

# **TOWN OF BELMONT PRIME WETLAND ASSESSMENT**

## **Introduction**

The following Prime Wetland Assessment report was prepared by Stoney Ridge Environmental LLC, in conjunction with Neatline Associates, for the Belmont Conservation Commission in Belmont, New Hampshire. The overall objective of the study was to complete a comprehensive evaluation of all large wetland systems in the town utilizing the NH Method (i.e. The Method for the Comparative Evaluation of Nontidal Wetlands in New Hampshire). The purpose of the study was to provide a detailed evaluation of the wetlands and rank wetlands utilizing the current accepted assessment methodology. However, the town is not currently seeking prime wetland designation at this time. This study provides an updated evaluation of large wetland complexes in the town, and represents a follow-up assessment to a prior study prepared by New England Environmental Associates, Inc. titled “Wetlands Within Nine Study Areas in Belmont, New Hampshire” revision dated November 1989.

## **Context of Study**

The original prime wetland assessment conducted for the Town of Belmont was completed approximately 20 years ago according to standards utilized at that time. Specifically, the study utilized the Wetland Evaluation Technique, Version 2 (i.e. WET). As part of the assessment, wetlands were hand drawn on the tax maps which yielded variable accuracy in the location of mapped wetlands. The current study sought to re-evaluate the study sites utilizing the NH Method and provide updated locations of wetlands based on aerial photo interpretation, review of current available georeferenced data, and information gathered during site visits. The NH Method was utilized because it is the current accepted standard for town-wide prime wetland assessments as described under Chapter Env-Wt 700 of the NH Code of Administrative Rules. The use of georeferenced data provided a mechanism to provide more accurate wetland boundaries (+/- 100 feet), as required by the DES Wetlands Bureau for prime wetland assessments.

## **Methods**

### Background:

As a first step, SRE and Neatline Associates developed a map of all wetlands greater than two acres in size to identify potential study areas. Georeferenced county soil data as well as National Wetland Inventory data were used to identify wetland complexes in the town. This map was then compared to the original Town of Belmont prime wetlands map to determine the study sites. Of the original 46 wetlands identified in the 1989 study, 34 met the size and soil criteria for prime wetland designation (i.e. greater than two acres and greater than 50% very poorly drained soil). Of the 34 wetlands that met the basic criteria, 25 wetlands were selected for further analysis based on relatively high ecological integrity (e.g. limited development surrounding the wetland and/or limited fill in the wetland) or presence in six target areas of the town that are associated with important water resource or ground water aquifer areas. SRE re-evaluated these 25 wetland systems utilizing the NH Method and current georeferenced data to

develop updated maps of the wetland systems. Of the 14 possible assessed wetland functions and values, 10 were chosen by the Conservation Commission for overall analysis purposes. These functions include: Ecological Integrity, Wildlife Habitat, Fish Habitat, Educational Potential, Visual/Aesthetic Quality, Flood Control Potential, Ground Water Use Potential, Sediment Trapping, Nutrient Attenuation, and Shoreline Anchoring. Recreation Potential was also evaluated and is included in the assessment. To avoid confusion, SRE utilized the old wetland designation numbers in the current assessment. Where wetland systems were merged for analysis, the wetland designation numbers have been hyphenated.

As part of field work, all wetlands were photographed and dominant vegetation was identified. Habitat types were also classified according to the Cowardin et al. system (see supplementary information section for wetland code descriptions). Where access could be obtained from public rights-of-way or non-posted areas (e.g. town property, railroad corridors, power line easements, and open space), wetland boundaries were also field verified using the three U.S. Army Corps of Engineers criteria for wetland determination including presence of hydric soils, hydrology, and hydrophytic vegetation. In many instances, wetland drainages were significantly smaller in the field compared to county soil maps and the maps were adjusted to reflect these differences. In addition, where drainages were less than fifty feet wide (between non-linear wetlands such as swamps and marshes), wetland complexes were separated for analysis purposes as recommended in the NH Method.

#### Map Review:

To assess land uses, aerial photos of the wetlands were overlaid with the current tax map boundaries. This overlay was then field verified to assess the number of buildings within the vicinity of the wetlands, as well as the overall level of human activity within and near the wetlands (e.g. number of road crossings, percent of original wetland filled, and percent of original wetland altered by farming and other activities). The Town of Belmont land use plans also provided valuable data to assess the functions. Specifically, the Belmont Stratified Drift Aquifers plan dated October 2002 was utilized to determine the approximate locations of aquifers to assess ground water use potential. In addition, the Belmont Unfragmented Lands map and the Belmont Municipal Property map were utilized to determine the locations of current use and municipal properties to assess long-term stewardship and recreation/education potential of the wetlands. Georeferenced data available through the NH Department of Environmental Services OneStop Program GIS was used to assess potential water quality threats and determine areas designated as “impaired waters”. These data were used to assess general water quality. The location of dams was determined through field review and through data available through NH GRANIT. Rare species habitat was evaluated through field assessments, review of data available through the NH Natural Heritage Bureau, and review of the current NH Wildlife Action Plan dataset (e.g. Highest Ranked Wildlife Habitat by Ecological Condition and Conservation Focus Areas).

#### Data Analysis:

The NH Method is an ideal assessment tool for a town-wide wetland assessment because it provides a mechanism for quantitatively evaluating and rating a large number of wetlands. The method generates evaluation numbers ranging from zero to 1.0. These evaluation numbers are referred to as average functional value index (FVI) numbers and higher numbers represent a

higher rating for a particular function. In the current NH Method, FVI numbers are multiplied by the size of the wetland (or assessment area) to yield Wetland Value Units (WVU's). This component of the method places higher emphasis on larger wetland complexes. The NH Method is currently under revision and the computation of WVU's is proposed to be dropped from the future version of the method to avoid placing unnecessary emphasis on the largest wetlands. However, the use of WVU's allows the town to identify the largest complexes with high Function Value Index numbers. As a result, the following report provides an assessment of both raw FVI numbers as well as WVU's for informational purposes.

