Functional Assessment of Wetlands Throughout the Moose River Area of Randolph, NH

July 2017

Report Prepared for:
The Town of Randolph
Conservation Commission

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Executive Summary

Nine wetlands throughout the Moose River watershed area in the Town of Randolph have been identified, inventoried, and assessed as part of an initiative to maintain good water quality and habitat diversity throughout the Town of Randolph.

Goal and Objectives

The goal of this project is to provide the Town of Randolph with the ability to work towards protecting or conserving several diverse and critical wetland complexes along the Moose River portion of Town. The objectives are to:

1. Provide the Town with biological on the functional assessment and ranking of wetland complexes not only along the Moose River mainstem, but also in the headwaters area of the Moose River Subwatershed.
2. Increase public awareness and education in relation to the importance of protecting wetlands and high water quality through data generated, maps, a written report, and a public presentation.
3. Generate biological data to equip the Town of Randolph to work with private landowners in the Moose River watershed area to protect wetlands on their property.
4. Provide data and information on wetland protection to the Randolph Conservation Commission, which will equip the Town to implement a program to adopt ordinances and Prime Wetland designations for protection of wetlands.

Conclusion

Although nine wetland areas were separated and compared relatively with each other, seven of the nine wetlands are directly connected by the Moose River, its tributaries, hydric soils, and a stratified drift aquifer (Wetland Numbers 3 through 9). In fact, if this study had been done at a larger scale (e.g., town-wide or region-wide), the Moose River wetlands would have been assessed as one contiguous area. The size of the combined wetland would not only increase the acreage of the area, but also the functional score, determined during field work.

These wetlands are not isolated from each other, but connected. Impact to any one of the wetlands, will impact the others. Furthermore, detrimental impact to these wetlands will affect wetlands and groundwater downstream. Given that these wetlands are in the headwaters region, the downstream area expands into larger watershed areas. The Moose River/Moose Brook watershed is a total of 14,095.85 acres. It is part of a much larger watershed called the Androscoggin River Watershed, which is 645,815 acres. Degradation of water quality in these headwater regions will not only affect water quality and wetland function immediately downstream, but could potentially affect a much larger area. Currently, these wetlands are in good shape. The ecological diversity is high, and water quality is good, and there is relatively little impact from development. Now is the time to work towards ensuring these wetlands continue to function at a high quality.

Fortunately, protecting wetlands in this study area is doable and moving forward at the time of this study. The wetlands in this study area range from nearly 6.4 acres to 34.11 acres. The entire study area is over 3962 acres. Three of these wetlands are already protected: Ravine House Pool/Durand Lake, Old Growth, and Paleosite Wetlands. This is an exciting start, and could be expanded, with willing landowners and potential funding.

The nine wetland complexes inventoried are all valuable to the Town of Randolph. Randolph has a rare opportunity compared to many towns in other parts of the state – an ability to proactively protect wetland areas and diverse natural resources before development, fragmentation, and degradation occurs.

Summary of average scores for 9 wetlands inventoried in Randolph, New Hampshire along the Moose River Watershed

Wetland Number	Size acres	Total Score	Average Scores for Each Function											
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	6.44	62.5	9.5	5.9	5.3	5.2	4.3	3.7	2.6	2.6	7.7	7.0	8.8	0.0
2	16.92	95.7	10.0	9.0	6.6	9.2	6.2	6.9	3.3	1.6	7.0	7.1	8.8	20.0
3	18.39	88.8	6.2	7.6	6.2	9.2	8.2	7.0	3.3	4.2	5.6	5.8	5.5	20.0
4	30.17	85.7	7.5	7.3	7.1	6.0	5.0	3.4	3.7	4.2	5.7	5.9	10.0	20.0
5	34.11	85.2	7.5	7.0	6.2	7.0	5.4	4.3	3.7	5.0	4.4	6.6	8.1	20.0
6	23.39	87.9	5.8	7.2	5.3	9.2	8.0	8.6	2.6	6.0	4.3	5.6	5.3	20.0
7	15.08	77.0	5.3	5.1	4.0	6.0	5.0	4.0	5.3	4.2	4.6	6.0	7.5	20.0
8	14.48	104.9	10.0	8.5	5.7	8.5	8.1	6.2	7.0	6.2	6.9	7.8	10.0	20.0
9	12.55	101.3	9.5	6.9	4.8	8.5	7.2	5.2	7.0	5.2	4.0	4.2	8.8	30.0

ROSE	Highest values among all assessed wetlands
GREEN	Second highest value among all assessed wetlands
BLUE	Third highest value among all assessed wetlands

1 = Ecological Integrity	**7 = Floodwater Storage**
2 = Wetland-Dependent Wildlife Habitat	**8 = Groundwater**
3 = Fish and Aquatic Habitat	**9 = Sediment Trapping**
4 = Scenic Quality	**10 = Nutrient Transformation**
5 = Educational Potential	**11 = Shoreline anchoring**
6 = Wetland-based Recreation	**12 = Noteworthiness**

Introduction

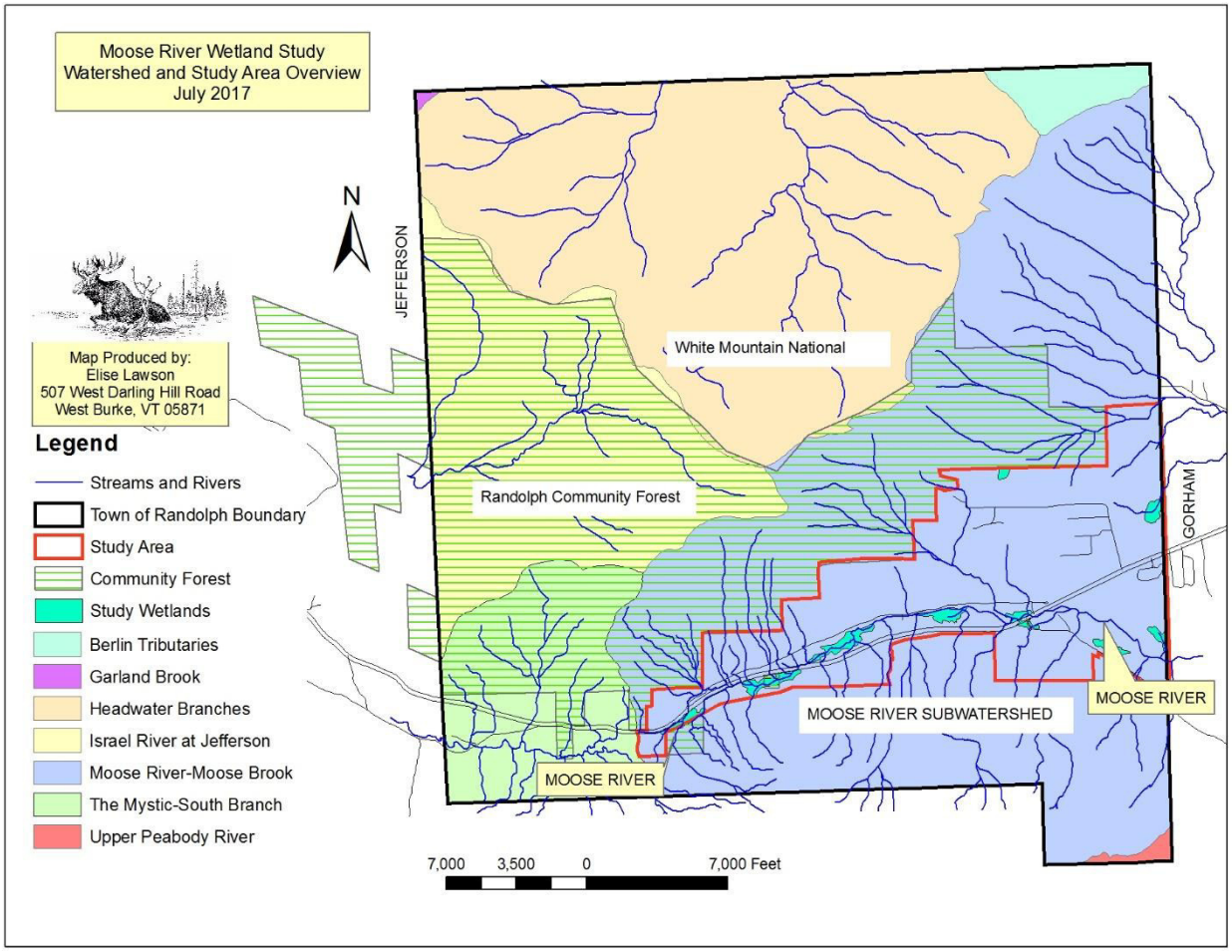
Nine wetlands throughout the Moose River area in the Town of Randolph have been identified, inventoried, and assessed as part of an initiative to maintain good water quality and habitat diversity throughout the Town of Randolph.

Randolph, NH is a mostly forested, mountainous community. To the south lies the Presidential Range of the White Mountains with 5,000-foot peaks and alpine environment above tree-line. To the north of the town is the smaller Crescent Range, with two 3,000-foot mountains. Beyond the Crescent Range, lies the Kilkenny Unit of the White Mountain National Forest (WMNF). In December 2001, the Town became the owner of the largest town forest in New Hampshire, acquiring a tract of over 10,000 acres of land (roughly 1/3 of the town's total land base). The Randolph Community Forest is owned by the Town of Randolph and subject to a conservation easement held by the State of NH. This land is permanently conserved as a working, multi-use forest, which will never be subjected to pressures of development and subdivision.

A stratified drift aquifer lies beneath much of this study area. This potential drinking water source, further highlights the importance of maintaining high water quality and limiting development. This large aquifer contains porous sand, and is just over 436 acres within the Town of Randolph. It ends just at the town line in Gorham.

The Town of Randolph's Conservation Commission (RCC) contracted biologist Elise Lawson (NH CWS #233) to assist them in assessment and functionality rating of wetlands, riparian zones, and uplands in the portion of the Moose River Watershed that is not in conserved lands throughout Randolph. Elise (former business partner with John Severance - Watershed to Wildlife, Inc.) is a natural resource consultant with wetland expertise. Elise has many years of experience conducting natural resource inventories for municipalities, watershed management plans, wetland identification, assessment, classification, delineating and impact permitting, educational workshops, and wildlife studies. Elise has been a NH Certified Wetland Scientist since 2004.

The Moose River watershed is the largest watershed in Randolph (over 14,000 acres). The Moose River begins on the northern slopes of Mount Adams in the Presidential Range of the White Mountains just south of Randolph's Town Boundary. It enters Randolph south of Bowman and flows east parallel to Route 2 through Randolph. Many perennial stream tributaries enter the Moose River from the North (Randolph Community Forest) and the South (White Mountain National Forest). From its headwaters, the Moose River runs approximately 11.7 miles in a general east and then northeast direction, traversing the towns of Randolph and Gorham, before its confluence with the Androscoggin River in Gorham, NH. Within the Town of Randolph, most of the Moose River is not in conserved or protected land thereby creating a potential for impaired buffers, wetlands, and overall water quality.



Subwatersheds in the Town of Randolph, NH. The study area for this project is outlined in red and within the Moose River-Moose Brook subwatershed.

