3. USING THE NH METHOD

Once the Individual Wetland Evaluation Maps have been prepared, the next step is to field check the wetlands in the study area. Field checking is an important part of the wetland evaluation. It allows the evaluator to ground truth the information on the Individual Wetland Evaluation Map and to gather additional field-based information needed to complete the wetland evaluation. Be sure to obtain landowner permission to access their property before field evaluating a wetland. If you are not able to obtain permission from a landowner, that landowner's portion of the wetland may need to be left out of the study. There may be other access points from other properties if there is more than one landowner. Reference can also be made to aerial photos and other data sources to help "fill the gap". When field checking wetlands, be prepared for outdoor conditions.

Field Visit Checklist

- Wetland Evaluation Maps
- Copy of completed Appendix B and the list of field questions to answer in the field in Appendix I.
- Copy of the NWI codes table in Appendix F (Figure F-1)
- Sturdy, waterproof hiking boots
- Rubber boots or waders if ground conditions are very wet or have shallow inundation
- Waterproof poncho or rain jacket.
- Bug repellant
- Compass or GPS unit to navigate larger or more remote wetlands (often without trails)
- Topographic map of the area to help find your way around.
- Cell phone, in case of emergency
- Water bottle and snacks if you will be out for a while.
- Clipboard, pencils and eraser + a Ziploc plastic bag to protect your papers during rain
- NH Method data sheets and/or summary data sheet (Data sheets can also be printed onto Rite-in- the-Rain paper for use in wet conditions).
- Camera to document wetland features
- Handheld electronic device to record data (if using)

The following pages provide instructions for answering the evaluation questions using field data and information derived from the Individual Wetland Maps. A blank set of data sheets is provided in Section 3 and is available on the NH Method web site.

EXCEL SPREADSHEET FOR DATA ENTRY

An Excel spreadsheet version of the data form with abbreviated questions and criteria is available on the NH Method web site. Users can enter their completed field data into the spreadsheet, which will total and average final scores and automatically generate a summary data sheet with all the function scores for each wetland evaluated.

Users new to the NH Method or Users who have not used the NH Method very often

We recommend that new users or those with relatively little experience with wetland evaluation take a set of data sheets into the field for each wetland being evaluated. This helps the user understand the wetland characteristics giving rise to each function. You can then enter the data onto the Excel spreadsheet after the field work is done.

Experienced/Professional Users of the NH Method

The abbreviated Excel spreadsheet form provides the user with the option of to use a portable electronic device to enter the data directly into the spreadsheet in the field, or use a paper version, and complete the data sheets back in the office. Be sure that you are **very familiar** with the NH Method questions before you use the abbreviated spreadsheet in the field.

A. Steps in the Use of the NH Method

1	**Establish Your Goals**	• What is the purpose of your wetland evaluation? To learn more about the wetlands in a study area? To determine unique features of a single wetland or a sub-group of wetlands? Evaluation for Prime Wetland Designation? A wetland permit application? Establishing goals helps you plan your evaluation project.
2	**Prepare the Wetland Inventory Map**	• Refer to Section 1C and Appendices B and C for guidance. • Use this map to identify the wetlands to evaluate.
3	**Prepare the Individual Wetland Evaluation Maps**	• Refer to Section 1C and Appendices B and C for guidance. • Use recent aerial photos to confirm wetland locations and modify the limits of the wetland evaluation unit if necessary.
4	**Determine Wetland Evaluation Units**	• Use the Guidelines in Section 2D to determine whether or not the wetland/s being evaluated should be broken into separate evaluation units and/or adjustments should be made to the boundaries. • Include aerial photo review in your determination
5	**Review Instructions to Answer Evaluation Questions**	• Review the questions and background information for each function (Section 4) to familiarize yourself with the information required for the wetland evaluation. • Familiarize yourself with the data sheets for each function
6	**Answer Data Sheet questions using map-based information BEFORE the field visit**	• Use individual wetland maps and NH Wetlands Mapper on-line tools or GIS to answer some of the questions on the data sheets (refer to Appendices B and C). • Appendix I provides a list of questions to answer in the field.
7	**Collect Field Data and complete data sheets**	• ***Be sure to secure landowner permission before checking wetlands in the field.*** • Visit each wetland and record field observations on the data sheets, on the Excel spreadsheet (paper or electronic), or use the abbreviated list of questions in Appendix I. Note that some map-based questions will require field checking to refine answers. • With all data collected, complete the NH Method worksheets. • Modify the wetland boundaries on the wetland maps where necessary.
8	**Complete Excel spreadsheets**	• Using the Excel spreadsheet, record the scores for the questions in each function for each wetland. The spreadsheet automatically computes the Average or Final Score for each function and creates a summary data form for all wetlands.
9	**Complete a Narrative Description for each wetland**	• Write a ½ to one page summary describing the physical features of the wetland, including dominant wetland plants, any wildlife observed, hydrologic characteristics, scenic views, size, watershed characteristics, location relative to other wetlands, etc. Refer to Section 5 for an example of a Narrative Description.
10	**Interpret the data**	• Using the Summary Excel spreadsheet, interpret the data for individual or multiple (comparative) wetlands. Identify data sources and note any limitations in data.

B. Evaluating Wetland Functions

Refer to the Appendices for information to help answer some of the questions in each function. **Appendices B and C** provide instructions for answering questions using mapped information. Hydric Soils Tables in **Appendix D** are used in Function 10: Nutrient Trapping/Retention/Transformation. A worked example of the application of the NH Method is provided in **Appendix E**. **Appendix F** provides a description of the Cowardin System of Wetland Classification and its use in the National Wetlands Inventory (NWI) maps. Instructions for interpreting topographic maps and delineating watersheds are provided in **Appendix G**.

WETLAND FUNCTIONS:

1. **Ecological Integrity**
2. **Wetland-Dependent Wildlife Habitat**
3. **Fish & Aquatic Life Habitat**
4. **Scenic Quality**
5. **Educational Potential**
6. **Wetland-Based Recreation**
7. **Flood Storage**
8. **Groundwater Recharge**
9. **Sediment Trapping**
10. **Nutrient Trapping/Retention/Transformation**
11. **Shoreline Anchoring**
12. **Noteworthiness**

1 – ECOLOGICAL INTEGRITY

Ecological Integrity describes the condition of a wetland where (1) the stability, structure and function of the ecosystem are intact and not impaired by human-caused stressors; (2) there is an abundance and diversity of native plant species, and (3) supporting processes are characteristic of an unstressed system.

Scientific research has found that wetlands are among the most highly productive ecosystems in the world. This high productivity is due in part to their location in the hydrologic cycle. Surface runoff water reaching wetlands from surrounding undeveloped uplands transport dissolved nutrients. These nutrients cycle within the wetlands and produce the dense, diverse vegetation characteristic of these communities. Diversity of wetland vegetation classes provide habitat for a variety of wildlife species, a number of which are uniquely adapted to wetlands and depend on wetlands for survival. All these factors contribute to the ecological integrity of the wetland.

The NH Method evaluates Ecological Integrity in the context of human-induced stressors to the wetland system, human activity in and around the wetland, etc. Each of the questions for this function addresses a stressor that could be impacting the system. Wetlands that are the least impacted by stressors will have a higher score for Ecological Integrity. A wholly intact system that is naturally functioning and has not been impaired by human activities will receive the highest score of 10. Wetlands that are in more developed settings and have been subjected to a number of human disturbances will score lower for this function. Note that impaired wetlands may signal opportunities for restoration. In these instances, document causes and possible solutions.

QUESTION 1 – Are there land uses in the wetland's watershed that could degrade water quality in the wetland?

In general, water quality deteriorates as the land use changes from forestland to agriculture to urban/commercial/industrial land. In addition, canopy shading is reduced causing higher water temperatures, water flow becomes more irregular and extreme, and more sediment is transported into the wetland.

Poor water quality can be harmful to many species of aquatic and terrestrial life. Indeed the whole character of the wetland ecosystem can change when it is exposed to excess sediments, nutrients and other pollutants beyond tolerable limits. Excess nutrients, for example, can cause oxygen deficiencies which can then cause a change in the species composition of both the plant and wildlife communities, often leading to reduced diversity.

> **How to answer the question:** From aerial photography (using GIS or the NH Wetlands Mapper), estimate the percent of the watershed covered by land uses that could produce unnatural sources of sediments, nutrients and other pollutants within the wetland's watershed that could degrade water quality in the wetland. Check these observations in the field wherever possible. These areas may include eroding road banks and ditches, construction sites, impervious surfaces (such as roadways, parking lots, industrial parks, airports and landfills), active cropland, and similar areas with little or no vegetation to protect soils from erosion. Be sure to document any sources on the data sheets. **Note:** Many inland wetlands, particularly peatlands, produce humic acids which stain the water brown but it remains clear. This is not necessarily a sign of poor water quality.

QUESTION 2 – Is there evidence of fill in the wetland?

Fill can disrupt wetland functions by changing the hydrology of the wetland and by altering plant communities.

> **How to answer the question:** Examine the wetland for evidence of fill. Estimate the percentage category (see data sheet) of the area of filled wetland and record the location on the Individual Wetland Evaluation Map. Areas of recent fill may be obvious, but older areas of fill may be more difficult to detect. Look for unnatural or abrupt changes in elevation, shoreline character or soils, especially between developed areas

and surrounding undeveloped areas. For example, alterations made to the wetland in past by railroad construction (old excavation shown by pit and borrow), transportation (borrow for road construction), or other disturbance relative to residential, commercial or industrial development. Indicate the location of the estimated area/s of fill on the Individual Wetland Map.

QUESTION 3 – What percentage of the wetland has been altered by agricultural activities?

Agricultural activities such as plowing, mowing, or pasturing, **within** the wetland, can alter the plant community of that wetland. Where drainage ditches are used, the soil moisture of a wetland can be reduced to a point that the area will no longer support wetland plants.

How to answer the question: Estimate the area of the wetland that includes pastures, mowed areas, and/or agricultural drainage ditches. Indicate the location of these areas on the Individual Wetland Map.

QUESTION 4 – What percentage of the wetland has been adversely impacted by logging activities within the last 10 years?

Logging can impact the plant and wildlife communities of a wetland. Unless the ground is frozen logging activities in the wetland can disturb wetland ecological functions over both the short and long term. Logging equipment can disrupt wetland hydrology by creating ruts and can compact surface soils and decrease soil permeability. Eroding logging roads including those outside/adjacent to the wetland, can add excess sediment to wetlands. Logging conducted in winter when the ground is frozen generally creates less disturbance. The following publications are good references for best management practices for logging activities:

- *Good Forestry in the Granite State – Recommended Voluntary Forest Management Practices for New Hampshire* (2010)
- *Best Management Practices for Forestry: Protecting New Hampshire's Water Quality to protect water quality in New Hampshire* (2005)

[Note: The 2009 revised NH Prime Wetlands Rules allow a property owner to apply for a waiver "…to perform forest management work and related activities in the forested portion of a prime wetland or its 100-foot buffer … A waiver shall be issued only when the department [NH DES] is able to determine there will be no significant net loss of wetland values as identified in …RSA 482-A:1"]

How to answer the question: Estimate the percentage of the wetland that has been adversely impacted by logging in the past ten years (recorded on the Individual Wetland Evaluation Map), e.g. eroding logging roads, altered hydrology, deep ruts, sedimentation, unvegetated landings that are eroding, etc. Note the percentage of the wetland that has been directly affected as well as those areas of the wetland that may have been affecting by logging in the upland area immediately adjacent to the wetland.

QUESTION 5 – How much human activity is taking place in the wetland?

High levels of human activity within the wetland itself are often detrimental to the wetland. The entire wetland ecosystem may be affected because of disturbances to the plant and wildlife communities. Peatlands in particular, are very sensitive environments. They are generally nutrient poor ecosystems that have developed slowly over several thousand years. Disturbed peatlands may take many years to recover and may never recover if the organic substrate is removed.

How to answer the question: Estimate the amount of human activity **in the wetland** other than agriculture and logging. Observable indicators of human activity could include: Motorized and non-motorized use on trails through the wetland, road traffic going through or adjacent to the wetland, structures in the wetland, and dumping of brush and garbage in the wetland.

QUESTION 6 – What percentage of the wetland is occupied by invasive plant species?

Invasive plants are indicators of disturbance and often occur in and around the wetland environment. Two non-native invasive plant species, phragmites (common reed) and purple loosestrife, are particularly adept at invading and ultimately dominating disturbed wetlands. A native species, cattail, often responds to increased sedimentation and can become invasive. To determine if cattails are becoming invasive, observe whether they are dominant near a road or recently cleared land, but are not dominant in the rest of the wetland.

For a list of invasive aquatic plant species, refer to page 4 NH DES's ENv-Wq 1300 rules. Upland (terrestrial) invasive plants that are prohibited or restricted in New Hampshire are listed in the 2011 publication New Hampshire Guide to Upland Invasive Species. Additional information about invasive species in New Hampshire is available on the NH Dept. of Agriculture, Markets & Foods Invasive Species Frequently Asked Questions web page.

> **How to answer the question:** Estimate the percentage of the wetland that is occupied by invasive plants such as phragmites, purple loosestrife or native species that may become invasive, such as cattail. Note that reed canary grass, Japanese barberry, glossy buckthorn, and Japanese knotweed are also problematic invasives that may occur at the edge or in disturbed wetlands.

QUESTION 7 – Are there roads, driveways, or railroads crossing or adjacent to the wetland or within 500 feet of the wetland?

Roads provide access to wetlands which might otherwise remain undisturbed, and represent areas of fill in a wetland. Road crossings are also potential sites for the introduction of invasive plants and water pollutants such as sediment, road salt, oil, and spilled chemicals. In addition, road and railroad crossings can fragment wetland wildlife habitat and disrupt wetland hydrology.