To conform to the upcoming revision to the method, rankings presented in the text are based on raw FVI numbers. Wetlands that rank highest have the greatest number of high FVI ratings for functions/values. In this study, the wetlands with the top three scores for ecological integrity, wetland wildlife habitat, fish habitat (rivers/streams), fish habitat (ponds/lakes), educational potential, visual/aesthetic quality, water-based recreation, sediment trapping, nutrient attenuation, and shoreline anchoring were identified to determine Prime Wetland candidates. In this study, virtually all assessed wetlands scored high for groundwater use potential, flood control potential, and Noteworthiness. As a result, these functions were not used for ranking purposes. Where necessary, the tabulation of the top four FVI scores was evaluated to break ties and rank wetlands sequentially. In other words, two wetlands with a total each of two top three scores for individual functions would be ordered in favor of the wetland that had the highest number of top four FVI scores for individual wetland functions.

#### Data Limitations:

The maps generated as part of this study are intended to be used to identify potential prime wetland candidates and are not intended to replace site-specific wetland delineation. Many of the data layers used to generate the Prime Wetland Assessment maps were created from remotely sensed data (e.g. aerial photography) and large landscape-level mapping projects (e.g. county soil data). As a result, the data layers are intended to be viewed at certain scales (generally 1:24,000/1:25,000) and have specific accuracy levels. As required by Env-Wt 702.02 of the NH Code of Administrative Rules, the attached wetland maps were created to be accurate to 100 +/- feet for the purposes of identifying large wetland complexes. However, the NH Method specifically focuses on wetland areas with greater than 50% very poorly drained soil. As a result, additional wetland areas and drainages are likely present in areas near and adjacent to the mapped wetland boundaries of this study. These areas are generally not considered a part of the mapped "prime wetland" boundaries, should the town seek prime wetland designation in the future.

#### **Results**

SRE mapped the locations of the original 25 wetlands identified as prime wetland candidates in the 1989 study. These wetlands are identified as Wetland 2, 4, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 26, 28, 29, 30, 33, 37, 38, 39, 40, 43, 44, 45, and 46. Of the 25 assessed wetlands, three of the wetland systems did not meet current DES Wetlands Bureau size and soil criteria for prime wetland assessment and were dropped from the assessment for further analysis. Specifically, Wetland 2 and 13 are less than two acres in size and do not meet the minimum size criteria for

prime wetland designation. Based on county soil data, Wetland 11 contains less than 50% very poorly drained soil, and does not meet the soil criteria for prime wetland designation.

Of the remaining wetlands, six of the areas were combined into two larger wetland systems for analysis purposes due to direct adjacency and lack of culvert restrictions that would warrant separating the systems. Specifically Wetland 29 and 30 were combined, as was Wetland 33, 37, 38, and 39. The general locations and assessed acreages of each wetland system are described below in Table 1.

Table 1. General location and assessed acreage of each prime wetland candidate (2008).

Wetland ID	Size (Ac)	Location (Nearest Roads)
4	27	West of Union Rd
10	16	West of Jefferson and Union Rd
14	11	South of Donway Dr
15	6	North of Hurricane Rd
16N	45	North of Hurricane Rd
17	64	West of Seavey Rd
18	167	North of Route 140 (Tioga River Wildlife & Conservation Area)
19	67	South of Route 140 and West of South Rd
20	59	East of South Rd
26	14	East of Wareing Rd
28	29	East of Route 106 and Badger Glen Dr
29/30	35	South of Farrarville Rd and North of Bryant Rd
33/37/38/39	122	North of Farrarville Rd and North of Bryant Rd
40	40	North and South of Jodi Dr
43	38	East of Bennington Dr to Brown Hill Rd
44	27	East of Rogers Road and south of Durrell Mountain Rd
45	8	East of Wildlife Blvd (Town Forest)
46	26	East of Horne Rd, West of Mile Hill Rd, and North of Dutile Rd

## Wetland Descriptions

### Wetland 4:

Wetland 4 totals approximately 26.71 acres and is located west of Union Road and south of Winnisquam Way in the northwestern section of the town. The wetland borders an inlet to Winnisquam Lake, near an existing shoreland development. Over time the wetland complex has been bisected by roads, as well as by the nearby railroad bed. Currently, the wetland exists as three fragmented areas hydrologically connected by culverts on Elaine Drive. Due to intense development pressure near the lake, this wetland only contains partial upland buffers to the south and the north.

Although the wetland exhibits a relatively high degree of fragmentation, the diversity of both wetland habitat types and plant species is relatively high in the wetland (see Table 2). The western edge of the system transitions from a seasonally saturated forested wetland (PFO1/4E) to

a semi-permanently flooded scrub-shrub/forested wetland (PSS/FO1F) on the eastern side of the complex. The western forested community is dominated by a well-developed canopy of red maple (*Acer rubrum*) and eastern hemlock (*Tsuga canadensis*) with an understory of cinnamon fern (*Osmunda cinnamomea*). The scrub-shrub areas on the eastern side of the wetland are characterized by well-developed hummock topography with a diverse mix of species including highbush blueberry (*Vaccinium corymbosum*), leatherleaf (*Chamaedaphne calyculata*), winterberry holly (*Ilex verticillata*), and black chokeberry (*Aronia melanocarpa*). The southwestern edge of the wetland that is located directly adjacent to the pond has a well developed aquatic bed community dominated by water-lily (e.g. *Nuphar* spp. and *Nymphaea odorata*) with an emergent edge dominated by broad-leaved cattail (*Typha latifolia*). During site assessments, a variety of songbirds were observed utilizing the wetland and the ponded areas have high potential to support a number of turtle species including painted turtle (*Chrysemys picta*) and snapping turtle (*Chelydra serpentina*).

Based on site review, the wetland appears to receive sediment laden water from the adjacent dirt road. Further, this wetland is within a one-mile area mapped as an “impaired water” by the Department of Environmental Services. Although sediment is observed on the edge of the pond on Elaine Drive, the wetland is surprisingly absent of visual detractors, and the wetland area adjacent to Elaine Drive has relatively high visual aesthetics. Similar to many of the large systems in Belmont, this wetland is directly underlain by stratified drift aquifer.

Based on the NH Method assessment, this wetland has the second lowest score for ecological integrity of all the assessed wetlands (see FVI values in Table 3). This can be attributed to the high level of fragmentation of the wetland and density of development within the watershed. However, due to the presence of ponded, emergent, and scrub-shrub habitat, the wetland is providing significant sediment trapping, nutrient attenuation, and flood control for the surrounding community. In addition, due to potential access from the railroad bed, the wetland areas have potential educational value, if a small parking area could be developed.

