

## 2. HOW THE NH METHOD WORKS

### A. Wetland Functions

Wetland functions represent the practical, measurable values of wetlands. While many functions of wetlands are important to people, not all wetlands perform all of these functions at a high level, and not all functions are performed equally in each wetland. How a wetland functions depends on the specific biological and physical features of each wetland site. The NH Method addresses twelve wetland Functions:

<b>FUNCTION</b>	<b>DESCRIPTION</b>
<b>Ecological Integrity</b>	Evaluates the overall health and stability of the wetland ecosystem
<b>Wetland-Dependent Wildlife Habitat</b>	Evaluates the suitability of the wetland as habitat for those animals typically associated with wetlands and wetland edges. No single species is emphasized.
<b>Fish and Aquatic Life Habitat</b>	Evaluates the suitability of surface waters associated with the wetland as habitat for fish and other aquatic life. No single species or group of species is emphasized.
<b>Scenic Quality</b>	Evaluates the visual and aesthetic quality of the wetland.
<b>Educational Potential</b>	Evaluates the suitability of the wetland as a site for education and research.
<b>Wetland-Based Recreation</b>	Evaluates the suitability of the wetland and associated streams and ponds for non-powered boating, fishing, hunting and other similar recreational activities.
<b>Flood Storage</b>	Evaluates the effectiveness of the wetland for storing floodwaters and reducing downstream flooding.
<b>Groundwater Recharge</b>	Evaluates the potential of the wetland to recharge an underlying aquifer.
<b>Sediment Trapping</b>	Evaluates the effectiveness of the wetland for trapping sediments in runoff water from surrounding upland.
<b>Nutrient Trapping/Retention/Transformation</b>	Evaluates the effectiveness of the wetland for retaining and cycling nutrients, thereby reducing the impacts of excess nutrients in runoff to downstream lakes and streams.
<b>Shoreline Anchoring</b>	Evaluates the effectiveness of the wetland in preventing shoreline erosion.
<b>Noteworthiness</b>	Evaluates the wetland for one or more outstanding features such as critical wildlife habitat, rare species, high value wetlands in urban settings, etc.

The instructions required for evaluating each of the Functions in the NH Method are provided in Section 3. Each Function is prefaced with a brief introduction describing its significance for wetlands. This is followed by a series of questions that examine the different factors that contribute to that Function. Each question includes the rationale behind the question as well as instructions for answering the question. The answers to each of the questions are recorded on the data sheets for each function, provided in Section 4.

## B. Completing the Data Sheets

In the NH Method, evaluation of the twelve Functions is carried out by completing a series of data sheets (see Sections 3 and 4). Appendix E provides an example of how to complete the data sheets. Each data sheet has four columns described below:

### Column 1 – Evaluation Questions

Lists the questions to be answered for evaluating each function.

### Column 2 – Observations and Notes

This blank column should be used for recording observations and explanatory notes that may be useful for reference at a later date. For example, time of year the wetland was evaluated; observations about dumping or litter in the wetland; notes about wetland access and parking, etc. The notes should make clear what the observation was that led to the chosen answer.

### Column 3 – Answers

Includes multiple choice answers to each question. In answering any particular question, the evaluator will need to decide which of the corresponding criteria given in Column 3 provide the most appropriate answer to that question.

### Column 4 – Score

Each answer in Column 3 is assigned a score. These scores are totaled and averaged to produce an **Average Score** for each Function.

The scores for the answers for each question are on a scale of 1-10 with increments of 10, 5, and 1 (and in some instances, 0). However, if it is felt that the answer to a particular question falls **between** two answer categories, inferences can be made as described below (refer to Appendix E for an example of how this is done):

If the answer to a question is neither a) nor b) but falls between the two, use a value of **7.5** if an answer falls between b) and c), then use a value of **2.5**. Provide justification for the alternate score in the Observations & Notes column. **Note that 7.5 and 2.5 are the only allowable values that can be substituted.** The scale of criteria scores that should be used is:

**10    (7.5)    5    (2.5)    1    0**

Note that Functions 7 (Flood Storage) and 12 (Noteworthiness) are scored differently. Flood Storage is based on a calculation, not single scores. Noteworthiness uses a single score of 10 for each question that qualifies, and the final score is **totaled**, not averaged.

