: |
| Watershed Characterization and Non-point Sources: | 19 | Class 2: | | Land Form Type: |
| | | Subclass 2: | | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: SUPERABUNDANCE OF TYPHA LATIFOLIA.

| Habitat Classification: | Substrate Classification: |
|---|---|
| EMERGENT NON-PERSISTENT VEGETATION | ORGANIC SOIL SUBSTRATE |
| EMERGENT PERSISTENT VEGETATION | SILT/MUCK SUBSTRATE |

Average Depth: 26 cm Visible Flow: No Rain In Previous 24 Hours: No

Sample Comments: ORIGIN OF WETLAND IS DIFFICULT TO DETERMINE -- WHETHER IS WAS ENCROACHED UPON OR WHETHER DEVELOPMENT HAS CONTRIBUTED TO ITS FORMATION WITH THE ADDITION OF DRAINAGE FROM NATURAL AND ANTHROPOGENIC SOURCES.

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Eleocharis obtusa* | Blunt spikerush | LW-34010501006010 | 2 | OBL | GRAMINOID |
| *Spiraea* | | LW-34024202026 | | | |
| *Lemna* | | LW-34010201002 | | | |
| *Typha* | | LW-34011301002 | | | |
| *Hypericum* | | LW-34022601001 | | | |
| *Lythrum salicaria* | Purple loosestrife | LW-34022901002004 | 0 | OBL | FORB/HERB |
| *Polygonum* | | LW-34023701005 | | | |
| *Triadenum* | | LW-34022601002 | | | |
| *Cornus* | | LW-34021001001 | | | |
| *Eleocharis acicularis* | Needle spikerush | LW-34010501006001 | 4 | OBL | GRAMINOID |

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

### Additional Summary Variables

**Station Number: W-285** Waterbody: SALEM HS WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-285-WET-SAL-2** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 0.00 | 0.000 | 0 | 0.00 |
| EPT Taxa: | 0.00 | 0.000 | 0 | 0.00 |
| Insects: | 12.00 | 0.265 | 6 | 0.55 |
| Non-Insects: | 33.33 | 0.735 | 5 | 0.45 |
| Leeches: | 2.00 | 0.044 | 1 | 0.09 |
| Oligochaetes: | 25.33 | 0.559 | 2 | 0.18 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 4.00 | 0.088 | 1 | 0.09 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 2.00 | 0.044 | 1 | 0.09 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.00 | 0.000 | 0 | 0.00 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 0.00 | 0.000 | 0 | 0.00 |
| Diptera: | 10.00 | 0.221 | 5 | 0.45 |
| Hemiptera: | 0.00 | 0.000 | 0 | 0.00 |
| Beetles: | 2.00 | 0.044 | 1 | 0.09 |
| Chironomids: | 6.00 | 0.132 | 3 | 0.27 |
| Tanypodinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomiinae Tribe: | 4.00 | 0.088 | 2 | 0.18 |
| Orthoclodiinae Tribe: | 2.00 | 0.044 | 1 | 0.09 |
| Collector-Filterers: | 6.00 | 0.132 | 2 | 0.18 |
| Collector-Gatherers: | 29.33 | 0.647 | 4 | 0.36 |
| Predators: | 4.00 | 0.088 | 2 | 0.18 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 2.00 | 0.044 | 1 | 0.09 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 25.33 | 0.679 | 2 | 0.25 |
| Intermediate: | 10.00 | 0.268 | 5 | 0.63 |
| Eurytopic: | 2.00 | 0.054 | 1 | 0.13 |
| Ratio of MTI Sensitive to Eurytopic | 12.67 | 12.667 | 2.00 | 2.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-285** Waterbody: SALEM HS WETLAND (NH) Town: Not Designated

**Log Number: DN-2015-285-WET-SAL-2** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Lumbriculidae | 08020101 | 2.00 | 2.00 | -- | -- | -- | -- | Worm |
| *Stylaria* | 08020202014 | 23.33 | 23.33 | -- | CG | 18-S | -- | Worm |
| *Erpobdella* | 08030203002 | 0.00 | 2.00 | -- | -- | 36.4-I | -- | Leech |
| *Erpobdella punctata* | 08030203002001 | 2.00 | 0.00 | -- | -- | -- | -- | Leech |
| *Hyalella* | 09010203006 | 0.00 | 2.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 2.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Bezzia/palpomyia* | 09021010043 | 2.00 | 2.00 | 6 | PR | 26.9-I | -- | Fly: Biting Midge |
| *Psectrocladius* | 09021011056 | 2.00 | 2.00 | 8 | CG | 22-S | -- | Fly: Midge |
| *Tanytarsus* | 09021011076 | 2.00 | 2.00 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Polypedilum* | 09021011102 | 2.00 | 2.00 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Odontomyia* | 09021013051 | 2.00 | 2.00 | -- | CG | 94.2-E | -- | Fly: Aquatic Soldier |
| *Hydrovatus* | 09021103007 | 2.00 | 2.00 | -- | PR | -- | -- | Beetle |
| Sphaeriidae | 10020201 | 4.00 | 4.00 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-286** Trip ID: 2015-286-WET-TRO-1 River Basin: Connecticut
Waterbody: PERKINS POND - UPPER (NH) HUC8 Name:
Town: Not Designated Latitude: 42 50 35.89 N
Mitigation Monitoring Site: No Longitude: 72 8 16.39 W

