

**TOWN OF MEREDITH, NEW HAMPSHIRE**  
**Page Pond and Forest- Town Forest**  
**Sherman Conservation Easement**

**ECOLOGICAL ASSESSMENT AND RECOMMENDATIONS**  
**FOR PROPERTY MANAGEMENT**

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## INTRODUCTION AND OBJECTIVES

The Page Pond Forest and Sherman Easement properties (called *Conservation Forest* when used together) are located in Meredith, New Hampshire and are adjacent to each other with the Sherman Easement to the southwest. Access to the properties is via Quarry and Blueberry Hill Roads in Meredith. Drainage from the properties flows into Fish Cove of Lake Winnepesaukee via Page Brook. Page Brook originates at the outlet of Little Pond, part of a conserved property owned by New Hampshire Fish and Game Department.

The Conservation Forest is a mixture of forested land and open wetlands, and contains a large diversity of habitat types. They include: open water, emergent, scrub-shrub, and forested wetland complexes, vernal pools, dense softwood stands, mature hardwood stands, and perennial streams, including Page Brook. Many wildlife species use these properties, some of which travel beyond the boundaries of the properties to adjacent undeveloped lands.

The Trust for Public Land (TPL) acquired and transferred the land to the town in January 2009 and the Meredith Conservation Commission has opened the property for year-round low-impact recreation, including hiking, cross-country skiing, hunting, fishing, canoeing, bird watching, and nature appreciation. In July 2008, Kate Wanner of TPL wrote *Stewardship Plan for the Page Pond & Forest Propert*. In May 2009 New England Forestry Consultants, Inc. completed a *Forest Management Plan for the Page Pond Conservation Forest*. Since then, John and Nancy Sherman put part of their abutting property to the west of Page Pond Forest into a conservation easement. In February 2012 Watershed to Wildlife, Inc. (WTW) was hired to assess the properties for wildlife habitat diversity and natural, cultural and scenic resources. Based on this assessment, recommendations are given to manage the Conservation Forest for wildlife habitat, recreation, scenic views and cultural resources.

The goal of this project is to inventory natural resource features throughout the properties, and to provide management recommendations on the property. This project can be used as a tool towards future management and conservation planning.

### ***Measurable objectives of this project include the following:***

1. Provide the Meredith Conservation Commission with biological data to help Commission members manage the forest for ecological health and diversity
2. Recommend additional recreational opportunities
3. Recommend strategies to enhance enjoyment of scenic views
4. Recommend strategies to project cultural resources found throughout the properties
5. Provide the Town of Meredith with the ability to integrate data generated from this project into existing GIS coverages, particularly related to natural resource inventories.
6. Provide the ability of the municipalities to continue to build upon and update the digital database for these properties.
7. Incorporate data generated from this study with other complementary studies including forest management plans, natural resource inventories, master plan updates, and watershed-wide planning.

## METHODOLOGY

### ***Compile Existing Data into ArcView***

Digital data was gathered from GRANIT, Natural Resource Conservation Service (NRCS), and the Town of Meredith, NH. GRANIT data includes the following:

1. Aerial photography
2. Topographic map
3. Conservation Lands
4. Hydrology (rivers, streams, lakes and ponds)
5. National Wetlands Inventory wetlands

Existing available maps were then integrated using ArcMap-ArcView software. Using the 2009 and 1998 aerial photos (DOQs), topographic maps, and soils maps, features were digitized and overlaid onto a base map. These include:

1. Dense softwood stands
2. Wetlands and perennial streams
3. Steep slopes
4. Unique or noteworthy community types including potentially significant wildlife habitat
5. Vernal pools
6. Wildlife sign

Steep slopes were determined using the NRCS soils maps. Data was displayed in ArcMAP and queried so only those soil map units with 15% slope and greater were displayed. Soils classified as poorly drained and very poorly drained were determined using NRCS soils maps. Data was queried in ArcMAP so only those soil map units with poorly or very poorly drained soils were displayed. Habitat types were digitized by WTW using a combination of aerial photographs, topographic maps, GPS points, and field observations with associated photographs and notes. They were displayed as polygons. Wetlands were mapped using data from previous work, aerial photographs, and field information generated from this project. GPS points were taken at all documented vernal pools and brought into the mapping.

All maps are displayed at the end of this report with the features described above. All information gathered, compiled, and mapped for this report is in digital format and owned by the Town of Meredith, New Hampshire.

### ***Field Work***

Fieldwork was conducted throughout the properties in Meredith in the winter, spring and summer 2012. This work included inventories and assessments of several different habitat types, wildlife sign (direct or indirect observations), cultural and scenic resources, and sensitive areas. GPS data was collected at points of interest including wildlife sign (tracks, scat, feeding or bedding sites, or direct visual or audio observations), habitat types, vernal pool locations, and rock outcrops. In addition, photographs were taken with a digital camera at points of interest throughout the properties. During fieldwork sessions rare, endangered, or species of concern and natural communities of New Hampshire (as described by the NH Natural Heritage Bureau and Nature Conservancy) were documented and placed on a map if observed. Likewise, non-native invasive species were also documented and referenced in the GIS if observed.

We appreciated the help of members from the Meredith Conservation Commission who joined us during our site visits. John Sherman, Ralph Pisapia, and Mark Billings assistance was very valuable to the project.

## RESULTS

### ***Wetlands***

Wetlands are an essential habitat type for the majority of plant and animal species in New Hampshire. As a whole, wetlands are extremely diverse depending on the hydrology, soils, topography, and climate of an area. In addition to the rivers, lakes, and ponds, there are four general types of Palustrine<sup>1</sup> wetlands: marsh, swamp, bog, and fen, with additional sub-types within each of these categories. This diversity extends into each individual wetland where diverse plant and wildlife species and water regimes co-exist. This creates edge habitats within and around wetlands which are frequently used by a great deal of wildlife species. It is estimated that riparian areas and wetlands are used by over 90% of the region's wildlife species and provide preferred habitat for over 40% of local species.