**IMPORTANT:** The **final scores for each of the 12 Functions** of a wetland **are not additive**. The NH Method does not calculate a single overall score for a wetland. Instead, each wetland receives 12 separate Function Scores. These scores can be interpreted as follows:

1. If a **single wetland** is being evaluated, review the final Scores for each Function. Higher scores (8-10) indicate a higher performance of that function in the wetland. Lower scores (below 5) indicate that wetland is either compromised for that function, or does not have the characteristics to perform that function well. Lower scoring wetlands should be reviewed for potential restoration.
2. If **multiple wetlands** (e.g. for a town-wide wetland inventory, or for Prime Wetlands Designation) are being evaluated, you can review and compare the scores for each Function for all wetlands evaluated. For example, review the Ecological Integrity scores for all wetlands included in the study. Wetlands with higher Ecological Integrity Function scores can be identified, while lower scoring wetlands could be flagged for potential restoration if the results show significant human-induced degradation. You can also identify wetlands with high scores for multiple functions, e.g. those with average scores above 8.0 on three or more functions.

## C. Preparing Wetland Evaluation Maps

An essential part of wetland inventory and evaluation is the preparation of wetland maps. Two sets of maps should be prepared:

- **Wetland Inventory Map:** A large scale map showing all the wetlands in the study area (a town, watershed, or region).
- **Individual Evaluation Maps:** An individual map for each wetland being evaluated.

Much of the information needed to create these maps already exists on GRANIT, the statewide GIS database, as well as other local and regional digital databases. The information recorded on the wetland maps is used to answer a number of the questions on the NH Method evaluation data sheets. Map preparation can be done electronically, using digital GIS data layers available through GRANIT or by using the [NH Wetlands Mapper](#) (see sidebar at right).

Typically, the National Wetlands Inventory (NWI) maps and hydric soils data (NRCS Soils Survey) are used for initial determination of the extent of the wetland area. However, the sources of information for NWI maps and NRCS Soil Surveys may be dated and several years old (the NWI maps were compiled using 1984 infrared aerial photography). Therefore they should be used as preliminary guidance rather than final wetland maps. Additional information including more recent aerial photos and orthophotos should be consulted. Most photos have been taken in spring (leaf-off) which helps to show water features and most wetlands areas. This information combined with field checking results in a more accurate estimate of the wetland area for evaluation.

**NH Wetlands Base Map:** In 2010, the NH Department of Environmental Services Watershed Management Bureau and Wetlands Bureau developed a wetland base map for the state using NWI data. This is intended to provide the first step in wetland mapping. The NH Wetlands Base Map can be accessed via the [NH Wetlands Mapper](#). The map uses the current NH Method Guidelines for Determining Wetland Evaluation Units to indicate where potential wetland breaks may exist.

**Prime Wetlands Designation:** If you are mapping wetlands for Prime Wetland Designation under RSA 482-A: 15, you will need to [refer to the most current legislation](#) for an update. Note that the final maps required for Prime Wetland designation are at a more detailed level than can be created using the NH Wetlands Mapper.

### Wetland Mapping Terminology

**NH Wetlands Mapper** – The NH Wetlands Mapper is a companion to the NH Method. It is a web-based mapping tool designed to assist users conducting functional evaluations of wetlands using the NH Method. It includes a set of flexible map display, navigation, query, and printing tools, as well as the companion forms required to conduct the evaluation.

