Wildlife Habitat and Land Stewardship Plan
for the
Rothwell Reserve
Lee, New Hampshire

Prepared for the:
Lee Conservation Commission
Lee, NH 03254

Prepared by:

Ellen Snyder
Ibis Wildlife Consulting
Newmarket, NH
Email: ellensnyder1@gmail.com
Certified Wildlife Biologist
Technical Service Provider, NRCS

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Location and General Description

The Town of Lee purchased the 13+ acre Rothwell Reserve in October 2006 from Kenneth and Alida Rothwell after residents at the March 2006 Lee Town Meeting voted in favor of using town funds for the acquisition. The property lies in "south Lee" with approximately 875 feet of frontage on Route 152, also known as Wadleigh Falls Road. Route 152 separates the Rothwell Reserve from the Lamprey River, which flows east here just upstream of Wadleigh Falls (Map 1, Appendix 1). In discussions leading up to the town meeting vote, some local residents commented that, "this is an important step toward the preservation of a part of Lee that serves as a historical, cultural, and wildlife crossroads." Supporters of the acquisition also noted the potential for a trail network from this part of Lee to the center of town (Laurel Cox, personal communication).

Directly abutting the Rothwell Reserve to the east is the Aldag property on which the Town of Lee holds a conservation easement on 13 acres (Appendix 5). Immediately to the west of the Reserve is a private residence with a landscaping business. The land to the north is undeveloped woodland. Appendix 6 has a map of the Town of Lee conservation lands as of 2010. On this map the Rothwell Reserve is identified as property #17.

The Rothwell Reserve is 100% forested with a rich diversity of plant life including black gum, American chestnut, red and white oak, red maple, white pine, among other tree species. The understory is lush, with a diverse mix of shrubs and herbaceous plants including ferns, fungi, and mosses. The land drains to the Lamprey River; a culvert directs water flow under Route 152. During flood events, much of the southern portion of the Rothwell Reserve is inundated with floodwater. During drier spells, the land is less saturated, although the lushness of growth is an indication of a high water table throughout much of the property.

A narrow footpath runs through the northern and western sections of the Reserve (See Map 2, Appendix 1). There are no structures or other public access points on the property. A small, gravel parking area and carry-in canoe/kayak launch are located on the Lamprey River, directly across the road from the Reserve (Map 2, Appendix 1).

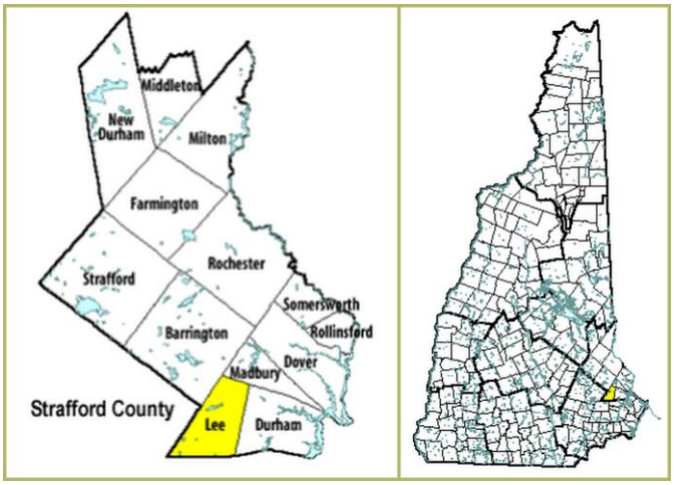


Figure 1.
Town of Lee, New Hampshire highlighted in yellow on Strafford County map and on state of NH map (maps from New Hampshire Employment Security 2014).

History of the Property

At the March 14, 2006 Lee Town Meeting, voters adopted Article 36 (included in Appendix 2):

36. *To see if the Town will vote to raise and appropriate the sum of up to eighty-five thousand dollars ($85,000) and, up to five thousand dollars ($5,000) for transaction costs, a total of ninety thousand ($90,000) to purchase and acquire in fee simple approximately 13 acres of land on Wadleigh Falls Road owned by Kenneth Rothwell, Map 21 Lot 3-2, and to authorize the withdrawal of funds from the following sources*:

- *Ninety thousand dollars ($90,000) from the Town Fund Balance*

The value of this property is being used as a match for the DES Water Supply Land Grant Program grant for the Moriarty/Young/Moynihan properties.