### Sample Information

**Sample ID: DN-2015-286-WET-TRO-1** Type of Sample: DIPNET Date Sampled: 7/29/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: I** Date: 10/25/2016
Model Result with P≥0.6: I **Reason for Determination: Model**
Date Last Calculated: 8/30/2016 Comments: Minimum provisions for Generic Richness not met.

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.98 |
| Class B: | 0.02 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.02 |
| Class C or Non-Attainment | 0.98 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 131 | < 787 |
| Ephemeroptera Abundance | 0.00 | most > 35 |
| Odonata Relative Abundance | 0.005 | most > 0.04 |
| Trichoptera Relative Abundance | 0.003 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.01 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.27 | < 0.4 |
| MTI Sensitive Taxa Abundance | 1.00 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.01 | most > 0.05 |
| MTI Sensitive Taxa Richness | 2 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.99 | > 0.5 |
| MTI Intermediate Taxa Richness | 7 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 1.00 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 11 |
| Hilsenhoff Biotic Index: | 8.04 |
| Shannon-Weiner Diversity: | 0.73 |
| Maine Tolerance Index: | 24.47 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 89.09 |
| 2 | *Procladius* | 6.09 |
| 3 | *Pisidium* | 2.03 |
| 4 | *Arrenurus* | 0.51 |
| 4 | *Polypedilum* | 0.51 |
| 4 | *Tribelos* | 0.51 |
| 5 | *Cladopelma* | 0.25 |

| | | |
|---|---|---|
| 5 | *Corixidae* | 0.25 |
| 5 | *Enallagma* | 0.25 |
| 5 | *Lestes* | 0.25 |
| 5 | *Oecetis* | 0.25 |

## Sample Collection and Processing Information

Sampling Organization: JP
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/29/2015 11:35:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 1.86 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 22 | % | |
| Surface Water | In-situ | pH | 5.51 | | |
| Surface Water | In-situ | Specific Conductance | 45.8 | us/cm | |
| Surface Water | In-situ | Temperature | 24.3 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 8 | System: | LACUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 3 | Subsystem: | LITTORAL | Lotic Gradient: |
| Vegetative Modifications: | 1 | Class 1: | EMERGENT | Flow Path: |
| Chemical Pollutants: | 0 | Subclass 1: | NON-PERSISTENT | Land Form: |
| Watershed Characterization and Non-point Sources: | 4 | Class 2: | SCRUB SHRUB | Land Form Type: |
| | | Subclass 2: | | Waterbody Type: |
| | | Class 3: | | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: FEN COMMUNITY

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
OPEN WATER STANDING

Substrate Classification:
PEAT SUBSTRATE

Average Depth: 60 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments: AREA USED BY BIRDS/WATERFOWL. DROPPINGS ON VEGETATED MOUNDS/ AREAS USED BY WATERFOWL ARE APPARENT.

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Potamogeton* | | LW-34011101001 | | | |
| *Alnus* | | LW-34021701001 | | | |
| *Carex lasiocarpa* | Woollyfruit sedge | LW-34010501002078 | 6 | OBL | GRAMINOID |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Poaceae* | | LW-34010502 | | | |
| *Utricularia purpurea* | Eastern purple bladderwort | LW-34022305002007 | 5 | OBL | FORB/HERB |
| *Sparganium* | | LW-34011301001 | | | |
| *Vaccinium macrocarpon* | Cranberry | LW-34021302023007 | 5 | OBL | SUBSHRUB, SHRUB |
| *Spiraea* | | LW-34024202026 | | | |
| *Symphyotrichum novi-belgii* | New York aster | LW-34020501073014 | 4 | FACW | FORB/HERB |
| *Triadenum* | | LW-34022601002 | | | |
| *Frangula alnus* | Glossy buckthorn | LW-34024102002002 | 0 | FAC | TREE SHRUB |