Page Pond and Sherman Easement forests contain rich, diverse and productive wetlands. The wetland complexes are extremely high value and should continue to be cherished. Over 25% of the Conservation Forest contains wetlands of all types. They are described below.

### **Page Pond**

Page Pond (formerly called Little Pond) is owned and protected by the State of New Hampshire. Although not part of the Conservation Forest, it is directly connected to it. It contains approximately 20 acres of open water habitat as well as emergent wetland with very high wildlife density. To the north of Page Pond is a large, highly productive wetland with dead standing trees used by osprey and diverse emergent vegetation.



Photo 1 – March 7, 2012 - Page Pond looking north towards emergent, scrub shrub and forested wetlands. An osprey nest can be seen in the center of the photograph.

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<sup>1</sup> Palustrine wetlands are a group of vegetated wetlands traditionally called marshes, swamps, bogs, fens. They also include the small, shallow, permanent or intermittent water bodies often called ponds.

The eastern shore of Page Pond is part of the Page Pond Forest conservation land. It is well buffered by eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and red oak (*Quercus rubra*).



Photo 2 – March 7, 2012 - Page Pond facing south. Coyote, deer, fox, red and grey squirrel, and ruffed grouse tracks were documented in this area during winter field work.



Photo 3 – April 30, 2012 - The southern part of Page Pond contains a matrix of open water, emergent and scrub-shrub wetland habitat. Here the dominant shrub species is high bush blueberry.

**Sherman Wetland Complex**

The Sherman Easement parcel contains 53 acres with over 26 acres of wetlands, which make up approximately 49% of the property. They are a combination of forested, scrub-shrub, emergent and open water wetlands, with the largest and most diverse section being in the northern portion of the property. This area contains a matrix of shallow open water, perennial stream, emergent wetland, scrub-shrub wetland, forested wetland and associated upland buffers.



Photo 4 – July 9, 2012 - Pond and wetland in the northern part of the Sherman Easement. The *Nymphaea odorata* (fragrant water lily) is eaten by beaver, moose, muskrat, porcupine, and deer. Waterfowl eat the seeds.



Photo 5 – July 9, 2012  
Emergent wetland to the north of the pond on John and Nancy Sherman's property.

The land adjacent to the wetland is well forested with an excellent buffer nearly all the way around the pond, emergent and scrub-shrub wetland. There is one separate, privately-owned parcel on the west side of this wetland, with a small building near the edge of the pond.



Photo 6 – July 9, 2012

Scrub shrub and then forested (larch swamp and fen) wetland in the far northern part of the Sherman Easement. It is connected to the emergent wetland and pond shown in the previous two photos.

Fresh beaver sign was observed, and five dams were found along the outlet of the Sherman wetland complex. Several species of wildlife were documented, including white-tailed deer, moose, bear, wild turkey, pileated woodpecker, oven bird, mink and raccoon.

Wetlands on the Sherman easement are connected to the Page Pond and Forest via hydric soils and a perennial stream. These waters eventually flow into Lake Winnepesaukee.

### **Page Wetland Complex**

In the southern part of the Page Pond and Forest parcel is the largest wetland complex on the two properties. The wetland is fed primarily from Page Brook, tributaries to Page Brook and other unnamed perennial stream inlets. It is over 120 acres<sup>2</sup> within the Page Pond and Forest property, and contains an incredible diversity of wetland and plant community types. With this diversity of wetland and habitat types, there is a high diversity of wildlife species that use this wetland.

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<sup>2</sup> The Page Wetland extends beyond Page Pond and Forest property boundary (to the south). In total it is over 281 acres.



Photo 7



Photo 8

These three photos were taken on the same pond throughout the season-2012.

- March, 7<sup>th</sup>
- April 30<sup>th</sup>
- July 9<sup>th</sup>

This pond is the northern-most open water and emergent wetland in the Page Wetland Complex. The photos were taken while standing on a beaver dam.



Photo 9

The Page Wetland Complex is well buffered with vegetation all around it. There are networks of trails used by people and wildlife.



Photo 10 – March 7, 2012 - These great blue heron nests have been used for years in the Page Wetland Complex. This photo was taken in March 2012 while on snow shoes. During field work in July and September, several great blue herons were seen flying in and out of this rookery.



Photo 11 – July 9, 2012 - View of the Page Wetland Complex near the southern boundary of Page Pond Forest. There is a large diversity of emergent wetland vegetation. The photo is facing towards the great blue heron rookery to the north. The wetland continues to the south well beyond the Conservation Forest boundary.

**Northern hardwood - black ash conifer swamp** - These wetlands are predominately hardwood forested wetlands, with some shrub dominated sections, and several small areas of open water. Dominant tree species include black ash (*Fraxinus nigra*), yellow birch (*Betula alleghaniensis*), and red maple (*Acer rubrum*). The wetland complex is located in the northern parts of the Page Wetland Complex, in the northeastern part of the Page Forest Property. Some of the open water sections throughout this wetlands contained vernal pool species (described below in the vernal pool section).



Photo 12 – September 21, 2012 - Black ash and red maple dominated forested wetland. The understory contains sedges, ferns and wetland grasses.



Photo 13 – March 7, 2012 - Black ash and northern hardwood forested wetland also contains witch hazel, high bush blueberry (here shown with a parasite called witches broom), and cinnamon fern.

**Seasonally flooded red maple swamp** - This forested wetland is located on the eastern part of Page Forest and is part of the Page Wetland Complex. It is dominated by Red Maple (*Acer Rubrum*). This type of wetland is associated with stream drainages that are seasonally flooded. It is commonly successional from wet meadows or shallow emergent marshes. Red maple is the primary tree species, high bush blueberry (*Vaccinium corymbosum*) is scattered in the shrub layer, and tussock sedge (*Carex stricta*) and cinnamon fern (*Osmunda cinnamomea*) are the dominant herbaceous species.



Photo 14 – March 7, 2012

Red Maple forested wetland is part of the Page Wetland Complex towards the eastern property line.