Of significance, this diverse but fragmented wetland exhibits a number of restoration opportunities. Currently, the wetland areas are connected across Elaine Drive by a series of small culverts. When these culverts require replacement, the town could investigate the possibility of installing larger culverts to increase the hydrologic connectivity and wildlife passage between the three main wetland areas. In general, 2-foot by 2-foot culverts are considered better at facilitating amphibian and turtle dispersal, compared to smaller culverts. However, any culvert change would require a site specific review of the road (e.g. minimum cover needed and existing grades) and other potential advantages and disadvantages of potential culvert upsizings.

As a second possible restoration opportunity, common reed (*Phragmites australis*) is located nearby in an adjacent wetland on Pond Road near Wetland 4. In freshwater systems, this species is often indicative of poor water quality conditions (e.g. high salt levels) and should be managed in higher quality wetlands to prevent the spread and proliferation of this species. If established, the species often forms monocultures that are associated with declines in community diversity and habitat quality. As a result, this species could be monitored to prevent its spread. If

interested, and if access was allowed, the study of this species and its distribution in the wetland might provide an ideal outdoor lab for the local high school or other educational group.

Table 2. Dominant habitat types (Cowardin et al. 1979) and associated waterbody of each prime wetland candidate in the Town of Belmont (2008).

Wetland Identification	Dominant Wetland Classifications	Associated Waterbody
4	PSS/FO1F, PUBAB, PFO1F, PFO1/4E	Winnisquam Lake
10	PEM1F, PSS/FO1E, PSS1F, R2UB	East of Ephram's Cove
14	PSS1F	West of Ephram's Cove
15	PFO1/4E	Unnamed perennial
16N	PEM/FO5, PSS1F, PFO1/4E, PFO4E, R2UB, PUB, PEM/SS1F	Unnamed perennial
17	PEM1F, R2UB, PFO1/4Eb, PUB	Unnamed perennial
18	PEM1F, PFO/SS1F, PFO1/4E, R2UB	Tioga River
19	PFO1E, R2UB, PEM/SS1F	Tioga River
20	PSS/FO1F, PEM/SS1F, PFO1E, R2UB	Tioga River
26	PSS/EM1F, PFO1/4E, R2UB	Pumping Station Branch
28	PEM1B, R2UB1	Tioga River
29/30	PFO1E, PEM1F, POW, PFO5E, R2UB	Perennial trib to Tioga Ri.
33/37/38/39	R2UB, PUB, PEM/SS1F	Tioga River & 5 tributaries
40	PEM/SS1F, PEM1F, PFO1E, PUB, R2UB	Perennial trib to Tioga Ri.
43	PSS/EM1E, PEM/FO5E, PUB, R3UB	Perennial trib to Tioga Ri.
44	PEM/SS1F, PUB, PEM/FO5F, R2UB	Tioga River
45	PUBb, PEM/SS1E, R2UB	Unnamed pond
46	PUB, PFO5/EM5Eb, R3UB1, R2UB, PSS1/EM1F, PEM1/SS1F, PFO1E	Durgin Brook

**Wetland 10:**

Wetland 10 is approximately 16.09 acres and is located west of Jefferson Road and Union Road on the western edge of town. The wetland directly borders Ephram's Cove of Lake Winnisquam. The wetland is associated with four lower perennial streams (R2UB) that drain westerly toward the cove. These streams converge and form a large semi-permanently flooded emergent wetland that borders the vast majority of the eastern side of the cove. The northern perennial stream directly borders Jefferson Road and is dominated by a dense canopy of eastern hemlock in this location. The stream then transitions into a seasonally saturated scrub-shrub and forested wetland area before finally transitioning into the large emergent marsh. The scrub-shrub-forested swamp (PSS/FO1E) is highly stratified in vegetation layers and contains a diversity of species including maleberry (*Lyonia ligustrina*), winterberry holly, highbush blueberry, and gray birch (*Betula populifolia*). The emergent marsh zone is dominated by broad-leaved cattail, in association with other species.

Although the watershed is partially developed, this wetland has a relatively large upland buffer for a lakeshore wetland community. Due to relatively low wetland fill and relatively wide upland buffers (as estimated from aerial photos), this wetland exhibits the highest ecological

integrity of the three assessed shoreline associated wetland systems (e.g. Wetland 4, 10, and 14). In addition, the wetland is located adjacent to a power line that provides potential turtle nesting habitat. The power line and nearby old railroad bed provide potential educational and recreational access to the wetland, and trails were observed in the uplands from the railroad bed leading to Wetland 10 and the cove. Due to the presence of trails and observed recreation on the edge of the wetland (e.g. boating in the cove) this wetland scored high for recreational value (0.73). Due to high vegetation density and adjacency to Ephram's Cove, the wetland is providing an exceptionally high value for shoreline anchoring and dissipation of erosive forces (i.e. bank stabilization). The wetland is also located near an osprey nesting platform, and the significant fish habitat provided by the wetland contributes to high quality food resources for osprey utilizing the cove. Further, the wetland is in an area identified as "Highest Ranked Wildlife Habitat by Ecological Condition" as determined by the New Hampshire Fish and Game Department (see attached NH Wildlife Action Plan maps). This wetland is rated as the twelfth highest ranked wetland in the town (see Table 5).

#### Wetland 14:

Wetland 14 totals approximately 11.2 acres and is located south of Donway Drive on the west side of Ephram's Cove. This wetland has low habitat and species diversity, and is a semi-permanently flooded palustrine scrub-shrub system (PSS1F). The dominant species in this wetland are red maple and gray birch and the wetland is not associated with any perennial streams.

The northern edge of the wetland is bordered by a densely developed trailer/camping community, while the southern edge is bordered by upland forest and an agricultural field. The northern edge of the wetland appears to have been subject to historical fill and houses and yards are built up to the edge of wetland. As a result, this wetland has a relatively low value for ecological integrity (0.55). In addition, the camping park is a gated community. As a result, the wetland has poor access and offers few educational or recreational opportunities.