Goal and Objectives

The goal of this project is to provide the Town of Randolph with the ability to work towards protecting or conserving several diverse and critical wetland complexes along the Moose River portion of Town. The objectives are to:

1. Provide the Town with biological on the functional assessment and discussion of wetland complexes not only along the Moose River mainstem, but also in the headwaters area of the Moose River-Moose Brook Watershed.
2. Increase public awareness and education on the importance of protecting wetlands and high-water quality through data generated, maps, a written report, and a public presentation.
3. Generate biological data to equip the Town of Randolph to work with private landowners in the Moose River watershed area to protect wetlands on their property.

4. Provide data and information on wetland protection to the Randolph Conservation Commission, which will equip the Town to implement a program to adopt ordinances and Prime Wetland designations for protection of wetlands.

Data generated from this study will enable the Town of Randolph to work towards conserving wetlands along the Moose River and adjacent areas. Another possibility is that the information gathered will garner support for purchase of property from landowners willing to sell. This study is also a major step to enabling the Town of Randolph, if they choose, to designate Prime Wetlands through methods provided by the State of NH Department of Environmental Services, Wetlands Bureau. The New Hampshire Code of Administrative Rules sets standards for designating Prime Wetlands, using those wetlands that are worthy of extra protection because of their uniqueness, fragility and/or unspoiled character. Chapter Wt700 of these Administrative Rules set the guidelines for designation as well as the permitting process for impacting of a designated Prime Wetland.

The photo on the left was taken on 6-3-2015 and the right photo was taken 9-20-2017.

Rollo falls is part of the headwaters of the Moose River, which comes out of the Presidential Range of the WMNF. It is a cool scenic destination – just under ½ mile from the parking area at Bowman Divide. These falls are now a part of the Randolph Community Forest thanks to a generous donation from Bob Potter and Roberta Arbree.

Methodology

Evaluating Existing Digital Data

Existing digital data was analyzed to determine which wetlands were to be evaluated in the field. Data evaluated included:

- 2003 and 2009 Aerial Photographs (Digital Orthophoto Quadrangles)
- United States Geologic Survey Topographic Maps (Digital Raster Graphics)
- Natural Resource Conservation Service (NRCS) soil maps
- U.S. Fish and Wildlife – National Wetland Inventory (NWI) data
- NH Fish and Game – Wildlife Action Plan

Using the above data sets, wetlands were assessed and ranked in the office to identify specific areas for field investigation.

A combination of NRCS soils maps, NWI wetland maps, and aerial photography were used to identify the outer perimeter borders of continuous hydric soil units (soils that are poorly and very poorly drained). In areas where the NWI and aerial photographs depicted additional areas of wetlands contiguous to the NRCS hydric soils maps, the wetland area was enlarged to incorporate those additional wetland areas. For example, in some cases portions of Palustrine emergent or Palustrine Scrub-shrub wetlands were not classified by the NRCS as hydric soils due to inherent errors in soils mapping. The areas were obvious continuations of the wetlands, so they were incorporated into the wetland polygon, in some cases increasing the area of wetlands beyond the NRCS hydric soil areas.

Very poorly drained soils are typically very soft, mucky, organic soils, with a depth of greater than 60” to bedrock, moderate to rapid permeability, high water potential, and a water table ranging a maximum of 12” below the surface to 12” above the surface. These characteristics make these soils unsuitable sites for agriculture and development, but there can be limited potential for timber harvesting. Due to the deep, soft, wet soil conditions, heavy equipment can only successfully access these sites during winter months when the ground is frozen. These soil conditions also create high potential for wind throw and seedling damage. Very careful planning and proper permitting must take place for timber harvesting to be successful on these sites.

Poorly drained soils are firmer soils, but generally still have moderate to rapid permeability, moderate to high water potential, and have seasonal high-water table levels that range from 0 to 18 inches below the surface. Some of these soils have periods throughout the year when they are drier, giving them potential for pasture land and developable sites. If development is to occur on these soils, careful, planning must include detailed information on drainage, topography, and septic systems. These soils typically have the same limitations for forestry practices as very poorly drained soils, so access during the winter months or dry periods are recommended. Careful planning and proper permitting must take place for intense activity to be productive on these soil types.

Prior to conducting field work, Elise consulted with the RCC so the Town would be aware of where fieldwork would be done. Local knowledge, experience, and input from the RCC and community members are a valuable asset to the project. In addition, written permission was sought from landowners before field work began. Investigators respect the rights of landowners and their decision to deny open access to their property. The majority of the wetland complexes were in areas where landowner permission was obtained, on a public rail trail, or on public lands. Wetland areas where landowner permission was not granted, digital data was used to assess those sections of the wetland.

Field Work

On September 20 and 22, 2016 and June 8, 2017 field work was conducted throughout the study area. Several members of the Randolph Conservation Commission participated in the field work, which greatly enhanced field work due to local knowledge of the area as well as historical data. RCC members Roberta Arbree, James Hunt, and Gary Newfield, and landowners Roberta Arbree and Bob Potter joined Elise in some or all three days of field work. Nine wetlands identified from the maps were scheduled for field onsite assessment over the three days of field work. Wetlands ranged from 6.44 to 34.11 acres. Digital photography, global positioning system (GPS) points, soil assessment, and field notes were used to document spatial and attribute data at all sites observed.

A *NH Method Wetland Function – Value Evaluation Form* was filled out onsite as a comparative means for each wetland. The matrix allowed for relative and objective comparison between different wetlands in the study area. Appendix A shows the data forms used for each wetland. Functional values evaluated included:

1. Ecological integrity
2. Wetland wildlife habitat
3. Fish and aquatic habitat
4. Scenic quality
5. Educational potential
6. Wetland recreation
7. Flood water storage
8. Groundwater (no field questions here – used provided formula for determination)
9. Sediment trapping
10. Nutrients
11. Shoreline anchoring
12. Noteworthiness

Mapping Analysis

Field data was processed as point and polygon data with linked attribute tables using ArcMap 9.1 software. Polygons and points of new coverages were digitized using aerial photography (DOQs), topographic maps, NRCS soil maps, FWS NWI maps, processed GPS points, and field notes.

Analysis of wetland function and value were conducted by following the *NH Method for Inventorying and Evaluating Wetlands in New Hampshire*[1]. The matrices and functional assessment in each set of evaluation forms allowed for side-by-side comparison of the wetlands in the Moose River Watershed Area. Summaries of the average function scores for all wetlands were included in the study.

Public Workshop Presentation

At the completion of the fieldwork and GIS analyses, Elise will hold a public presentation/workshop in Randolph, NH to discuss results of the study and future planning options for the Town. The goal of this meeting is to increase public awareness of the importance of sustainable conservation or protection of some of the Town's wetlands and associated wildlife habitat. In addition, work from this project will be available for public viewing via printed report and maps.

Results

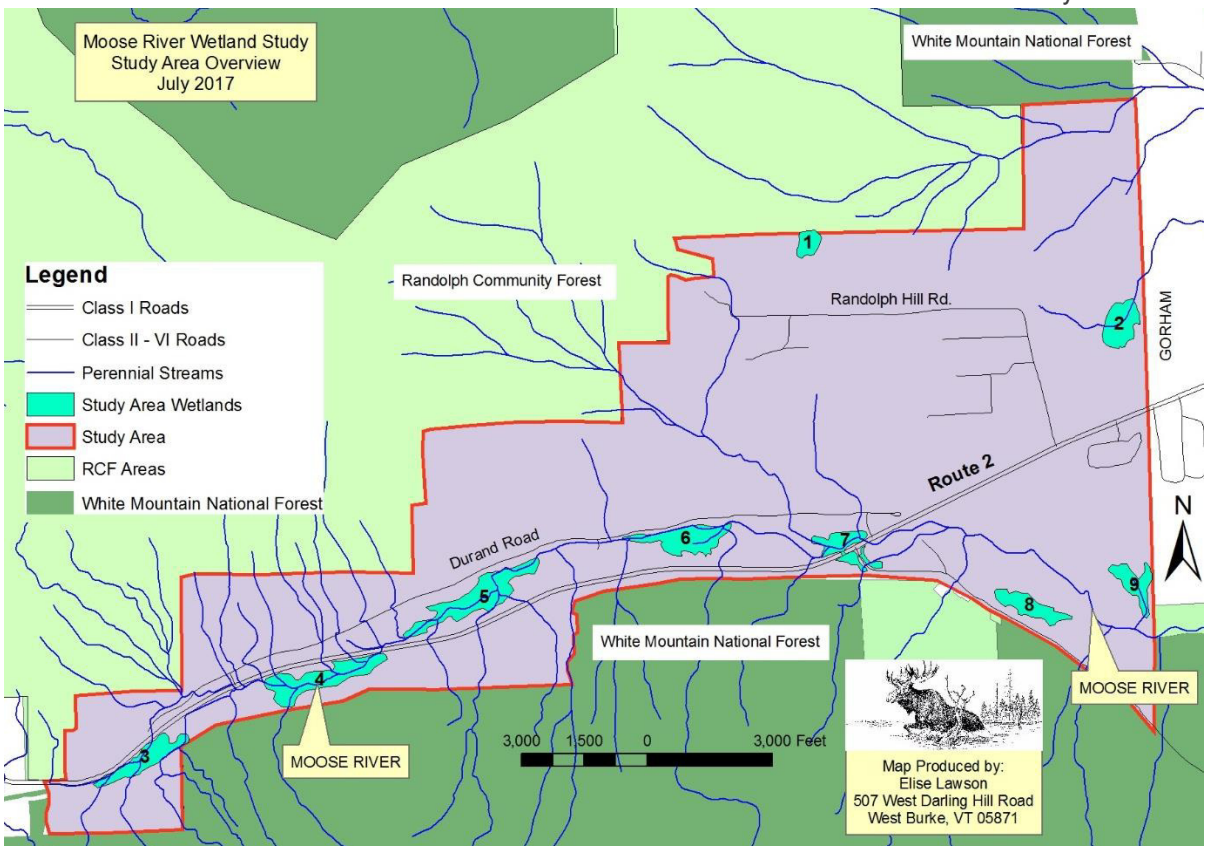
Nine wetland complexes were identified as potential areas for further field inventory. There are many more wetlands throughout Randolph, but these were not inventoried for one or more of the following reasons:

1. Wetlands located in areas already containing conserved land (Randolph Community Forest or White Mountain National Forest)
2. Wetlands located outside of the Moose River subwatershed area
3. Size of wetland was under 2 acres

As with many towns in mountainous areas, wetland complexes are generally smaller and found in river valleys. There are relatively fewer wetlands in Randolph compared to neighboring municipalities in Coos County including Jefferson, Whitefield, and Berlin. However, wetlands in mountainous areas such as Randolph are at or near the headwaters, thus contributing to downstream rivers and wetland complexes. Impairment of these wetlands and streams will lead to accumulated problems further downstream.

The nine wetland complexes ranged in size from 6.44 to 34.11 acres. All contained hydric soils. Below is a map of the wetland areas in the Moose River area of Randolph where wetlands were assessed and evaluated. Each wetland is numbered in black. The numbers do not indicate ranking order.

[1] The ***Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire*** (NH Method) provides communities, conservation groups and professionals a practical method for evaluating wetland functions. Originally published by UNH Cooperative Extension in 1991, the NH Method was first revised in 2011 and updated in 2012 and 2013.



Please also refer to full-page printout of this map - an attachment at the end of this report.

All 9 wetlands share several features, which should be noted before describing them individually. As designed by the study, they are in the same watershed called the Moose River-Moose Brook, which is part of the much larger Androscoggin River Watershed. A breakdown of the watershed levels are listed below.