**Hemlock – cinnamon fern forest** - This forested wetland is located in the central portion of the Page Pond Forest Property along the eastern border. It contains mostly eastern hemlock (*Tsuga canadensis*) tree species with a few scattered white pine (*Pinus strobus*), balsam fir (*Abies balsamea*), and red spruce (*Picea rubens*). Drainage from this wetland complex flows west and south, eventually into Page Brook. It is connected to the Page Wetland Complex. This wetland complex is part of a larger dense softwood stand, with upland soils found on the knolls and hummocky wetlands in depressions between the knolls. This wetland complex offers excellent dense softwood habitat with a thick canopy and very little undergrowth. During field work, abundant deer sign (tracks, scat, trails, and bedding sites) were documented; particularly during March 7<sup>th</sup> field work. This indicates that the area is a deer wintering area.



Photo 15 – September 21, 2012 - Hemlock – Cinnamon Fern Forest in the central eastern part of Page Pond Forest property. The edge of this wetland was well used by deer.



Photo 16 – September 21, 2012 - This hemlock forested wetland contains several isolated vernal pools and is used extensively by white tailed deer.

### ***Recommendations for Wetland Complexes***

1. Maintain buffers around all wetlands. Ideally buffers should be over 100 feet or more, particularly around wetland containing open water and emergent vegetation. For some wetlands (forested, scrub-shrub) a 50-foot buffer should be adequate, especially since the area will not be developed and only temporarily affected by timber harvest. This recommendation applies particularly to timber harvest activities, and does not apply to trail development for the purpose of non-motorized use.
2. Protect the great blue heron rookery located in the southeastern portion of Page Pond Forest by limiting access during the breeding season, until the young have fledged.
3. Use some of these wetlands for education, especially where access is relatively easy. The Page Wetland Complex has easy trail access to some of the beaver ponds, and would make an excellent outdoor classroom.
4. There are a few areas that offer excellent scenery and wildlife/wetland viewing. Benches in key areas would enhance viewing and enjoyment of these wetlands. See following section for details on enhancing scenic viewing.

### **Perennial Streams**

A perennial stream is a stream or river (channel) that has continuous flow in parts of its stream bed all year during years of normal rainfall. "Perennial" streams are contrasted with "intermittent" streams which normally cease flowing for weeks or months each year. During unusually dry years, a normally perennial stream may cease flowing, becoming intermittent for days, weeks, or months depending on severity of the drought. Several perennial streams were documented throughout Conservation Forest. All drain into the main perennial stream, Page Brook.



Photo 17 – July 9, 2012 - View towards the main outlet of the Sherman Wetland Complex. The outlet has been actively dammed by beaver, and from where this photo was taken, 5 beaver dams could be seen! This perennial stream eventually flows into Page Brook.



Photo 18 – July 9, 2012 - Perennial stream outlet from the Sherman Wetland Complex. This photo is a view looking downstream compared to Photo 17.

Page Brook is the main perennial stream on the Conservation Forest. The type of channel, stream velocity, and stream sinuosity vary greatly as it flows south, and eventually enters Lake Winnepesaukee. Page Brook begins at the outlet of Page Pond. Its flow and size increases as it is fed by other tributaries. It runs for approximately 13,500 feet before entering Fish Cove in Lake Winnepesaukee.

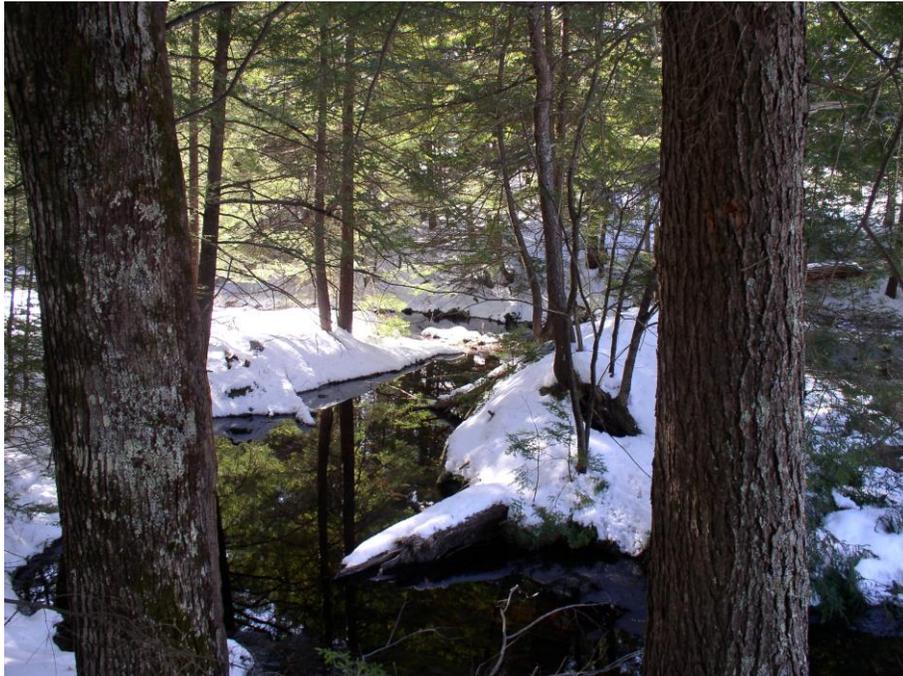


Photo 19 – March 7, 2012 - Page Brook as it leave Page Pond (also called Little Pond). This photo is taken just upstream from the old Mill Site.

Page Brook is rocky and cobbly when it leaves Page Pond and the Mill Site. When it enters the Page Wetland Complex on the Page Pond Forest, it flows slower, has more sinuosity and is impacted again by beaver activities. There are several beaver dams throughout this section of Page Brook – all at varying degrees of use and disrepair. In this section, the bottom is mucky with sedimentation accumulation.



Photo 20 – April 30, 2012 - Page Brook at an outlet of a large beaver pond in the Page Wetland Complex. The river is flatter, slower moving, impacted by beaver, and has a muddy bottom.