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

### Additional Summary Variables

**Station Number: W-286** Waterbody: PERKINS POND - UPPER (NH) Town: Not Designated

**Log Number: DN-2015-286-WET-TRO-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 1.00 | 0.008 | 3 | 0.27 |
| EPT Taxa: | 0.33 | 0.003 | 1 | 0.09 |
| Insects: | 11.00 | 0.084 | 8 | 0.73 |
| Non-Insects: | 120.33 | 0.916 | 3 | 0.27 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 0.00 | 0.000 | 0 | 0.00 |
| Snails: | 0.00 | 0.000 | 0 | 0.00 |
| Bivalves: | 2.67 | 0.020 | 1 | 0.09 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 117.00 | 0.891 | 1 | 0.09 |
| Mites: | 0.67 | 0.005 | 1 | 0.09 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.00 | 0.000 | 0 | 0.00 |
| Odonates: | 0.67 | 0.005 | 2 | 0.18 |
| Caddisflies: | 0.33 | 0.003 | 1 | 0.09 |
| Diptera: | 9.67 | 0.074 | 4 | 0.36 |
| Hemiptera: | 0.33 | 0.003 | 1 | 0.09 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 9.67 | 0.074 | 4 | 0.36 |
| Tanypodinae Tribe: | 8.00 | 0.061 | 1 | 0.09 |
| Chironomiinae Tribe: | 1.67 | 0.013 | 3 | 0.27 |
| Orthoclodiinae Tribe: | 0.00 | 0.000 | 0 | 0.00 |
| Collector-Filterers: | 2.67 | 0.020 | 1 | 0.09 |
| Collector-Gatherers: | 118.00 | 0.898 | 3 | 0.27 |
| Predators: | 9.00 | 0.069 | 4 | 0.36 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 0.67 | 0.005 | 1 | 0.09 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 1.00 | 0.008 | 2 | 0.22 |
| Intermediate: | 127.33 | 0.992 | 7 | 0.78 |
| Eurytopic: | 0.00 | 0.000 | 0 | 0.00 |
| Ratio of MTI Sensitive to Eurytopic | 1.00 | 0.779 | 2.00 | 22.22 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-286** Waterbody: PERKINS POND - UPPER (NH) Town: Not Designated

**Log Number: DN-2015-286-WET-TRO-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Hyalella* | 09010203006 | 0.00 | 117.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 117.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Lestes* | 09020308045 | 0.33 | 0.33 | 9 | PR | 32.6-I | -- | Dragonfly/damselfly |
| *Enallagma* | 09020309051 | 0.33 | 0.33 | 9 | PR | 26.2-I | -- | Dragonfly/damselfly |
| Corixidae | 09020501 | 0.33 | 0.33 | -- | -- | -- | -- | True Bug |
| *Oecetis* | 09020618078 | 0.33 | 0.33 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Procladius* | 09021011015 | 8.00 | 8.00 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Cladopelma* | 09021011081 | 0.33 | 0.33 | 9 | CG | 27.9-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.67 | 0.67 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Tribelos* | 09021011107 | 0.67 | 0.67 | 5 | CG | 9.3-S | C | Fly: Midge |
| *Arrenurus* | 09030111001 | 0.67 | 0.67 | -- | -- | 23.8-I | -- | Mite |
| *Pisidium* | 10020201002 | 2.67 | 2.67 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-269** Trip ID: 2014-269-WET-WHI-1 River Basin: Connecticut
Waterbody: JOHNS RIVER (NH) HUC8 Name: Waits
Town: Not Designated Latitude: 44 22 9.06 N
Mitigation Monitoring Site: No Longitude: 71 33 37.85 W

### Sample Information

**Sample ID: DN-2014-269-WET-WHI-1** Type of Sample: DIPNET Date Sampled: 8/6/2014
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: C** Date: 2/9/2016
Model Result with P≥0.6: C **Reason for Determination: Model**
Date Last Calculated: 10/20/2015 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.00 | Class C: | 0.69 |
| Class B: | 0.31 | NA: | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.31 |
| Class C or Non-Attainment | 0.69 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

A Model

| | |
|---|---|
| Class A | 0.00 |
| Class B or C or Non-Attainment | 1.00 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 70 | < 787 |
| Ephemeroptera Abundance | 1.67 | most > 35 |
| Odonata Relative Abundance | 0.000 | most > 0.04 |
| Trichoptera Relative Abundance | 0.005 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.00 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.20 | < 0.4 |
| MTI Sensitive Taxa Abundance | 3.03 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.05 | most > 0.05 |
| MTI Sensitive Taxa Richness | 2 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.90 | > 0.5 |
| MTI Intermediate Taxa Richness | 12 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 0.90 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 20 |
| Hilsenhoff Biotic Index: | 7.61 |
| Shannon-Weiner Diversity: | 3.13 |
| Maine Tolerance Index: | 26.00 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 32.23 |
| 2 | *Procladius* | 17.54 |
| 3 | *Tanytarsus* | 15.64 |
| 4 | *Dicrotendipes* | 8.53 |
| 5 | *Paratanytarsus* | 4.74 |