1. Hydrologic Unit 12 name = Moose River-Moose Brook (24,619 total acres – 14,095.85 are within Randolph)
2. Hydrologic Unit 10 name = Gorham-Shelburne Tributaries (98,997 total acres)
3. Hydrologic Unit 8 name = Lower Androscoggin (143,841 total acres)
4. Hydrologic Unit 6 name = Androscoggin River (645,815 total acres)

A second common feature of 5 of the 9 wetlands is that they are within the same aquifer (Wetland numbers 5, 6, 7, 8, and 9). The Aquifer follows the Moose River for most of the way through Town. There are three types of groundwater aquifers: stratified-drift; till; and bedrock. Stratified-drift and till aquifers are composed of unconsolidated glacial deposits (loose earth materials), while bedrock aquifers are solid rock. In stratified drift aquifers, such as the one in the study area, the materials are sorted sand and gravel. In till aquifers, the material is a gravel, sand, silt and clay mixture. In bedrock aquifers, the rock is fractured. Stratified-drift aquifers are an important source of ground water for commercial, industrial, domestic, and public-water supplies in the State of New Hampshire. Approximately 14% of land surface in the State is underlain with stratified-drift aquifers. In and around the Moose River they consist of stratified,

sorted, principally coarse-grained sediments (sands and gravels) deposited by glacial melt-water during deglaciation. This portion of the Town's aquifer represents potential usable water sources for municipal purposes and should be protected to insure their future quality and availability.

Thirdly, seven of the nine wetlands (numbers 3 through 9 displayed on the map - page 11) are closely associated with the mainstem of the Moose River and flood plains. All are directly connected hydrologically by perennial streams, and the three closest to the rail trail (numbers 3 through 7) were hard to separate into distinct wetlands. These five wetlands all contained varying degrees of beaver sign, indicating that beaver used the entire area throughout history. While beavers are considered to be pests by some, scientists actually have proven that beavers are a "keystone" species in North America. They play a crucial role in biodiversity. Innumerable species, many of them threatened or endangered, rely either partly or entirely on beaver ponds. Therefore, whenever we can coexist with beavers, we are providing the habitat necessary for supporting many other species.

Many areas of the wetland complexes in this study area provide breeding habitat for vernal pool species including wood frogs and spotted salamanders. Vernal pool species were found in isolate vernal pools such as this one, as well as pools part of larger wetland complexes including beaver ponds.

Photo taken on 9-20-2017 and is part of Wetland #3 (Bowman East).

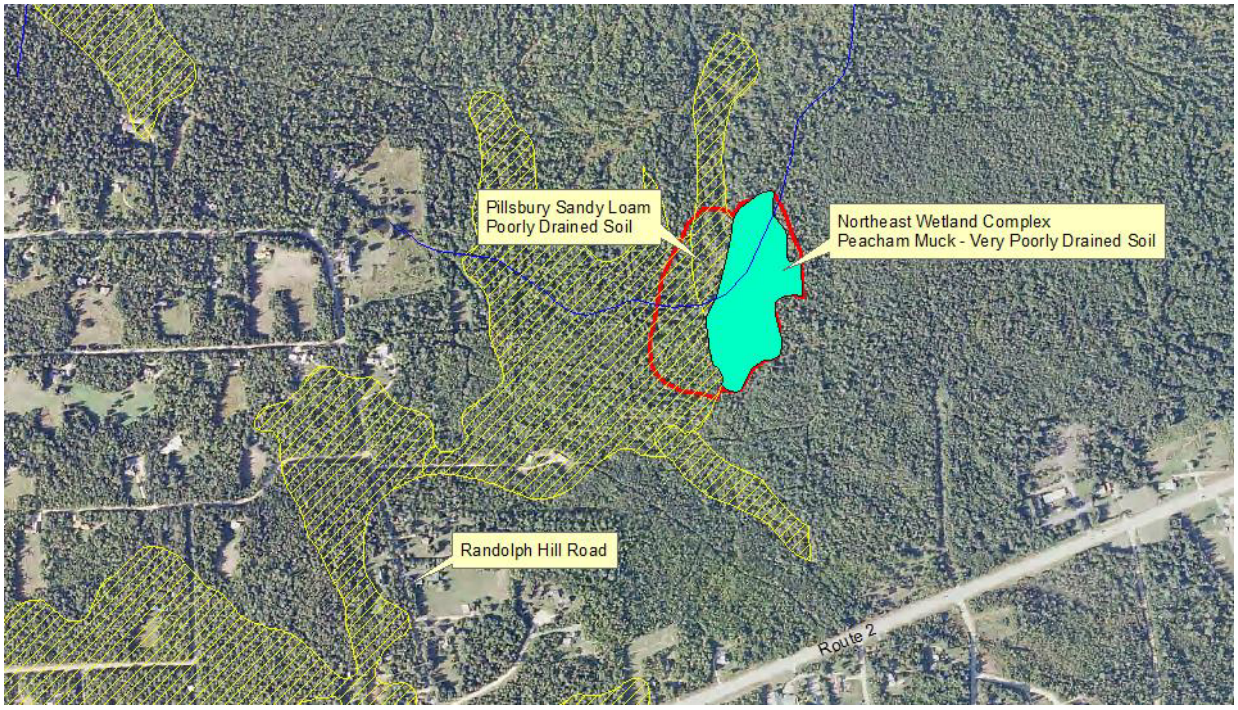
Lastly, there were several areas classified as vernal pools found throughout the study area. Vernal pools are distinct, often isolated, and important wetland types. Vernal pools provide essential breeding habitat for certain amphibians and invertebrates such as wood frogs (*Rana sylvatica*), spotted salamanders (*Ambystoma maculatum*), marbled salamanders (*A. opacum*), and fairy shrimp (*Branchinecta lynchi*). These creatures depend on vernal pools as breeding sites because they are only temporary water bodies, preventing fish and other aquatic predators from taking up residency. Reptiles such as wood turtles (*Glyptemys insculpta*) also rely on vernal pools as an important feeding area in early spring. Vernal pools fill annually from precipitation, runoff, and rising groundwater, typically in the spring and fall. By mid-summer, however, these wetlands are typically dry, making them a dynamic system inhabitable by specifically adapted plant and wildlife species. For this reason, many unique, rare, threatened, and endangered species

are linked to this wetland type. They are common in New Hampshire, and the State recognizes their value as important habitat.

Wetland #1 - Northeast Wetland[2]

The Northeast Wetland is 16.92 acres, containing forested and scrub-shrub wetlands. The NRCS has two soil types mapped: Peacham muck – a very poorly drained soil; and Pillsbury Sandy Loam – a very poorly drained soil. Peacham muck is nearly level and found in depressions along the edges of streams, lakes, ponds and marshes. It formed in layers of muck up to 16 inches thick with a hardpan underneath. It is also very stony. National Wetland Inventory data shows a small area of Forested wetland within the very poorly drained soil. The actual wetland is much larger than indicated by NWI data based on soils mapping and field verification.

Although it appears to be a discrete wetland, the Northeast Wetland drains towards the west and then south. Poorly drained Pillsbury soils connect it with the Moose River and associated wetlands.



Northeast Wetland with poorly and very poorly drained soils displayed.

The wetland is remote with no public access. As a result, wetland based recreation and education potential were rated lower compared with other wetlands in the area. Also, because it contains taller vegetation with little or no open water areas, the overall scenic quality score is lower compared to other wetlands inventoried in the study area.

On the other hand, a combination of the remote location of this wetland, excellent wetland and upland buffers, and a wide diversity of wetland vegetation, give it highest scores for

[2] Wetland numbers do not indicate wetland rank, but were established prior to field work for identification purposes only.

sediment trapping, nutrient transformation, shoreline anchoring and ecological integrity. The wetland was formed from a natural bowl in the topography. The wettest sections contain a very deep, mucky organic layer, and the wetland is completely covered in all layers of vegetation. Deer and moose tracks and droppings were observed all around the wetland during field work. Moreover, although no large open water areas were observed, there were many small pools of water, some of which could function as vernal pools. There are several dead standing trees (snags) in the middle of the wetland, and several species of song birds were noted during the site visit on June 8, 2017.

Northeast Wetland is primarily a forested and scrub shrub wetland. It contains a lush diversity of wetland vegetation at all vegetative layers. There are several dead standing trees, which are excellent habitat for perching and nesting birds.

The dominant shrub here is speckled alder with balsam fir, red maple in the tree layer, and several species of sedges, rushes and ferns making up the ground cover.

Wetland #2 - Hidden Gem Wetland

The Hidden Gem Wetland is at the northern section of the study area, directly adjacent to the Randolph Community Forest. This wetland, is in the same watershed as the other 8 wetlands, but is the only one not directly associated with the Moose River. Small seeps and perennial streams enter it from the south, and the wetland is the beginning of a series of beaver ponds: most of which are within the Community Forest. The perennial stream leaving the beaver ponds heads east and enters Moose Brook. Moose Brook flows along the north side of Route 2 in Gorham, and the Moose River flows parallel to and south of Route 2. They both enter the Androscoggin River at separate locations, with Moose Brook entering approximately 3,700 feet upstream from Moose River.

The Hidden Gem Wetland has fresh beaver activity and is the first of a series of beaver ponds - the rest of which are in the Randolph Community Forest. The perennial stream leaving this wetland does not flow into the Moose River, but a smaller stream called Moose Brook. Photo taken on June 8, 2017 from the south end facing north towards the RCF and the outlet.

Although the smallest wetland area inventoried for this study at 7.62 acres, it scores extremely high biologically. Overall, it was the third highest ranked wetland with all 12 scores added together. The Hidden Gem Wetland contains a variety of wetland types creating suitable habitat for a diversity of plant and wildlife species. The pond is an active beaver pond with abundant fresh and older beaver evidence. The NWI data suggest that it is a forested wetland. Although there is forested wetland to the north and east, over half of this wetland is open water and emergent wetland. There are areas of scrub-shrub wetlands along the edges and a riverine perennial stream to the south and north (inlet and outlet).

The only NRCS soil type mapped for this wetland is a poorly drained Pillsbury Sandy Loam. However, in and around the beaver-impacted pond are inclusions[3] of Peacham soils. Peacham soils are very deep, very poorly drained soils that formed in organic material over loamy lodgement till in glaciated uplands and lowlands.

An adult wood frog near a small pool south of the Hidden Gem Wetland. Vernal pools are within and around this wetland.

The Hidden Gem wetland scores the highest in ecological integrity, wetland-dependent wildlife habitat, and scenic quality. It is second highest in fish and aquatic habitat, sediment trapping, nutrient transformation and shoreline anchoring due to the large open water, the natural bowl, and adjacent forested buffers. The perennial stream leaving the beaver pond is one of the headwater streams for Moose Brook. The diversity plants, plant community types, wetlands and uplands, remote location, and proximity to undeveloped land (Randolph Community Forest) makes this wetland a high use area for many wildlife species.

Although there is no public access to the wetland, it is approximately 600 feet off the Boothman Spring Cutoff Trail. If there was a public trail to the wetland, it would allow for excellent education possibilities.

Hi CC members…I was thinking of adding a locational map with some GIS layers here, but do not want to do this if the landowner is concerned people will trespass…particularly with the close proximity to Bothman Spring Cutoff Trail. What do you think?

[3] In all soil surveys, virtually every delineation of a map unit includes areas of soil components or miscellaneous areas that are not identified in the name of the map unit. Many areas of these components are too small to be delineated separately.

View as entering the Hidden Gem wetland from the south. There is a combination of forested wetlands, scrub shrub wetlands and forested upland habitat around the wetland; all well buffered with no development nearby.