How to answer the question: Identify all roads, driveways or railroads that cross, border or are within 500 ft. of a wetland. Roads, driveways and railroads are defined for the NH Method as any byway or thoroughfare that currently supports vehicular traffic, and whose current footprint alters the natural flow of water into, across, and/or out of the wetland. Three principal categories of impact are recognized

- Road, driveways and/or railroads that are more than 500 ft. away from the edge of the wetland
- Road, driveways and/or railroads that are within 500 ft. of the wetland but do not border the edge or cross the wetland
- Road, driveways and /or railroads that either border the wetland or cut through the wetland itself

Keep in mind that continuous wetland evaluation units that have been separated on account of a significant road crossing must be assessed according to the third bullet above (see also Section 2, Part D).

QUESTION 8 – How much human activity is taking place in the upland within 500 feet of the wetland edge?

Human activity (land disturbance, clearing, logging, active trails, development, roads, etc.) in the upland immediately bordering the wetland can have significant effects in the wetland itself. An undisturbed woodland buffer decreases the amount of disturbance within the wetland. This is especially important for nesting birds which may be disturbed by people or household pets. An undisturbed buffer also protects water quality. The ecological integrity of the wetland is maintained by relatively undisturbed conditions in the bordering upland.

How to answer the question: Estimate the amount of human activity **in the adjacent upland,** within 500 ft of the wetland edge, based on criteria provided on the data sheet.

QUESTION 9 – What is the percent of impervious surface within 500 feet of the wetland edge?

Impervious surfaces are an indicator of human activity. Buildings that are within or adjacent to wetlands can be a source of pollutants. Roofs, sidewalks, parking lots, driveways and other paved surfaces that are associated with buildings increase the amount of impervious area next to a wetland, resulting in more runoff, pollutant, sediment and nutrient inputs. Lawns are less pervious than forests and may be sources of pollutants. Impervious surfaces also break up habitat and deter wildlife species that are sensitive to human presence. Nearly all water dependent organisms are negatively affected by pollution and it has been show that watersheds with greater than 10% impervious surface have a significantly higher probability of containing impaired waters.

> **How to answer the question:** Estimate the percentage of impervious surfaces within 500 ft of the wetland edge, and identify on the Individual Wetland Map. Use aerial photos as well as field checking.

QUESTION 10 – Is there a human-made structure that regulates the flow of water through the wetland?

Human-made structures that alter the flow of water through a wetland can have both short and long term effects on ecological integrity. Dams that completely block flow during low water will prevent passage of fish and other aquatic life. Culverts typically constrict flow and provide unnatural substrates for aquatic life. Bridge abutments often accelerate flow through a confined channel and alter the natural meanders of a stream. Artificial barriers to the surface water (hydrology of a wetland) – dams, culverts, bridge abutments, roads, etc. reduce the fundamental ability of a wetland to function as an intact hydrologic system.
[**Note** that beaver dams are regarded as a natural part of the wetland ecosystem. Beaver dams tend to be temporary for the most part, and result in a natural transformation of the wetland ecosystem]

> **How to answer the question:** Consider the source and flow of water through the wetland. Is the flow of water being severely constricted by upstream blockages within wetland such as culverts, artificial dams, or other obstructions? Next examine the flow of water through the wetland and record the presence/absence of a human-made dam, bridge and/or culvert that may be clogged or failing, including at the outlet of the wetland. If the wetland is bisected by a road, check the flow of water through the crossing structure.

2 – WETLAND-DEPENDENT WILDLIFE HABITAT

Habitat can be defined as an environment in which organisms live. The NH Method does not attempt to evaluate the wetland as habitat for particular wildlife species. It assesses the overall suitability of a wetland as habitat for those wildlife species that are dependent on wetlands for all or most of their life cycle. This Function concentrates on those species that are mostly dependent on emergent marsh, flooded shrub wetlands, snag swamps (e.g. flooded dead wooded swamps) or aquatic bed systems.

Wetlands represent a continuum of hydrologic conditions, with uplands at one extreme and deep water habitats at the other. In terms of wetland vegetation classes, emergent wetlands (i.e. marshes) and flooded shrub and dead forested (snag) swamps fall toward the wetter end of the continuum, while most forested and some scrub-shrub wetlands occur successively toward the dryer end. Generally speaking, the more open water in a wetland, the more likely it is to provide habitat for wildlife that are highly dependent on wetlands, such as waterfowl, wading birds, and turtles. Forested wetlands at the less wet end of the spectrum typically provide habitat for primarily upland species rather than wetland-dependent species, e.g. northern waterthrush, Canada warbler, etc.

Peatlands are a common wetland type providing specialized ecological niches for certain peatland-dependent species. For example, one of the state's rarest mammals, the northern bog lemming, is an example of a species dependent on peatland habitat.

Vernal pools are unique wetlands with a seasonal cycle of flooding and drying. The annual drying cycle plays a key role in determining which wildlife species use these pools as habitat. Vernal pools provide critical breeding habitat for a number of amphibian species (frogs and salamanders) as well as insects and crustaceans such as fairy shrimp. Spotted and Blanding's turtles, great blue herons, raccoons and predatory insects travel to vernal pools to feed on amphibian eggs, tadpoles, insects and crustaceans. Vernal pools can exist in a variety of habitats, such as forests, fields, swamps, marshes and in old gravel pits. Section 5 provides further information about vernal pools. Vernal pools are not specifically addressed in this function, but can be flagged in Function 12 – Noteworthiness.

QUESTION 1 – What is the wetland acreage?

Larger wetland complexes are likely to provide greater area and higher plant diversity for wetland-dependent species requiring larger home ranges.

> **How to answer the question:** Record wetland acreage based on the Individual Wetland Map and field checking (include any upland islands located within the wetland in your calculation of wetland acreage)

QUESTION 2 – What is the score for Ecological Integrity?

Those wetlands which are the least degraded by human activity provide the highest quality habitat for wildlife.

> **How to answer the question:** Record the average score from **Ecological Integrity**.

QUESTION 3 – Has water quality in the wetland been degraded by land use in the watershed?

Poor water quality can be harmful to many wetland dependent species. The whole character of the wetland ecosystem can change when it is exposed to excess sediments, nutrients and other pollutants beyond tolerable limits. For example, excess nutrients can cause oxygen deficiencies which in turn can cause a change in the species composition of both the plant and animal communities

> **How to answer the question:**   Record the answer from **Ecological Integrity,** Question 1.

QUESTION 4 – What is the area of shallow permanent open water less than 6.6 feet deep, including streams and shallow ponds that are part of the wetland complex?

Open water in or adjacent to a wetland is essential for a number of aquatic wildlife species including fish, mink, otter, waterfowl, wading birds, most amphibians, some reptiles, insects, shellfish, crustaceans, and other invertebrates. Shallow open water is classified as PUB (Palustrine Unconsolidated Bottom), PAB (Palustrine Aquatic Bed) or PEM2 (Palustrine Emergent, Non-persistent) on the NWI Maps (see Appendix F for more details about wetland classification).

> **How to answer the question:** Estimate the area of open water from the Individual Wetland Map, the NH Wetlands Mapper or using GIS tools. Shallow permanent open water (less than 6.6ft deep) is defined as ponded open water having less than 30% of its area covered by trees, shrubs and rooted persistent emergent vegetation. This needs to be determined by field observation in summer or early fall, or from aerial photos taken with the leaves of trees on (see NH Wetlands Mapper or use GIS).

QUESTION 5 – Is there deepwater habitat (lakes or ponds > 6.6 feet deep) and/or 4th order or higher rivers associated with the wetland?

Deepwater habitat is critical for a variety of aquatic life, such as diving waterfowl (e.g. loons and pied billed grebes), ducks, geese, mink, otter, fish, etc. The presence of deep water within or adjacent to a wetland enhances wildlife diversity by providing a greater variety of aquatic habitats, a permanent source of water for the wetland, and more nutrients (food sources) for shallow water and terrestrial organisms within the wetland.

> **How to answer the question:** This question looks at the presence of deepwater habitat deeper than 6.6 feet depth within or adjacent to the wetland (lake, pond or river, classified as Lacustrine or Riverine in the Cowardin Wetland Classification System – see Appendix F for more details). Aquatic vegetation is not typically present in these deeper water habitats, although some may be present in the shallower edges. Determine the type of deepwater habitat within or immediately adjacent to the evaluation area by using the NH Wetlands Mapper, GIS, or visual inspection. Note that NH Fish & Game Department has bathymetry (water depth) data available for some state water bodies. Estimate lake or pond acreage using topographic maps or aerial photographs, both available on the NH Wetlands Mapper or by using GIS. Consult the NH DES list of 4th Order and Higher Streams using the links in the sidebar on stream order. Estimate stream length using the topographic maps or aerial photos available on the NH Wetlands Mapper or by using GIS tools.

Stream Order

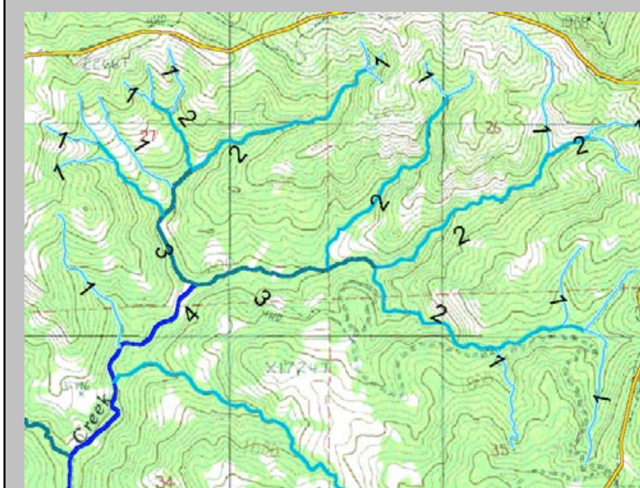

Illustration from http://www.krisweb.com/stream/stream_order_kris.htm

The Strahler system of stream order is a simple method to classify stream segments based on the number of tributaries upstream. A stream with no tributaries (i.e. headwater stream) is considered a first order stream. A stream segment downstream of the confluence (joining) of two first order streams is a second order stream, and so on. A general rule of thumb is that the smaller the number (1st, 2nd order) the smaller the stream, and the larger the number (e.g. 4th, 5th etc.), the larger the streams.

NH DES List of Fourth Order and Higher Streams

NH Statewide Map Atlas "Fourth Order and Higher Streams"

QUESTION 6 – What is the diversity of vegetation classes in the wetland?

Vegetation is an important component of wildlife habitat. Biologists recognize that diversity in the plant community increases the diversity of the wildlife community. Since each wetland class represents a different plant community, the more wetland classes that are present in a wetland, the greater the overall plant diversity of the wetland. In addition, having two wetland classes adjacent to each other may improve the wildlife habitat value over each alone because some wetland wildlife species, such as the alder flycatcher and common yellowthroat, use the edge between two different plant communities. Upland "islands" are areas of upland (usually at a slightly higher elevation than the wetland) that are surrounded by wetland. Because they are relatively inaccessible (being surrounded by wetland) these upland inclusions are often undisturbed by humans and household pets and provide sanctuaries for wildlife. They also provide additional "edge" between plant communities, adding to the overall vegetation diversity.

> **How to answer the question:** Count the number of wetland vegetation classes and upland "islands," each of which should occupy at least 5% of the total wetland area. Count individual wetland classes (e.g. PEM, PFO, and PSS) as well as combined wetland classes (e.g. PEM/PSS, PFO/PEM). Refer to Appendix F for more details about wetland classes and the Cowardin System of Wetland Classification. Note that the wetland vegetation classes and upland islands shown on the NWI map will need field checking to verify. The vegetation in some wetland areas may have significantly changed since the NWI maps were produced in the 1980s. If there are wetland vegetation classes that occupy less than 5% of the wetland area, document these observations in the Observations & Notes column of the NHM Data Form. This will document smaller fringe or patch wetland vegetation areas that may be present.

Wetland Vegetation Classes

Refer to Appendix F for more information about wetland vegetation classes.

Aquatic Bed vegetation is characterized by plants that grow at or below the surface of water. They may be floating, rooted and/or non-rooted and can include species such as duckweed, milfoil, etc.

Emergent vegetation is characterized by rooted herbaceous and grasslike plants that stand erect above or at the water or wetland surface (excluding mosses and Lichens).

Persistent emergents are plant species that normally remain standing until the beginning of the next growing season, e.g. cattails, bulrushes, sedges, reeds.

Non-persistent emergents are plant species that fall below the surface of the water at the end of the growing season, so that at certain times of year there is no obvious sign of emergent vegetation, e.g. pickerel weed, arrowheads, water lilies.

Forested wetlands are characterized by woody vegetation greater than 20 ft tall. They usually include an understory of young trees or shrubs, and an herbaceous layer.

Scrub-Shrub wetlands are dominated by woody vegetation less than 20 ft tall. Species may include true shrubs, young trees, or trees or shrubs that are stunted by saturated conditions.

Bog is a peat accumulating wetland with no inflows or outflows and supports acidic-tolerant plants, such as sphagnum moss and small shrubs, e.g. leatherleaf.

Fen is a peatland that receives some drainage from surrounding mineral soils, and supports persistent emergent plants.

QUESTION 7 – Are other wetlands in close proximity to the study wetland?

Proximity to other wetlands enhances the wildlife value of a wetland. Birds, such as great blue herons, may roost in one wetland and travel to other wetlands to fish. Blanding's turtles typically require a small network of ponds or pools for their seasonal feeding requirements. Wildlife use of wetlands is enhanced when two wetlands in close proximity include wetland vegetation classes that are different. For example, there may be no open water in the evaluation wetland but water may be present in a neighboring wetland. This water enhances the wildlife habitat value of the study wetland because it offers a greater diversity of habitats available to birds, reptiles, and mammals moving between wetlands.