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

## Sample Collection and Processing Information

Sampling Organization: NHDES
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 8/6/2014 12:00:00 PM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 6.12 | mg/l | |
| Surface Water | In-situ | pH | 6 | | |
| Surface Water | In-situ | Specific Conductance | 6.75 | us/cm | |
| Surface Water | In-situ | Temperature | 21.4 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 21 | System: | PALUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 8 | Subsystem: | | Lotic Gradient: |
| Vegetative Modifications: | 3 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 1 | | | |
| Watershed Characterization and Non-point Sources: | 9 | Subclass 1: | | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | BROAD-LEAVED DECIDUOUS | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations: PLANT LIST IS NOT COMPREHENSIVE. EDGES OF WATERWAY HAVE EQUISETUM FLUVIATILE AND SPARGANIUM.

| Habitat Classification: | Substrate Classification: |
|---|---|
| AQUATIC MACROPHYTE BED | GRAVEL SUBSTRATE |
| EMERGENT NON-PERSISTENT VEGETATION | SAND SUBSTRATE |
| EMERGENT PERSISTENT VEGETATION | SILT/MUCK SUBSTRATE |

Average Depth: 55 cm Visible Flow: Yes Rain In Previous 24 Hours: Yes

Sample Comments: RAINED DURING MACRO SAMPLING AT SITE2. WATER SAMPLE HAD BEEN PREVIOUSLY COLLECTED AT SITE 1. RIVER IS CROSSED BY MULTIPLE BEAVER DAMS

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Alnus incana ssp. rugosa* | Speckled alder | LW-34021701001002 | 2 | FACW | TREE, SHRUB |
| *Equisetum fluviatile* | Water horsetail | LW-32010101001004 | 6 | OBL | FORB/HERB |
| *Potamogeton amplifolius* | Largeleaf pondweed | LW-34011101001002 | 6 | OBL | FORB/HERB |
| *Vaccinium corymbosum* | Highbush blueberry | LW-34021302023005 | 4 | FACW | SHRUB |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Nymphaea odorata* | American white waterlily | LW-34023103003002 | 5 | OBL | FORB/HERB |
| *Phalaris arundinacea* | Reed canarygrass | LW-34010502054001 | 1 | FACW | GRAMINOID |
| *Sparganium americanum* | American bur-reed | LW-34011301001001 | 5 | OBL | FORB/HERB |
| *Sagittaria latifolia* | Broadleaf arrowhead | LW-34011401002005 | 5 | OBL | FORB/HERB |
| *Spiraea* | | LW-34024202026 | | | |
| *Eleocharis* | | LW-34010501006 | | | |
| *Schoenoplectus tabernaemontani* | Softstem bulrush | LW-34010501011011 | 5 | OBL | GRAMINOID |
| *Potamogeton* | | LW-34011101001 | | | |

## Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Acer rubrum* | Red maple | LW-34024603001006 | 2 | FAC | TREE |
| *Carex* | | LW-34010501002 | | | |
| *Scirpus cyperinus* | Woolgrass | LW-34010501012003 | 2 | OBL | GRAMINOID |

## Additional Summary Variables

**Station Number: W-269** Waterbody: ST JOHNS RIVER (NH) Town: Not Designated

**Log Number: DN-2014-269-WET-WHI-1** Subsample Factor: X1 Replicates: 3 Calculated: 10/20/2015

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 2.00 | 0.028 | 4 | 0.20 |
| EPT Taxa: | 2.00 | 0.028 | 4 | 0.20 |
| Insects: | 43.33 | 0.616 | 16 | 0.80 |
| Non-Insects: | 27.00 | 0.384 | 4 | 0.20 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 2.00 | 0.028 | 1 | 0.05 |
| Snails: | 1.00 | 0.014 | 1 | 0.05 |
| Bivalves: | 1.33 | 0.019 | 1 | 0.05 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 22.67 | 0.322 | 1 | 0.05 |
| Mites: | 0.00 | 0.000 | 0 | 0.00 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 1.67 | 0.024 | 3 | 0.15 |
| Odonates: | 0.00 | 0.000 | 0 | 0.00 |
| Caddisflies: | 0.33 | 0.005 | 1 | 0.05 |
| Diptera: | 40.33 | 0.573 | 11 | 0.55 |
| Hemiptera: | 1.00 | 0.014 | 1 | 0.05 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 40.33 | 0.573 | 11 | 0.55 |
| Tanypodinae Tribe: | 15.46 | 0.220 | 4 | 0.20 |
| Chironomiinae Tribe: | 24.54 | 0.349 | 6 | 0.30 |
| Orthoclodiinae Tribe: | 0.34 | 0.005 | 1 | 0.05 |
| Collector-Filterers: | 13.43 | 0.191 | 3 | 0.15 |
| Collector-Gatherers: | 33.08 | 0.470 | 6 | 0.30 |
| Predators: | 15.46 | 0.220 | 4 | 0.20 |
| Piercers: | 0.00 | 0.000 | 0 | 0.00 |
| Shredders: | 0.34 | 0.005 | 1 | 0.05 |
| Scrapers: | 1.00 | 0.014 | 1 | 0.05 |
| Maine Tolerance: | | | | |
| Sensitive: | 3.03 | 0.046 | 2 | 0.13 |
| Intermediate: | 58.95 | 0.902 | 12 | 0.80 |
| Eurytopic: | 3.36 | 0.051 | 1 | 0.07 |
| Ratio of MTI Sensitive to Eurytopic | 0.90 | 0.900 | 2.00 | 2.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-269** Waterbody: ST JOHNS RIVER (NH) Town: Not Designated