**GRANITView II** – The GRANITView II web mapping application provides access to key NH GRANIT data layers, along with a suite of tools to navigate and interact with those data layers. The layers are grouped into a series of functional categories that contain numerous data layers that can be displayed and queried by the user

**NH GRANIT** (New Hampshire Geographically Referenced ANalysis and Information Transfer system) is a cooperative project to create, maintain and make available a statewide geographic data base serving the information needs of state, regional and local decision makers. It is a collaborative effort between the University of New Hampshire and the NH Office of Energy and Planning. The core GRANIT System is housed at UNH, and is available at

**GIS – Geographic Information Systems** – are computer-based systems that are used to store, manipulate, and display geographic information. The data in a GIS system is stored in “**data layers**” with each layer representing a different landscape feature. Examples of different data layers are: soils, topography, roads and railroads, surface waters, wetlands, aquifers, etc

**Polygon** – This is a feature in a GIS data layer used to represent area. A polygon is defined by the line that makes up its boundary. Polygons have attributes that describe the geographic feature(s) they represent. Polygons are often irregular in shape. Each polygon contains one or more types of data (e.g., soils, wetland, or aquifer).

**NWI – National Wetlands Inventory** – This is a program administered by the US Fish and Wildlife Service for mapping and classifying wetland resources in the United States. The NWI was established to develop and provide resource managers with information on the location, extent, and types of wetlands and deepwater habitats.

## 1. Using the [NH Wetlands Mapper](#) (See also Appendix B)

This method is recommended for users not experienced in using GIS software, but GIS users can also use the Mapper. **Specific instructions for using the *NH Wetlands Mapper* to produce wetland maps are provided in [Appendix B](#).**

The NH Wetlands Mapper is a free on-line web tool (<http://nhwetlandsmapper.unh.edu>) available to the public, designed for the lay person and that does not require any specialized knowledge to use. The maps, data and on-line tools in the NH Wetlands Mapper can be used to obtain information needed to answer most non field-based questions asked in the *NH Method*, including:

- Size of the wetland
- Questions you can answer from digital maps generated from the NH Wetlands Mapper, such as land use.
- Questions for which you can get the data using the on-screen tools in the NH Wetlands Mapper, such as number of road crossings, amount of open surface water, etc.

The NH Wetlands Mapper also allows you to save your maps and data on the site and to enter data into an online spreadsheet version of the NH Method evaluation data sheets.

If you are not familiar with the NH Wetlands Mapper, click the **Welcome** and the **Help Tabs** to read the explanation of all the Mapper's functions and how to use them. This will help you learn the basics of how to compile data layers to create a map. Note that the NH Wetlands Mapper uses pop-up windows to report information when the user queries the data, so pop-up blockers should be disabled when using this site.

## 2. Using GIS Software (See also Appendix C)

The use of computer-based mapping software is recommended for NH Method users who are **experienced in using GIS** or other electronic applications to generate maps using the data layers stored in the GRANIT database. This work can also be contracted out to a GIS professional. Users of this mapping method have typically have greater flexibility when combining various data layers than when using the NH Wetlands Mapper. Specific instructions for using GIS software are not provided in this manual, however, Appendix C provides some more specific instructions for GIS users.

### Creating the Wetland Evaluation Maps

A sample set of maps is provided in Appendix E. Tables 1 and 2 below provide instructions for generating paper map copies. Additional map information needed to answer questions in the NH Method can be obtained by using GIS analytical tools or by using on-screen tools on the NH Wetlands Mapper.

**Refer to [Appendices B and C](#) for more detailed information for compiling the maps.** These appendices list all the questions that require maps and other data accessed using the NH Wetlands Mapper or GIS, and provide instructions about how to answer these questions.

**Table 1 - WETLAND INVENTORY MAP FOR THE STUDY AREA**

- This map provides the initial inventory of all the likely wetlands in the study area (town, watershed, etc.)
- Generate this map at an appropriate scale to display all wetlands in the study area on a single map.
- This map is used to observe the landscape and watershed contexts for the wetlands being evaluated. Having printed paper copies of these maps enables you to use them as a reference throughout the evaluation process.