(Selectmen recommend this appropriation. Majority vote required).

Article 36 was moved by Selectman Wellington, seconded by Bill Humm. Mr. Wellington moved to amend the article to delete the wording: *The value of this property is being used as a match for the DES Water Supply Land Grant Program grant for the Moriarty/Young/Moynihan properties.*

Motion to amend was adopted. Article 36 was adopted as amended.

The Town of Lee acquired the property in fee from Kenneth and Alida Rothwell on October 20, 2006 using money from the Town Fund Balance. To date, the Town of Lee has placed no additional protective easements or other restrictions on the Rothwell Reserve.

Prior to the sale, the Rothwells commissioned a boundary survey by McEneaney Survey Associates, Inc. of Dover, NH (Appendix 3). The Rothwells acquired the property from Frances C. Thompson in 1971. Prior to that, the property changed hands several times. There is little indication on the land today that these recent owners attempted any land clearing or other development; however, the Rothwells researched the feasibility of a residential building site; information on soil testing and building feasibility is included in Appendix 3.

Table 1. Documents related to the Rothwell Reserve.

Document	Date Recorded or Prepared	Registry of Deeds and/or Appendix #
March 2006 Lee Town Meeting Warrant Article 36	March 2006	Appendix 2
Rothwell Boundary Survey by McEneaney Survey Assoc., Inc.	8/3/2006	Plan #87-22; Appendix 3
Warranty Deed (Rothwell to Town of Lee)	10/20/2006	BK 3449 PG 0268; Appendix 3
Rothwell proposal to Town of Lee	5/3/2005	Appendix 3
Lee planner review of building options on Rothwell land	2/6/2006	Appendix 3
Certificate of Title research	6/2/2006	Appendix 3
Lee Tax Map 21 Lot 3-2	------	Appendix 4
Aldag Conservation Easement	10/19/2009	BK 3783 PG 0767; Appendix 5
Aldag Boundary Survey by Atlantic Survey Co.	9/23/2009	Plan #97-73: Appendix 5

Purpose of this Plan

The purpose of this Wildlife Habitat and Land Stewardship Plan was to assess the current condition of the property and guide the implementation of stewardship activities to benefit wildlife and other ecological values in concert with identifying potential public access and uses and nature interpretation and education. This was achieved by evaluating the soils, topography, plants, animals, habitats, wetlands, cultural features, environmental health, and landscape setting of the property.

This Wildlife Habitat and Land Stewardship Plan Includes the following chapters and materials:

- **Chapter 1 – Property Description** describes the location, property history, and purpose of the Plan.
- **Chapter 2 -- Ecological and Cultural Features** describes the landscape setting, topography, soils, habitats, wildlife observations, trails, and environmental health of the property.
- **Chapter 3 – Land Stewardship Recommendations** presents management actions to sustain and enhance wildlife habitats and other ecological features, to maintain the environmental health of the property, and to enhance public access where feasible.
- **A set of maps is included as Appendix 1** to further illustrate the property features.
- **Appendices 2-10** provide additional background material and property documents.

The Lamprey Rivers Advisory Committee (LRAC) funded the development of this Plan. Ibis Wildlife Consulting met with the Lee Conservation Commission twice, initially to discuss the purpose of the Plan (June 2, 2014) and again to review the findings and recommendations in the Plan (September 2, 2014). Ibis Wildlife Consulting also met with the Lamprey Rivers Advisory Committee on September 10, 2014. After the LRAC meeting, we toured the property with interested members of the Lee Conservation Commission and Lamprey Rivers Advisory Committee. This Plan was then finalized based on input from both groups.