The beaver pond contains both old and active beaver sign. The beaver dams (dog walking across a beaver dam) have been around for many years, but also contain recent additions. There are also several snags which are excellent wildlife habitat.

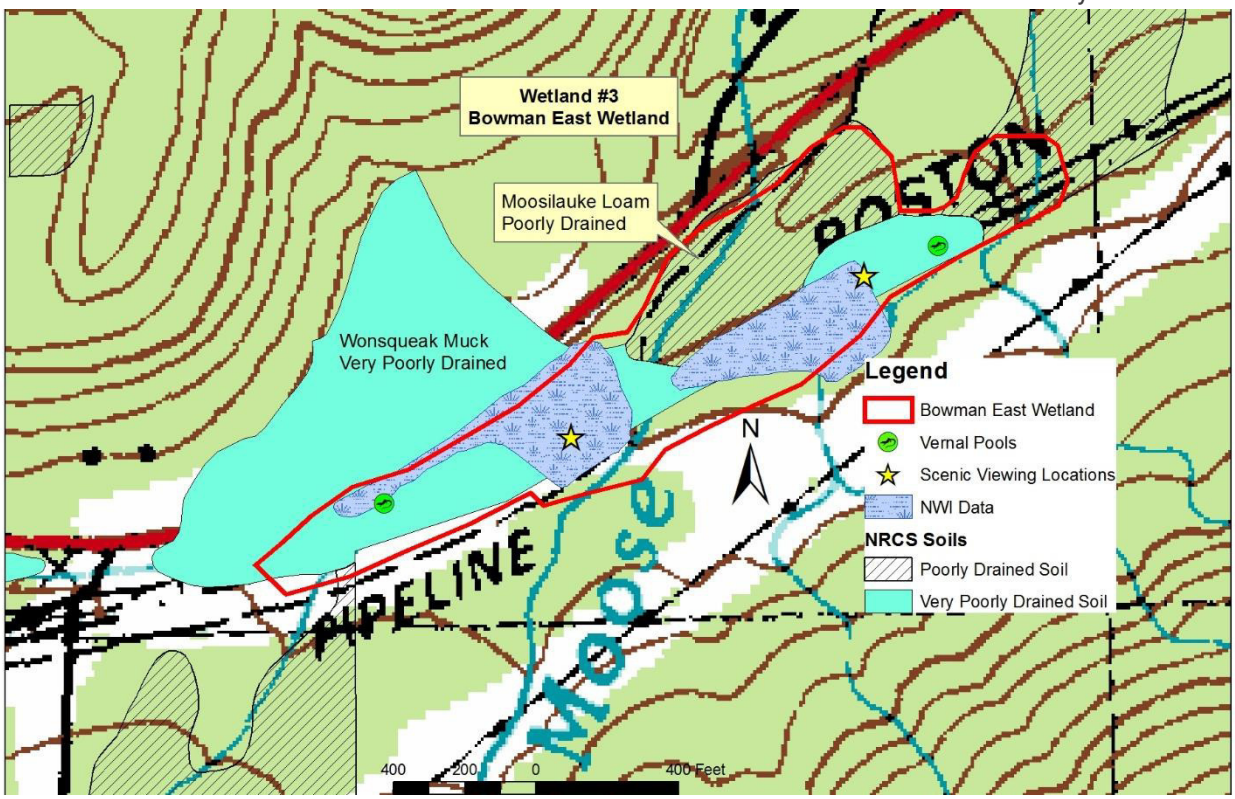
This mature beech tree has been climbed by black bear foraging for beech nuts in the fall. Although mostly a young beach stand, there are a few mature trees which will continue to attract bear. The proximity to the Hidden Gem wetland is an added benefit for many bear, deer, ruffed grouse, and many other wildlife species.

Bowman East Wetland Complex #3

The Bowman East Wetland (Wetland #3) is 18.39 acres. It is the first upstream wetland in the Moose River watershed and is approximately 1,000 feet downstream from Rollo Falls. Bowman East is south of Route 2 and is on either side of the rail trail. It is about ½ miles long and 400 to 500 feet wide. Although the Moose River leaves the wetland and crosses Route 2, the Bowman East wetland continues south of the major road before hydric soils and beaver activity ends.

In a previous study on the Israels River Watershed, the Bowman Divide Wetland was inventoried and assessed (Watershed to Wildlife, May 2012). Although in a distinct and separate watershed (at Bowman), The Bowman East and Bowman Divide wetlands are only 330 feet apart. The Israels River flows west and the Moose River flows east.

The variety of adjacent vegetation cover types (wet meadows, shrubs and trees) along with the varying hydrology (seasonally flooded to permanently flooded) provide potential foraging, resting, and reproduction sites in this wetland. Although close to Route 2 and bisected by the rail trail, vegetative cover on the southern side of this wetland allows for wildlife travel parallel to the wetland including bird, amphibian, reptile, fish, invertebrate, and mammal species. The tributaries with vegetative cover feeding this system provide cold water habitat for many fish species including eastern brook trout. During field visits,



Overview of the Bowman East Wetland showing vernal pools, scenic overlooks, NRCS soils and NWI wetland data.

The Bowman East Wetland view from the rail trail looking south. The wetland is on both sides of the rail trail with easy access and excellent viewing opportunities.

Recent and past beaver activity was evident throughout the Bowman East Wetland. This photo shows an old beaver dam with recent upgrades made by the beaver.

Based on the NRCS data there two hydric soil mapped for this wetland as shown in table #1 below.

Table 1: Bowman East Wetland, Hydric Soils

Drainage Class	Soil Description	NRCS Soil Symbol
Very poorly drained	Wonsqueak muck	995A
Poorly drained	Moosilauke loam	415A

Wonsqueak Muck is a nearly level, very poorly drained soil found in depressions and along the edges of lakes, ponds, and marshes. It has formed in greater than 16 but less than 51 inches of organic material. Poorly drained Moosilauke loam is also nearly level soil found in depressions on glacial uplands. Data from the Fish and Wildlife Service – National Wetland Inventory are listed in Table 2 below. Of special note is the modifier "b" which illustrates that the wetland has been impacted by beaver.

Table 2: NWI Wetland Classifications for Bowman East Wetland - #3

NWI wetland code	NWI wetland description
PSS1Eb	Palustrine, Scrub/shrub, Broadleaved-deciduous, Seasonally flooded/saturated Beaver Impacted.
PFO1Eb	Palustrine, Forested, Broadleaved-deciduous, Seasonally flooded/saturated Beaver impacted

Overall the Bowman East Wetland scores in the middle of all other wetlands assessed. Although this wetland is close to Rte. 2 and bisected by the rail trail, there was a diversity of wetland types observed with open water offering habitat for fish, amphibians, and shellfish. Scenic quality and educational potential had the highest scores, while wetland-based recreation had the second highest scores of all wetland ranked. These scores are higher because of easy public access and visibility from along the rail trail. The Bowman East Wetland scored the third highest for wetland-dependent wildlife habitat and fish and aquatic habitat because of a combination of open water, scrub-shrub, forested and riparian wetland habitat types. It is undoubtedly used by many wildlife species for travel, food and cover.

Along the Bowman East Wetland by the rail trail, there are several old stone culverts. Many of them are still functioning well. They add an element of historic noteworthiness to the wetland.

Wetland #4 - Moose Wetland

The Moose Wetland is located between Route 2 and the rail trail. The Moose River flows through this wetland and the beaver have impacted it throughout history. It is the second largest wetland containing 30.17 acres and is just over 700 feet upstream from Wetland #5 - directly connected by the Moose River. Several perennial tributaries flow into the Moose River Headwaters Wetland, including Randolph Springs, enlarging the main stem of the Moose River as it meanders through this wetland. It was named the Moose Wetland because many moose tracks were found throughout the alder stands and beaver-impacted areas.

Excellent vegetative buffers, wildlife habitat, and plant diversity were documented in the Moose Wetland.

Much of Wetland #4 contains dense speckled alder scrub shrub wetland. This could change in the future if the beaver become more abundant and active.

Fresh beaver sign created a small clearing among thick alder growth. The fresh alder cut by beaver is both eaten and used for dam construction (see photo below) The wetland area also serves as an excellent floodplain.

Two fresh beaver dams are started along the mainstem of the Moose River in Wetland #4.

Two NRCS soil types are mapped within the Moose Wetland: a very poorly drained Bucksport muck and a poorly drained Moosilauke loam. The Moosilauke loam is a continuation from that soil type found in Wetland #3. Bucksport muck is a nearly level, very poorly drained soil found in depressions on terraces, glacial till uplands, and along the edges of lakes, ponds, and marshes. It formed in 51 inches or more of organic material. Areas such as this unit of Bucksport muck improve and maintain water quality by acting as natural filters to remove chemicals, nutrients, and sediment. They also recharge groundwater aquifers and store runoff water which lessons flood damage downstream.

Table 3: Moose Wetland (Wetland #4), Hydric Soils

Drainage Class	Soil Description	NRCS Soil Symbol
Very poorly drained	Bucksport muck	895A
Poorly drained	Moosilauke loam	415A

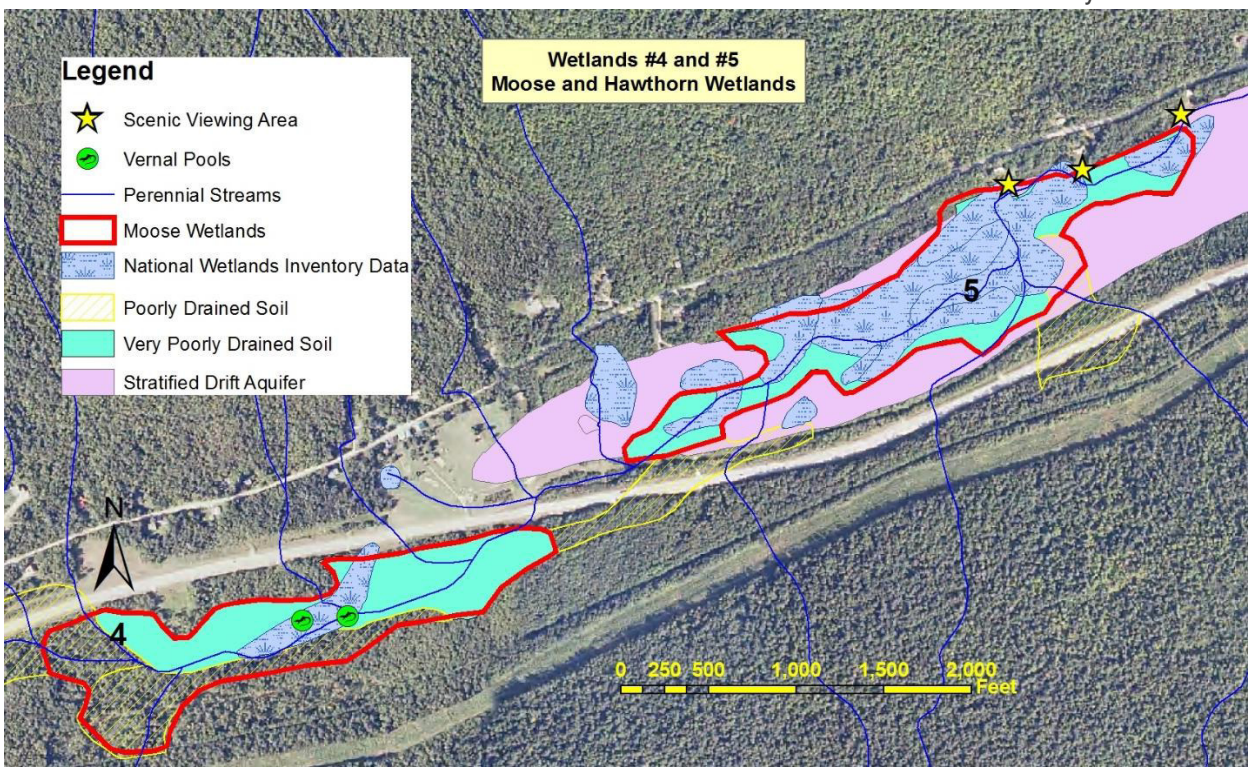
NWI indicates one wetland type Palustrine, Scrub Shrub, broad-leaved deciduous, seasonally flooded/saturated (PSS1E). Other wetland types noted during field work are Palustrine forested wetland and Riverine perennial streams.