DATA LAYERS NEEDED	GIS USERS	NH WETLAND MAPPER USERS
<ul style="list-style-type: none"> <li>• Political boundaries (Political Boundaries Section)</li> <li>• Roads (Transportation Networks Section)</li> <li>• Railroads (Transportation Networks Section)</li> <li>• Surface waters (lakes, ponds, river, streams) (Water &amp; Watersheds Section)</li> <li>• Wetlands (NH DES Wetlands Base Map or National Wetlands Inventory) (Wetlands &amp; Soils Section)</li> <li>• Watersheds (Water &amp; Watersheds Section)</li> <li>• Select one of the following backgrounds for the maps:               <ul style="list-style-type: none"> <li>○ <b>DRG Topographic Map base</b> (required for some questions) (Imagery Section)</li> <li>○ <b>Aerial Photo Imagery</b> (use the most current aerial photo imagery available). (Imagery/NAIP &amp; Other Imagery Sections)</li> <li>○ Hillshade (Imagery Section)</li> <li>○ No background (Imagery Section)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Generate this map at 1:24,000 or other appropriate scale (poster size) using the data layers listed in this table and available through GRANIT. Other local GIS data, as available may be incorporated.</li> <li>• See instructions in <a href="#">Appendix C</a> for further information.</li> </ul>	<p>See instructions in the NH Method <a href="#">Appendix B</a> for using the NH Wetlands Mapper to create and print maps.</p>

**Table 2 - INDIVIDUAL WETLAND MAPS.**

- Create an individual wetland map for each wetland being evaluated.
- Select an appropriate scale to display the wetland. Smaller wetlands may need a larger scale, and large wetland complexes may need a smaller scale. (Large scale maps zoom in to an area, and small scale maps zoom out and show a larger area).

DATA LAYERS NEEDED	GIS USERS	NH WETLAND MAPPER USERS
<ul style="list-style-type: none"> <li>• Political boundaries (Political Boundaries Section)</li> <li>• Roads (Transportation Networks Section)</li> <li>• Railroads (Transportation Networks Section)</li> <li>• Surface waters (lakes, ponds, rivers, streams) (Water &amp; Watersheds Section)</li> <li>• Wetlands (NH DES Wetlands Base Map or National Wetlands Inventory) (Wetlands &amp; Soils Section)</li> <li>• Hydric (wetland) soils (National Wetlands Inventory) (Wetlands &amp; Soils Section)</li> <li>• Watersheds (Water &amp; Watersheds Section)</li> <li>• Select one of the following backgrounds for the maps:               <ul style="list-style-type: none"> <li>○ <b>DRG Topographic Map base</b> (required for some questions) (Imagery Section)</li> <li>○ <b>Aerial Photo Imagery</b> (use the most current aerial photo imagery available). (Imagery/NAIP &amp; Other Imagery Sections)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Generate individual wetland maps using the combination of data layers that best meets your needs.</li> <li>• Using GIS tools create a 100 ft and a 500 foot zone around the wetland. This will be used to evaluate soil type and land use within this zone, as required by the NH Method.</li> <li>• See instructions in <a href="#">Appendix C</a> for further information.</li> </ul>	<ul style="list-style-type: none"> <li>• See instructions in the NH Method <a href="#">Appendix B</a> for detailed instructions for using the NH Wetlands Mapper to create and print maps.</li> <li>• Using GIS tools create a 100 ft and a 500 foot zone around the wetland. This will be used to evaluate soil type and land use within this zone, as required by the NH Method.</li> <li>• A map scale of 1:12,000 or 1:10,000 is recommended for most wetlands.</li> </ul> <p>1:10,000 is 1cm = 100 m or 328 feet            1:12,000 is 1" = 1000 ft, or ½" = 500 ft.            1:24,000 is 1" = 2000 ft, or ¼" = 500 ft.</p>

## D. GUIDELINES TO DETERMINE WETLAND EVALUATION UNITS

When evaluating wetlands, there are situations when some wetlands may need to be broken into two or more units for evaluation, either where there is a natural break or where there is an artificial break that interferes with wetland hydrology. Artificial flow restrictions (such as roads, culverts, bridges, etc.) can fragment and alter the character of a wetland to a degree that may warrant evaluating the wetland areas on each side of the restriction as separate units. Natural breaks can occur at a stream channel or when there is a natural constriction such as a beaver dam. The guidelines presented below will assist you in deciding under which circumstances to break a wetland complex into separate units for purposes of evaluation. By following the guidance below **consistently** for all the wetlands in the study area, decisions will be more objective and defensible.