> **How to answer the question:** Determine if there are any other wetlands in close proximity to the study wetland. These wetlands may be hydrologically connected via a watercourse or they may be unconnected.

QUESTION 8 – Are there wildlife travel corridors allowing access to other wetlands?

Access to other wetlands is important to maintaining wildlife populations. Wildlife travel corridors between wetlands should be areas of dense vegetation over 100 feet in width. Very often these will run along the main stream channels through dense woodlands or along shorelines. A wetland that is part of an interconnected system of wetlands can be expected to support more species than a single isolated wetland. Connection via a vegetated watercourse makes travel between different wetlands easier, with the greater diversity of wetland vegetation classes leading to a greater diversity of wildlife species.

> **How to answer the question:** Determine the presence of potential travel corridors for wildlife between the wetland being evaluated and other nearby wetlands as determined above. Optimal travel corridors should be areas of uninterrupted dense vegetation over 100 feet in width. Obstructions to travel lanes might include complete or partial blockage by roads, fences, developed areas, etc.

QUESTION 9 – What percentage of the wetland edge is bordered by undisturbed woodland or idle land (e.g. shrub land or abandoned fields) at least 500 feet in width?

Undisturbed woodland, shrubland or abandoned fields adjacent to the wetland increases the value of the habitat within the wetland itself. This is particularly important for nesting birds that may be disturbed by people and household pets, or for beaver that require well vegetated buffers adjacent to wetlands.

> **How to answer the question:** Review aerial photos along with field observation. Note undisturbed areas within 500 ft of the wetland on the Individual Wetland Map, and estimate the percentage of the wetland edge that is undisturbed by human activity.

QUESTION 10 – What percentage of the wetland is occupied by invasive plant species?

Invasive plants have lower wildlife value than a diverse community of native wetland plants and can form dense stands that crowd out other more valuable plant species, resulting in a loss of native plant diversity. This loss of diversity can significantly reduce the amount and diversity of wildlife using the wetland.

For a list of invasive aquatic plant species, refer to page 4 NH DES's ENv-Wq 1300 rules. Upland (terrestrial) invasive plants that are prohibited or restricted in New Hampshire are listed in the 2011 publication New Hampshire Guide to Upland Invasive Species. Additional information about invasive species in New Hampshire is available on the NH Dept. of Agriculture, Markets and Foods Invasive Species Frequently Asked Questions web page.

> **How to answer the question:** Record your answer from **Ecological Integrity: Question 6**

3 – FISH & AQUATIC LIFE HABITAT

NOTE: This Function evaluates wetlands associated with open water or those that have seasonal or permanent open water within their bounds. It applies to wetlands with standing water, running water, ponded water or lakes, with or without vegetation, whether or not fish are known to be present. If you are assessing a wetland that lacks open water at any time of year, such as raised bog mats, perched forested swamps without pools, or sloping seepage wetlands, omit this function and write "N/A" on the data form and explain why.

In the first edition of the NH Method, fish were treated as a separate group of wildlife with strong affinities to wetlands, particularly those associated with perennial streams or lakes and ponds. Yet, the recognition of fish populations as a subset of wetland wildlife must also include recognition of all of the species that support their well-being, in other words, *aquatic life*.

Since most wetlands have standing water, most wetlands contain habitat for aquatic life. While some wetlands are better at providing viable habitat for water-dependent species than others, most contain varying degrees of the necessary ingredients for their success – namely, food, shelter, and reproductive opportunity. Among the lower tiers of food chain support are the microscopic protists, algae, and bacteria that rely on a 'chemical soup' of nutrients. Higher on the food chain are the snails, clams, crayfish, plus hundreds of invertebrate species that live largely unnoticed in wetlands until they take flight – the caddisflies, mayflies, hellgrammites, midges, and no-see-ums. If present in sufficient numbers, these invertebrates support fish and a host of other vertebrate fauna.

This function addresses the wetland's ability to support all levels of aquatic life that are strictly dependent on water for their survival. The functional capacity of a wetland will score higher if there is abundant water year-round, water quality is high, and there is a diversity of habitat structure supporting a diversity of aquatic wildlife.

QUESTION 1 – What is the dominant land use in the watershed above the wetland?

In general, aquatic life habitat deteriorates as the land use changes from forestland to agriculture to urban/commercial/industrial land because water quality decreases, canopy shading is reduced, water flow becomes more irregular and extreme, and more sediment is transported into the wetland.

> **How to answer the question:** Using topographic maps and aerial photos using the NH Wetlands Mapper, GIS, or images from Google Earth™, identify the dominant land use types in the watershed above the wetland (undisturbed woodland, wetland or abandoned farmland, active farmland, rural residential, and heavily developed urban).

QUESTION 2 – Has water quality in the wetland been degraded by land use in the watershed?

Poor water quality can be harmful to many species of aquatic life. Low oxygen, excess nutrients, and toxic substances can stress species tolerance beyond their limits of survival. Aquatic invertebrates, especially those that are intolerant of pollution, are excellent indicators of water quality. The higher the water quality, the more likely that a higher diversity and abundance of organisms will be present at all levels in the food chain.

> **How to answer the question:** Record the answer from **Ecological Integrity: Question 1.**

QUESTION 3 – What is the area of shallow permanent open water less than 6.6 feet deep, including streams and ponds within the wetland?

While most wetlands contain some open water at least for a portion of the year, those with perennial flowing or open water bodies have more habitat opportunity for aquatic life. In general, the longer the period of inundation throughout the year, the more likely a complex array of water-dependent invertebrate organisms will be present that supports fish and other vertebrate species.

How to answer the question: Record answer from **Wetland-Dependent Wildlife Habitat**: **Question 4**.

QUESTION 4 – What is the acreage of deepwater habitats deeper than 6.6 feet (pond or lake) associated with the wetland?

Those wetlands associated with ponds or lakes tend to have higher populations of aquatic life than those that only contain small impoundments within them. Lakeshore or pondshore fringe wetlands are enhanced by the nearby presence of deepwater habitats (i.e. > 6.6 feet deep). More interactions between trophic groups are possible, and greater stabilizing effects on water quality and condition are also possible.

How to answer the question: This question looks at the presence of deepwater habitat deeper than 6.6 feet within or adjacent to the wetland (lake, pond or river, classified as Lacustrine or Riverine in the Cowardin Wetland Classification System – see Appendix F for more details). Aquatic vegetation is not typically present in these deeper water habitats, although there may be some along the shallower edges. Record the acreage of the pond or lake associated with the wetland being evaluated. This should include the entire acreage of the water body as listed in the NH Wetlands Mapper or on GIS.

QUESTION 5 – What is the width (bank to bank) of the stream <u>within</u> the wetland?

Streams greater than 50 feet wide are typically major rivers that have a wide diversity of habitats and aquatic life associated with them, particularly fish. Streams between 25 feet and 50 feet wide are perennial streams that usually have a high enough gradient to contain a mixture of substrates, channels and pools, yet lack the complex habitat structure of large rivers. Streams less than 25 feet wide are high energy systems with highly variable water levels that typically have natural or artificial barriers to fish passage. Streams less than 2 feet wide are usually intermittent, and tend to be restricted in terms of aquatic life habitat.

How to answer the question: Estimate the average width of the stream (in feet) within the wetland during times of average high water. Note that this can often be determined by observing either high water marks on trees or banks, or the limit of moss growth on the rocks along the water channel.

QUESTION 6 – Does the stream channel appear to have been recently altered?

Note: Consider "recent" to mean within the last five to ten years. Naturally occurring stream channels and banks provide optimally suitable habitat for aquatic life. Altering stream velocity, water depth, or natural flow paths through ditching, excavation, debris removal, channel straightening or leveling can have significant impacts on the natural diversity of aquatic life that absolutely depends on particular types of microhabitat. 100-year flooding events tend to scour channels, move large quantities of sediment and eliminate natural substrate beds (substrate refers to the stream bed materials). Bulldozers and excavators can have a similar effect especially when attempting to "correct" natural flooding events by re-channelizing flows or redirecting riverbank terraces.

How to answer the question: Look at the characteristics of the stream channel associated with the wetland. Does it look like it has been recently altered by extreme flooding? Or has it been significantly altered by artificial (i.e. human) means? Both types of alteration may have had detrimental effects on the health and diversity of the aquatic life community. Does the channel have straight sides and uniformly level banks? Or does it have variably steep or undercut banks that meander? Does the channel itself contain a uniform or diverse mixture of gravels, cobbles, or stones?

Since the gradient of the stream may mask past practices of streambank straightening or excavation, it is important to estimate the type of stream gradient when answering this question:

Low gradient (slow flowing) streams have meandering channels, steep banks, and soft substrates of mud, silt, or organic material. They also often contain oxbows or lateral overflow channels created during periodic high water events.

Medium gradient (moderate flowing) streams have fairly straight channels between wider arcs or bends. The banks are fairly steep and rocky, and the substrate is a mix of coarse and fine sediments, with the silts and fine sands in backwater eddies and pools, and the coarser gravels and cobbles in faster moving riffles.

High gradient (fast moving) streams have nearly straight channels between sharp, angular bends. The banks tend to be angled sharply upwards on the faster current side, but can be shallowly sloped around bars and bends. The substrate is coarse and rocky, with few coarse sands and gravels. Water flow is 'flashy' (subject to rapid change with storms)

When answering this question, consider that the highest value aquatic habitat sites with have natural pools and riffles, varying substrate types, and naturally sloped channels that conform to the topography of the landscape. Medium-value sites will have one or more of these features missing as a result of the types of disturbance events noted above. Although the 5 – 10 year period is generally good for estimating "recent," some streams take much longer to recover (if ever) from human-caused, bank straightening or flow-altering impacts.

QUESTION 7 – Within the wetland, what is the diversity of substrate types in the area(s) <u>occupied by open water</u> (flowing or standing water) during the non-growing season?

Substrate in this question refers to the aquatic bed materials, which could include soils such as peat, muck, sand and gravel. Invertebrate aquatic life is highly dependent on diversity and abundance of substrate types for their survival needs. Shelter, attachment sites, home territories, breeding success, and food types are all associated with substrate. The greater the diversity of substrates, the greater the diversity of invertebrate aquatic life. High invertebrate diversity tends to also support higher vertebrate diversity, especially fish.

How to answer the question: From direct visual field observation, determine the number of substrate types that are subject to regular inundation for at least a portion of the year. Substrate types can be generally lumped into the following categories:

- <u>Organic material</u> – Undecomposed to very well-decomposed plant materials, which could include stumps
- <u>Mud</u> – Very fine sands, silts and clays that are enriched with decomposed plant matter but still have a gritty feel
- <u>Sand</u> – Very fine to coarse gritty soil particles .01 – 2 mm in diameter
- <u>Gravel</u> – Coarse soil fragments 2 – 75 mm in diameter
- <u>Cobble</u> – Angular or rounded soil fragments 75 - 254 mms in diameter
- <u>Stones, boulders or ledge</u> – Consolidated rock fragments > 254 mms in diameter or rock surfaces e.g. ledge

Note: 25.4mm = 1inch

Note that rapidly flowing water is typically underlain by cobbles, gravels and coarse sands; moderately fast flowing water is typically underlain by medium to fine sands; and slow-moving water typically has mud and/or organic material as the substrate type. Under normal water conditions, substrate type *even if not sampled* can be estimated by the flow dynamics of a stream. Pond and lakeshores will have to be directly observed, however, as these are not generally determined by water flow but are more commonly regulated by wave action.

QUESTION 8 – How abundant are coarse woody material and large rocks associated with the open water portion of the wetland?

Cover objects such as rocks, logs, stumps, branches and rocks occur naturally in wetlands, particularly those associated with streams and the edges of ponds or lakes. Cover objects are critical for defense against predators, providing shade, basking sites and regulating water temperature. Coarse woody material is simply woody plant fragments such as bark, twigs, branches, logs, and stumps that fall or float into water bodies associated with wetlands.

Streamside, pondshore, or lakeshore wetlands with more coarse woody material offer greater natural microhabitat diversity for invertebrates, and better hiding places for fish and other aquatic vertebrates. This material also contributes valuable substrate for bacteria, fungi, algae, etc.

> **How to answer the question:** Visually determine the approximate percentage of cover objects in open water portion of the wetland made up of coarse woody material and large rocks. This may include submerged stumps or logs as well as dead or dying trees that have fallen into a wetland and its associated water body.

QUESTION 9 – What is the abundance of floating & submerged vegetation?

A second set of cover objects includes floating leaved and submerged vegetation in the wetland associated with a river, stream, pond, or lake. Floating vegetation includes water lilies, pondweeds, bur–reed, and other aquatic vegetation that has floating leaves. Submerged vegetation includes bladderworts, milfoils, waterworts, and other herbaceous vegetation that typically grows beneath the surface of the water. Streamside, pondshore, or lakeshore wetlands with a high percentage of floating-leaved and submerged vegetation have better habitat for aquatic life due to an increase in microhabitat structure, shading from the sun, and reduced detection by predators, as well as valuable nutrients from the decomposition of herbaceous vegetation. Areas with less of this vegetation tend to have fewer invertebrates and fish.

> **How to answer the question:** Visually estimate the approximate percentage of cover objects made up of floating leaved and submerged vegetation. This question is best answered in summer when there is vegetative growth. In the non-growing season this will require an estimate of maximum summer growth, or the use of GIS or NH Wetlands Mapper leaf-on aerial photo imagery as a substitute for estimating cover. Note on the data sheets what time of year you were estimating cover, and if the data was derived from NH Wetlands Mapper, GIS or field observation.