The principal functions of this system based on overall scores for the functions are shoreline anchoring and groundwater use potential. Similar to all of the assessed wetlands, this area is underlain by stratified drift aquifer. The wetland also borders roughly 20% of the western side of Ephram's Cove and is providing bank stabilization. In addition, the wetland is located in close proximity to an osprey nesting platform and may help to support fish habitat by providing some nutrient attenuation and potentially enhancing water quality. However, Wetland 10 provides more direct fish habitat due to the inclusion of perennial stream and emergent marsh components that provide potential nursery habitat to fish in the cove.

#### Wetland 15:

Wetland 15 totals approximately 5.97 acres and is the smallest of the assessed wetland systems. This wetland is located North of Hurricane Road to the west of the town Public Works garage property. This wetland has relatively low diversity and is classified as a seasonally saturated, palustrine forested wetland that is dominated by deciduous and needle-leaved evergreen vegetation (PFO1/4E). This dominant species in this wetland are red maple and eastern hemlock, in association with other species. Based on the U.S.G.S. map of this site, this wetland is the headwaters to an unnamed perennial stream that drains into Winnisquam Lake and forms

part of Wetland 10. Currently, based on review of the aerial photo of the site, a driveway bisects the stream from the western edge of the wetland. As a result, the assessed wetland supports the hydrology of the stream, but the stream itself is not part of the assessment area.

Although the wetland is a headwater area to a stream, the wetland exhibits relatively low scores for wildlife habitat, sediment trapping, and nutrient attenuation, due to low habitat diversity, reduced ecological integrity, and lack of open water, or interspersed open water with vegetation types. In addition, the wetland is primarily located on private property and lacks significant educational or recreational opportunities. The highest ranking functions of this system are flood control potential (due to the presence of a large basin) and ground water use potential (due to the presence of a stratified drift aquifer).

#### Wetland 16:

Wetland 16 totals approximately 45.26 acres and is located North of Hurricane Road primarily on the Town of Belmont Public Works garage property. This is a large diverse wetland system that forms the headwaters of a perennial stream that flows across Hurricane Road and eventually drains into Wetland 19 and the Tioga River. This is one of the most diverse wetland complexes assessed in the town. Wetland 16 contains five dominant wetland habitat types including a large emergent/dead forested swamp (PEM/FO5F), a scrub-shrub peatland community (PSS1F), hemlock swamp (PFO4E), riverine channel (R2UB), pond (PUB), and emergent/scrub shrub wetland areas (PEM/SS1F). The scrub-shrub peatland community is a rhodora swamp and considered a rare community type. This wetland area is located on the east side of the community and contains a mix of species including leatherleaf and maleberry. The seasonally saturated forested wetland adjacent to Hurricane Road contains a well-developed overstory of eastern hemlock, spruce, and red maple with an understory of highbush blueberry and cinnamon fern. This forested community transitions to the emergent marsh/dead forested swamp area which contains a well developed herbaceous layer dominated by tussock sedge (*Carex stricta*), blue-joint grass (*Calamagrostis canadensis*), bladderwort (*Utricularia* spp.), and duckweed (*Lemna* spp.).

The southern edge of the wetland is surrounded by a mix of land use types including the Public Works garage, closed and capped, former town dump, low-density residential areas, and a salvage yard. On the contrary, the northern edge of the wetland contains an intact and well-developed upland buffer. As a result, even with the existing land uses to the south, the wetland has a high score for ecological integrity (0.73). As a largely town-owned wetland, the system also offers unique educational and recreational opportunities. An informal pull-off suitable for a van is present on Hurricane Road and this area directly abuts the emergent and dead forested habitat component of the system, near the rhodora/leatherleaf shrub swamp. Further, because a large part of the wetland can be viewed from Hurricane Road, this system offers the second highest score for visual/aesthetic quality when wetland size (i.e. wetland value units) is considered (0.74 raw FVI value, 23.09 WVU). The wetland also exhibits relatively high scores for wetland wildlife habitat, flood control potential, ground water use potential, sediment trapping, nutrient attenuation, shoreline anchoring, and noteworthiness. This wetland is rated as the seventh highest ranked wetland system in the town.



#### Wetland 17:

Wetland 17 totals approximately 63.52 acres and is located to the north of Hurricane Road, west of Seavey Road, and east of Wetland 16. Wetland 17 is associated with a separate perennial stream that drains in a southerly direction across Hurricane Road. Similar to Wetland 16, this second perennial stream eventually drains into Wetland 19 and the Tioga River. Wetland 17 contains four habitat types including a semi-permanent emergent marsh (PEM1F), palustrine unconsolidated bottom system maintained in part by beaver (PUBb, i.e., pond), lower perennial stream channel (R2UB), and a seasonally saturated palustrine forest dominated by a mix of deciduous and needle-leaved evergreen vegetation (PFO1/4Eb). The emergent marsh habitat is the largest habitat type and covers roughly two-thirds of the system. The marsh is dominated by broad-leaved cattail in association with wool grass (*Scirpus cyperinus*). The outer forested edges of the wetland contain a well-developed canopy dominated by red maple, eastern hemlock, and American elm (*Ulmus americana*) with interrupted fern (*Osmunda claytoniana*) and jewelweed (*Impatiens capensis*) in the understory.

Wetland 17 is the second highest ranked system in the town. This wetland has high function value index scores for virtually also assessed functions and values. In addition, this wetland received the third highest FVI for ecological integrity, as well as the second highest FVI for wetland wildlife habitat and fish stream (streams) and highest FVI score for fish habitat (ponds and lakes). Overall, this wetland ranks second out of 18 assessed wetlands and rates in the top five regardless of whether size is considered in the assessment of the wetland. As a result, this wetland can be considered a potential conservation priority for the town.