The Moose Wetland scored highest in fish and aquatic habitat due to the Moose River being well shaded and cool. Although sandwiched between the rail trail and Route 2, there are excellent buffers all around this wetland. It had the highest score for shoreline anchoring. It also had the third highest scores for Ecological integrity and floodwater storage. The wetland had a network of channels and small pools, and there were vernal pools scattered throughout the floodplain area.

Because the Moose Wetland is on private property with no scenic overlooks and no large open bodies of water, some of the lower scores for the Moose Wetland include educational potential, scenic quality, and wetland-based recreation.

Wetland #5 - Hawthorn Wetland

The Hawthorn Wetland is the largest of the wetlands inventoried and assessed in Moose River watershed region of Randolph at 34.11 acres. It is approximately 3,700 feet long, and ranges from 150 to 800 feet across. It is located between Route 2 and Durand Road. The Moose River flows through this wetland, and several perennial streams enter the Moose – draining both the WMNF to the south and the RCF to the north. The presence of beaver and number of wetland community types have created diverse habitats within this wetland.



Overview of Moose and Hawthorn Wetlands showing NRCS soils, national wetland inventory data and aquifer data. Vernal pool and scenic overlook locations are also shown.

A dense thicket of hawthorn (*Crataegus*, spp) is adjacent to the wetland on a private property. They create a natural barrier and shore stabilizer along the wetland and are the namesake of this wetland.

The soil types mapped in the Hawthorn Wetland are the same as in the previous Moose Wetland (#4). Most of the wetland is made up of very poorly drained Bucksport Muck. There are also areas of poorly drained Moosilauke Loam. These soil types are shown on the map above and described in the Moose Wetland section previously.

This wetland contains the largest diversity of wetland habitat types in the study area including open water, emergent wetlands, scrub-shrub wetlands, forested wetlands, and perennial streams. Although more types of wetlands were recorded during field inventory, Table illustrates those documented by the National Wetlands Inventory.

Table 4: NWI Wetland Classifications Hawthorn Wetland - #5

NWI wetland code	NWI wetland description
PSS1E	Palustrine scrub-shrub, Broad-leaved deciduous, Seasonally flooded/saturated,
PSS1Eb	Palustrine scrub-shrub, Broad-leaved deciduous, Seasonally flooded/saturated Beaver impacted
PFO1E	Palustrine forested, Broad-leaved deciduous, Seasonally flooded/Saturated
PFO4	Palustrine forested, Needle-leaved evergreen
PSS1C	Palustrine scrub-shrub, Broad-leaved deciduous Seasonally flooded
PSS1	Palustrine scrub-shrub Broad-leaved deciduous

Despite being located between Route 2 and Durand Road, the Hawthorn Wetland is well vegetated and it has a feel of being remote with very little development around those areas visited. Being the largest wetland with a diversity of plant community types, the wetland scores the third highest in Ecological Integrity, Fish and Aquatic Habitat, Scenic Quality, Floodwater Storage, and Shoreline Anchoring. During field work we documented lush vegetation, including softwood stands. These are excellent travel corridors for wildlife.

The Hawthorn wetland did not score as high in Educational Potential, because it is within several parcels of private property, making access not possible without landowner permission. Although no expansive open water area was documented during field work, there were active and historic beaver signs. During the June 8, 2017 site visit, we documented a small colony of Japanese knotweed, mostly likely due to proximity to roads.

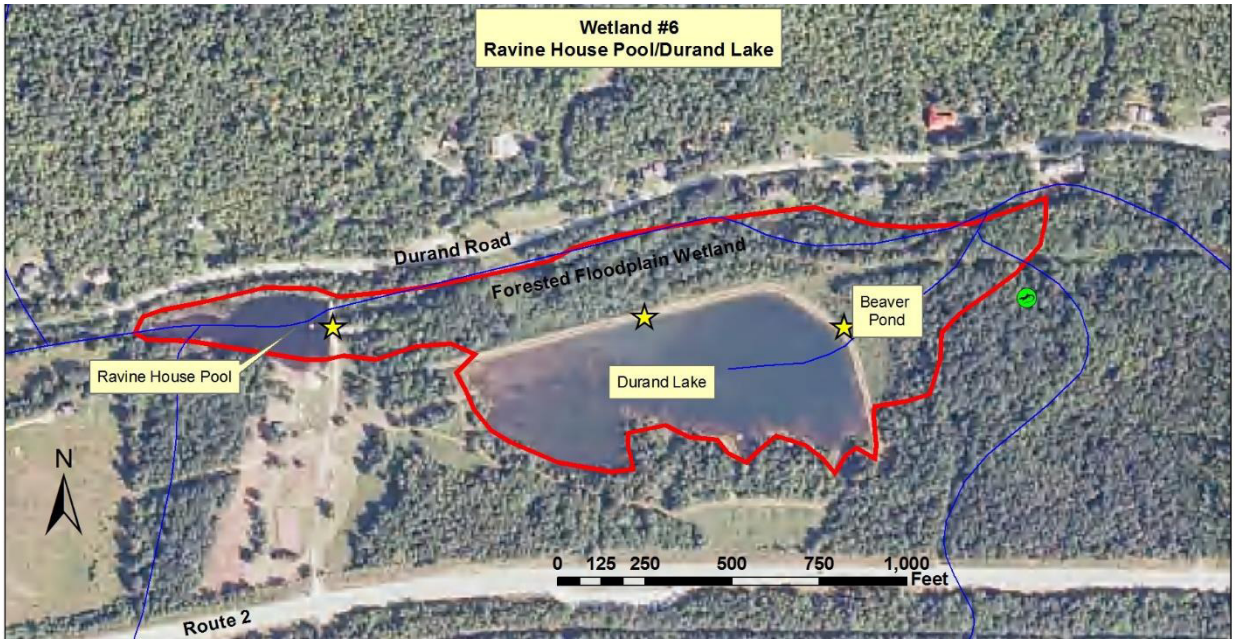
Scenic view over the Hawthorn Wetland (#5) looking towards the Presidential Range of the White Mountains. The photo shows a variety of wetland types including emergent, scrub-shrub, and forested wetlands along with deciduous and coniferous wetland types. Even with close proximity to roads, the feel of this wetland is very remote.

Fresh and old beaver sign was found in all areas of this wetland visited.

Deciduous forested wetland on the left and coniferous forested wetland on the right are part of the Hawthorn Wetland. They allow for excellent travel corridors for wildlife.

Wetland #6 - Ravine House Pool/Durand Lake Wetland

The Ravine House Pool/Durand Lake Wetland (Wetland #6) is 23.39 acres, and is well known in Randolph for the open water ponded areas. The ponds are created by two dams and used for seasonal swimming: The Ravine House Pool is just over 1 acre, and Durand Lake is 7.6 acres. The most diverse feature of this wetland, though, a 12.18-acre area to the east of the Ravine House Pool and to the north and east of Durand Lake. It contains a forested wetland floodplain, scrub shrub wetlands, and beaver-impacted open water wetlands. The main stem of the Moose River flows through this wetland.



Overview of Ravine House Pond/Durand Lake Wetland (#6)

View of active beaver pond just below Durand Lake. Meadow sweet, royal fern, cinnamon fern, speckled alder, red maple, black cherry, and grasses/sedges create excellent buffers around this beaver pond.

Floodplain forested wetland to the east of Ravine House Pool, north of Durand Lake, and adjacent to the Moose River. Black cherry, black ash, red maple, and black spruce are the dominant trees in the forested wetland. Active beaver sign found throughout this wetland.

The hydric soil type within Wetland #6 is Searsport Mucky Peat. It is just over 12 acres. It is a nearly level, very poorly drained soil which generally occurs in sandy glacial outwash deposits near lakes, streams and bogs. The nature of this soil can maintain and improve water quality by acting as a natural filter to remove harmful chemicals, nutrients, and sediments. It also recharges groundwater aquifers and stores runoff water, which will lessen flood damage. The same aquifer mentioned in previous wetlands is under Wetland #6 too, making this soil an important feature for water quality in the aquifer below.

The NWI data mapped but the US Fish and Wildlife shows four different wetland types, which are described in table 5 below.

Table 5: NWI Wetland Classifications Ravine House Pool/Durand Lake Wetland - #6

NWI wetland code	NWI wetland description
PUBFh	Palustrine unconsolidated bottom Semipermanently flooded Diked/impounded (human-made)
PUBHh	Palustrine unconsolidated bottom Permanently flooded Diked/impounded (human-made)
PSS1C	Palustrine scrub-shrub Broad-leaved deciduous Seasonally flooded
PFO1Eb	Palustrine Forested Broad-leaved deciduous Seasonally flooded/saturated Beaver impacted

The Ravine House Pool/Durand Lake Wetland had the highest scores for scenic quality and wetland based recreation. The two impounded areas and easy public access to the town-owned property allow for public enjoyment of the open water pond and ponded river. It is also excellent for educational activities, with a diversity of wetland types that can be visited along maintained trails. During site visits, we followed existing boardwalks into the forested wetland floodplain forest.

Panoramic views from Durand Lake in addition to views over active beaver ponds and forested floodplains gave Wetland #6 highest marks for scenic quality and wetland based recreation. It also scored third highest for education potential given easy public access to the site.

This exiting board walk and trail not only allow visitors access to Durand Lake, but an opportunity to see a lush and diverse forested floodplain forest.

Compared to other wetlands in the Moose River-Moose Brook study area, the Ravine House Pool and Durand Lake wetland scored relatively lower on ecological integrity, floodwater storage, sediment trapping, and shoreline anchoring since it is the most impacted by human activity.

1. It is sandwiched between Route 2 and Durand Road.
2. It has a maintained pipeline running through the middle of it.
3. There are relatively less vegetated buffers around the wetland as a whole.
4. The dam forming the Ravine House Pool acts as a barrier for fish passage when dam is intact (during the summer months).
5. Because Durand Lake is impounded and shallow, water leaving it and will be warmer as it enters the Moose River.

With that said, the wetland's overall scoring falls in the middle of the other 8 wetlands, but it is the third largest in area at 23.39 acres. Moreover, the different wetland types adjacent to the open water, the forested floodplain directly along the Moose River, and the presence of beaver make this wetland valuable. It is recommended that the Town of Randolph keep the forested floodplain undisturbed to help maintain good water quality and minimize negative impacts from flooding events.

Wetland #7 - Dolly Copp Wetland

The Dolly Copp Wetland (Wetland #7) is 15.08 acres in size. The wetland runs on both sides of Route 2 and both sides of Dolly Kopp Road. It is can be viewed from both roads, but also has the most impact from its proximity to roads. The southern end of this wetland is bordered by the transmission line ROW and an upland forested area.