### ***Recommendations for Perennial Streams***

1. Protect all perennial streams by maintaining an adequate buffer around them. We recommend 100 feet around Page Brook with 100 feet around the smaller tributaries to Page. This recommendation applies particularly to forestry practices and does not include trail development for non-motorized use.
2. Removal of any temporary crossings used for logging purposes. Examples include, temporary bridges and pole fjord crossings
3. If any type of crossing is planned for perennial streams, a bridge that runs “top of bank” to “top of bank” is recommended to maintain natural stream flow, fish passage, and aquatic insect travel.

### **Vernal Pools**

Unique, sometimes isolated and important wetland types are vernal pools. Vernal pools provide essential breeding habitat for certain amphibians and invertebrates such as wood frogs (*Rana sylvatica*), yellow spotted salamanders (*Ambystoma maculatum*), jefferson/blue spotted salamanders (*Ambystoma jeffersonianum/laterale*), and fairy shrimp (*Branchinecta lynchi*). These creatures depend on vernal pools as breeding sites, because they are mostly temporary water bodies preventing fish and other aquatic predators from taking up residency. Reptiles such as Blanding’s turtles (*Emydoidea blandingi*) and spotted turtles (*Clemmys guttata*) also

rely on vernal pools as important feeding areas 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 often dry, making them a dynamic system habitable to specifically adapted plant and wildlife species.

Twenty-seven (27) vernal pools were documented throughout the Conservation Forest properties and further studies in the spring (May to early June) may find others. Although most were isolated pools, some were associated with large wetland complexes found throughout the properties. Wood frog tadpoles and egg masses, yellow spotted salamander egg masses and Jefferson/blue spotted salamander egg masses were found in all vernal pools documented during the site visit on April 30, 2012.



Photo 21 – April 30, 2012 - One of the many isolated vernal pools found within the Conservation Forest. The small photo is of spotted salamander eggs. These and wood frog tadpoles were very commonly found in vernal pools documented on April 30, 2012.

The vernal pools documented throughout the Conservation Forest were scattered throughout and were usually found in natural depressions, often between two knolls or ridges. All vernal pools documented had good to excellent buffers.

### **Vernal Pool Recommendations**

1. Maintain buffers around vernal pools. Ideally buffers should be over 100 feet or more. However, given the number of vernal pools, this could be impractical, and in some cases a 50 foot buffer may be sufficient, especially since the area will not be developed and only affected by timber harvest. The US Environmental Protection Agency and NH Department of Environmental Services recommend at least a 50-foot buffer around vernal pools and each situation should be reviewed to determine adequate buffer. This

recommendation applies to forestry practices and not to the development of hiking, skiing, and snow shoe trails.

2. Education – bring schools in to document some of these pools, particularly those that are easily accessible for groups.
3. Continue to monitor some or all vernal pools, especially if there is a change in use of the forest (e.g., timber harvest, new trails, etc.).

## **Forest Stands**

Refer to the *Forest Management Plan – Page Pond Conservation Forest* for details on forest types in the Page Pond Forest. This document gives details on forest types throughout with recommendations for management of timber stands. A few forest communities stood out from a natural resource and wildlife perspective.

### **Dense Softwood Stands**

Dense softwood stands are important deer wintering areas, which cover only about 3% of land base in New Hampshire. For an area to be considered a deer yard two basic elements must be met:

1. Core area identified by concentrations of dense softwoods (hemlock, balsam fir, spruce)
2. Mixed hardwood and softwoods adjacent to, or within the core area will provide accessible forage.

Just over 71.5 acres or 11.5% of the Conservation Forest contains dense softwood. Dense softwood on these properties is primarily eastern hemlock (*Tsuga canadensis*) tree species with a few scattered white pine (*Pinus strobus*), balsam fir (*Abies balsamea*), and red spruce (*Picea rubens*). The hemlock forests on these properties typically occur on rocky, coarse, and/or thin soils poor in nutrients.



Photo 22 – March 7, 2012 - This area of dense softwood is to the south and east of Page Pond. It is 8.5 acres and an excellent wildlife travel corridor along the pond and wetland complex.

Dense softwood stands within the Conservation Forest range in size from 1.7 acres to 28.9 acres. The largest stand is in the central and western portion of the property. Please refer to the *Wetlands and Natural Resources Map* for location of the dense softwood stands on the properties. Although mostly upland, there are some wetland areas within this stand in low areas and depressions. It is part of the Page Wetland Complex. A network of deer trails and sign was noted in this part of the Conservation Forest during all site visits. Six vernal pools were also documented within this stand.

Even though deer or moose may not use the smaller softwood stands in the winter, many other smaller mammals and birds rely on them. Their location provides shelter from harsh winter weather by reducing snow accumulation and wind speeds, while allowing access to food supplies and escape from predators.



Photo 23 – September 21, 2012

This area is within the largest dense softwood stand within the Conservation Properties. It contains a combination of upland ridges, vernal pools in depressions, forested wetland, and perennial streams. There was a network of deer trails and sign found throughout this softwood stand.

### ***Recommendations for Dense Softwood Stands***

1. Retain hemlock stands throughout the conservation forest to be used as deer wintering areas. Ideally 20% of the area in general should have dense softwood stands for use as important wintering areas for the following reasons:
  - wetland complex protection
  - stream buffers
  - evidence of plentiful wildlife
  - surrounding land contains mostly hardwood or mixedwood stands, and therefore retaining softwood on the property is important
2. Maintain and continue to encourage dense softwood growth to ensure winter cover and wildlife travel corridors

3. Retain some dead standing cavity trees, as they provide feeding and nesting opportunities
4. Hiking trails through dense softwood stands will also benefit people by offering cool shade during hot summer months and reduced snow depths in the winter.