#### Wetland 18:

Wetland 18 totals approximately 167.33 acres and is the largest wetland complex in the Town of Belmont, based on NH Method delineation criteria. This wetland is located to the north of Route 140 on the western corner of the town. Significantly, a large portion of the wetland is located on a Town of Belmont conservation property known as the “Tioga River Wildlife & Conservation Area.” This wetland forms a large wetland complex on the border of the Tioga River and lower portion of Silver Lake. Wetland 18 also contains an intricate network of small lower perennial streams stemming off of the main channel of the river (R2UB). The network of stream channels supports a wide semi-permanent palustrine emergent marsh (PEM1F). On the Tioga River Wildlife & Conservation Area, this wide marsh zone then transitions into a palustrine forested and scrub-shrub wetland (PFO/SS1F) and a seasonally saturated palustrine forested, broad-leaved deciduous and needle-leaved evergreen system (PFO1/4E). These forested areas are dominated by eastern hemlock, red maple, and winterberry holly. The presence of hummocks and variable microtopography is supporting a diverse herbaceous layer dominated in part by inflated sedge (*Carex inflata*), rattlesnake grass (*Glyceria canadensis*), wool grass (*Scirpus cyperinus*), fringed sedge (*Carex crinita*), royal fern (*Osmunda regalis*), bunchberry (*Cornus canadensis*), and bristly dewberry (*Rubus hispидus*). Due to the presence of ponded water, this habitat type also provides potential breeding habitat to four-toed salamander (*Hemidactylium scutatum*), a species that is tracked by the NH Fish and Game Department. Due to previous activities on the property, a portion of the wetland is also dominated by gray birch and glossy buckthorn (*Rhamnus frangula*), an invasive non-native shrub. The emergent zones are dominated by tussock sedge and blue-joint grass, in association with wool grass and swamp candles (*Lysimachia terrestris*). The scrub-shrub zones are dominated mainly by meadowsweet

and winterberry holly, although a variety of other species are present including northern arrowwood (*Viburnum recognitum*) and red maple.

Wetland 18 is the highest ranking wetland system in the Town of Belmont, regardless of whether size is considered in the ranking system (see Table 4, 5 and Figure 1). Although Wetland 18 is located near Route 140, the wetland has the highest FVI score for ecological integrity, which enhances the overall values for each assessed function. In addition, Wetland 18 rated second highest for educational potential, water-based recreation, and sediment trapping. The wetland provides an ideal educational and recreational site due to the presence of a parking area near an informal trail system, with potential access to the water. The wide highly interspersed emergent and scrub-shrub zones have a high capacity to trap potential sediments from the surrounding watershed and contribute to maintaining water quality. The wetland also rated third highest for wetland wildlife habitat due to high ecological integrity, the presence of large areas of standing water, high wetland diversity, dominance of marsh and scrub-shrub habitat, and adjacency of undeveloped upland habitat. The wetland is also located in an area identified as a “Conservation Focus Area” and as a “Highest Ranked Wildlife Habitat by Ecological Condition” by the New Hampshire Fish and Game Department (see attached NH Wildlife Action Plan maps).

#### Wetland 19:

Wetland 19 totals approximately 67.03 acres and is located to the south of Route 140 and West of South Road in the southwestern section of the town. Wetland 19 borders a large section of the Tioga River upstream of Wetland 18 and downstream of Wetland 20. Both Wetland 16 and Wetland 17 drain into this large system from unnamed perennial streams. Wetland 19 is juxtaposed between and within two distinct zoning districts (commercial and rural). As a result, the northern portion of the wetland is partially bordered by existing commercial buildings while the southern edge of the wetland is bordered by pasture and undeveloped woodland.

From South Road, the northern edge of the wetland transitions from a seasonally saturated red maple swamp (PFO1E) to the channel of the Tioga River. This channel is classified as a lower perennial unconsolidated bottom system (R2UB). The forested areas then transition into a large marsh and scrub shrub complex classified as a semi-permanently flooded system (PEM/SS1F). Similar to Wetland 18, the marsh and scrub-shrub areas are interspersed with a network of channels that feed into the Tioga River. The scrub-shrub areas in the vicinity of Route 140 have high vertical stratification and well-developed hummock topography. Dominant plant species in this area include black chokeberry, winterberry holly, and gray birch in association with red maple, meadowsweet, silky dogwood (*Cornus amomum*), willow (*Salix* spp.), highbush blueberry, and sweet pepperbush (*Clethra alnifolia*). Glossy buckthorn, an invasive species, is also present near Route 140. The herbaceous layer is diverse and includes tussock sedge, wool grass, inflated sedge, cotton grass (*Eriophorum* spp.), marsh fern (*Thelypteris palustris*), Canada rush (*Juncus canadensis*), and marsh St. John’s wort (*Triadenum virginicum*).

Wetland 19 is the fifth highest ranked wetland in the Town of Belmont. The wetland rates highest compared to all of the assessed wetlands for sediment trapping (0.93 FVI) and nutrient attenuation (0.97 FVI) due to the presence of large expanses of emergent and scrub-shrub habitat highly interspersed with open water, as well as due to the presence of nutrient and sediment

sources in the surrounding watershed. The wetland also scores third highest for shoreline anchoring (bank stabilization) and water-based recreation.

#### Wetland 20:

Wetland 20 is approximately 59.44 acres and is located east of South Road upstream of Wetland 19. This system forms a large floodplain to the Tioga River in the Residential Multi-Family Zone located south of Route 140. The northern edge of the wetland is bordered by dense residential development while the southern boundary is currently forested, with a small area managed as pastureland and corn field.

The wetland grades from an emergent/scrub shrub wetland near Route 140 on the eastern side of the system to a seasonally saturated broad-leaved deciduous floodplain system (PFO1E). The canopy of this floodplain is dominated by red maple in association with speckled alder, common elderberry (*Sambucus canadensis*), and meadowsweet in the shrub layer. The herbaceous layer is comprised of a dense layer of ferns including sensitive fern (*Onoclea sensibilis*) and royal fern with areas of blue-joint grass and bristly dewberry replacing the ferns as dominant herbaceous species. This habitat zone along the river contains areas of standing water that provide potential amphibian breeding habitat and function as potential floodplain vernal pools. A variety of wildlife species were observed in the river corridor including coyote (*Canis latrans*), mallard (*Anas platyrhynchos*), spring peeper (*Pseudacris crucifer*), blue jay (*Cyanocitta cristata*) and red squirrel (*Tamiasciurus hudsonicus*).

The forested floodplain areas then transition into a semi-permanently flooded scrub-shrub/forested wetland (PSS/FO1F) and scrub-shrub/emergent zones (PEM/SS1F) in the western portions of the wetland. These areas are dominated by red maple, nannyberry (*Viburnum lentago*), American elm, speckled alder, and winterberry holly. The channel of the Tioga River contains an unconsolidated bottom (R2UB) and densely vegetated banks.