Once you have made the initial wetland unit determination, follow the guidelines below to see if any breaks are necessary. **Note that the guidelines will not cover all situations, since there is so much variability in nature.** These are simply guidelines that cover some of the more common situations encountered.

NHDES Wetlands Base Map: The NH Wetlands Base Map developed by the NH DES Watershed Management and Wetlands Bureaus, follows the guidelines below to indicate potential breaks where separate wetland evaluation units may be identified. Note that review of soils, aerial photos, and field checking is still necessary to verify whether these breaks are necessary and appropriate.

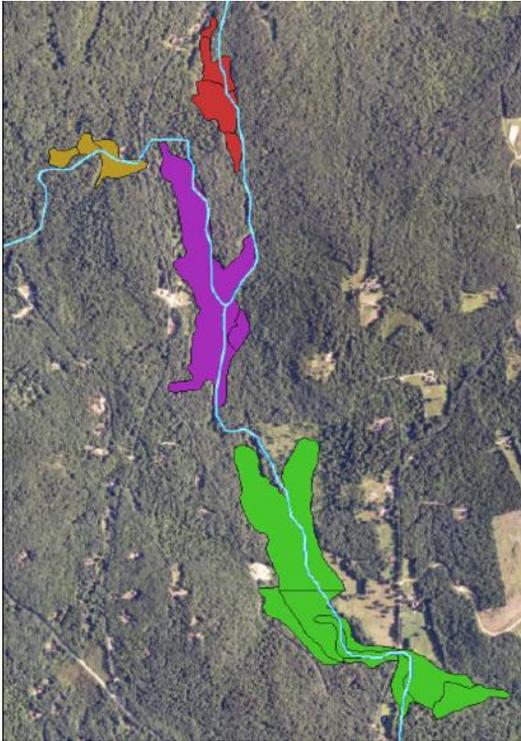
It is recommended that you keep wetland systems whole unless there is a good reason to break the complex into two or more evaluation units. It is not possible to anticipate every situation, and whether or not to break a wetland into separate evaluation units is up to the evaluator's judgment, based on a thorough review of mapped information, aerial photos and field checking.

### Step 1: Review wetland maps and field check

Prior to field work, review the wetlands map prepared for the wetland/s being evaluated:

- a. First look at the **National Wetlands Inventory (NWI)** wetland areas identified on the **NH DES Wetlands Base Map**, in the NH Wetlands Mapper.
- b. Review the Guidelines in Step 2, below, to make an initial determination of potential breaks. Unless one or more of conditions in Step 2 (below) applies, use the entire mapped wetland area as your evaluation unit.
- c. If a wetland crosses the boundary of the study area (town, watershed, etc.) the entire wetland should be mapped and evaluated.
- d. **If the wetland includes one or more upland islands, these should be included in the total wetland acreage except when answering Function 7 (Flood Storage), Question 1, which excludes upland islands.**

**Step 2: Guidelines to determine if a wetland system needs to be broken into separate evaluation units.**



***Situation 1: Wetland narrows to a Stream Channel***

**Description:** After the narrowing point, there is no dominance of wetland vegetation or hydric soils outside the channel or beyond the limits of the stream channel and bank.

**Decision:** The point at which the wetland narrows to the stream channel is the downstream limit of that wetland evaluation unit. The evaluator will need to determine if a break is needed based on field assessment.