QUESTION 10 – **Are there artificial barriers/blockages to passage of aquatic life?**

Barriers to the passage of aquatic life in a stream can severely limit population health and productivity. Many fish species depend on a barrier-free environment in order to migrate from feeding or shelter areas to breeding grounds. Even stream salamanders and caddisflies will be affected if a barrier such as a dam, elevated culvert, bridge abutment, or roadway has blocked passage up or downstream. Besides blocking animals from a feeding area and a spawning or breeding area, barriers can also limit the invaluable exchange of genetic strains in a population of organisms. For clam and mussels species that rely on fish passage in order to populate different stream reaches, barriers can mean the demise of an entire local population.

Note that some culverts and bridge abutments provide adequate passage for aquatic life except during the low water time of year. If the water level in the outlet drops by more than 8” in a culvert during this time of year **(see photo below)**, then these structures are considered a barrier to fish passage. Also, if the culvert is too small or narrow to contain a natural bed of sand and gravel, it may also prevent passage for aquatic life. While there is no hard and fast rule about when and if animals will use culverts for passage, if in doubt, answer by choosing the lower score. In this question, we are interested in *artificial barriers*, since natural barriers such as beaver dams, downed logs, or rocky ledges are all part of the natural system that aquatic life is adapted to.

> **How to answer the question:** Determine if there are any artificial barriers/blockages to aquatic life passage such as man-made dams (with or without fish ladders), elevated culverts or restricted bridge openings, roadways without a free-flowing culvert, or beaver excluder grates within or at the edge of the wetland. If there is no stream associated with the wetland, then answer the appropriate option.

Left: A perched culvert showing an artificial barrier to aquatic life. A drop of 8" or more during low flow times of year can severely limit the passage of fish and aquatic organisms.

QUESTION 11 – Are fish or aquatic species present that are rare, threatened, endangered or "Species of Special Concern"?

Evidence of high quality wetland habitat is often characterized by the presence of rare, threatened and endangered species and "species of special concern" as defined by NH Fish and Game Dept. These species include those that are *federally* or *state* listed as rare, threatened or endangered, as well as those designated by the NH Fish & Game Department as "Special Concern" because of the likelihood of them becoming threatened or endangered in the future. Lists of these species can be found on the NH Fish and Game website. High quality (i.e. undisturbed) habitat is also essential for most species. Many of our rarest aquatic life species (e.g. blueback herring or ringed boghaunter dragonfly) have declined in the landscape because of habitat loss or severe alteration.

[Note: Not all occurrences of rare, threatened and endangered wildlife have been recorded by the NH Natural Heritage Bureau or the NH Fish & Game Department. Suitable habitat for rare species may exist on the site and these species may be present but currently undocumented].

> **How to answer the question:** Consult the NH Natural Heritage Bureau List of Towns and select the town in question (listed in alphabetical order). See if any species that use wetlands are listed and determine their habitat type(s). For help with this, also see the NH Wildlife Plan Species Profiles. For site specific information on whether or not a rare species is found in or adjacent to the wetland you are evaluating, please submit a formal request to the Non-game and Endangered Species Program, NH Fish & Game Department, 6 Hazen Drive, Concord, NH 03301. Note that other than fish, reptiles, amphibians and dragonflies, most aquatic life species are not tracked by Fish & Game or Natural Heritage.

4 - SCENIC QUALITY

Wetlands can be areas of scenic beauty, and are appreciated for their wild quality and tranquility. Most often wetlands are viewed from public roads, but other important viewing locations might be along a stream, from a canoe, along a nature trail, or from an overlook. In larger wetlands, there may be several viewing locations. In this case, pick the best and most accessible site. Note that some sites that have high scenic quality may not be easily accessible by the public. Use your best judgment in determining scenic quality at such sites (e.g. more remote wetlands). The evaluation area may include the entire wetland, or if the wetland is large, it is possible that only a portion(s) will be evaluated for scenic quality, e.g. an area that is clearly visible from a road or stream. Determine the location/s from which the wetland can be viewed, and note the location/s on the Individual Wetland Map as well as at the top of the data form. Add this information to the spreadsheet and the datasheet. For some wetlands along lakes or rivers, however, the viewing area experienced by the many people might be from a boat.

For this function, the primary viewing site is defined as the point where people are most likely to observe the wetland. Be sure to indicate the location of the viewing site on both the data form and a map.

QUESTION 1 – How many wetland vegetation classes are visible from the primary viewing location(s)?

The question assumes that scenic diversity (several different plant communities visible at one location) increases visual quality.

> **How to answer the question:** Determine the number of wetland vegetation classes that are visible at the viewing site. Use National Wetland Inventory wetland vegetation classes to describe these. Count individual wetland vegetation classes (e.g. PEM, PFO, PSS) as well as combined wetland vegetation classes (e.g. PEM/PSS, PFO5/PEM). Refer to Appendix F for more details about wetland classes and the Cowardin System of Wetland Classification. Note that the wetland classes shown on the NWI map will need field checking to verify. The vegetation in some wetland areas may have significantly changed since the NWI maps were produced in 1989.

QUESTION 2 – Is there public access at the viewing site?

Wetlands on publicly accessible properties may have some form of trail for easier access. Wetlands that are easily viewed from the road and/or have parking nearby provide a good viewing opportunity, as do wetlands that are viewed from trails (include canoe trails as well as walking trails).

> **How to answer the question:** Determine ease of getting to to the viewing location and whether or not there is public access. Keep in mind that Class VI roads and logging skid roads (if passable) can constitute a trail. Access is considered public if the site can be viewed from a roadside or a stream, or written permission is obtained from the landowner to access the viewing point from their property.

QUESTION 3 – What is the visible extent across the wetland?

A clear unobstructed view that shows the wetland's expanse and surrounding landscape provides a high quality visual experience.

> **How to answer the question:** Assess the extent of the wetland visible from the viewing location. Is there a clear view with a large visual expanse, or is the view restricted by taller vegetation, such as trees and shrubs?

QUESTION 4 – What is the approximate extent of open water (including streams) visible from the primary viewing location/s?

Views of open water are generally considered to be aesthetically appealing.

> **How to answer the question:** Estimate the acreage of open water and streams using field observation and/or the NH Wetlands Mapper or GIS tools. For a visual comparison, a soccer field is about 1.1 acres, not including the end zones.

QUESTION 5 – Does the wetland provide visual contrast with the surrounding landscape

Wetlands, which are generally low-lying, often contrast dramatically with the surrounding areas, for example, a marsh adjacent to a ridge or a dense stand of trees. On the other hand, some floodplain or forested wetlands may provide little visual contrast.

> **How to answer the question:** Determine whether the wetland provides visual contrast with the surrounding landscape.

QUESTION 6 – What is the general appearance of the wetland and surrounding land use(s) visible from primary viewing location(s)?

The aesthetic quality of wetlands lies in the natural beauty of their diverse vegetation. Trash and other signs of disturbance detract from this beauty.

> **How to answer the question:** Judge the visual quality of the wetland and surrounding area - is the wetland undisturbed and natural, or are there visual detractors such as litter, abandoned cars, power lines etc. present.

5 – EDUCATIONAL POTENTIAL

- If there is no public or private (i.e. with written permission) access to a potential educational site at the time of evaluation, but there may be potential to develop access in the future, evaluate the wetland for educational potential and flag it as needing future assessment for accessibility.
- If there is no public or private access to the educational site, and/or unacceptable safety hazards (such as steep embankments near water, busy roads, railroad trestles, etc.), and developing public or private access in the future is NOT feasible, then leave this Function out of the evaluation and give it a zero score.

For this function, the primary educational site is defined as the area most likely to be used for education. Be sure to indicate the location of the viewing site on both the data form and a map.

Field studies are considered an important part of the educational process. Wetland field studies are particularly important for teaching ecological principles about wetlands for determining wetland function. This function assesses the educational potential of wetlands in terms of access to the widest variety of wetland types and other natural resources that might be studied. The area evaluated may include the entire wetland, or if the wetland is large it is possible that only a portion of it will be used (based on visibility, accessibility, etc.). Mark the location of the potential educational site on the individual wetland map.

QUESTION 1 – What is the Ecological Integrity of the wetland?

It is assumed that a naturally functioning ecosystem is an excellent educational site for learning about wetland ecological processes in a natural, undisturbed setting.

> **How to answer the question:** Record the Average Score from **Ecological Integrity**.

QUESTION 2 – Does the wetland have high value wildlife habitat?

The educational potential of a site is enhanced by high value wildlife habitat.

> **How to answer the question:** Record the Average Score from **Wetland-Dependent Wildlife Habitat.**

QUESTION 3 - Does the wetland have high value fish and aquatic life habitat?

The educational potential of a site is enhanced by high value aquatic life habitat.

> **How to answer the question:** Record the Average Score from **Fish & Aquatic Life Habitat.**

QUESTION 4 – Is all or part of the wetland on public or private property that has public or private access (i.e. with written permission)?

Wetlands on properties that are publicly owned and managed and have public access usually have some form of trail system. These wetlands may be good locations for educational purposes. Land that is posted cannot be publicly accessed without landowner permission. Permanently conserved lands and public lands are displayed in the NH Wetlands Mapper and are available through GIS. However, note that not all privately owned conserved lands allow public access, and that some require property owner permission for educational use.

> **How to answer the question:** Determine if the wetland is on a property that has public access, e.g. state parks, documented nature preserves, wildlife management areas, or conservation easements with public access. Determine if the landowner is willing to give permission to use the site for educational purposes.

QUESTION 5 – How close is the educational site to off-road parking suitable for 5-10 vehicles or large enough for a school bus?

A suitable parking area close to the potential educational site is important for access and participant safety. Parking areas that are limited in size or are a long walk from a potential educational site reduces the value for group field studies.

> **How to answer the question:** Determine how big the parking area is and how long it takes to get from the parking area to the potential educational site.

QUESTION 6 – How many wetland vegetation classes are accessible or potentially accessible for study at educational site/s?

Several wetland vegetation types in close proximity are considered to provide the best educational opportunity. However, sometimes two or even one wetland vegetation class is adequate for a workshop session.

> **How to answer the question:** Locate all wetland vegetation classes within the wetland, each of which should occupy at least 3% of the total wetland area, that are within a 15 minute walk from the parking area (see Individual Wetland Map), and determine their accessibility. Count individual wetland classes (e.g. PEM, PFO, PSS) as well as combined wetland classes (e.g. PEM/PSS, PFO5/PEM). Refer to Appendix F for more details about wetland classes and the Cowardin System of Wetland Classification. Note that the wetland classes shown on the NWI map will need field checking to verify. The vegetation in some wetland areas may have significantly changed since the NWI maps were produced in 1989. If there are wetland vegetation classes that occupy less than 3% of the wetland area, document these observations in the Observations & Notes column of the NHM Data Form. This will document smaller fringe or patch wetland vegetation areas that may be present.

QUESTION 7 – Is there access to open water (include streams) associated with the wetland at the educational site?

Access to open water (include streams) provides opportunities for students to study the interactions between the wetland and open water ecosystems.

> **How to answer the question:** Determine if there is access to open water associated with the wetland at the educational site.

QUESTION 8 – What is the aesthetic and visual quality of the educational site?

Areas that are undisturbed are assumed to be more visually appealing than areas that are disturbed or part of a built environment. Built areas are less attractive for group studies, and often do not foster a sense of the natural beauty of wetlands.

> **How to answer the question:** Record the Average Score from **Scenic Quality.**

QUESTION 9 – Is the educational site accessible to the disabled?

The educational potential of a wetland is increased if it is accessible to both disabled and able-bodied persons.

> **How to answer the question:** Determine whether the wetland is accessible to the disabled, e.g. nature trails designed for, or useable by, the disabled. Does the site have special disabled access points (parking, etc.). Give details of accessibility (or lack of it) in the Notes section of the data sheet.

6 – WETLAND-BASED RECREATION (CANOEING, KAYAKING, HIKING AND WILDLIFE OBSERVATION)

Note: If the property is posted against access, prohibiting recreational activities such as hiking, hunting and fishing, this function will receive a low score.

A variety of recreational activities take place in and around wetlands. Many people simply enjoy the beauty and sounds of nature and spend their leisure time walking in or near wetlands, observing plant and animal life. Wetlands associated with open water bodies also support recreational activities such as canoeing and kayaking. This evaluation stresses non-power boating which is usually less disruptive to the wetland environment than power boating.

QUESTION 1 – Are there opportunities for wildlife observation?

Observational wildlife-related recreation, which includes birding, photography, etc. is the most popular form of wildlife-related recreation**.**

> **How to answer the question:** Record the Average Score from **Wetland-Dependent Wildlife Habitat**

QUESTION 2 – Is there access to suitable open water for canoes and kayaks?

Many wetlands occur along canoeable streams or lakes. Some more extensive wetlands have sufficient open water for canoeing or kayaking. These attributes provides valuable recreational opportunities. In addition, a canoe or kayak route can provide an important viewpoint for enjoying the scenic beauty of a wetland.

> **How to answer the question:** Determine the suitability of open water or streams (if present) within or adjacent to the wetland for canoeing and kayaking. In some cases, water levels may only be adequate during spring high water.

QUESTION 3 – Are there trail-based recreation opportunities?

Trails provide easy access to the wetland for hiking, fishing, hunting and other low impact recreational activities.

> **How to answer the question:** Determine if there are trails, including water trails, in and immediately adjacent to the wetland that provide access for activities such as hiking, hunting, and fishing.

QUESTION 4 – Are there off-trail recreation opportunities?