### **Mature Oak and Beech**

In addition to dense softwood stands, the Conservation Forest is well stocked with hardwood species that are mature and producing abundant supplies of mast<sup>3</sup>, particularly beech nuts and acorns. Although there are trees mature enough to produce nuts and berries throughout all of the properties, one area in particular stood out as mature hardwood stands during field inventories for the following reasons:

1. Most trees in the stands have large diameters over 18” DBH
2. The understory represents open, mature hardwood stand with relatively less undergrowth compared to other, younger hardwood stands
3. There was bear and deer sign on and around the trees
4. A network of wildlife trails were found throughout the area

Mature hardwood stands containing mast-producing beech and oak trees are very important for wildlife in the fall when feeding on the nuts is critical for obtaining protein and fats. Black bear, deer, wild turkey, red and grey squirrels, chipmunks, and many other wildlife species rely on nuts in the fall as they store up fats and protein.



Photo 24 – March 7, 2012 - This large white ash is in an open hardwood containing red oak, beech, and ash. Although containing little timber value, this large tree produces seeds for wildlife and cavities for nesting. There are several excellent mast-producing trees throughout this open hardwood stand.

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<sup>3</sup> Mast refers to nuts and fruits produced by woody plants. It is usually subdivided into hard mast (nuts) and soft mast (fleshy fruits). Forest tree and shrub mast is an important seasonal food for many forest wildlife species. Examples of mast trees and shrubs include, oaks, beech, ash, apples, hickories, beaked hazelnut, dogwoods, choke cherry, raspberry, and black berry, etc.

**Recommendations for Mast Producing Trees:**

1. Manage mast producing trees and shrubs for a continuous source of wildlife food and quality seed for regeneration
2. Retain beech trees with bear claw marks on the trunk or clumps of broken branches in the crown.
3. Whenever possible avoid harvesting beech and oak mast stands during the fall (September through November), important foraging time for bears and other wildlife.

Following these recommendations compliments the Forests Management Plan long-term goal of working towards developing mature oak stands.

**Soils**

The nature of soil has a profound effect on plant growth. Whether it is rich with organic material, very poorly drained, or sandy, will affect the type of vegetation adapted to grow in those conditions. Scientists can learn much about the soil type by examining the vegetation. At the same time, examining the soil will predict the type of vegetation that can grow in the area. Because soils affect the vegetation that will grow in an area they also influence the habitat types and therefore the wildlife species that will occur in particular areas. As a result, understanding soil conditions and characteristics can be excellent indicators of critical areas such as wetlands, agricultural lands, forestlands, wildlife habitat and areas with limitations to development. In descriptions of soil types, the Natural Resource Conservation Service (NRCS) evaluates soil types according to their capacity for agriculture, woodland, community development, recreation, and wildlife habitat.

Soil information is critical in making sound land use decisions. By examining soil types and morphology, many predictions can be made regarding forest management, erosion potential, and development possibilities. Certain soils are better suited for certain land uses such as forestland, agriculture or residential development.

The majority of the Conservation Forest contains Tunbridge- Lyman- Becket complex soils (380). This soil type is further broken down by slope, C to E with E having the steepest slope at 25% to 60%. Tunbridge-Lyman-Becket soils are on hillslopes with a restrictive layer found between 20 and 40 inches. In contrast to this well drained soil are two large areas of very poorly drained soils: Catden mucky peat (194A – 86.5 acres) and Meadowsedge peat (894A- 35.6 acres). Both have very deep organic material and are over 80 inches to layers. Catden soil is found in the Sherman and Page Wetland Complexes, and the Meadowsedge in the Black Ash and Hemlock-Cinnamon Fern Wetland Complexes.

**Table describing soils mapped by NRCS**

| Munsell symbol | Soil Name                        | Drainage Class      | Slope | Description                             | Acres |
|----------------|----------------------------------|---------------------|-------|---|-------|
| 143B           | Monadnock sandy loam, very stony | Well drained        | 3%-8% | Very stony Farmland of local importance | 16.5  |
| 194A           | Catden mucky peat                | Very poorly drained | 0%-1% | Very deep organic material Hydric soil  | 86.5  |
|                |                                  |                     |       |   |       |

| Munsell symbol | Soil Name                         | Drainage Class          | Slope   | Description   | Acres |
|----------------|-----------------------------------|-------------------------|---------|---|-------|
| 380C,D+E       | Tunbridge-Lyman-Becket complex    | Well drained            | 3%-60%  | Very stony, Till<br>Farmland of local importance  | 393.9 |
| 415A+B         | Moosilauke fine sandy loam        | Poorly drained          | 0%-8%   | Glacial drift<br>Hydric soil  | 26.5  |
| 543C           | Monadnock-Becket-Skerry Complex   | well drained            | 15%-25% | Very stony, Till  | 21.7  |
| 558B           | Skerry fine sandy loam            | Moderately well drained | 8%-15%  | Prime Farmland<br>Basal melt-out till derived from granite, gneiss or schist                      | 1.5   |
| 559B           | Skerry fine sandy loam very stony | Moderately well drained | 8%-15%  | Farmland of local importance<br>Basal melt-out till derived from granite, gneiss or schist, stony | 28.6  |
| 56C            | Becket fine sandy loam            | Well drained            | 8%-15%  | Farmland of statewide importance<br>Basal melt-out till derived from granite, gneiss, or schist   | 3.2   |
| 647A           | Pillsbury sandy loam, very stony  | Poorly drained          | 0%-3%   | Lodgement till derived from granite, gneiss or schist   | 6.2   |
| 894A           | Meadowsedge peat                  | Very poorly drained     | 0%-1%   | Organics<br>Hydric soil   | 35.6  |

### ***Rare Species and Exemplary Natural Communities***

Page Pond and Brook, and Page Wetland Complex are one of the highest co-occurrence areas in the town of Meredith (Wanner, 2008, Van de Poll, 2009). Although the purpose of this study was not to complete an exhaustive inventory of the flora and fauna, this study and others identified many exemplary natural communities, rare wildlife, and rare plant species. Please see the 2008 *Stewardship Plan for the Page Pond and Forest Property* by Kate Wanner of The Trust for Public Land and the 2009 *Meredith NRI Phase II Co-occurrence Area Summary* by Rick Van de Poll for additional information. Species and communities that we identified during field work are listed below and shown on the maps at the end of this report. They are also described in previous sections of the report.