The Dolly Copp Wetland. View from Dolly Copp Road facing west. This part of the wetland looked as though it has been flooded in the past.

The two soil types mapped in this wetland by the NRCS are classified as Cohas Loam and Naumburg Loam: both are poorly drained soils. Although no very poorly drained soils are mapped within this area, both Cohas and Naumburg soils have inclusions of very poorly drained soils. Cohas soils can have inclusions of very poorly drained Medomak soils in low parts of the floodplain. Naumburg soils often have inclusions of very poorly drained Searsport and Pondicherry soils also in low depressions.

In addition to soils, there three different types of wetland data mapped by NWI. They are described in table 6 below.

Table 6: NWI Wetland Classifications Dolly Copp Wetland - #7

NWI wetland code	NWI wetland description
PSS1C	Palustrine scrub shrub Broad-leaved deciduous Seasonally flooded
FO1C	Palustrine forested Broad-leaved deciduous Seasonally flooded
PSS1E	Palustrine scrub-shrub Broad-leaved deciduous Seasonally flooded/Saturated

Several moose tracks were documented in the dried ponded areas in the Dolly Copp Wetland, including a set of cow/calf tracks.

View of the Dolly Copp Wetland from Route 2 (facing North). There was fresh beaver sign on this side of the road in the Moose River during field work. Generally where there are no roads, there are excellent buffers along the Moose River.

The Dolly Copp Wetland is one of the lower ranked wetlands in this study. It is ranked lowest for ecological integrity and wetland-dependent wildlife habitat (although this would change if beaver moved into the area to create a small open water pond). Some degradation from proximity to the road also dropped the scores slightly.

View from Route 2 facing North. For the entire Moose River study area, this was the only location of water quality degradation noted during field work. Better vegetative buffer here could help filter water before entering this wetland.

On the other hand, the soil types and natural bowls throughout the wetland give it the second highest score for floodwater storage. Educational potential and scenic value area also relatively high since the presence of roads creates scenic overlooks. Although unsafe to have students visiting this wetland along Route 2, the Dolly Copp Road is quiet with pull-off areas for future site visits.

Stone culvert under the old railway bed is still in excellent condition. The railway bed is south of the Dolly Copp Wetland and also within a transmission line ROW.

Forested and scrub shrub wetland makes up the southern part of the Dolly Copp Wetland. View looking towards the intersection of Dolly Copp Road and Route 2. There is an abrupt transition from wetland to upland forest along this wetland edge.

Wetladn #8 - Old Growth Wetland

The Old Growth Wetland is 15.2 acres. It straddles the rail trail and is part of two contiguous conserved properties totaling 67.27 acres. The location of the wetland allows for easy access and viewing along the rail trail. Although not directly on the mainstem of the Moose River, a tributary enters the Moose about 600 feet downstream.

What makes this property especially noteworthy is the diversity of habitat types surrounding and supporting the wetland. Approximately 200 feet north of the wetland is a former gravel pit now containing pioneer species including white birch, lichens, mosses and a few grasses. In NH only about 6% contains early successional tree species like paper birch and aspen. Species such as ruffed grouse, woodcock, kestrels, flycatchers and New England cottontail rabbit depend on this habitat.

Former gravel pit with pioneer species. This area is just north of Wetland #8 and adds diversity to the area. Paper birch is the dominant species here.

Also adjacent to this area is a stand of old growth forest southeast of the former gravel pit and northeast of Wetland #8. The old growth stand is in a forested wetland floodplain right along the Moose River. Mature tree species include yellow birch and eastern hemlock shown in the photos below. This area is an excellent travel corridor for wildlife.

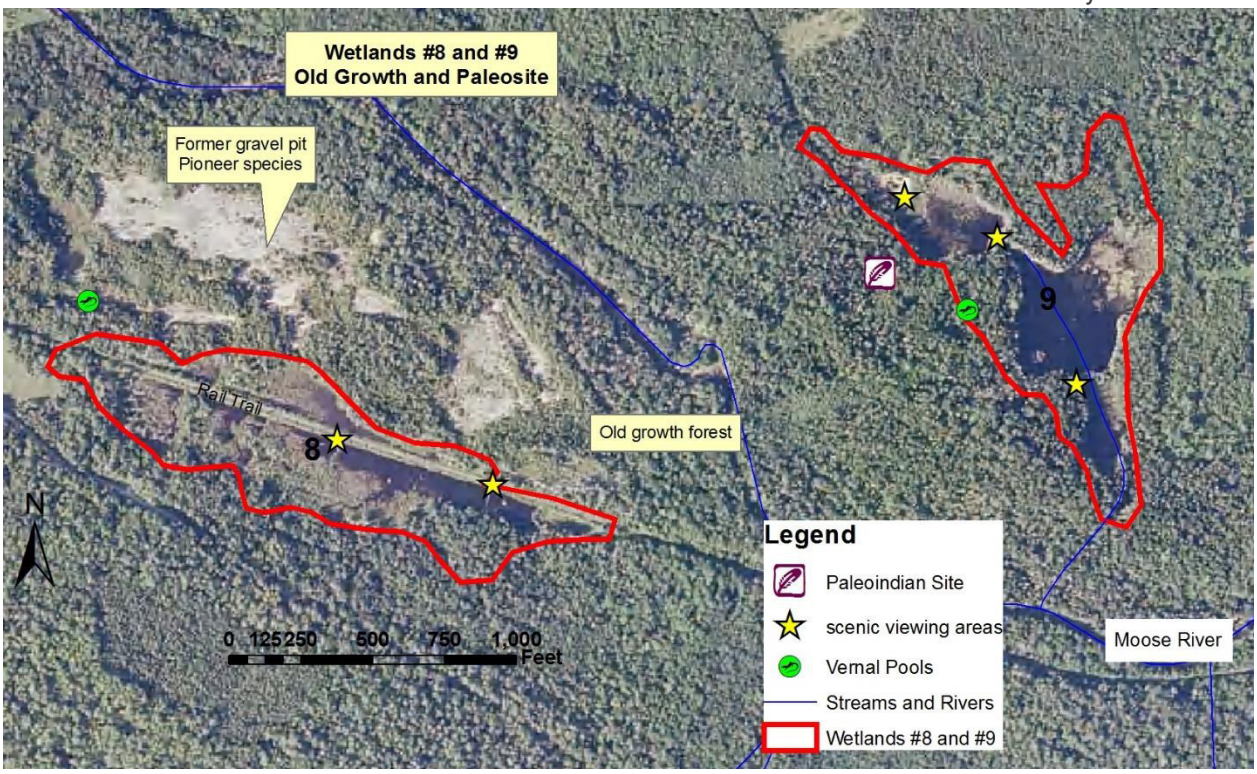

Bob Potter (left photo) stands beside a mature hemlock, and Roberta Arbree (right photo) poses by a mature yellow birch. Both trees are adjacent to the Moose River and within a forested floodplain wetland northeast of Old Growth Wetland #8.

The NRCS has one mapped hydric soil type within the Old Growth Wetland: Grange silt loam – a poorly drained soil. Grange soils are located on broad flat areas, depressions and concave areas of outwash plains. Very poorly drained Wonsqueak soils are included within this soil type.

The NWI has also mapped one unit of wetland type: PFO1/SS1Eb. This map unit is a combination of Palustrine forested and Palustrine scrub-shrub wetland types, both are broad-leaved deciduous, seasonally flooded, and beaver impacted. This was confirmed during the 9-22-16 site visit. Additionally, there are areas of balsam fir dominated forested wetlands, open water wetlands, and emergent wetlands. Although there was no active beaver sign during the time of the study, beaver have been in the area and the ponded areas have the capacity to contain much more water when the beaver return.

Evidence of past beaver activity in the Old Growth Wetland can be seen from the rail trail. There was very little fresh beaver sign at the time of the study, but they will undoubtedly be back.

The Old Growth Wetland had the highest overall score of all nine wetlands studied. It scored highest in ecological integrity, floodwater storage, groundwater, nutrient transformation and shoreline anchoring. It scored second highest in the wetland-dependent wildlife habitat, scenic quality, and educational potential. Both scenic quality and educational potential are due to easy walking access along the rail trail, as well as landowner permission to visit their property for educational purposes. The well-vegetated buffers, diverse wetland and upland plant community types will attract a wide diversity of wildlife to the area, as well as accommodate those species travelling through.



Overview of Wetlands #8 and #9. Tributaries from both wetlands enter the Moose River, which bisect them. The area as a whole is remote and under a conservation easement.

Wetland #9 - Paleosite Wetland

The Paleosite Wetland (#9) is 15.47 acres and contains a series of three beaver ponds. At the time of the study (field work 9-22-17), the beaver pond series was mostly drained with smaller pools of water. Nevertheless, this wetland contained a diversity of wetland types, vegetation and wildlife habitat. The Paleosite Wetland received the second highest overall functional score. It would be even higher if the beaver ponds had been full at the time of the study. Based on the vegetation in the drained beaver ponds, it is evident that the beaver had not been out of the area for long. Recent aerial photos show the beaver pond series full of water (see map of 2009 aerial photo above).

The wetland is named because along the western edge is one of the largest Paleoindian sites in NH. The site dates from about 12,500 to 11,000 years ago and has been studied by Dr, Richard Boisvert, New Hampshire's State Archeologist. The latest field school studies were done onsite in 2008.

(Bob and Roberta…anything you want to add here about the Paleoindian Site?)

The pink flags shown here mark the location of the archeological dig done in 2008, and the location of the Paleoindian site to the west of Wetland #9.

View of the largest and middle “beaver pond” area. It is now mostly a wet meadow with a diverse mixture of wetland grasses, sedges and rushes. Speckled alder is found along some of the edges, and the dominant tree species is balsam fir. Vernal pool species were found in the open water areas throughout the wetland.

Descriptions of both the NRCS soil maps and the NWI wetland inventory data describe an area that is used extensively by beaver. The only soil type mapped by the NRCS in the Paleosite Wetland is classified as a very poorly drained Peacham, Bucksport, and Rumney soil. This map unit (897a) consists of Peacham, Bucksport, and Rumney soils that are mapped together because they are similar in use and management, and because it is not practical to extensively explore areas of open water in the course of mapping. These nearly level soils are very poorly drained glacial till, very poorly drained organic soils, and poorly drained alluvial soils respectively. They occur in boggy areas. Often beaver dams help to create ponded conditions associated with this map unit. Most areas of this unit are covered by grasses, reeds, cattails, or open water. Some map units have all three soils others have just one or two of the three soils.

National Wetlands Inventory data has several wetland types mapped and they are described in Table 7 below.

Table 7: NWI Wetland Classifications Paleosite Wetland - #9

NWI wetland code	NWI wetland description
PEM1Eb – 3 areas in wetland	Palustrine emergent Broad-leaved deciduous Seasonally flooded/Saturated Beaver impacted
PSS1Eb	Palustrine scrub-shrub Broad-leaved deciduous Seasonally flooded/Saturated Beaver impacted
PUBHb	Palustrine unconsolidated bottom Permanently flooded Beaver impacted

The Paleosite Wetland scored highest for floodwater storage and noteworthiness. Noteworthiness score is significantly higher than the other 8 wetlands studied, due to the large Paleoindian site adjacent to the wetland. It scored second highest in ecological integrity, scenic quality, and shoreline anchoring, and third highest for groundwater recharge. The diversity of vegetation, plant community types, and wetland types, along with wide buffers of forested vegetation (wetland and upland) make this site excellent wildlife habitat. It is used by many wildlife species regularly, but also important contiguous habitat used as travel corridors.