Wetlands with good access that have ample open water or upland buffer characteristics offer better opportunities for off-trail hiking, nature study, fishing or hunting, etc. Those that are small, lack open water, or a disturbed upland buffer offer less.

> **How to answer the question:** Determine the acreage of open water using the Individual Wetland Map and aerial photos. Then, using aerial photos and field observation, determine how much of the wetland edge has an undisturbed buffer of 500 ft.

QUESTION 5 – Is there off-road public parking at the potential recreation site for at least two cars?

Parking near the water is convenient for recreational uses.

> **How to answer the question:** Determine if there is adequate parking for at least two cars and access to the water from it. Adequate parking requires an open area with a firm soil or gravel base. For safety, the parking area should be located on the same side of the road as the wetland and should have an unobstructed view of oncoming traffic at the point of entrance and exit.

QUESTION 6 – What is the scenic quality of the potential recreation site?

Aesthetically pleasing surroundings enhance an outdoor recreational experience. This is particularly true for such activities as canoeing and wildlife observation.

> **How to answer the question:** Record the Average Score from **Scenic Quality**

7 - FLOOD STORAGE

Freshwater wetlands act as natural flood regulators by temporarily storing floodwaters and then slowly releasing the stored waters downstream. During heavy rains and rapid periods of melting in late winter, the water entering the wetland from rainfall, surface runoff and stream-flow is temporarily stored in wetland depressions and slowed down by shrubs, trees, emergent vegetation and surface topography. This reduces the quantity of water in the downstream river system at the peak of the flood, and ensures that floodwaters from tributaries do not reach the main river at the same time. In this way, wetlands help protect adjacent and downstream areas from flood damage. The loss of upstream floodplain wetlands can significantly increase downstream flooding and damage.

The intention of this function is to evaluate the ability of the wetland to attenuate (slow down and store) floodwaters. This requires determining the wetland acreage, watershed acreage, location of the wetland within watershed, and estimating the flood storage volume of the wetland. The flood storage index method provided below is an approximate, simplified method for evaluating the ability of the wetland to store water.

In the following situations, the Flood Value Index does not need to be calculated for the wetland being studied. Instead a certain flood index range can be assumed:

1. Wetlands with slopes steeper than 10% (10' vertical : 100' horizontal) as measured along the flow path, where it is obvious that little flood attenuation could occur, **should be assigned a Low Flood Index Value.** For wetlands or portions of wetlands with slopes steeper than 10%, a flood index value of 0.5 may be assigned without further analysis (Use Terrain Navigator or other similar software to mark the point upstream and downstream to calculate slope, or calculate slope based on other available topographic information, or estimate in field with an inclinometer or other method for determining slope).
2. For large ponds, lakes or wetlands with greater than 200 acres of ponded water surface area under normal conditions and streams that are Fourth Order or higher (i.e. 4^{th}, 5^{th}, 6^{th} etc.) **assign a High Flood Index Value**.

QUESTION 1: What is the Wetland Area (acreage) likely to pond or flood (W)?

The larger the area of the wetland that is likely to flood or is ponded, the greater the capacity of the wetland to store floodwater.

How to answer this question: Using the NH Wetlands Mapper, GIS tools, or wetland maps, calculate the area of the wetland (in acres) <u>that is likely to pond or store water during and for a period at least 6 hours after rainfall events.</u> Field observation may also be needed. You can also use PEM, PUB, and PAB wetland classes as evidence of ponding and estimate the acreage using the NH Wetlands Mapper. Only include the relatively flat portions of the wetland, not including steep slopes or transitions at the perimeter of the ponded area that would not allow for water ponding (see Figures 1 and 2). If there are any upland islands/inclusions in the wetland area, you will need to subtract the acreage of the upland from the total wetland acreage and use this adjusted acreage in this calculation. If better information is not available, then the area of wetland likely to flood or be ponded may be estimated as percent of the wetland that is likely to flood or be ponded based on field observations and available mapping (i.e. if 80% of an entire 100 acre wetland is estimated to flood or be ponded, then the Wetland Area would equal 80 acres).

QUESTION 2: What is the Watershed Area in acres (S)?

The size of the watershed is can be an important factor determining the effectives of a wetland for storing floodwaters.

How to answer this question: Draw the wetland's watershed using the evaluated wetland's outlet as the downstream limit of the watershed. Refer to Appendix G for instructions for drawing the watershed boundary.

If the wetland has no surface outlet (e.g. a kettlehole or bog), demarcate the watershed area using the high points in the landscape around the wetland (hills & ridges as shown on USGS topographic map) from which water would flow to the wetland.

QUESTION 3: What is the Water Storage Depth in wetland (D)*?*

The depth at which a wetland can store water is a factor in its flood control capacity. The Water Storage Depth is the depth of water that can be stored within a wetland above normal stage (i.e. above normal ponded elevation of the wetland).The greater the water storage depth, the greater the flood storage capacity of the wetland is.

How to answer this question: The Water Storage Depth is the additional depth at which water can pond above normal stage water elevation. Normal stage water depth is the typical depth of water within wetland most of the year between and prior to rainfall events - this can either be the ponded water elevation or ground surface of the wetland depending on site conditions. Refer to Figures 1 and 2 below for an illustration of water storage depth.

Debris lines (wrack line) around wetland and/or water stains at outlet culvert or headwall may be used as indicators of water storage depth. For wetlands with beaver dams at outlet determine normal stage pond elevation and maximum ponded depth based on wrack lines, the difference would be the Water Storage Depth. Conduct field observation to collect information on wrack lines, water stains, etc.

Estimate the Water Storage Depth in the wetland using one of the following ways:

1. If detailed flood storage information is available from hydrologic studies, or the actual available water storage depth is known, this information may be used as the water storage depth. Indicate the water storage depth in tenths of feet.

2. If better data is not available assume the default **Water Storage Depth (D)** for the wetland area to be 1.0 foot.

Note for Professionals: *If FEMA Flood Elevations are available, check the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the town in which the wetland is located to determine if wetland is within Zone AE where base flood elevations have been determined. If wetland is within FIRM Zone AE, then use the base flood (100-year) elevation and USGS mapping to determine the average depth of flooding that would occur across the wetland being evaluated. Use this average flood depth as the Water Storage Depth instead of the default value of 1.0 foot. If elevations of wetland areas are shown with contours on the available topographic maps (2 ft minimum contour interval with same elevations datum as the FIRM map), use the average difference between contour elevations and base flood elevation for flood depth. For ponds and lakes with a defined water surface elevation as shown on USGS map, use the average difference between this elevation and base flood elevation for flood depth. The flood depth (i.e. Water Storage Depth) is the difference between the normal water surface elevation of pond, lake or stream and the FIRM base flood elevation.*

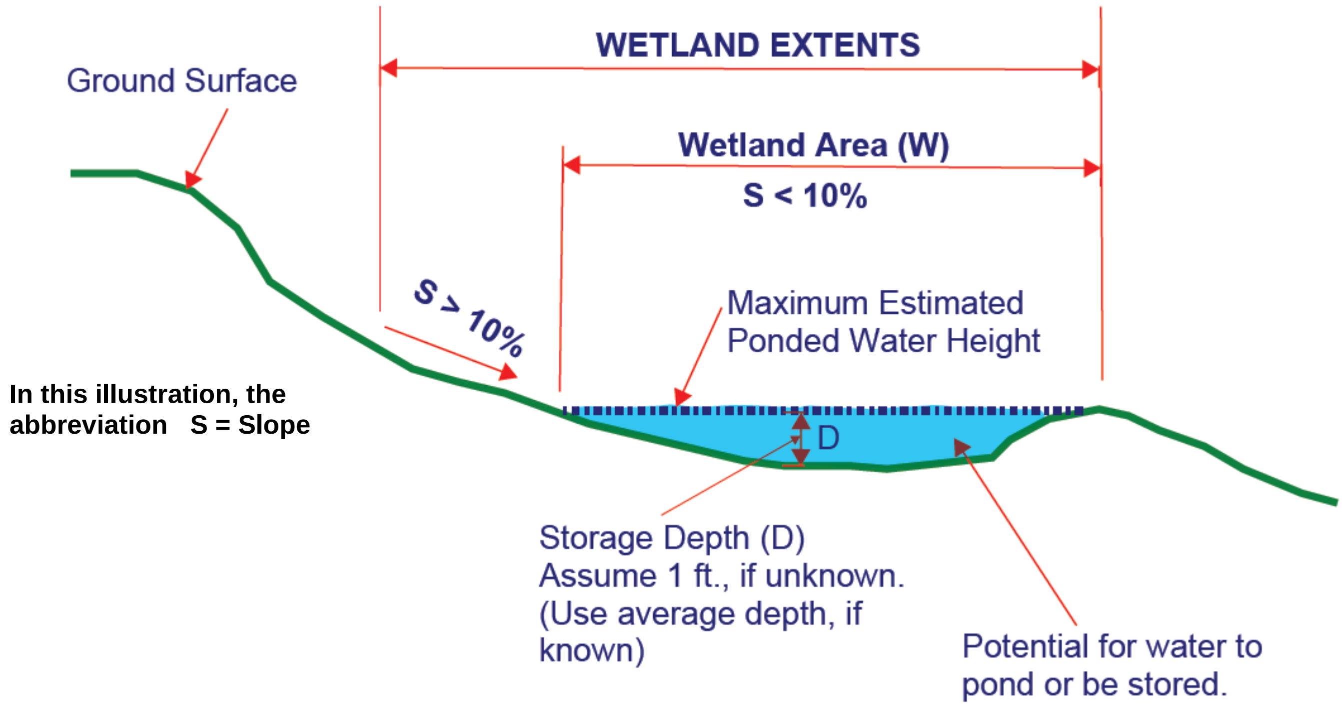

Figure 1: Water Storage Depth in a wetland with no ponding under normal conditions

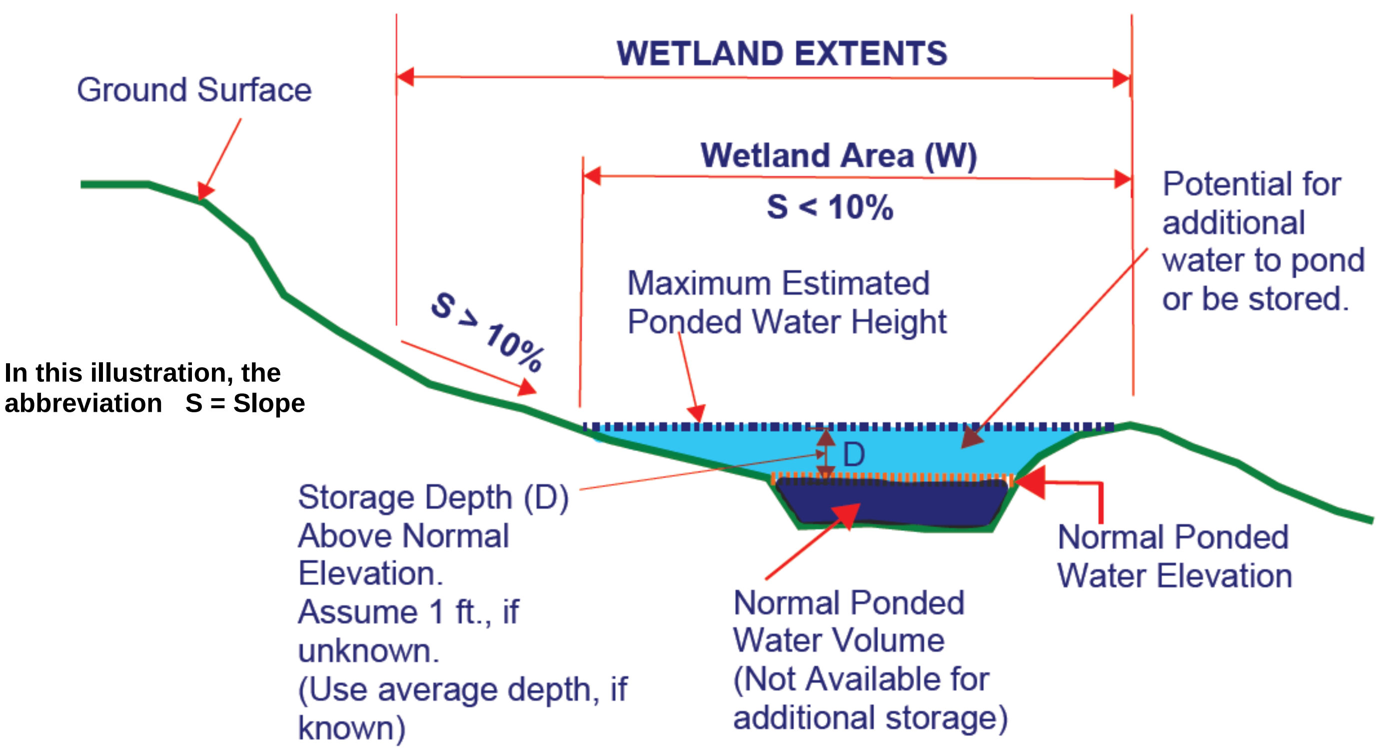

Figure 2: Water Storage Depth in a wetland with ponding under normal conditions

QUESTION 4: What is the Wetland Storage Volume (V)?

The greater the wetland acreage and associated water storage depth, the greater the amount (volume) of floodwaters the wetland can attenuate.

How to answer this question: Calculate the **Wetland Storage Volume (V)** using your answers for Wetland Area (**W**) in acres (Question 1) and the water storage depth (**D**) in feet (Question 3).

Wetland Acres (**W**) x Water Storage Depth (**D**) = Wetland Storage Volume (**V**) in acre-feet

The Excel spreadsheet, available on the NH Method web site, can be used for this calculation.