*The illustration at left shows four hydrologically connected but spatially disconnected wetlands. Each wetland narrows to the stream channel at its outlet.*



***Situation 2: Wetland is bisected by an active railroad or a one or two lane road***

*Situation 2a:*

**Description:** Properly sized culverts or a bridge allow the free flow of surface water from one side to the other.

**Decision:** Evaluate the wetland area on each side of the road as a single wetland evaluation unit.

*Situation 2b:*

**Description:** Undersized culvert or properly sized culvert is blocked; culvert is perched above the water surface, or no culvert present. In these instances, there may be different vegetation types and hydrology on each side of the road.

**Decision:** Evaluate the wetland areas on each side of the road as two separate wetland evaluation units.

*The illustration at left shows a wetland bisected by a two lane road*



**Situation 3: Wetland is bisected by an abandoned railroad or a Class 6 road**

**Description:** The wetland is traversed by an abandoned railroad or a Class 6 road.

**Decision:** Evaluate the wetland areas on both sides of the road/abandoned railroad as a single wetland evaluation unit **unless there is an obvious hydrologic disconnection between the two sides**, e.g. no culverts or bridges, and distinctly different vegetation classes on each side of the Class 6 road/abandoned railroad. .

*The illustration at left shows a wetland bisected by a Class 6 road*



**Situation 4: Wetland is cut by four-lane or larger highway**

*Situation 4a:*

**Description:** The highway is elevated and spans the entire wetland complex, and there is no obvious interruption to wetland hydrology

**Decision:** Consider the wetland on both sides of the highway as a single wetland evaluation unit.

*Situation 4b:*

**Description:** The highway crosses through the wetland on fill and there are no culverts or bridges allowing the free flow of water or there are inadequately sized culverts.

**Decision:** Consider the wetland areas on each side of the highway to be two separate evaluation units.

*The illustration at left shows a wetland bisected by four-lane highway*

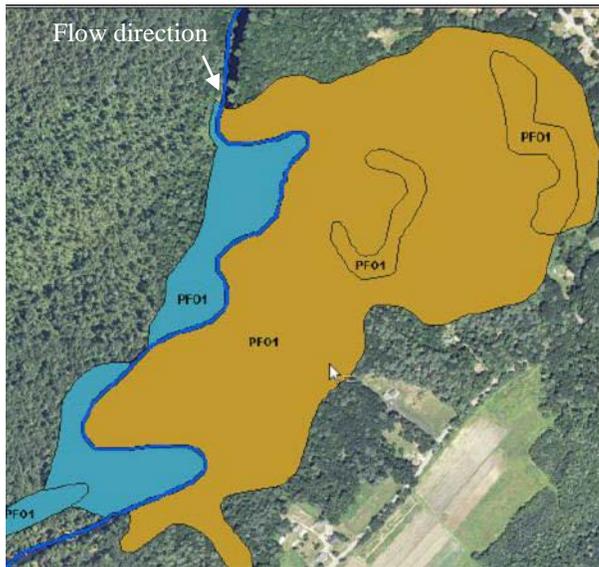


**Situation 5: Wetland crosses a town boundary**

**Description:** Wetland extends across a town line or watershed boundary

**Decision:** Evaluate the wetland complex as a single unit regardless of the boundaries.

*The illustration at left shows a wetland complex spanning three town boundaries*



**Situation 6: Wetland is directly adjacent to a river or stream**

*Situation 6a:*

**Description:** Wetland is associated with a 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> or 4<sup>th</sup> order stream

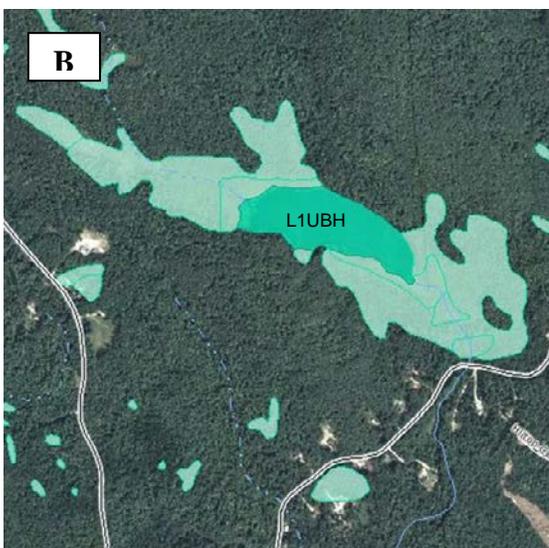
**Decision:** The stream and associated wetland(s) are considered to be a single wetland unit for evaluation. Only include the stream reach between the beginning and end points for the wetland