**Log Number: DN-2014-269-WET-WHI-1** Subsample Factor: X1 Replicates: 3 Calculated: 10/20/2015

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| Naididae | 08020202 | 2.00 | 2.00 | -- | -- | -- | -- | Worm |
| *Hyalella* | 09010203006 | 0.00 | 22.67 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 22.67 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Callibaetis* | 09020401002 | 0.33 | 0.33 | 9 | CG | 40.5-I | -- | Mayfly |
| *Litobrancha* | 09020407029 | 0.33 | 0.33 | -- | -- | -- | -- | Mayfly |
| *Caenis* | 09020412040 | 1.00 | 1.00 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 1.00 | 1.00 | -- | -- | -- | -- | True Bug |
| Limnephilidae | 09020610 | 0.33 | 0.33 | -- | -- | -- | -- | Caddisfly |
| Chironomidae | 09021011 | 0.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 0.67 | 0.67 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Clinotanypus* | 09021011002 | 0.00 | 1.01 | 8 | PR | 30.3-I | T | Fly: Midge |
| *Clinotanypus pinguis* | 09021011002008 | 1.00 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Procladius* | 09021011015 | 12.33 | 12.44 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Tanypus* | 09021011018 | 1.33 | 1.34 | 10 | PR | 33.5-I | T | Fly: Midge |
| *Psectrocladius* | 09021011056 | 0.33 | 0.34 | 8 | CG | 22-S | -- | Fly: Midge |
| *Paratanytarsus* | 09021011071 | 3.33 | 3.36 | 6 | -- | 43-E | Y | Fly: Midge |
| *Tanytarsus* | 09021011076 | 11.00 | 11.09 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 6.00 | 6.05 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 1.00 | 1.01 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 0.33 | 0.34 | 6 | SH | 24.2-I | C | Fly: Midge |
| *Tribelos* | 09021011107 | 0.00 | 2.69 | 5 | CG | 9.3-S | C | Fly: Midge |
| *Tribelos jucundus* | 09021011107198 | 2.67 | 0.00 | -- | -- | -- | C | Fly: Midge |
| *Gyraulus* | 10010203029 | 0.00 | 1.00 | -- | SC | 37.2-I | -- | Snail |
| *Gyraulus deflectus* | 10010203029056 | 1.00 | 0.00 | -- | -- | -- | -- | Snail |
| *Pisidium* | 10020201002 | 1.33 | 1.33 | -- | CF | -- | -- | Clam |

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

### Station Information

**Station Number: W-287** Trip ID: 2015-287-WET-WOO-1 River Basin: Merrimack
Waterbody: ELBOW POND (NH) HUC8 Name: Pemigewasset
Town: Not Designated Latitude: 43 58 45.62 N
Mitigation Monitoring Site: No Longitude: 71 44 7.7 W

### Sample Information

**Sample ID: DN-2015-287-WET-WOO-1** Type of Sample: DIPNET Date Sampled: 7/23/2015
Subsample Factor: X1 Replicates: 3

### Classification Attainment

**Statutory Class: A** **Final Determination: A** Date: 10/25/2016
Model Result with P≥0.6: A **Reason for Determination: Model**
Date Last Calculated: 8/30/2016 Comments:

### Model Probabilities

First Stage Model

| | | | |
|---|---|---|---|
| Class A: | 0.91 | Class C: | 0.01 |
| Class B: | 0.08 | NA: | 0.00 |