Note: Use Wetland Area in Acres times Water Storage Depth in Feet to obtain Wetland Storage Volume in Acre-Feet.

QUESTION 5: Wetland Storage Volume Factor (F)

The Wetland Storage Volume Factor (F) increases as the wetland storage volume increases, that is, the greater the storage volume, the greater the capacity of the wetland to store floodwater.

How to answer this question: Use Table 1 (you will likely need to interpret your value to the closest value in Table 1 to determine the **Wetland Storage Volume Factor (F).** Using the **Wetland Storage Volume (V)** determined in Question 4, locate the number in the first column of Table 1 that most closely approximates (V).

Read off the corresponding Wetland Storage Volume Factor (F) from column 2 of Table 1.

NOTE: If the Wetland Storage Volume is greater than 200 acre-feet, use a Wetland Storage Volume Factor (F) equal to 1.00.

QUESTION 6: Watershed Area Factor (A)

Generally, the larger the wetland is in relation to the watershed, the greater the opportunity to store floodwaters. A watershed with >10% wetland area is likely to have a significant effect on floodwater runoff (i.e. A=1.0). Where the percentage of wetland in the watershed is less than 10%, the ability of the wetland to affect downstream flooding is reduced. If the wetland/watershed percentage falls below 1% then a minimum value of 0.5 is assigned. Table 2 is based on a linear relationship between wetland size and watershed size.

How to answer this question: Use Table 2 to determine the **Watershed Area Factor (A)**. This factor is based on the wetland area as a percentage of the watershed..

W = Wetland Area (acres) x 100 = Wetland Area to Watershed Area Percentage **(P)**
S = Watershed Area (acres)

Locate the percentage in column 1 of Table 2 that most closely approximates your answer (you will likely need to interpret your value to the closest value in Table 2). Read off the corresponding Watershed Area Factor (**A**) from column 2 of Table 2 (interpolate to the closest value).

If the wetland acreage is greater than 10% of the watershed area, use a **Watershed Acreage Factor (A)** equal to 1.00.

TABLE 1*	
Wetland Storage Volume Factor (F)	
Wetland Storage Volume (V) (acre-feet)	Value of F
≥ 200	1.000
150	0.950
100	0.900
75	0.850
50	0.800
37.5	0.750
25	0.700
18.75	0.650
12.5	0.600
9.375	0.550
6.25	0.500
4.69	0.450
3.125	0.400
2.36	0.350
1.6	0.300
1.2	0.250
0.8	0.200
0.6	0.150
0.4	0.100
0.3	0.075
0.2	0.050
0.15	0.037
0.1	0.025
0.05	0.012
0	0.000

TABLE 2*	
Watershed Area Factor (A)	
(P) Wetl. Area/Wshed Area x 100	Value for A
≥10%	1.00
9%	0.95
8%	0.90
7%	0.85
6%	0.80
5%	0.75
4%	0.70
3%	0.65
2%	0.60
1%	0.55
< 1%	0.50

*****(you will need to interpret your value to the closest value in Tables 1 and 2)*

SEE BELOW LEFT FOR EXAMPLES OF WETLAND FLOOD INDEX CALCULATION:

Example 1: *(See Wetland I.D. 1 in Table 3– sample spreadsheet)*

Wetland Area (W) = 0.25 acres
Watershed Area (S) = 25 acres
Water Storage Depth (D) = 0.5 ft (known depth)
Water Storage Volume (V) = 0.5 ft x 0.25 acres = 0.125 acre-feet
Wetland Storage Volume Factor (F) = 0.03 (from Table 1)
Watershed Area Factor (A) = 0.55 (from Table 2, where 0.25 acres/25 acres x 100 = 1%)
Location in Watershed (L) = 0.8
Wetland Flood Index = 0.03 x 0.55 x 0.80 = 0.0132
Flood Value Type = Low Flood Value

Example 2: *(see Wetland I.D. W3 in Table 3 – sample spreadsheet)*

Wetland Area (W) = 33 acres
Watershed Area (S) = 17,937 acres
Water Storage Depth (D)= 1.0 ft (default value)
Water Storage Volume (V) = 1.0 ft x 33 acres = 33 acre-feet
Wetland Storage Volume Factor (F) = 0.73 (from Table 1)
Watershed Area Factor (A) = 0.5 (from Table 2, where 33 acres/17,937 acres x 100 = 0.18%)
Location in Watershed (L)= 1.0
Wetland Flood Index Value Type = 0.73 x 0.5 x 1.0 = 3.65
Flood Value = Moderate Flood Value

Table 3: Example of Flood Index Worksheet for Multiple Wetlands

Use the Excel spreadsheet on the NH Method Website for automated calculation of the Flood Water Storage Index

"Red" headings indicate data input columns

"Black" headings indicate columns where figures are automatically calculated

Flood Index = (F x A x L) x 10, where:
Maximum Wetland Storage Volume = 200 acre-ft
Maximum Wetland Flood Function Value = 10

Wetland I.D.	Wetland Acreage (W)	Watershed Acreage (S)	Wetland Area as % of Watershed (P) from Table 2	Watershed Area Factor (A) Table 2	Location in Watershed (L) (1.0/0.8/0.6)	Water Storage Depth feet (D) 1.0 = default	Wetland Storage Volume acre feet (D) acre feet	Wetland Storage Volume Factor (F) Table 1	Flood Index
1	0.25	25	1.00	0.55	0.8	0.5	0.125	0.03	**0.132**
2	0.75	15	5.00	0.75	1	1	0.75	0.19	**1.425**
3	2	50	4.00	0.7	0.8	2.5	5	0.46	**2.576**
4	10	100	10.00	1	1	3	30	0.72	**7.200**
5	10	1000	1.00	1	1	4	40	0.77	**7.700**
6	3	47	6.38	0.81	0.8	2	6	0.48	**3.110**
7	0.1	3	3.33	0.42	0.6	0.5	0.05	0.016	**0.040**
8	0.75	20	3.75	0.68	0.6	0.15	0.1125	0.027	**0.110**
9	1	50	2.00	0.6	1	2.5	2.5	0.35	**2.100**
10	50	400	12.50	1	0.8	3	150	0.95	**7.600**
W1	283	19548	1.45	0.57	1	1	283	1	**5.700**
W3	33	17937	0.18	0.5	1	1	33	0.73	**3.650**
W4	54	17291	0.31	0.5	1	1	54	0.73	**3.650**
W5	202	16619	1.22	0.56	1	1	202	1	**5.600**
W6	175	2664	6.57	0.82	1	1	175	0.95	**7.790**
W7	40	446	8.97	0.94	1	1	40	0.78	**7.332**
W8	24	380	6.32	0.51	1	1	24	0.69	**3.519**
W9	43	679	6.33	0.51	1	1	43	0.77	**3.927**
W10	116	2161	5.37	0.77	1	1	116	0.92	**7.084**
W11	63	880	7.16	0.86	1	1	63	0.83	**7.138**
W12	24	3302	0.73	0.86	1	1	24	0.69	**5.934**
ND1	93.7	5169	1.81	0.57	1	1	93.7	0.88	**5.016**
ND2	50	3741	1.34	0.57	1	1	50	0.8	**4.560**
ND3	37	258	14.34	1	1	1	37	0.75	**7.500**
ND4	101	2700	3.74	0.68	1	1	101	0.9	**6.120**
ND5	110.5	562	19.66	1	1	1	110.5	0.92	**9.200**
ND6	99	1753	5.65	0.77	1	1	99	0.9	**6.930**

QUESTION 7: Location of wetland within the watershed (L)

Wetlands located in the lower portions of the watershed have the greatest potential to reduce flooding. Wetlands in the upper portions of the watershed have a somewhat lower potential to reduce flood waters, although these wetlands are still of significance for flood storage.

> **How to answer this question:** Refer to Figure 3 for an illustration showing how to determine location of the wetland in the watershed
>
> > **Step 1** – determine if any portion of the wetland is located within 1,000 feet of a 4th Order or higher stream, or a pond or lake that outlets to a 4th Order or higher stream that it is a tributary to. If any portion of the wetland is hydrologically connected and within 1,000 ft of a 4th Order or higher stream that it is a tributary to, then assign a location factor (L) of 1.0 on the data forms (answer (a)). If this situation does not exist, not proceed to Step 2.
> >
> > **Step 2** – determine if any portion of the wetland is located within 500 feet along the flow path of a perennial stream (solid blue line as shown on USGS Map) that it is a tributary to. If so, assign a location factor (L) of 0.8 on the data forms (answer (b). If not proceed to Step 3.
> >
> > **Step 3** – If no portion of the wetland is hydrologically connected and within 1,000 ft. of a 4th Order or higher stream that it is a tributary to, or within 500 feet of a perennial stream that it is a tributary to, assign a location factor of 0.6 on the data forms (answer (c)).

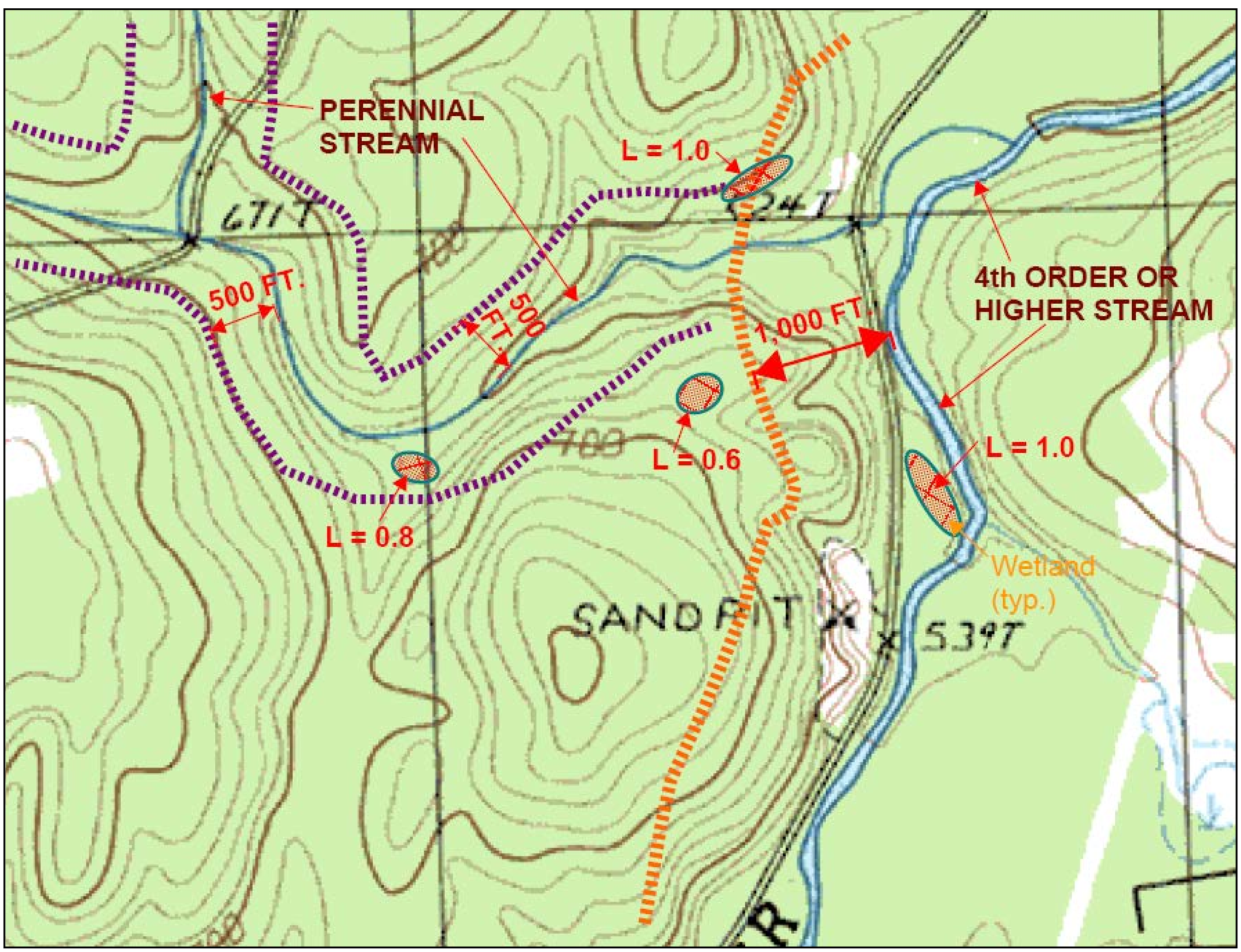

Figure 3: Determining the location of the wetland within the watershed

8 – GROUNDWATER RECHARGE

Note that this function does not require field observation.

Groundwater is a critical element in the functioning of wetland systems. Wetlands are typically groundwater discharge areas. Water that moves beneath the ground surface often discharges into wetlands throughout the year, even when rain or surface water flows are absent. Springs and seeps, often be seen at the edge of wetlands or along stream bank, are examples of groundwater discharge sites, and are essential in maintaining water tables and stream base flows throughout the year.

Wetlands may also serve as groundwater *recharge* areas. In certain instances, wetlands may play an important role in recharging ground water supplies by delivering water back into the ground through permeable coarse-textured soils that allow for rapid infiltration of rainwater, snowmelt and run-off. These soils include sands, gravels and cobbles associated with glacial outwash deposits. If these deposits are deep and widespread and include layers of variously sorted materials, they have mostly likely been identified as **stratified drift aquifers** by NH DES. Stratified drift aquifers have a high correlation with the potential to yield water for human consumptive uses.