*Situation 6b:*

**Description:** Wetland is associated with a 5<sup>th</sup> order or larger stream.

**Decision:** Evaluate the wetland areas on each side of the river as separate wetland evaluation units. Include any part of the river that is less than 6.6ft deep (i.e. include any water with aquatic bed vegetation) in the evaluation area. **Use your judgment; based on field checking, to decide if the wetland on both sides of the river should be evaluated as a single unit (some 5<sup>th</sup> order streams may be quite shallow).**

*The illustration at left shows a wetland complex with a 5<sup>th</sup> order stream*



**Situation 7: Wetland is associated with a lake that is classified as Lacustrine**

**Description:** Wetland is connected to a lake, classified as Lacustrine (e.g. L1UBH) on NWI maps (depth greater than 6.6ft).

**Note:** NWI maps were prepared using spring leaf-off photography. Check summer leaf-on photography (NAIP 2003, or more recent photography when available) to look for evidence of aquatic bed vegetation prior to field checking.

**Decision A:** If the wetland areas cumulatively occupy less than 1/3 of the surface area of the adjacent deepwater habitat, identify separate "fringe" wetland evaluation units. These units may be formed by bays, coves and other similar shoreline features. Include any adjacent deepwater that is less than 6.6ft deep - i.e. include any water with aquatic bed vegetation directly out from the lakeshore end of the wetland evaluation unit (see illustration A at left).

**Decision B:** Where the wetland areas around a lake occupy more than 1/3 of the surface area of the deepwater habitat, evaluate all wetland areas surrounding the water body as a single evaluation unit and include the area of water as part of the evaluation unit (see illustration B at left).

### Step 3: Review additional map data

- a. Next review the **hydric soils** (see side bar on page 2 of Section 1) together with NWI data and identify areas of hydric soils beyond the NWI boundaries that may need to be field checked to confirm that these areas are wetlands.
- b. Review **aerial photos** (provided on the NH Wetlands Mapper or other sources) that can provide additional information prior to field evaluation. It is best to use spring leaf-off photos for this step.
- c. If you are evaluating wetlands for Prime Wetlands Designation, very poorly and poorly drained soils should be identified on the wetland evaluation map.
- d. Use all of the above data to refine the estimated wetland boundary.

### Step 4: Field check wetland site to the extent possible

**Note: Be sure to secure landowner permission before accessing properties to field check wetlands**

- a. Field checking is an important next step for determining wetland evaluation units. Pay particular attention to wetland units whose continuity is not clear from mapped information.
- b. After following the guidance above, you may find that after field analysis the wetland evaluation unit may need to be changed in order to more accurately reflect the functions and values of the entire wetland. For example, if the field visit shows that hydrology is not being significantly impaired by a road, railroad, or trail bridge crossing, then you may end up combining two units you previously separated. The reverse may be true if plant community characteristics indicate that the wetland is so impaired that it is effectively acting as two separate units with very different functional values.
- c. Keep in mind both historic conditions prior to human disturbance as well as future conditions that may arise from restoration or enhancement efforts. Are the separate units of a wetland complex irreparably distinct? Or could they act as a fully functioning unit after being restored? Are most of the wetland functions completely different among the units? Or is there only one or two that is being affected by the artificial separation?
- d. Adjust the wetland size (larger or smaller) based on field checking.
- e. When calculating wetland size, include all upland islands that are contained within the overall wetland evaluation unit, *(but remember to deduct these islands from the wetland acreage for the Flood Storage function)*
- f. When field checking wetlands for determining evaluation units, you can make more efficient use of your time in the field by conducting wetland evaluation at the same time. Section 3 describes what to look for in the field.