Wetland 20 ranks tenth highest among all the assessed wetlands. This system rates extremely high for flood control and rates third highest for overall education potential. Education potential is high due to the presence of a sewer line and woods road that runs along the southern periphery of the system and provides potential high quality access to all of the major wetlands systems located in the wetland. Currently, the sewer line is fenced and access would need to be granted by property owners. However, the woods road is in excellent condition and could function as a valuable educational trail leading from the informal parking lot currently located directly adjacent to South Road.

From an ecological perspective, the wetland also rates relatively high for sediment trapping and shoreline anchoring due to the wide floodplain located in the center and western portions of the system.

#### Wetland 26:

Wetland 26 is approximately 13.68 acres and is located in the southern portion of Belmont east of Wareing Road. This wetland consists of Pumping Station Branch (Brook) and its associated floodplain wetlands. Pumping Station Branch originates at Clough Pond and merges with a second unnamed perennial stream before forming Wetland 26. Pumping Station Branch Brook

then outlets under Wareing Road via (3) three-foot wide culverts and a four-foot culvert. The stream then continues in a northwesterly direction on the south side of the center of Belmont and eventually drains into Wetland 20.

A large percentage of Wetland 26 is a scrub-shrub/emergent system dominated by broad-leaved deciduous and persistent emergent vegetation (PSS1/EM1F). In the vicinity of Wareing Road, the scrub-shrub layer is dominated by speckled alder and the dense herbaceous layer includes broad-leaved cattail and tussock sedge. The brook channel branches within the wetland complex and contains an unconsolidated bottom (R2UB). The northern fingers of the wetland are classified as palustrine forest dominated by a mix of broad-leaved deciduous and needle-leaved evergreen vegetation including red maple and white pine.

Based on the aerial photo of the wetland, the entire assessed area is located within an active gravel/sand pit operation and is surrounded by private access roads to the southeast and town roads (e.g. Wareing Road, Field Lane) to the west and north. Due to surrounding land uses, the wetland lacks a 500-foot buffer to any direction and has been fragmented in at least four locations by roads. As a result, the wetland exhibits the lowest FVI score for ecological integrity of all the assessed wetlands.

Due to the presence of large floodplain wetlands, the system exhibits high scores for flood control potential (0.85), sediment trapping (0.85), and nutrient attenuation (0.76). In addition, the wetland is underlain by a coarse-grained stratified drift aquifer and provides high groundwater use potential (0.94). However, the wetland exhibits four FVI numbers of less than 0.5 (i.e. for ecological integrity, educational potential, visual/aesthetic quality, and water-based recreation), which leads to a relatively low ranking of this wetland overall, compared to the other assessment areas.

Currently, the culvert outlets at Wareing Road are not ideal for fish passage. If the town wished to restore the crossing and enhance fish passage between Wetland 26 and downstream areas, the town could consider upgrading the existing pipes to larger culverts when the existing culverts require replacement. Currently, the draft stream crossing guidelines recommend open bottom structures 1.2 times the channel width plus two feet for a perennial stream. However, as part of any culvert replacement, potential upstream and downstream effects on the wetland system and nearby property owners should be considered before implementing a new design.

#### Wetland 28:

Wetland 28 is approximately 28.98 acres and is located on the eastern side of Belmont, south of Brown Hill Road and east of Route 106 and Badger Glen Drive. This wetland includes a central portion of the Tioga River, outlet of Badger Brook, and previous Badger Pond area. The channel of the Tioga River is classified as a riverine unconsolidated bottom system dominated by cobbles and boulders (R2UB1). From this wetland, the river drains under Route 106, to the north of the center of Belmont and eventually drains into Wetland 20.

The Badger Pond dam was removed in 2004 and this change in hydrology has resulted in a wet meadow in the location of the previous pond. This wet meadow is classified as a palustrine emergent system dominated by persistent vegetation (PEM1B). This area is currently dominated

by sedges (*Carex* spp.) in association with steeplebush (*Spiraea tomentosa*), wool grass, and goldenrod (*Solidago* spp. and *Euthamia* spp.). Shrubs have started to colonize the system and this sparse shrub layer is dominated by gray birch. Due to the removal of the dam, this area will likely continue to be colonized by additional shrub and tree species. Further, the boundary of the system may change overtime due to the alteration of hydrology resulting from the removal of the dam.

Compared to other assessed areas, Wetland 26 has median scores for most functions. However, the wetland does exhibit a high FVI score for flood control potential due to the presence of the large wet meadow which provides a high level of potential flood storage. Also, although the wetland is located near Route 106, the eastern boundary of the wetland has a large upland buffer and results in a relatively high ecological integrity FVI score (0.78) which enhances the overall ratings for wetland wildlife habitat, and finfish habitat. Due to the removal of the dam, fish passage has been enhanced within this system.

#### Wetland 29/30:

Wetland 29/30 totals approximately 34.92 acres and is located in the east-central portion of town south of Farrarville Road and north of Bryant Road. The wetland contains an unnamed perennial stream that drains across Bryant Road into the Tioga River and Wetland 28. This headwater wetland has exceptionally high habitat diversity and contains five palustrine wetland habitat types including dead forested swamp (PFO5E), emergent marsh (PEM1F), open water (POW), unconsolidated bottom river channel (R2UB), and deciduous forested swamp (PFO1E). The emergent marsh areas are well distributed throughout the system and are dominated by broad-leaved cattail, in association with wool grass, goldenrod, and steeplebush. Reed canary grass (*Phalaris arundinacea*), an invasive species, is also present on the eastern edges of the wetland. The forested areas on the edges of the system contain a mix of species including red maple and eastern hemlock.

Similar to other large emergent complexes in the town, this system provides a high potential for sediment trapping (0.85 FVI), nutrient attenuation (0.81 FVI), and shoreline anchoring (1.0 FVI) due to the interspersed riverine channel with densely vegetated emergent areas. The high habitat diversity present in the system, combined with the presence of upland islands, is also contributing to a high score for wetland wildlife habitat (0.86 FVI). The wetland is directly underlain by a coarse-grained stratified drift aquifer and provides a high level of ground water use potential. This wetland is rated as the eleventh highest ranked wetland in the town.