The questions in this function are all related to groundwater recharge since drinking water supplies derived from groundwater are so critical for all living organisms. They ask the user to identify areas of stratified drift aquifers, areas where there are potential drinking water supplies known as *Favorable Gravel Well Areas*, and areas where coarse sands and gravels exist adjacent to or underlying the wetland that have not been identified as an aquifer.

QUESTION 1 – Does the wetland overlie stratified drift aquifer?

Under normal circumstances (i.e. at most times of the year, and in the absence of land use changes) most wetlands function as groundwater discharge areas. At certain times of year, however, some wetlands function as recharge areas. This is not uncommon in summer in wetlands that overlie deep sands and gravels.

> **How to answer the question:** Using the "Aquifers" data layer in the NH Wetlands Mapper or using GIS tools, determine if the wetland overlies or lies along a stratified drift aquifer boundary. "Adjacent" is defined as within ¼ mile (1,320 feet).

QUESTION 2 – Is the wetland in a potential public water supply area?

Wetlands in direct contact with Favorable Gravel Well areas have the potential to affect ground water quality.

> **How to answer the question:** You will need to access the stratified drift aquifer maps showing Favorable Gravel Well Analysis (FGWA) to determine if the study wetland overlies or is in direct contact with areas identified as potential public water supplies. This information is not available on the NH Wetlands Mapper - users can go to the Society for the Protection of NH Forests web site to access FGWA information. Scroll to the bottom of the page to download the statewide map showing Favorable Gravel Well analysis. Use the PDF Zoom tool to zoom into your town. A 600% zoom gives you a close up view of your town's data. To get a paper map showing the data for your town, or for GIS users wanting to obtain the data set, contact Pierce Rigrod, NH DES Drinking Water and Groundwater Bureau, at pierce.rigrod@des.nh.gov or 603-271-0688.

QUESTION 3 – Is the wetland within a public wellhead protection area?

Wetlands that are associated with public wellhead protection areas may be a significant factor in groundwater discharge and recharge interactions.

> **How to answer the question:** Using the NHDES Drinking Water Map, determine if the wetland is within a public wellhead protection area. To obtain a copy of this map, contact Pierce Rigrod (see Q. 2 above)

QUESTION 4 – What is the percent coverage of highly permeable soils within 100 ft of the wetland?

Well drained soil and gravel deposits beneath and adjacent to the wetland provide permeable layers that facilitate infiltration. If these soils are dominant, there is likely to be an interaction between the water in the wetland and water stored in the underlying stratified drift. You are looking at coarse sediments adjacent to the wetland boundary as well in within the wetland.

> **How to answer the question:** Identify the soils types within 100 ft. of the wetland using the NH Wetlands Mapper or by using GIS tools. Using Table 3, check off the soils in the list that correspond to the soils within 100 ft. of the wetland. Estimate the percent coverage of all of the soils you checked off in Table 3.

Table 3: SAND & GRAVEL SOIL TYPES

***Note**: This list of soils was prepared for the purpose of providing an additional data layer for consideration under the groundwater function – i.e. to include areas that are not mapped as aquifer recharge areas yet contain surface soils with coarse particle sizes which enhance infiltration.*

Number & Slope Classes[1]	Map Unit name & Particle Size Groups[2]	Drainage Class[3]	Record % of 100-ft. wetland buffer
12 B,C,D	Hinckley gravelly LS	ED	
21 B,C,D	Colton, gravelly LS	ED	
22 B,C,D	Colton LS	ED	
24 B,C	Agawam FSL & LS	WD	
25 B,C,D	Ninigret-Windsor complex LS	MWD/WD	
26 B,C,D	Windsor LS	ED	
35 B,C,D	Champlain LS	SED	
36 B,C,D	Adams LFS	SED	
22 A,B,E	Colton S&G	ED	
212 B,C	Hinckley, very gravelly LS	ED	
222 B,C,D	Colton, very stony LS	ED	
236 B,C,D	Adams, very stony FLS	SED	
300	Udipsamments	SED	
313	Deerfield, LS	MWD	
350	Udipsamments	SED	
400	Udorthents, S	ED	
526 B,C	Caesar LS	ED	

1. SLOPE CLASSES
A, B = 0 – 8% (includes ‘A’ on older maps) C = 8 – 15% D = 15 – 25% E = > 25%

2. PARTICLE SIZE GROUPS
F = fine L = loam S = sand LS = loamy sand SL = sandy loam G = gravel

3. DRAINAGE CLASSES
WD = well drained SED = somewhat excessively drained ED = excessively drained MWD = moderately well drained

QUESTION 5: What is the percent coverage of the highly permeable soil types listed in Table 4 within the wetland?

Water table wetlands are associated with soils formed in sand and gravel deposits (stratified drift) that lack horizontal restrictive layers. Water table levels fluctuate with the seasons, rainfall events, etc. At certain times of the year these wetlands potentially function as recharge areas.

> **How to answer the question:** Identify the soil types within the wetland using the NH Wetlands Mapper, GIS tools, etc. Using Table 4, check off the soil types in the list and estimate the percent coverage of all of these soil types.

Table 4: HIGHLY PERMEABLE WETLAND SOIL TYPES THAT POTENTIALLY CONTRIBUTE TO RECHARGE DURING DRY SEASONS.

Map Symbol	Soil Name	Drainage Class			
		Somewhat Poorly Drained	Poorly Drained	Very Poorly Drained	Record % of wetland area
15	Searsport			X	
34	Wareham		X		
115	Scarboro			X	
125	Scarboro, very stony			X	
214	Naumberg		X		
314	Pipestone		X		
315	Mashpee		X		
325	Scarboro variant			X	
326	Scarboro variant, very stony			X	
393	Timakwa			X	
394	Chocorua variant			X	
395	Chocorua			X	
433	Grange		X		
546	Walpole		X		
547	Walpole, stony		X		
614	Kinsman		X		
615	Augres		X		
900	Endoaquents, sandy		X	X	
913	Sudbury variant	X			
914	Duane variant	X			
915	Deerfield variant	X			
916	Croghan variant	X			
918	Madawaska variant	X			
992	Pondicherry			X	
				Total percent	________%

9 - SEDIMENT TRAPPING

Sediment trapping is the process by which inorganic particles (mineral particles derived from rock) of any size are removed from surface waters and retained within a wetland. This water quality function occurs in wetlands when fewer inorganic sediments leave a wetland than enter it, either as runoff from the land surrounding the wetland or as surface flow in the streams that enter the wetland. During periods of heavy rainfall, surface runoff within the wetland's watershed may cause erosion and increase the amount of suspended sediment in surface water. Suspended sediment entering Riverine and Lacustrine systems in storm water runoff can be harmful to aquatic ecosystems. The sediment accumulates in stream bottoms, smothering gravel spawning areas and killing aquatic insect larvae. Sediment can also reduce the storage capacity of downstream water supply reservoirs.

Although too much sediment deposition and accumulation in a wetland may alter its biological functions, floodwater storage capacity and groundwater exchange, the quality of ecosystems located downstream is maintained or protected if suspended sediment is retained in wetlands. Because toxins (such as pesticides and petroleum products) often adhere to suspended sediment, they also may be retained with the sediment. Retaining sediment in wetlands will lengthen the lifespan of downstream reservoirs and channels, and reduce the need for costly removal of accumulated sediment from lakes, ponds and man-made structures.

Sediment deposition in many wetland systems is also an important annual source of nutrients that support wetland aquatic life. As water flows through wetlands, it is slowed by plants and the size of the wetland and much of the sediment load settles to the bottom before the water moves further on downstream. As much as 80-90% of the sediments in the water may be removed as they move through wetlands, resulting in cleaner water entering lakes, rivers and streams.

Of the factors that affect the ability of a wetland to trap and retain sediments, those included in this evaluation method are: the size and capacity of the wetland to store surface waters; the shape and gradient of the wetland basin; the shape and gradient of any streams that enter or flow through the wetland; and the density and distribution of vegetation within the wetland. Of these, flow velocity is the single most important factor affecting the ability of a wetland to trap sediments.

QUESTION 1 – What is the wetland's Flood Storage value?

The Flood Storage function as evaluated in this method assesses the ability of a wetland to store surface water flows during weather events that result in higher than normal surface water flows. Storing or holding surface waters in a wetland also results in a reduction in water velocities. As water velocities decrease, suspended sediments begin to drop out of the water column. Thus, an increased ability to store flood waters generally has a positive correlation with a wetland's ability to trap sediments.

How to answer this question: Record the average score from **7–Flood Storage.**

QUESTION 2 –Does the wetland lack an outlet or have a constricted outlet?

If the wetland lacks an outlet or has a constricted outlet, most incoming suspended sediments will end up being retained within the wetland. Constricted outlets may include undersized culverts. (Refer to attached figure to determine if the wetland has a constricted outlet). Sheet flow (or overland flow) is the movement of water that occurs over land in places where there are no defined channels. The water spreads out over a large area at a uniform depth. This also referred to as overland flow.

How to answer this question: Determine whether there is an outlet to the wetland by looking at USGS Topographic Maps and by field inspection. Determine whether the outlet is constricted. An outlet is constricted if you can answer YES to any of the following statements:

- Channel flow is present, and the width of the wetland outlet at annual high water is less than one-third the average width of the wetland perpendicular to the flow path.
- Channel flow is present, and the cross-sectional area of the wetland outlet is less than the cross-sectional area of the inlet(s).
- Channel flow is not present – the wetland has no gradient and the total width of the wetland outlet is less than one-tenth the average width of the wetland.

QUESTION 3 – What is the character of water flow through the wetland?

Irregular (or sinuous) stream channels increase frictional resistance along the shoreline, reducing velocities and increasing the effectiveness of the wetland system at trapping sediments. Sinuosity (shape of stream channel) is calculated as the ratio of stream channel length to the straight line distance of the stream. Stormwater runoff may also be slowed by contact with vegetation where sediments are deposited on the plants and/or the wetland substrate. This means that less sediment will leave the wetland and make its way to a downstream water body. A sinuous (winding or "snaking") shaped stream channel usually indicates slower water velocities and a greater travel distance through the wetland, increasing the ability of the wetland to trap sediments. For this question, wetland systems that do not have a discernible stream channel through all or part of the wetland are considered effective at removing sediments. **Note that a discernable stream channel in only a very small portion of the wetland does qualify the wetland to be included in answering the questions in this function.**

How to answer this question: Determine the shape of the stream channel(s) within the wetland by looking at aerial photos on the NH Wetlands Mapper in the Topography and Imagery section, or by using GIS tools to review aerial photos, and field observation. Measure the length of the stream channel along the centerline of the channel. Then measure a straight line from the upstream end of the stream channel to the downstream end of the channel (note: only measure those areas where a discernible channel is present). The sinuosity ratio is the length of the actual channel divided by the straight line distance of the stream. **NOTE:** If there is more than one stream channel in the wetland, do the calculation based on the total length of all streams.

$$\frac{\textit{Channel Length}}{\textit{Straight line distance of stream}} = \textit{Sinuosity Ratio}$$

If the ratio is 1.5 or greater, then assign a score of 10 for this question. If there is no channel or the outlet is impounded and standing water is present, a score of 10 should also be assigned to this question.

QUESTION 4 – What is the ratio of the wetland's size to the size of its watershed?

Wetlands that are large in relation to their watershed are more likely to be able to slow surface waters and store any suspended sediments.

How to answer this question: Using the acreage of the watershed above the outlet of the wetland, and the acreage of the wetland, calculate the ratio as a percentage (include any upland islands located within the wetland in your calculation of wetland acreage)

$$\frac{\textit{Acres of Wetland}}{\textit{Area of watershed above wetland outlet}} \times 100$$

QUESTION 5 – What is the gradient within the wetland?

The gentler the slope or gradient of the wetland, the lower the velocity of the water flowing through it and the greater the likelihood that any suspended sediments in the surface water flows, sheet flow or channel flow, will be removed from suspension and retained in the wetland. Use default data from NH Wetlands Mapper or use an instrument that is more precise (gradient should not be estimated in the field)

How to answer this question: Measure the change in elevation between the highest elevation of the wetland and the lowest (usually the outlet) – note that the elevation change is likely to be small, but this is still significant for sediment trapping. Divide this by the length of the wetland along it longest axis. Multiply this by 100 to get the percent gradient.

$$\frac{\textit{Highest Elevation of Wetland – Lowest Elevation of Wetland}}{\textit{Total Length of Wetland}} \times 100$$

Elevations can be determined in several ways:

- Use the Digital Elevation Model (DEM) data in the NH Wetlands Mapper to estimate gradient.
- Using the **DRG Topographic Map** background, determine the highest and lowest elevation of the wetland along its longest axis. Subtract the two elevations to get the elevation difference.
- Alternatively, you can use **Google Earth** (free download from the internet). As you hold the cursor over a point on a map, the elevation will be displayed in the lower left part of the screen. Determine the elevation at the highest and lowest ends of the wetland, as best as you can identify it on the Google Earth map.
- Terrain Navigator (commercial product) is another tool that can be used to calculate elevations.
- Professionals can calculate slope using GIS tools or they can use site specific elevations that were generated via traditional ground survey.

QUESTION 6 – What is the extent (percent cover) of all vegetation types that will most likely trap sediments? (e.g. forested swamps, scrub shrub swamps, and persistent emergent marshes).

Forested wetlands, fens, shrub swamps and wetlands dominated by persistent emergent plants will have a higher capacity to trap sediments and to stabilize sediments with their stems, leaves and root systems than wetlands dominated by non-persistent emergent vegetation and/or aquatic bed vegetation which have a high percentage of open water with no vegetation.

How to answer this question: Use aerial photos available through GRANIT, the NH Wetlands Mapper, or other sources together with field observation to determine which wetland vegetation class dominates the wetland during the growing season. Refer to Appendix F for more detailed explanation of wetland vegetation classes.