1. Great blue heron nesting area (S3)
2. Vernal woodland pools (S3)
3. Northern hardwood-black ash-conifer swamp (S2)
4. Larch swamp and fen (S3)
5. Seasonally flooded red maple swamp (S4S5)
6. Hemlock-cinnamon fern forest (S4)

## ***Invasive Species***

Throughout NH and the world, non-native invasive species have become an overwhelming problem. Invasive species typically possess certain traits that give them an advantage over native species. They produce many offspring, have early and rapid development and/or are adaptable to many environmental conditions. Studies have shown that invasive species can reduce natural diversity, impact endangered or threatened species, reduce wildlife habitat, create water quality impacts, stress and reduce forest and agricultural crop productions, damage personal property, and even cause health problems (Cygan, 2011).

Although not an exhaustive botanical survey, we found that the Conservation Forest as a whole did not have many non-native, invasive plant species. A couple were found and documented. Oriental bittersweet (*Celastrus orbiculatus*) was observed at the quarry pond near the Quarry Road Trail loop. It is an invasive vine and should be removed. Japanese barberry (*Berberis thunbergii*) was also noted in the forest off Blueberry Hill Road. It does not appear to be spreading or robust, so may not be a problem. It should be monitored.

## ***Recommendations to control non-native, invasive species***

1. Implement a program to monitor invasive species and control or eradicate as needed
  - Possible assistance from the NE Wildflower Society, Invasive Plant Atlas of New England (IPANE), and volunteers
2. Early detection, coupled with a quick and effective response is viewed as one of the best and cost-effective ways to deal with problems.
3. Consider training with IPANE to become volunteers to help document invasive species. This is particularly important in the key wetland habitats found throughout the Conservation Forest. In IPANE training session takes a full day and includes an indoor information session, and an outdoor field session. Below is a website for volunteering with IPANE.
  - <http://www.eddmaps.org/ipane/volunteers/volunteers.htm>

## ***Cultural Resources***

Cultural resources include evidence left by people who once inhabited the land. They include stone walls, cellar holes, sugar shacks, logging camps, old dam sites, cemeteries, Native American ceremonial grounds, and even trash dumps from old farmhouses. During field inventory several cultural resources were documented, many which are accessible for the enjoyment by the general public and schools. In 2010 Dr. Daniel Heyduk, anthropologist and historian, wrote a thorough and detailed report on historic resources within the Conservation Forest. This is an excellent resource for the Town of Meredith, and contains details of cultural and historic resources with the Conservation Forest.

The Mill is the most prominent historic resource on the properties. It is at the outlet of Page Pond and the beginning of Page Brook. The dam was originally built in 1830 by Sewall Leavitt, who operated it as a sawmill until selling the mill to John Page in 1836 (Heyduk, 2010). Mr. Page continued operation of the sawmill for an additional 19 years.



Photo 25 – March 7, 2012 - The Mill Dam site is a prominent cultural resource on the Page Pond Forest. It is at the outlet of Page Pond and is easily accessed by hiking trails from the north and the south.



Photo 26 – April 30, 2012 - View of historic mill dam and associated stone work around it.

“Measured today, the dam is 96 feet long, 16 feet wide and 18 feet high at the spillway. The sluice opening is 5 feet wide and 9 feet high. The walls of the spillway which carries water from the sluice are 53 feet long.” (Heyduk, 2010).



Photo 27 – July 9, 2012 - One of the many stonewalls, which were found throughout the Conservation Forest. This one is on the Sherman Easement near the Sherman Wetland Complex.



Left photo (Photo 28 – April 30, 2012) stonewall in an open hardwood forest near the Page Wetland Complex. Stonewall to the right (Photo 29 – March 7, 2012) is on an upland knoll in the northern part of the Conservation Forest.



Photo 30 – April 30, 2012 - Old storage shed with a drill sharpener inside. This feature can be found along the red trail on the Page Pond Forest. There are several pieces of metal scattered around this shed. Although a historic resource, it could also pose a safety hazard.

### ***Recommendations to Protect Cultural Resources***

1. During timber harvests in the area of cultural resources, flag the area to show loggers which areas to avoid.
2. Fell trees away from stone walls, the mill dam site or other sites to protect them
3. Use existing stone-wall openings when possible. Limit the number of new openings and cut only the minimum width necessary. Leave openings for future use if necessary. Otherwise restore the wall when work is completed.
4. Collect rusty nails and scrap metal from the shed area on Quarry Road trail. They provide a safety hazard for the general public.
5. Discuss with local historians and archaeological professionals the best way to manage the shed and drill sharpener: they are a historic resource, which should be protected, but are also vulnerable to vandalism.
6. Contact the NH Division of Historical Resources for additional advice about documenting and protecting cultural and historic resources, particularly the mill site and the shed on the red trail. <http://www.nh.gov/nhdhr/>. The agency is located at 19 Pillsbury Street, Concord, NH 03301-3570. Phone: 603-271-3483

### ***Scenic Resources***

The Town of Meredith is one of the most scenic places in New Hampshire. It is located on Lake Winnepesaukee and is also close to the White Mountains. Meredith has a mixture of outstanding scenery and natural beauty through a combination of the lakes, surrounding

mountains, and a rural environment. As discussed in the sections prior, the Conservation Forest contains a wide diversity and matrix of habitat types from all types of forested habitat to a diversity of wetlands. These natural resources have very high scenic values and can be appreciated and enjoyed by a variety of people.



Photo 31 (also Cover Photo) – July 9, 2012

While sitting under a white pine stand in the shade, there is not only a very scenic view of a diverse wetland mosaic, but also a high potential for wildlife viewing and appreciation.