Presently, educational potential on this site is lower due to difficult access. With improved access, this site would offer excellent educational potential for people of all ages. In addition, when the beaver ponds are full, open water in this wetland is over 6 acres. It is one of the largest open water areas in the Moose River Watershed Area, smaller only to Durand Lake (7.6 acres).

Access to the Paleosite Wetland (#9) through an old gravel pit to the north of the wetland. This gravel pit has had more time to revegetate compared to the more recent pit shown in the Old Growth Wetland (#8).

View towards the southern-most beaver pond area. The entire wetland is well buffered with vegetation in all canopy layers.

Summary of average scores for all 12 functions in Randolph, New Hampshire along the Moose River watershed

Wetland Number	Size acres	Total Score	Average Scores for Each Function											
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	6.44	62.5	9.5	5.9	5.3	5.2	4.3	3.7	2.6	2.6	7.7	7.0	8.8	0.0
2	16.92	95.7	10.0	9.0	6.6	9.2	6.2	6.9	3.3	1.6	7.0	7.1	8.8	20.0
3	18.39	88.8	6.2	7.6	6.2	9.2	8.2	7.0	3.3	4.2	5.6	5.8	5.5	20.0
4	30.17	85.7	7.5	7.3	7.1	6.0	5.0	3.4	3.7	4.2	5.7	5.9	10.0	20.0
5	34.11	85.2	7.5	7.0	6.2	7.0	5.4	4.3	3.7	5.0	4.4	6.6	8.1	20.0
6	23.39	87.9	5.8	7.2	5.3	9.2	8.0	8.6	2.6	6.0	4.3	5.6	5.3	20.0
7	15.08	77.0	5.3	5.1	4.0	6.0	5.0	4.0	5.3	4.2	4.6	6.0	7.5	20.0
8	15.20	104.9	10.0	8.5	5.7	8.5	8.1	6.2	7.0	6.2	6.9	7.8	10.0	20.0
9	15.47	101.3	9.5	6.9	4.8	8.5	7.2	5.2	7.0	5.2	4.0	4.2	8.8	30.0

ROSE	Highest values among all assessed wetlands
GREEN	Second highest value among all assessed wetlands
BLUE	Third highest value among all assessed wetlands

1 = Ecological Integrity	**7 = Floodwater Storage**
2 = Wetland-Dependent Wildlife Habitat	**8 = Groundwater**
3 = Fish and Aquatic Habitat	**9 = Sediment Trapping**
4 = Scenic Quality	**10 = Nutrient Transformation**
5 = Educational Potential	**11 = Shoreline anchoring**
6 = Wetland-based Recreation	**12 = Noteworthiness**

Wetland #8 (Old Growth), Wetland #9 (Paleosite), and Wetland #2 (Hidden Gem) received the highest scores during field assessment. The results are based on examining these wetlands individually. These top three ranked wetlands contained the highest diversity of plant community types, wetland types, diversity of wildlife habitat, wide buffers, potential for exemplary species, as well as capability of maintaining high water quality. On the other hand Wetlands #4 (Moose), #5 (Hawthorn), and #6 (Recreations Pond/Durand) were the largest wetlands and directly connected by the mainstem of the Moose River. They also received high assessment scores and due to their size and connectivity to each other. Had these three wetlands been assessed as a single area, their scores would have been even higher.

Discussion and Future Applications

This project provides the Town of Randolph with the ability to work towards protecting or conserving several diverse and critical wetland along the Moose River portion of Town. Moreover, this study is a step towards implementing Prime Wetland Designation if Randolph residents choose to do so. Based on field work results and GIS analyses, below are some of the options to help conserve this area.

Option #1

It is recommended that Randolph residents consider working with willing landowners to protect some of the wetlands on their property in the Moose River-Moose Brook Watershed area. Protecting these wetlands will help maintain connectivity and travel corridors between the Randolph Community Forest to the north and the White Mountain National Forest to the south, as well as the east/west movement of wildlife along the Moose River Corridor. A combination of public meetings and public outreach can achieve these goals. There are two possibilities in this case:

1. Willing landowners can place their land (or a portion of their land) in a conservation easement, where they continue to own the land. The terms of the conservation easement are transferred to new owners in this situation. Organizations such as land trusts generally hold and enforce conservation easements.
2. Willing landowners can sell their property or portions of it to interested parties including
    a. The Town of Randolph
    b. The White Mountain National Forest
    c. A state agency such as NH Fish and Game Department
    d. A land trust or similar organization which will conserve the area.

Conservation easements create a legally enforceable land preservation agreement between a landowner and a government agency (municipality, county, state, federal) or a qualified land protection organization (often called a "land trust") for the purposes of conservation. They restrict real estate development, commercial and industrial uses, and certain other activities on a property to a mutually agreed-upon level. The property remains the private property of the landowner. The decision to place a conservation easement on a property is strictly a voluntary one where the easement is sold or donated. The restrictions of the easement, once set in place are binding on all future owners of the property. The restrictions are spelled out in a legal document that is recorded in the local land records, and the easement becomes a part of the title and deed for the property.

Option #2

The Town of Randolph could write and adopt town-wide ordinances to offer protection of all or specific wetlands throughout the town. The purpose of the ordinances could be: to

protect water quality and wildlife habitat, to control placement of structures and associated impervious surfaces, and/or to maintain the natural beauty and scenic views of wetland complexes. There are several sample wetland ordinances available which Randolph could use as a template. Many of these can be found online or at regional planning commissions (North Country Council in Randolph's case). Wetland ordinances have been used by several municipalities in New Hampshire.

Option #3

Another option is to establish Prime Wetlands as a means to help protect some or all of these wetlands from developmental pressures. This requires approval by willing landowners, followed by a town vote in favor of this special designation of wetlands. If the Town of Randolph decides to proceed with designating Prime Wetlands it must submit a report with appropriate maps to the State of New Hampshire, Department of Environmental Services - Wetlands Bureau. The Wetlands Bureau will review the submission, and grant the designation if the submission is complete. At the time of this report 33[4] towns in NH have designated prime wetlands: Andover, Atkinson, Barrington, Bow, Brentwood, Brookline, Center Harbor, Derry, Enfield, Exeter, Fremont, Gilford, Goffstown, Hampton, Hampton Falls, Hillsborough, Holderness, Hooksett, Meredith, Nashua, New Ipswich, New London, Newington, Newmarket, Northwood, Pelham, Portsmouth, Salem, Sanbornton, Sandwich, Tamworth, Weare, and Wolfeboro.

Randolph officials and residents should evaluate the functions and values of the identified wetlands. If Randolph decides to select one or more wetlands to designate as prime, a public hearing must be held before the residents of the community vote on the designation. If the town approves the wetlands for designation as prime, the town provides to the DES Wetlands Program a copy of the study and tax maps with the designated prime wetlands identified. DES will review the submission from the municipality to ensure that it is complete and in accordance with Env-Wt 702.03.

Once the submission is considered complete, the rules and laws that are applicable will apply to any future projects that are in or within 100 feet of a prime wetland. All projects that are in or within 100 feet of a prime wetland are classified as major projects. All major projects require a field inspection by DES and all prime wetland projects require a public hearing to be conducted by DES.

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[4] Interesting to note that when the report for the Israels River Wetland Study was written (2011), There were 31 towns in NH with Prime Wetland Designation. Only 2 additional towns have done this in the last 6 years. I am not sure if we want to say this, but it is interesting for you to know as a Commission. Maybe many towns are not finding it worth the trouble??

Conclusion

Although nine wetland areas were separated and compared relatively with each other, seven of the nine wetlands are directly connected by the Moose River, its tributaries, hydric soils, and a stratified drift aquifer (Wetland Numbers 3 through 9). In fact, if this study had been done at a larger scale (e.g., town-wide or region-wide), many of the Moose River wetlands would have been assessed as one contiguous area. The size of the combined wetland would not only increase the acreage of the area, but also the functional score, determined during field work.

These wetlands are not isolated from each other, but connected. Impact to any one of the wetlands, will impact the others. Furthermore, detrimental impact to these wetlands will affect wetlands and groundwater downstream. Given that these wetlands are in the headwaters region, the downstream area expands into larger watershed areas. The Moose River-Moose Brook Watershed is a total of 14,095.85 acres. It is part of a much larger watershed called the Androscoggin River Watershed, which is 645,815 acres. Degradation of water quality in these headwater regions will not only affect water quality and wetland function immediately downstream, but could potentially affect a much larger area. Currently, these wetlands are in good shape. The ecological diversity is high, and water quality is good, and there is relatively little impact from development. Now is the time to work towards ensuring these wetlands continue to function at a high quality.

Fortunately, protecting wetlands in this study area is doable and moving forward at the time of this study. The wetlands in this study area range from nearly 6.4 acres to 34.11 acres. The entire study area is over 3962 acres. Three of these wetlands are already protected: Ravine House Pool/Durand Lake, Old Growth, and Paleosite Wetlands. This is an exciting start, and could be expanded, with willing landowners and potential funding.

The nine wetlands inventoried are all valuable to the Town of Randolph. Randolph has a rare opportunity compared to many towns in other parts of the state – an ability to proactively protect wetland areas and diverse natural resources before development, fragmentation, and degradation occurs.

Maps

List of Maps:

1. Wetlands and Water Resources in the Moose River/Moose Brook Watershed Area
2. Wetlands with USGS Topographic Map
3. Wetlands and parcels with 2009 Aerial Photograph.