C or Better Model

| | |
|---|---|
| Class A, B, or C | 1.00 |
| Non-Attainment | 0.00 |

B or Better Model

| | |
|---|---|
| Class A or B | 0.99 |
| Class C or Non-Attainment | 0.01 |

A Model

| | |
|---|---|
| Class A | 0.91 |
| Class B or C or Non-Attainment | 0.09 |

### Model Variables

| | | Reference Range |
|---|---|---|
| Total Mean Abundance | 149 | < 787 |
| Ephemeroptera Abundance | 0.33 | most > 35 |
| Odonata Relative Abundance | 0.002 | most > 0.04 |
| Trichoptera Relative Abundance | 0.060 | most > 0.02 |
| Shredder Taxa Relative Abundance | 0.02 | < 0.2 |
| Non-insect Taxa Relative Richness | 0.22 | < 0.4 |
| MTI Sensitive Taxa Abundance | 8.75 | most > 30 |
| MTI Sensitive Taxa Relative Abundance | 0.06 | most > 0.05 |
| MTI Sensitive Taxa Richness | 6 | most > 7 |
| MTI Intermediate Taxa Relative Abundance | 0.93 | > 0.5 |
| MTI Intermediate Taxa Richness | 11 | < 25 |
| Ratio of MTI Sensitive to Eurytopic Taxa Abundance | 24.76 | most > 1 |

### Other Variables

| | |
|---|---|
| Generic Richness: | 23 |
| Hilsenhoff Biotic Index: | 7.82 |
| Shannon-Weiner Diversity: | 2.03 |
| Maine Tolerance Index: | 24.39 |

### Five Most Dominant Taxa

| Rank | Taxon Name | Percent |
|---|---|---|
| 1 | *Hyalella azteca* | 69.13 |
| 2 | *Procladius* | 5.82 |
| 3 | *Corixidae* | 5.37 |
| 4 | *Ablabesmyia* | 3.80 |
| 5 | *Oxyethira* | 3.13 |

## Sample Collection and Processing Information

Sampling Organization: AH, SC, SM
Taxonomist: ESS LABORATORY

## Water Chemistry

**Sample Date:** 7/23/2015 11:53:00 AM

| Sample Type | Collection Method | Parameter | Value | Units | Qualifier |
|---|---|---|---|---|---|
| Surface Water | In-situ | Dissolved Oxygen | 6.67 | mg/l | |
| Surface Water | In-situ | Dissolved Oxygen Saturation | 72.3 | % | |
| Surface Water | In-situ | pH | 4.45 | | |
| Surface Water | In-situ | Specific Conductance | 11.4 | us/cm | |
| Surface Water | In-situ | Temperature | 18.9 | deg c | |

## Landcover Summary - 2004 Data

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

### Summary of Habitat Characteristics

| Human Disturbance | | Landscape-level Cowardin Classification | | Hydrogeomorphic Setting |
|---|---|---|---|---|
| Total Score: | 2 | System: | LACUSTRINE | Landscape Position: |
| Hydrologic Modifications: | 0 | Subsystem: | LITTORAL | Lotic Gradient: |
| Vegetative Modifications: | 0 | Class 1: | UNCONSOLIDATED BOTTOM | Flow Path: |
| Chemical Pollutants: | 0 | | | |
| Watershed Characterization and Non-point Sources: | 2 | Subclass 1: | ROOTED VASCULAR | Land Form: |
| | | Class 2: | EMERGENT | Land Form Type: |
| | | Subclass 2: | NON-PERSISTENT | Waterbody Type: |
| | | Class 3: | SCRUB SHRUB | Waterbody Subtype: |
| | | Subclass 3: | | |
| | | | | Comments: |

Dominant Plant Species:

Additional Plant Community Observations:

Habitat Classification:
AQUATIC MACROPHYTE BED
EMERGENT NON-PERSISTENT VEGETATION
OPEN WATER STANDING

Substrate Classification:
PEAT SUBSTRATE
SAND SUBSTRATE

Average Depth: 65 cm  Visible Flow: No  Rain In Previous 24 Hours: No

Sample Comments: FRESHWATER SPONGES OBSERVED

### Common Plants Observed

| Scientific Name | Common Name | Maine Taxonomic Code | Plant CoC Score | Wetland Indicator Status | Growth Form |
|---|---|---|---|---|---|
| *Eleocharis* | | LW-34010501006 | | | |
| *Eriocaulon aquaticum* | Sevenangle pipewort | LW-34010601001001 | 7 | OBL | FORB/HERB |
| *Utricularia* | | LW-34022305002 | | | |
| *Brasenia schreberi* | Watershield | LW-34023103001001 | 6 | OBL | FORB/HERB |
| *Rosa palustris* | Swamp rose | LW-34024202020012 | 4 | OBL | SUBSHRUB |
| *Carex lasiocarpa* | Woollyfruit sedge | LW-34010501002078 | 6 | OBL | GRAMINOID |
| *Nymphoides cordata* | Little floatingheart | LW-34024802002001 | 6 | OBL | FORB/HERB |
| *Spiraea* | | LW-34024202026 | | | |
| *Myrica gale* | Sweetgale | LW-34022801003001 | 5 | OBL | SHRUB |
| *Sparganium* | | LW-34011301001 | | | |
| *Pontederia cordata* | Pickerelweed | LW-34010906002002 | 4 | OBL | FORB/HERB |
| *Nuphar lutea ssp. variegata* | Varigated yellow pond-lily | LW-34023103002002 | 4 | OBL | FORB/HERB |
| *Triadenum* | | LW-34022601002 | | | |