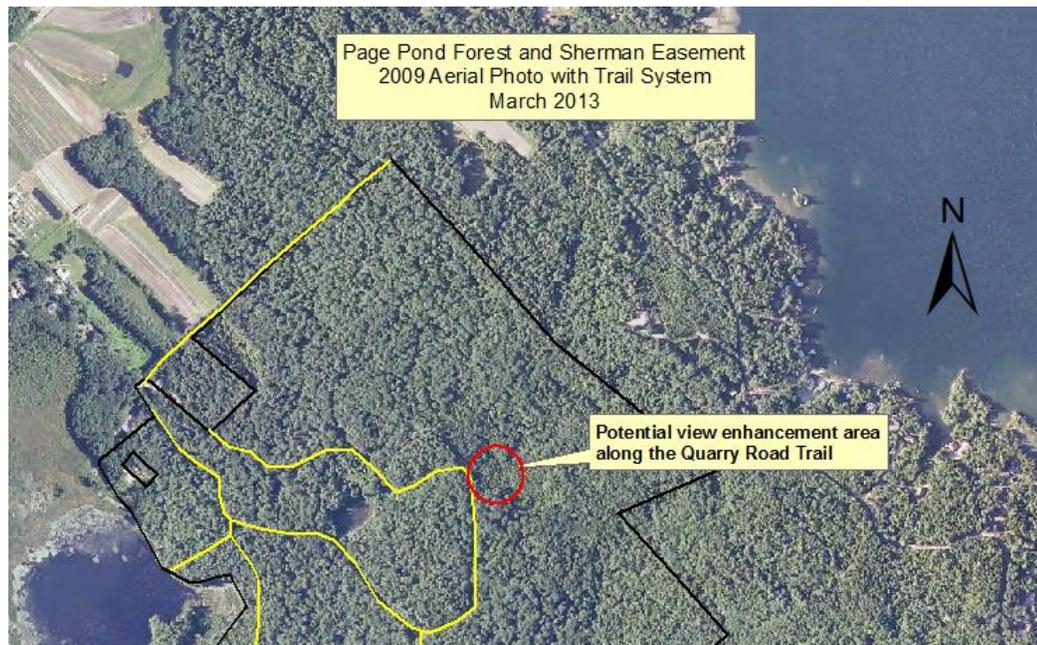
Photo 32 – July 9, 2012 - Beautiful views in the Page Wetland Complex near the southern boundary of Page Pond Forest property. During field work in July, several great blue heron, Canada geese, many species of ducks, and broad winged hawks were observed from this location. The diversity of wetland vegetation and views towards the far side of the wetland are valuable.

### **Recommendations for Scenic Resources**

1. Along the Quarry Road Trail, cut the young saplings to make a small clearing on a hillside to open a view towards the Ossipee Range. Most of the saplings and young trees can be sold for firewood, and those that are not large enough can be chipped and placed on trails if desired.



Views towards Lake Winnepesaukee and the Ossipee Range beyond. The photo on the left (Photo 33) was taken on March 7, 2012 and the photo on the right (Photo 34) taken on April 30, 2012. By mid-May, the view will be completely obstructed by leaves. Cutting some of these trees to create a small clearing would make a spectacular view towards the northeast.



This map shows the location of a possible view enhancement cut along the Quarry Road Trail.

2. Continue the hiking trail which runs along the west side of Page Wetland Complex. We recommend continuing the trail to the southern boundary of Page Pond Forest property. There are several beautiful viewing areas beyond where the existing maintained trail ends.
3. At a few key locations along the western side of the Page Wetland Complex, we recommend clearing a small area near the wetland to enhance viewing. Some of the

lumber can be used to construct a wooden bench for those who want to linger in the area, watching wildlife and enjoying the view.



Photo 35 – July 9, 2012 - A simple wooden bench near this location would offer a shady view of the Page Wetland Complex at a natural narrow “neck” in the wetland. Clearing a few shrubs would create unobstructed views, without compromising the integrity of the wetland.



Photo 36 – April 30, 2012 - With little or no clearing, a wooden bench at this location would enhance the viewing potential for visitors. During our April 30<sup>th</sup> site visit, we documented two breeding pair of Canada geese.

## FUTURE OPPORTUNITIES

### Educational Projects

1 – Present a slide show annually to the public. Ideas for slide shows include, but are not limited to:

- Ongoing ‘Natural Resource review, updates, and practices on the Forest’ event
- Winter presentation or workshop on any component of the Forest
- Wetland functions, vernal pool cycles, natural history of wildlife species, silvicultural practices, etc.

2 – Conduct an annual field tour including informational handout materials and hands-on demonstrations.

3 – Develop and distribute a brochure to the public, annually or biannually.

4 – Develop an Educational Poster, GIS Analysis of Resources.

### GIS Mapping

1 – Continue to create, update and maintain database. (*Ongoing*)

- New data layers
- Additional inventory data
- Update of previous actions and implementation such as forest stand harvest completion, culvert replacements, wildlife openings completed, trail extensions, etc.

2 – Annually produce and distribute at least one full-sized plot displaying various Conservation Forest features, areas of interest, and changes.

### Wildlife Habitat Improvements

1 – Locate and create permanent wildlife openings throughout the Conservation Forest targeting ruffed grouse and woodcock. This will also benefit many other wildlife species. We identified four possible areas with easy access, which could benefit from creating small permanent wildlife openings. We recommend these opening be one to three acres. They are listed below, and displayed on the attached map at the end of this report.

- a. South of the southern part of Quarry Road Trail. The area has been logged, contains dry soil, and would offer views of the area since on a hillside
- b. In the middle of the Sherman Easement – to the east of the beaver pond.
- c. On a knoll just north of the Class VI road extension of Blueberry Hill Road. Although some small forested wetlands in this area, there are also some

excellent upland soils that could easily be maintained as a permanent opening.

- d. Further along and to the south of the Class VI road extension is the third easily accessible and potential permanent opening location. The forest is on a hillside with predominately hardwood species. It contains well drained soils. Because it is on a hillside, this opening would also generate views towards the extensive, diverse, and scenic Page Wetland Complex.

The locations of these three potential openings are general based on field notes from mapping work that followed. They should be assessed on the ground to avoid wetlands and find the best possible placement.

**2** – Encourage dense softwood regeneration Timber Stand Improvement (TSI) throughout the forest with an ultimate goal of creating and enhancing deeryards and winter area travel corridors. This is particularly important in the eastern part of the property where there is a historic deer wintering area noted by NH Fish and Game Department.