#### Wetland 33/37/38/39:

Wetland 33/37/38/39 is approximately 122.15 acres and is located in the northeastern corner of the town, north of Farrarville Road and Bryant Road. The wetland is formed by the upper reaches of the Tioga River and five contributing perennial streams. This large stream network flows under Brown Hill Road before merging with the combined flows of Wetland 29/30 and transitioning into Wetland 28. The habitat types of the system transition from small headwater streams into large emergent marsh and scrub-shrub systems (PEM/SS1F) interspersed with beaver and human-dammed ponds (PUB). The emergent and scrub-shrub areas also contain areas classified as sedge fens. These areas are dominated by a variety of sedges in conjunction with cotton grass and sphagnum moss. The scrub-shrub borders of these areas are dominated in

part by speckled alder and provide thick cover on the edges of the stream channels. In total, this system is significant because it is the largest intact and unfragmented stream network in the Town of Belmont.

In addition, this wetland rates exceptionally high for all assessed functions. Notably, this system received the highest FVI scores for wetland wildlife habitat (0.99 FVI) and fish habitat (0.88 FVI; rivers and streams). Further, the wetland received the second highest FVI scores for ecological integrity and fish habitat (ponds and lakes). The extremely high rating for wetland wildlife habitat can be attributed to the presence of wide and intact upland buffers, as well as to the interspersed diverse habitat types. During site assessments, SRE observed a large turtle population in the wetland and the open water areas also provide high habitat value to waterfowl and wading birds. Further, as an intact stream network, the wetland functions as a large landscape corridor in the town and provides high quality habitat to a variety of species including river otter (*Lontra canadensis*) and mink (*Mustela vison*) which rely on intact riverine systems. The presence of intact upland buffers and lack of development near the wetland is contributing to the high scores for ecological integrity and wetland wildlife habitat. Further, these upland areas serve to protect the water quality of this system which buffers a large section of the Tioga River.

This wetland is rated third out of the 18 assessed systems, second only to Wetland 18 and 17. Due to the high level of wetland functions provided and the location of this wetland in the middle reaches of the Tioga River, this system should be considered a focus area for conservation efforts. Long-term conservation of this wetland and adjacent uplands would serve to protect valuable wildlife habitat and maintain important water resources downstream of the wetland.

#### Wetland 40:

Wetland 40 totals approximately 40.12 acres and is located in the eastern corner of the town, north and south of Jodi Drive. This wetland contains a portion of the Tioga River and a contributing perennial stream. Jodi Drive bisects the unnamed perennial stream and joins with the Tioga River north of Jodi Drive. The wetland is bordered by a mix of land uses including undeveloped woodland, residential areas, and a previous gravel pit area.

The wetland forms a large floodplain to the unnamed perennial stream and contains a high diversity of habitat types including emergent marsh (PEM1F), emergent marsh/scrub-shrub (PEM/SS1F), ponds (PUB), riverine channel (R2UB) and seasonally saturated deciduous-leaved forest (PFO1E). From Jody Drive, the wetland transitions from a red maple swamp to marshes dominated by broad-leaved cattail, tussock sedge, and American bur-reed (*Sparganium americanum*). The scrub-shrub zones contain a mix of species including winterberry holly, speckled alder, highbush blueberry, and northern arrowwood.

Due to the presence of large emergent/scrub-shrub areas this wetland exhibits high scores for flood control potential and shoreline anchoring. In addition, the wetland is directly bisected by Jodi Drive and is actively providing sediment trapping.

Wetland 43:

Wetland 43 is approximately 37.96 acres and is located east of Bennington Drive and northwest of Brown Hill Road. This system contains the upper and middle reaches of an unnamed perennial stream that drains into the Tioga River. Wetland 43 was separated from Wetland 33/37/38/39 for analysis purposes due to the presence of a subdivision road that forms a constricted outlet to this system.

The wetland contains a diversity of habitat types including scrub-shrub swamp/emergent wetland (PSS/EM1E), emergent marsh/dead forested swamp (PEM/FO5E), open water (PUB), and riverine channel (R3UB). The emergent zones are characterized by dense sedge (*Carex* spp.) hummocks dominated by tussock sedge.

This wetland received the third highest FVI scores for fish habitat (ponds and lakes) and sediment trapping potential. In addition the wetland scores relatively high wetland wildlife habitat (0.89 FVI). During site assessments, hooded mergansers (*Lophodytes cucullatus*) were observed in the wetland. This species favors clear streams and requires cavity trees for nesting. The wetland also has high potential to support a diversity of rare turtle species including wood turtle (*Glyptemys insculpta*) and Blanding's turtle (*Emydoidea blandingii*), which is now listed as State Endangered. Overall, this wetland is ranked as number nine out of the 18 assessed wetland systems.

At the time of the site assessment, a woods road was eroding into the wetland. This area could be stabilized to restore the stream bank in this location and prevent unnecessary sedimentation into adjacent wetlands.

Wetland 44:

Wetland 44 is approximately 26.90 acres and is located south of Durrell Mountain Road and east and west of Rogers Road. This wetland is the headwaters and upper reaches of the Tioga River. Although the system is bisected by Rogers Road, the river is bridged at Rogers Road and the road itself is effectively a trail. The town owns a large portion of the wetland complex to the east of Rogers Road.

The wetland transitions from an emergent marsh/dead forested swamp (PEM/FO5F) to an emergent/scrub-shrub system (PEM/SS1F), interspersed with ponded areas (PUB). The Tioga River flows through this system and forms a meandering channel (R2UB). Dominant plant species in the marsh zones include tussock sedge, sensitive fern, American bur-reed, pondweed (*Potamogeton* spp.), and broad-leaved cattail. The scrub-shrub areas are comprised of a diversity of shrub species including nannyberry (*Viburnum lentago*), speckled alder, highbush blueberry, and red maple. Currently, the system is surrounded by undeveloped upland forest to the east and south, and rural residential to the northwest.