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

### Additional Summary Variables

**Station Number: W-287** Waterbody: ELBOW POND (NH) Town: Not Designated

**Log Number: DN-2015-287-WET-WOO-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| | Abundance | Relative Abundance | Richness | Relative Richness |
|---|---|---|---|---|
| EOT Taxa: | 9.67 | 0.065 | 7 | 0.30 |
| EPT Taxa: | 9.33 | 0.063 | 6 | 0.26 |
| Insects: | 42.00 | 0.282 | 18 | 0.78 |
| Non-Insects: | 107.00 | 0.718 | 5 | 0.22 |
| Leeches: | 0.00 | 0.000 | 0 | 0.00 |
| Oligochaetes: | 0.67 | 0.004 | 1 | 0.04 |
| Snails: | 0.67 | 0.004 | 1 | 0.04 |
| Bivalves: | 1.00 | 0.007 | 1 | 0.04 |
| Isopods: | 0.00 | 0.000 | 0 | 0.00 |
| Amphipods: | 103.00 | 0.691 | 1 | 0.04 |
| Mites: | 1.67 | 0.011 | 1 | 0.04 |
| Stoneflies: | 0.00 | 0.000 | 0 | 0.00 |
| Mayflies: | 0.33 | 0.002 | 1 | 0.04 |
| Odonates: | 0.33 | 0.002 | 1 | 0.04 |
| Caddisflies: | 9.00 | 0.060 | 5 | 0.22 |
| Diptera: | 24.33 | 0.163 | 10 | 0.43 |
| Hemiptera: | 8.00 | 0.054 | 1 | 0.04 |
| Beetles: | 0.00 | 0.000 | 0 | 0.00 |
| Chironomids: | 23.67 | 0.159 | 9 | 0.39 |
| Tanypodinae Tribe: | 15.54 | 0.104 | 3 | 0.13 |
| Chironomiinae Tribe: | 7.06 | 0.047 | 5 | 0.22 |
| Orthoclodiinae Tribe: | 1.06 | 0.007 | 1 | 0.04 |
| Collector-Filterers: | 2.06 | 0.014 | 3 | 0.13 |
| Collector-Gatherers: | 107.93 | 0.724 | 4 | 0.17 |
| Predators: | 18.21 | 0.122 | 7 | 0.30 |
| Piercers: | 4.67 | 0.031 | 1 | 0.04 |
| Shredders: | 3.47 | 0.023 | 3 | 0.13 |
| Scrapers: | 0.00 | 0.000 | 0 | 0.00 |
| Maine Tolerance: | | | | |
| Sensitive: | 8.75 | 0.064 | 6 | 0.33 |
| Intermediate: | 127.23 | 0.933 | 11 | 0.61 |
| Eurytopic: | 0.35 | 0.003 | 1 | 0.06 |
| Ratio of MTI Sensitive to Eurytopic | 24.76 | 24.761 | 6.00 | 6.00 |