**3** – Encourage aspen regeneration, especially along existing beaver ponds. This will enhance ruffed grouse and woodcock habitat in particular, but have additional benefits for many other wildlife species.

**4** – In addition to avoiding wetlands throughout the property, there is an approximately 80 acre area and adjacent wetlands with buffers that should be designated as a ‘No Touch’ zone. This area contains a blue heron rookery, wetlands, and steep ledge outcrop, which is very steep. Please refer to the attached map for location.

### **Travel Corridors and Wildlife Connectivity**

**1** - Analyze potential wildlife travel corridors in relationship to linking with abutting parcels at a landscape scale utilizing GIS and further fieldwork.

### **Wildlife Monitoring and Increased Inventory**

**1** - Establish a coarse transect grid for year-round and long-term documentation of population densities and movement.

**2** - Organize and train volunteers to assist with track counts, bird surveys, and vernal pool documentation

### **Grant Writing**

**1** – Submit one proposal seeking funding on an annual basis. Examples of proposal submissions could include, but not be limited to:

- Wildlife habitat management activities
- Research projects within the Conservation Forest
- Education and workshop grants
- Recreational trail development, improvements, and links
- Development of an educational poster

### **Rare species inventory and monitoring**

1 - Expand fieldwork focused on co-occurrences of natural resources within the Conservation Forest.

- Analyze GIS data such as hydrology, geology, soils, etc
- Identify and locate talus sites
- Identify and locate areas with higher pH readings (water and soil)

### **Invasive species monitoring and control**

1 - Increase inventory and spatial data through the following means

- Continue to document through fieldwork and inquiries
- Develop an invasive plant eradication program through volunteers
- Consult and partner with New England Wild Flower Society and IPANE

### **Water Monitoring Program**

1 - Establish a network of accessible sampling points throughout the Forest

- Sample at least three times per year; spring, summer, and fall
- Record temperature, pH, specific conductivity, and turbidity
- Consider the feasibility of college students continuing the sampling in future years

2 - Create a GIS database of sampling locations with attribute data linked to spatial locations.

- Update at least annually

### **Research Projects within the Conservation Forest**

1 - Determine research possibilities, funding opportunities, public interest, and Conservation Easement goals.

### **Additional recreational opportunities**

1 – Place benches along some of the wetlands where there are scenic views

2 – Expand trail network system for access to additional areas (see attached map for potential areas). Avoid trails to places where human presence or impact will have a negative effect on wildlife. One example is the great blue heron rookery.

⇒ Along west side of Page Wetland Complex

⇒ Along northeastern boundary of the Page Pond and Forest Property until you get to the boundary of the Page Wetland Complex

3 – Identify public picnic area



This map shows areas with excellent views and wildlife viewing opportunities. The pink icons show possible locations for benches.

## CONCLUSIONS

It is always a pleasure to inventory an area which is protected from development, particularly an area with such a high diversity of habitat types, wetland complexes and wildlife. The Conservation Forest as a whole is one of the most valuable natural resource places in Meredith, NH. The ecological value of these properties goes well beyond the parcel boundaries to the broader region, where tracts of unfragmented land contribute to additional diversity of wildlife species and habitat types. Fortunately, some of that land is conserved:

- Page Pond owned and conserved by NH Fish and Game Department
- Moulton Farm Conservation Easements
- Sherman Forest Easement

One of the best ways to continue to maintain high water quality, ecological diversity, and wildlife diversity, is to continue to work towards conserving properties adjacent to the currently conserved parcels. Two examples stand out from the study.

1. Page Wetland Complex continues beyond the southern-most boundary of the Page Pond and Forest. It would be beneficial to try to ensure protection of this part of the wetland complex. This can be accomplished by purchasing it to incorporate into the Conservation Forest, or by encouraging landowner(s) to place this portion of their property into a Conservation Easement.
2. Land to the east of Page Pond Wetland Complex contains a steep, rocky, forested slope. It is too steep for development, and having an extra forested buffer to the east of the great blue heron rookery would offer excellent protection.

This report is a working document. It is one of many related studies done in the Town of Meredith, and will hopefully compliment work already completed. The Meredith Conservation Commission members should be applauded for the work they have done in protecting this rich, diverse, scenic, and high quality section of Town.

## REFERENCES

- Cygan, D. 2011. *New Hampshire Guide to Upland Invasive Species*. New Hampshire Department of Agriculture Markets and Food, Plant Industry Division. 3<sup>rd</sup> Edition.
- Heyduk, Daniel. 2010. *Page Pond and Forest: A History and Guide*. Town of Meredith. Meredith Conservation Commission.
- New England Forestry Consultants, Inc. (NEFCo) 2009. *Forest Management Plan: Page Pond Conservation Forest*. Prepared by Shaun Lagueux, Bristol, NH.
- Spear, Peter. 2002. *Stewardship Plan Map: Overview Plan of Land*. Natural Resource Consulting Services. 167 South Street, Concord, NH 03301.
- Sperduto, D.D. and W.F. Nichols. 2004. *Natural Communities of New Hampshire*. NH Natural Heritage Bureau, Concord, NH. Pub. UNH Cooperative Extension, Durham, NH.
- Van de Poll, Rick, 2009. *Natural Resource Inventory – Phase II – of the Town of Meredith, NH*. Town of Meredith; Meredith Conservation Commission.
- Wanner, Kate. 2008. *Stewardship Plan for the Page Pond & Forest Property*. The Trust for Public Land. 3 Shipman Place, Montpelier, VT 05602.
- Verbal communications with Meredith Conservation Commission members: John Sherman, Ralph Pisapia, Peter Miller, and Mark Billings.

## **MAPS**

**Aerial Photograph with Trails and Property Boundaries**  
**USGS Topographic map**  
**Wetlands and Natural Resource Features**  
**NRCS Soils Map**  
**Wildlife Documentation from 4 Days of Field Work**  
**Photograph Index of Photos Shown in the Report**  
**Suggested Future Wildlife Permanent Openings**