QUESTION 7 – What is the average water depth in the wetland during the growing season?

Shallow densely vegetated wetlands are more likely to retain sediments than are wetlands with greater water depths. Shallow wetlands offer greater frictional resistance, particularly when they are densely vegetated along the flow path. Water depths of greater than 6.6 feet deep inhibit the growth of woody and persistent emergent plants which are important to the ability of the wetland to slow the velocity of surface water and allow for sediments to settle out of the water column.

How to answer this question: Estimate the average depth of water within the portion of the wetland that is either permanently or regularly inundated with water. Where there is open water with no emergent vegetation and or aquatic bed vegetation is sparse, assume the water depth is greater than 6.6 feet deep. If the open water area is dominated by persistent and non-persistent emergent plants, assume the water depth is less than 6.6 ft. deep.

10 – NUTRIENT RETENTION, REMOVAL & TRANSFORMATION

Nitrogen and phosphorous are components of fertilizers used in agriculture and on lawns and gardens. These are the nutrients most often associated with water pollution. Excessive amounts of these nutrients in lakes and ponds can cause algal blooms and oxygen deficiencies which may result in the death of fish and aquatic organisms. This process is known as eutrophication. Undeveloped watersheds generally export very low levels of nutrients to downstream watersheds, whereas highly developed watersheds export high levels of nutrients downstream. Within reason, a wetland can reduce nutrient levels flowing into downstream ponds, lakes, streams, rivers or estuaries so that the effects of eutrophication are prevented or reduced.

Some wetlands are effective at retention, removal and transformation of nutrients, which is important for maintaining water quality in lakes, streams and ponds. **Nutrient retention** is the storing of nutrients (most importantly nitrogen and phosphorus) within the substrate or vegetation of wetlands. **Nutrient removal** includes the elimination of dissolved chemicals through sedimentation or the conversion of nutrients, such as nitrogen, into gas. **Nutrient uptake** includes biological processes that transfer nutrients into the bodies of plants and animals.

It is important to note that in some instances, the nutrient loads in a watershed may be so high that the wetland itself is overwhelmed to the point that excess nutrients are simply passed on downstream without significant reduction. In addition, certain wetland systems, such as bogs, are highly sensitive, to excessive amounts of nutrients and this can eventually degrade several wetland functions. The application of sound conservation and best management practices, such as those for stormwater management, in the watershed can significantly reduce excess nutrient loading to wetlands and downstream water bodies.

QUESTION 1 – What is the wetland's Flood Storage value?

Increased ability to store flood waters may also result in a greater capacity for the wetland to transform nutrients.

> **How to answer this question:** Record the average score from **7 – Flood Storage.**

QUESTION 2 – What is the wetland's ability to trap sediments?

Nutrients can adhere to sediment particles, and are often transported with sediments. The ability of a wetland to slow velocities and trap sediments is a necessary component of nutrient retention/removal.

> **How to answer this question:** Record the average score from **9 – Sediment Trapping**.

QUESTION 3 – What is the extent (percent cover) of persistent emergent vegetation, trees and/or shrubs within the wetland?

Vegetated wetlands have a greater ability to transform nutrients than wetlands that include open water and low vegetation density. Forested wetlands, shrub swamps, and wetlands dominated by persistent emergent plants (marshes) have a higher capacity than other wetland types (such as open water, fens, or aquatic bed) to remove nutrients from the water by absorption through their root systems and transformation.

> **How to answer this question:** Record the answer from **Sediment Trapping,** Question 6.

QUESTION 4 –What hydroperiod occurs over more than 50% of the wetland?

The wetland hydroperiod is the length of time during which surface water remains in the wetland**.** Flooded or ponded water in a wetland creates conditions that help retain nutrients in the bottom sediments as well as release nitrogen as a harmless gas. Wetlands that are seasonally flooded develop low oxygen (anoxic) conditions which allows transformation of nitrogen compounds to gaseous nitrogen and release into the atmosphere. Wetlands with constantly (or nearly constantly) saturated substrates tend to retain nutrients, partly because the rate of oxygen diffusion into the constantly saturated soils is slow. These conditions usually favor oxygen retention. Some oxidation of the substrate/sediments is essential for optimal nitrogen removal.

> **How to answer this question:** Determine the dominant hydroperiod within the wetland using aerial photos (NAIP aerial photos on the NH Wetlands Mapper and GIS) and field observation. What is the most dominant/most persistent hydroperiod year-round? National Wetland Inventory wetland codes (the water regime modifiers) may provide helpful supplemental information, but keep in mind that this source of information may be somewhat dated and only approximates actual hydroperiods in the field. Refer to the side bar at right for more information about the water regime modifiers. Vegetation growing in and around a wetland can provide a simple and relatively accurate indicator of wetland hydroperiod. Wetlands with hydroperiods of less than six months usually have a predominance of trees. Wetlands with hydroperiods of less than 9 months have more shrub species growing in the wetland. The presence of floating aquatic plants and/or persistent herbaceous vegetation usually indicate wetlands with more permanent hydroperiods.

Description of Water Regime Modifiers, as used in the Cowardin System of Wetland Classification

(refer to Appendix F)

Temporarily flooded (A): Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season. Plants growing both in uplands & wetlands are characteristic of the temporarily flooded regime.

Saturated (B): The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

Seasonally flooded (C) Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface.

Seasonally Flooded/Well Drained (D): Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. Soils are coarse (e.g. sandy or gravelly) and therefore water tables lower fairly quickly during the growing season.

Seasonally Flooded/Saturated (E): Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent the substrate remains saturated to the surface for extended periods during the growing season.

Semi permanently flooded (F): Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.

Intermittently Exposed (G): Surface water is present throughout the year except in years of extreme drought.

Permanently flooded(H): Water covers the land surface throughout the year in all years. Vegetation is composed of obligate wetland plants

QUESTION 5 – What hydric soils cover the greatest percentage of the wetland?

Wetlands dominated by finely textured soils tend to be most effective at transforming nutrients within the water column.

> **How to answer this question:** Use NRCS Soils data from the NH Wetlands Mapper or GRANIT GIS and refer to Tables A, B and C in Appendix D to find out which soil type is most dominant in the wetland.
> *Note to Professionals*: *Some wetlands may be have been field delineated in an area that has been mapped as upland soil by NRCS, so none of the Tables referenced would have the applicable soil unit on it. If this is the case, the user should determine the closest NRCS soil map unit to that found in the wetland being evaluated. Look at hydric soil types for nearby wetlands to make an educated guess, or dig a hole and key it out.*

11 - SHORELINE ANCHORING

If there is no stream, river, lake or pond within or adjacent to the wetland, leave this Function out of the evaluation.

Shoreline anchoring is an important function of wetlands. Wetlands typically occur at the interface between water bodies and uplands. They provide a physical barrier that dissipates wave action and slows down currents. Vegetated wetlands bordering waterbodies, in particular, can play a critical role in stabilizing banks, trapping sediments, and taking up nutrients. These are important aspects of protecting water quality.

QUESTION 1 – What is the gradation of wetland vegetation types along the shoreline?

Those wetlands that provide a gradual transition from open water to upland across a wide range of wetland vegetation classes, such as emergent to scrub-shrub to forested, provide greater protection against shoreline erosion.

> **How to Answer the Question:** Determine the number of wetland vegetation classes (including mixed vegetation classes) in the wetland area bordering the area of open water (stream or pond). Refer to Appendix F for more detailed explanation of wetland vegetation classes.

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QUESTION 2 – What is the vegetation density in the wetland bordering the watercourse, lake or pond?

The greater the vegetation density, the greater the ability of wetlands to anchor soil. Sparsely vegetated or bare areas are very susceptible to erosion. Forested wetlands, fens, shrub swamps and wetlands dominated by persistent emergent plants will have a higher capacity to anchor shorelines than wetlands dominated by non-persistent emergent vegetation and/or aquatic bed vegetation which are not very effective at anchoring shorelines.

> **How to Answer the Question:** Make a visual estimate of vegetation density in the wetland bordering the watercourse or lake/pond. This is best done during the summer because some wetland plant species die back during the winter.

QUESTION 3 – How wide is the wetland bordering a watercourse, lake or pond?

Wider wetlands are more resistant to erosive forces than narrower wetlands.

> **How to Answer the Question:** Using the NH Wetlands Mapper measuring tool or GIS tools, determine the average width of wetland bordering watercourse, lake or pond.

QUESTION 4 – How "rough" is the substrate of the wetland at the shoreline of the waterbody?

Wetlands with a higher density of coarse substrate particles (e.g. gravels, cobbles or stones) have a greater ability to anchor shorelines than those with evenly fine particles (e.g. clays and silts).

> **How to Answer the Question:** Review the aerial photographs using NH Wetlands Mapper (zoom in to a large scale to get close-up detail) to get an initial idea of substrate types. Confirm this in the field using a visual inspection to the degree possible.

12 - NOTEWORTHINESS

Noteworthiness refers to certain features a wetland may possess that gives it a high value regardless of any other attribute. Unlike the preceding functions, the score for this function is calculated by totaling the scores for each question answered affirmatively. **There is no score averaging for this function.**

Question 1 – Is the wetland located in or within 500 ft of an area of Highest Ranked Habitat (state or regional level), as identified in the NH Wildlife Action Plan Highest Ranked Habitat Condition map?

The NH Wildlife Action Plan has identified areas of **Highest Ranked Habitats** for species of concern. Wetlands that are part of these designated habitat complexes play an important role in providing habitat diversity. These habitat complexes provide key buffer areas and travel corridors along streams and between wetlands. They also include large unfragmented blocks of land

> **How to Answer the Question:** Information on Highest Ranked Habitat Condition can be obtained from the Wildlife Action Plan critical habitats layer in the NH Wetlands Mapper, GRANIT GIS, or at NH Fish & Game's website

Question 2 – Does the wetland have local significance because it has consistently high scores for a number of functions and/or is among the top 10 largest wetlands in, or partially in, town?

Wetlands can be significant within a local geographical or political area even though they may rate as an average when compared to other wetlands in a larger geographic area. The NH Method assumes that a wetland has local significance if one or more of its functions are among the highest scores of all wetlands in the study area.

> **How to Answer the Question:** After all the wetlands within the evaluation area have been evaluated, determine which wetlands have the highest scores for each of the functions. The top scoring wetlands for each of the functions should be given a score of 10 for this question. The cutoff score for inclusion in this group should be documented. A recommended level is the top 10% of wetlands in each Function. Determine if this wetland is among the top 10% largest wetlands in town. If you are doing a single wetland evaluation that does not involve an inventory, estimate the percentage using the NH Wetlands Mapper.

Question 3 – Does the wetland have local, regional or statewide significance because it is it located in a priority area, is documented in a local or regional conservation plan, or it has been recognized as having regional importance in the state?

Wetlands that are in priority areas identified by conservation plans have local and sometimes regional significance, and could be part of a larger land conservation effort. Large wetland complexes have the capacity to perform a variety of functions at a relatively high level, depending on the level of disturbance in and around the wetland. A wetland may be the largest wetland of its vegetation class in the study area or it may have regional important for storing floodwaters.

> **How to Answer the Question:** Review local, regional or statewide conservation plans (check with land trusts covering your area), Master Plans and Natural Resources Inventories and determine if the wetland is in a priority area. Review the NWI maps and aerial photographs and determine if the wetland is among the largest in the area or region.

Question 4 – Does the wetland have known biological, geological, or other elements that are rare or unique as documented by the NH Natural Heritage Bureau or as determined by a professional?

Some wetlands may have locally rare or unique attributes that may not otherwise be recognized by the NH Method.

How to Answer the Question: Using field observation, local/professional knowledge and review of the NH Natural Heritage Bureau records, determine if there are any known exemplary natural communities (e.g. Atlantic White Cedar Swamp, Black Gum Swamp, vernal pools) or rare or endangered plants within the wetland complex. See Appendix A in the NH Method for links to the publication *Natural Communities of NH*, which includes a form to report possible rare or exemplary natural communities and a key to the communities. In addition, look for any significant geological features associated with the wetland that might be unique or rare in the area. Document your rationale in the observations and notes section of the data form.

Question 5 – Is the wetland known to contain a documented historical or archaeological site?

Certain wetlands may contain or be adjacent to important historic or archaeological sites such as old mill ponds or Indian encampments. Native Americans frequently lived near wetlands, and used resources provided by the wetland itself. Early settlers had a need for water which they found in ample supply in and around wetlands. Water power was harnessed to provide power for milling flour, sawing timber, and eventually for manufacturing.

How to Answer the Question: Consult town historic resources or inquire through the state archaeological office to determine known or documented evidence of historic or archaeological sites in the wetland. **Note:** It is recommended that the specific location of archaeological sites should be kept confidential to reduce the possibility of vandalism.

Question 6 – Is the wetland hydrologically connected to a state or federally designated river within ¼ mile of the wetland's outlet?

Wetlands that are hydrologically connected to State Designated Rivers or federally designated Wild and Scenic Rivers form an important component of the ecology of that river system. River resources may be protected under these state and federal programs.

How to Answer the Question: Determine whether the wetland is hydrologically connected (by a stream, river, lake or pond) to a river designated under the New Hampshire Rivers Management and Protection Program or the National Wild and Scenic Rivers Program within ¼ mile of the wetland's outlet.

Question 7 – Is the wetland one of just a few left in an urban setting?

Wetlands that are among just a few left in an urban area, especially if they are relatively large and have an adequate buffer, may be among the last refuges for wildlife, and can provide important habitat for migratory birds. These wetlands also provide natural viewscapes and educational opportunities for people living in urban areas.

How to Answer the Question: Establish if the wetland has local significance because of its setting in an urban area.