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

### Aquatic Life Taxonomic Inventory Report

**Station Number: W-287** Waterbody: ELBOW POND (NH) Town: Not Designated

**Log Number: DN-2015-287-WET-WOO-1** Subsample Factor: X1 Replicates: 3 Calculated: 8/30/2016

| Taxon | Maine Taxonomic Code | Count (Mean of Samples) Actual | Count (Mean of Samples) Adjusted | Hilsen-hoff Biotic Index | Func-tional Feeding Group | Maine Toler-ance Index | Tribe | Taxa Group |
|---|---|---|---|---|---|---|---|---|
| *Pristina* | 08020202004 | 0.67 | 0.67 | -- | -- | -- | -- | Worm |
| *Hyalella* | 09010203006 | 0.00 | 103.00 | 8 | CG | 24.5-I | -- | Amphipod |
| *Hyalella azteca* | 09010203006011 | 103.00 | 0.00 | -- | -- | -- | -- | Amphipod |
| *Sympetrum* | 09020306041 | 0.33 | 0.33 | 10 | PR | 37-I | -- | Dragonfly/damselfly |
| *Caenis* | 09020412040 | 0.33 | 0.33 | 7 | CG | 22.1-I | -- | Mayfly |
| Corixidae | 09020501 | 8.00 | 8.00 | -- | -- | -- | -- | True Bug |
| *Polycentropus* | 09020603010 | 1.33 | 1.33 | 6 | PR | 15.4-S | -- | Caddisfly |
| *Oxyethira* | 09020607028 | 4.67 | 4.67 | 3 | P | 22-S | -- | Caddisfly |
| *Banksiola* | 09020608036 | 1.00 | 1.00 | -- | SH | 14.9-S | -- | Caddisfly |
| Leptoceridae | 09020618 | 1.67 | 1.67 | -- | -- | -- | -- | Caddisfly |
| *Oecetis* | 09020618078 | 0.33 | 0.33 | 8 | PR | 16.3-S | -- | Caddisfly |
| *Bezzia/palpomyia* | 09021010043 | 0.67 | 0.67 | 6 | PR | 26.9-I | -- | Fly: Biting Midge |
| Chironomidae | 09021011 | 1.33 | 0.00 | -- | -- | -- | -- | Fly: Midge |
| *Ablabesmyia* | 09021011001 | 5.67 | 6.00 | 8 | PR | 23.6-I | T | Fly: Midge |
| *Guttipelopia* | 09021011006 | 0.33 | 0.35 | 5 | PR | 19.4-S | T | Fly: Midge |
| *Procladius* | 09021011015 | 8.67 | 9.18 | 9 | PR | 25.1-I | T | Fly: Midge |
| *Psectrocladius* | 09021011056 | 1.00 | 1.06 | 8 | CG | 22-S | -- | Fly: Midge |
| *Tanytarsus* | 09021011076 | 0.67 | 0.71 | 6 | CF | 25.7-I | Y | Fly: Midge |
| *Dicrotendipes* | 09021011085 | 3.33 | 3.53 | 8 | CG | 28.8-I | C | Fly: Midge |
| *Glyptotendipes* | 09021011088 | 0.33 | 0.35 | 10 | SH | 43-E | C | Fly: Midge |
| *Microtendipes* | 09021011094 | 0.33 | 0.35 | 6 | CF | 22.3-I | C | Fly: Midge |
| *Polypedilum* | 09021011102 | 2.00 | 2.12 | 6 | SH | 24.2-I | C | Fly: Midge |
| Arachnida | 0903 | 0.67 | 0.67 | -- | -- | -- | -- | Arachnid |
| *Arrenurus* | 09030111001 | 1.00 | 1.00 | -- | -- | 23.8-I | -- | Mite |
| Lymnaeidae | 10010201 | 0.67 | 0.67 | -- | -- | -- | -- | Snail |
| *Pisidium* | 10020201002 | 1.00 | 1.00 | -- | CF | -- | -- | Clam |

**Results of ANOVA and Bonferroni analyses**

| **Analyses Conducted** | **ANOVA p values** | **Bonferroni Results (on ANOVA)** |
|---|---|---|
| **Water** | | |
| pH to predicted attainment class | 0.004 | SIGNIFICANT: A to B |
| Specific conductance to attainment class | 0.0038 | SIGNIFICANT: A to B and A to C |
| Dissolved oxygen to attainment class | 0.088 | SIGNIFICANT: B to C |
| Dissolved oxygen saturation to attainment class | 0.040 | SIGNIFICANT: B to C |
| Chlorophyll *a* to attainment class | 0.167 | |
| Alkalinity to attainment class | 0.354 | |
| Dissolved organic carbon to attainment class | 0.171 | |
| Total phosphorus to attainment class | 0.356 | |
| Total Kjeldahl nitrogen to attainment class | 0.144 | |
| Chloride to attainment class | 0.24 | |
| Turbidity to attainment class | 0.085 | |
| **Macroinvertebrates** | | |
| Mean macroinvertebrate abundance to attainment class | 0.013 | SIGNIFICANT: A to B and B to C |
| Depth of macroinvertebrate samples to attainment class | 0.23 | |
| Generic richness to attainment class | 0.079 | insignificant |
| Maine Tolerance Index | 0.152 | insignificant |
| **Vegetation and Rapid Assessments** | | |
| Mean C to attainment class | 0.22 | |
| Adjusted FQI by attainment class | 0.339 | |
| WHDA by attainment class | 0.079 | |
| AA size by attainment class | 0.667 | |
| AVG buffer by attainment class | 0.43 | |
| EIA LUI by attainment class | 0.299 | |
| EIA by attainment class | 0.134 | |
| Nonnative species by attainment class | 0.166 | |
| [1] Bonferroni: insignificant means p>0.05 for all pair combinations | | |