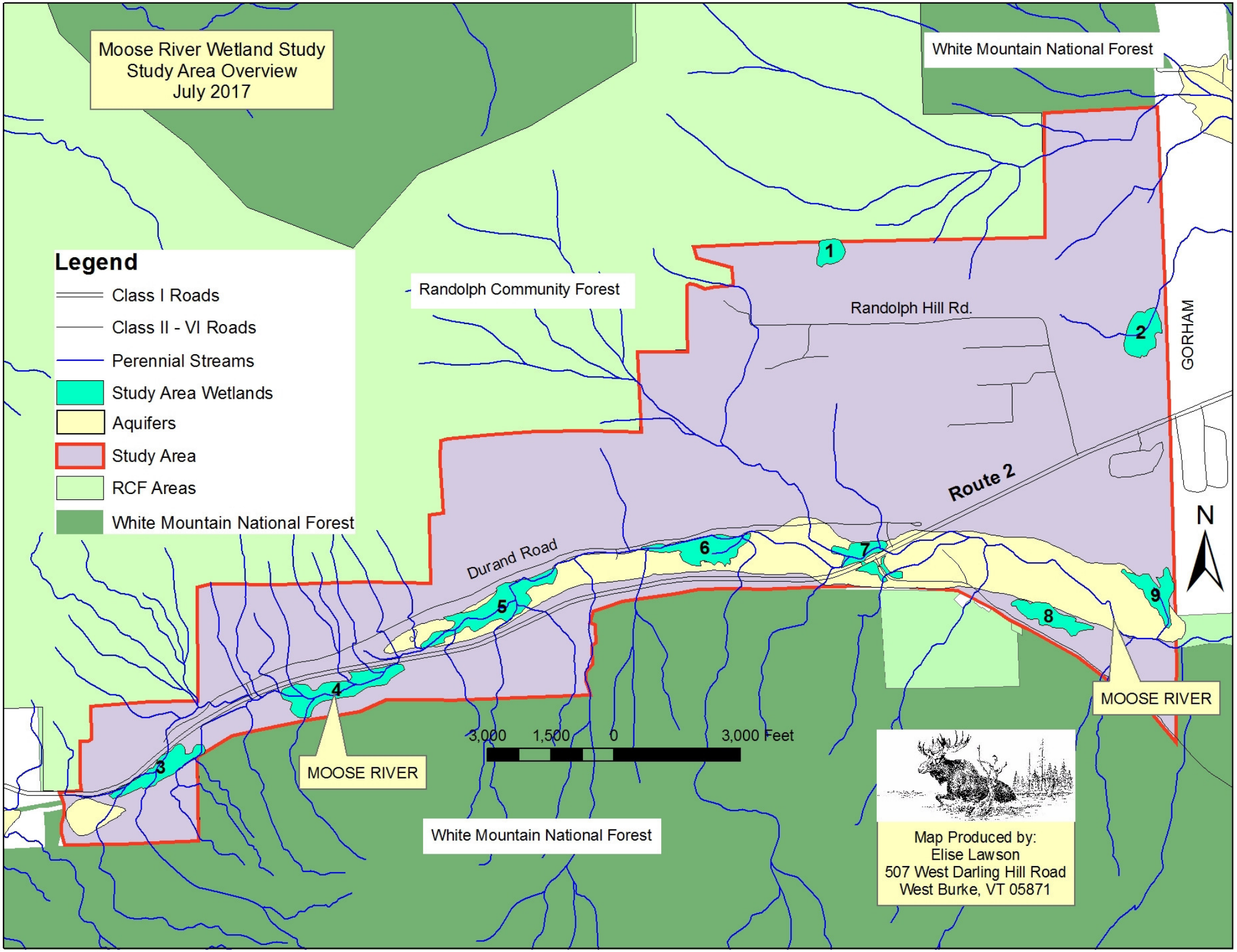
References

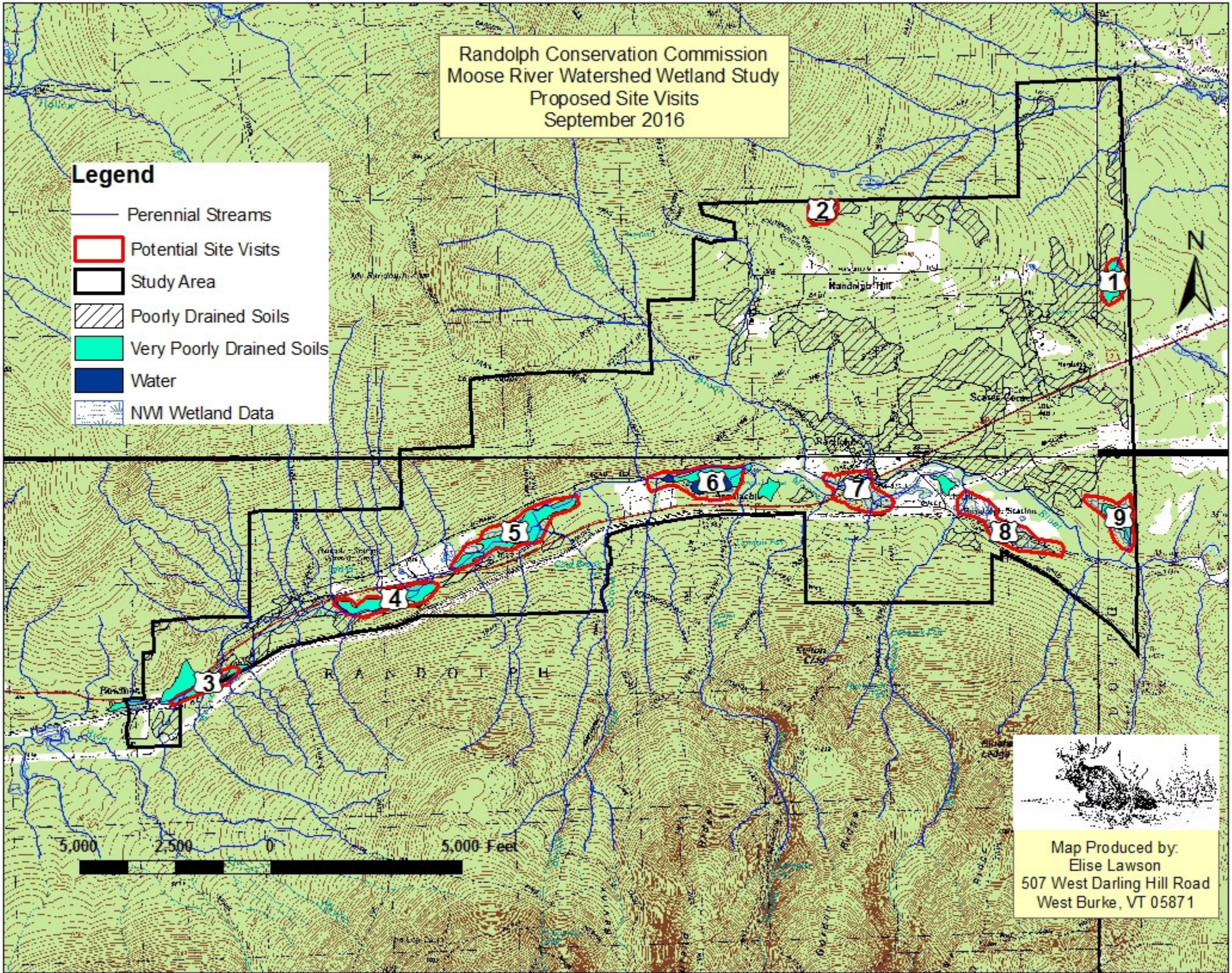
Stone, AL, F. Mitchell, R. Van de Poll, N. Rendall. 2013. *Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire (NH Method).* University of New Hampshire Cooperative Extension. Found on website: https://nhmethod.org.

Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington, D.C. . Publication Number FWS/OBS-79/31.

State of New Hampshire. 2004. *New Hampshire Code of Administrative Rules: Wt 100-800*. Department of Environmental Services, Public Information and Permitting Office.

US Geological Society. 1997. *Wetland Functions, Values, and Assessment*. https://water.usgs.gov/nwsum/WSP2425/functions.html. Retrieved from the worldwide web on July 20, 2017.


Moose River Wetland Study
Study Area Overview
July 2017
White Mountain National Forest
Randolph Community Forest
Randolph Hill Rd.
GORHAM
Route 2
Durand Road
Legend
Class I Roads
Class II - VI Roads
Perennial Streams
Study Area Wetlands
Aquifers
Study Area
RCF Areas
White Mountain National Forest
1
2
3
4
5
6
7
8
9
N
MOOSE RIVER
MOOSE RIVER
3,000 1,500 0 3,000 Feet
White Mountain National Forest
Map Produced by:
Elise Lawson
507 West Darling Hill Road
West Burke, VT 05871


Randolph Conservation Commission
Moose River Watershed Wetland Study
Proposed Site Visits
September 2016
Legend
Perennial Streams
Potential Site Visits
Study Area
Poorly Drained Soils
Very Poorly Drained Soils
Water
NWI Wetland Data
1
2
3
4
5
6
7
8
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R A N D O L P H
5,000 2,500 0 5,000 Feet
Map Produced by:
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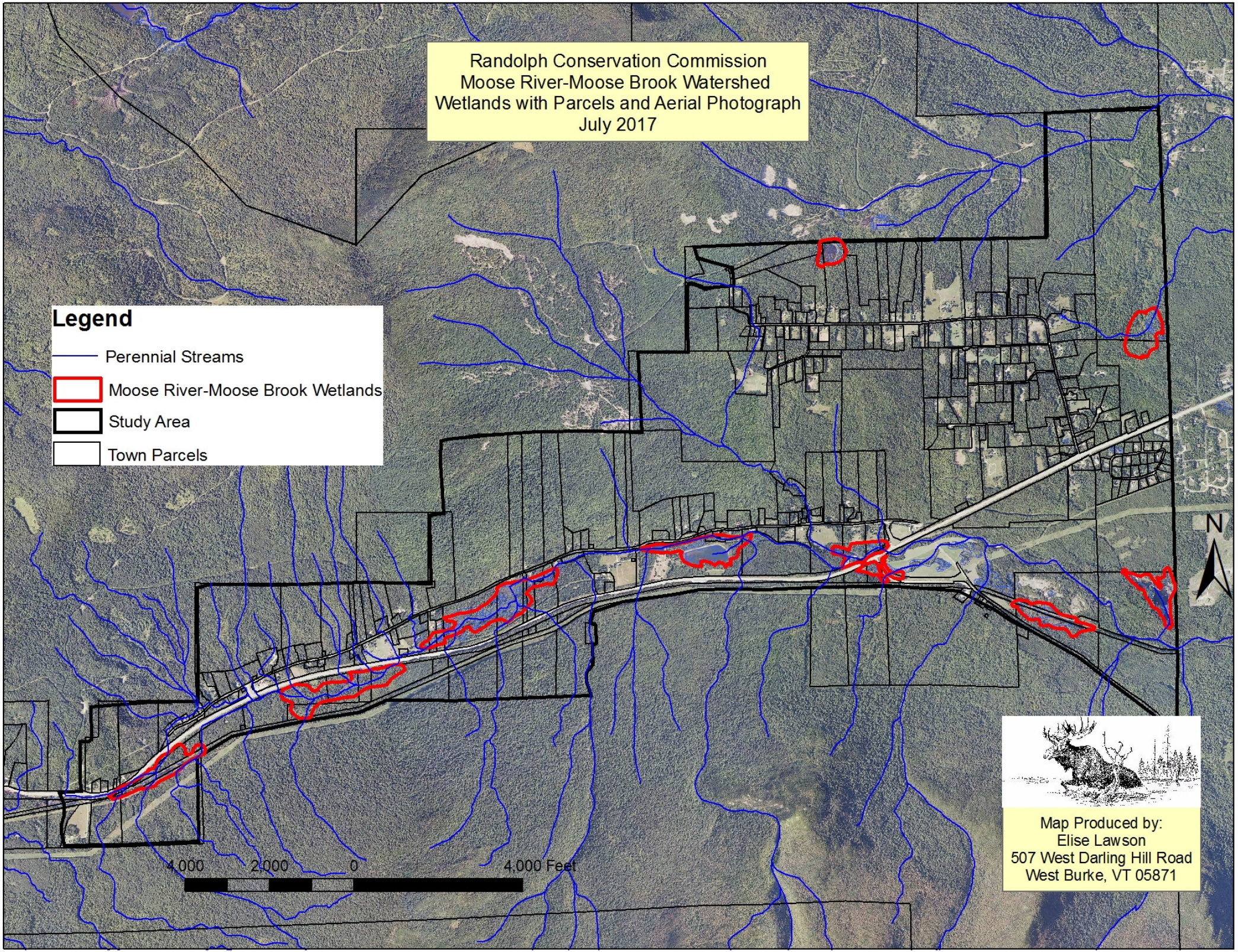
Randolph Conservation Commission
Moose River-Moose Brook Watershed
Wetlands with Parcels and Aerial Photograph
July 2017
Legend
Perennial Streams
Moose River-Moose Brook Wetlands
Study Area
Town Parcels
N
4,000
2,000
0
4,000 Feet
Map Produced by:
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West Burke, VT 05871