This wetland rates relatively high for virtually all assessed wetland functions and provides the highest FVI score for water-based recreation in the town. This is primarily due to easy access from Durrell Mountain Road and Rogers Road. In addition, the wetland provides the second highest score for visual/aesthetic quality in the town due to the presence of large expanses of open water and low growing emergent areas near accessible viewing areas. This system also

provides the third highest score for fish habitat (ponds and lakes). The wetland also relates relatively high for ecological integrity, which helps to protect the quality of the wetland and downstream portions of the Tioga River. Due to the high individual scores for the assessed functions, this wetland rates as the fourth highest ranked wetland system in the Town of Belmont.

#### Wetland 45:

Wetland 45 is approximately 8.05 acres and is located in the center portion of the town east of Wildlife Boulevard. This wetland is located in the Jeff Marden Town Forest. The perennial stream associated with this wetland drains into the Tioga River just downstream of Wetland 28. Wetland 45 contains three habitat types. The most expansive habitat type is a beaver pond (PUBb). The pond transitions into a seasonally saturated emergent and scrub-shrub system (PEM/SS1E) bordering a perennial stream channel (R2UB). The emergent/scrub-shrub zone is dominated by speckled alder, broad-leaved cattail, wool grass, and a variety of sedges (*Carex* spp.).

As part of an actively managed town forest, this wetland provides high recreation and education potential. Compared to the other assessed wetland complexes, this wetland provides the highest score for educational potential due to the presence of trails, parking, and adjacency to the high school. In addition, this wetland provides the highest score for visual aesthetics. Overall, this system is ranked sixth out of the assessed wetlands based on raw FVI scores.

#### Wetland 46:

Wetland 46 is approximately 26.44 acres and is located in the northern section of Belmont east of Horne Road and west of Mile Hill Road. This wetland consists of Durgin Brook and its associated floodplain wetlands. Two streams and additional wetlands drain across Horne Road to form the Durgin Brook wetland complex which eventually flows into Winnisquam Lake. This stream complex has high habitat diversity and contains seven different systems. The eastern section of the wetland begins as a wide emergent/scrub-shrub system (PSS1/EM1F) and transitions into ponded areas (PUB), and dead forested swamp interspersed with emergent zones dammed by beaver (PFO5/EM5Eb). The channel of Durgin Brook varies from an upper perennial (R3UB1) to a lower perennial system (R2UB). The upper northeastern leg of the wetland contains a dense scrub-shrub/emergent system (PSS1/EM1F). The edges of the system also contain areas of seasonally saturated deciduous forest (PFO1E).

Wetland 46 is scored third highest for fish habitat (rivers and streams) and water-based recreation. In addition, the wetland rates high for shoreline anchoring (i.e. bank stabilization), flood control potential and groundwater use potential. The wetland has relatively high ecological integrity and the fourth highest score for wetland wildlife habitat. Due to the presence of dense emergent and scrub-shrub areas, the wetland also rates relatively high for sediment trapping and nutrient attenuation. Based on all functions combined, Wetland 46 is the eighth highest ranked wetland in the town.



## Summary

The original twenty-five prime wetland candidates in the Town of Belmont were re-assessed during 2008 using the current NH Method. Out of the original 25 target areas, three wetlands were dropped from further analysis due to small size (e.g. less than 2 acres) or soil characteristics (i.e. less than 50% very poorly drained soil based on county soil data). Of the remaining 22 wetland systems that met minimum prime wetland criteria, six were combined into two larger assessment areas to be consistent with methodologies outlined in the NH Method. As a result, 18 wetland areas were assessed and ranked as part of this study.

Under the current NH Method, Wetland Value Units (WVU's) are determined to rank individual wetlands. WVU's are calculated by multiplying the Function Value Index (FVI) score for a wetland by its size in acres. This intentionally places emphasis on larger wetland systems. However, the NH Method is currently under revision and it is the intention of the committee to drop the calculation of WVU's due to a concern that this will always rank large wetlands higher, regardless of the scores of functions that may not rely on wetland size (e.g. noteworthiness). As a result, we have presented rankings for both WVU's and FVI scores, in case the town pursues prime wetland designation in the future.

Under both ranking systems, Wetland 18, 33/37/38/39, 19, 17, 20, and 16 rank in the top ten highest ranked systems (see Table 3). As a result, regardless of the ranking system used, these systems clearly provide significant functions to the town including flood protection, water quality maintenance (e.g. nutrient attenuation and sediment removal), wildlife habitat, and groundwater use potential.

When wetland size is not considered in the ranking, as is intended with an upcoming update of the NH Method, 12 systems rank high and meet prime wetland designation criteria. These systems include, in descending order of rank, Wetlands 18, 17, 33/37/38/39, 44, 19, 45, 16, 46, 43, 20, 30, and 10. These wetlands are individually rated as providing the top three values for individual wetland functions. Significantly, regardless of overall ranking, 16 of the 18 assessed wetlands are rated very high for flood control potential and ground water use potential. In addition, the majority of the wetlands (all except Wetland 15) provide potential habitat to wood turtle, spotted turtle, and/or Blanding's turtle due to the presence of semi-permanently flooded scrub-shrub, emergent, and/or riverine habitat. All three of these turtle species are thought to be in decline and the spotted (*Clemmys guttata*) and Blanding's turtle were recently listed as State Endangered. As a result, the majority of the assessed wetlands provide significant habitat and are considered noteworthy. In addition, these wetlands provide important flood control potential and serve to protect significant ground water resources in the Town of Belmont.

Table 5. Overall ranking of proposed Prime Wetland candidates based on raw Function Value Index numbers and Wetland Value Units (with size as a multiplier). The new proposed ranking method includes addition wetlands as “high ranking” but incorporates all wetlands top ranked under the current evaluation method.

<b>Wetland Rank</b>	<b>Assessment based on WVU’s (Current NH Method)</b>	<b>Assessment based on FVI’s (Proposed Revision to NH Method)</b>
1	Wetland 18	Wetland 18
2	Wetland 33, 37, 38, 39	Wetland 17
3	Wetland 19	Wetland 33, 37, 38, 39
4	Wetland 17	Wetland 44
5	Wetland 20	Wetland 19
6	Wetland 16	Wetland 45
7		Wetland 16
8		Wetland 46
9		Wetland 43
10		Wetland 20
11		Wetland 30
12		Wetland 10

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