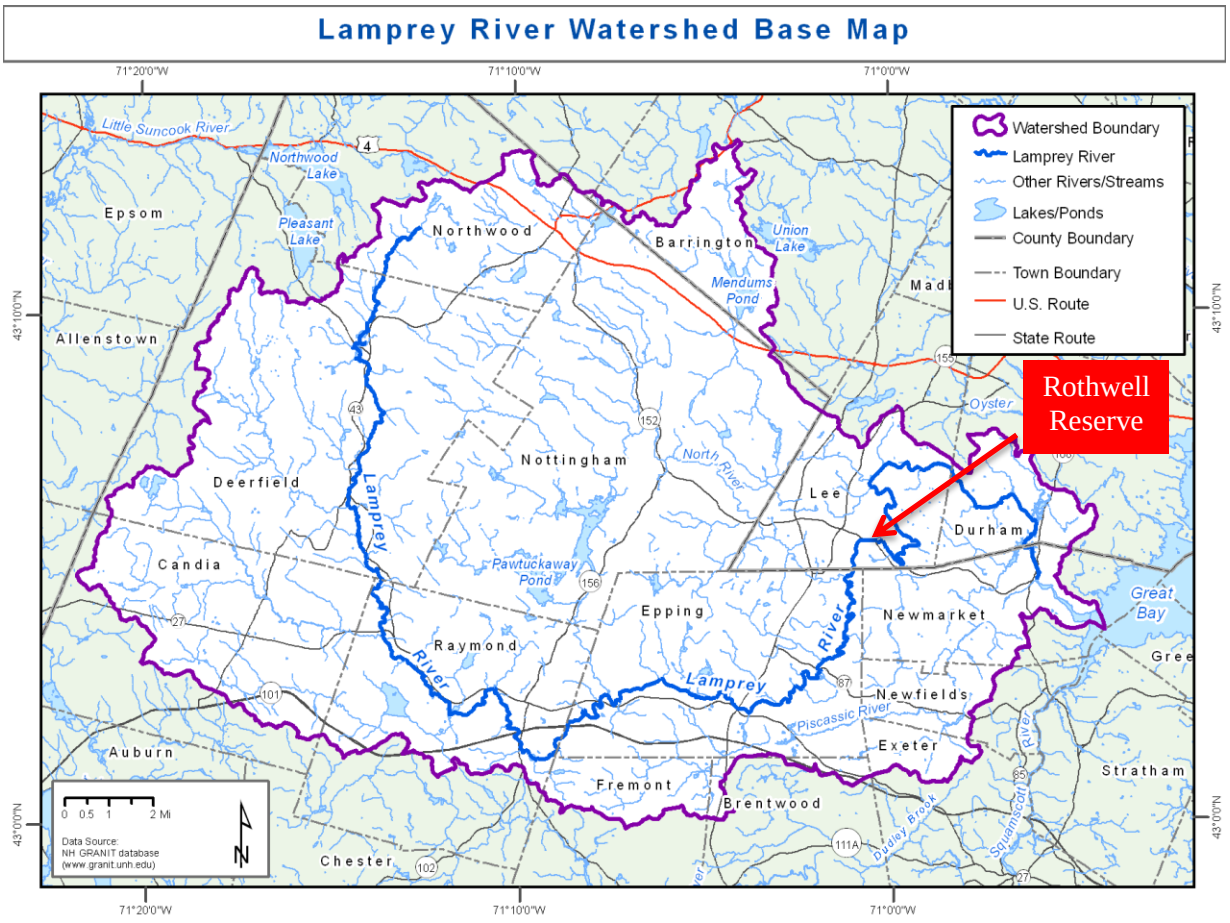
Chapter 2 Ecological and Cultural Features

Landscape Setting

Lamprey River Watershed

The Rothwell Reserve lies within the Lamprey River watershed, the largest of the six watersheds that are collectively known as New Hampshire's "coastal watersheds." The Lamprey River begins on the slopes of Saddleback Mountain in Northwood and meanders more than 50 miles through eight towns before it reaches the McCallen Dam at the mills in Newmarket (Figure 2). The Lamprey River drains an increasingly populous watershed of 212 square miles or 135,680 acres; it is the largest watershed and the longest river that flows into the Great Bay estuary, one of the most significant inland estuaries along the entire East Coast.

Figure 2. Lamprey River Watershed (from 2010 Carbon Solutions New England: http://100yearfloods.org/resources/)



Historically, the Lamprey River supported large populations of river herring, sea lamprey, American shad, American eel, and Atlantic salmon. Dams constructed for industrial and commercial purposes have long blocked or limited fish passage upstream. The McCallen Dam, site of the first natural falls on the Lamprey, separates the tidal portion of the river from the freshwater portion. A Denil fish ladder on this dam enables alewives, American eels, sea lamprey, and American shad to move upriver. Blueback herring do not use the ladder and have been seen spawning below the dam. Three and a half miles upstream of McCallen is the Wiswall Dam in Durham, originally constructed in 1835. That dam was upgraded in 2011, which also included the installation of a fish ladder. A third dam at Wadleigh Falls in Lee (just downstream of the Rothwell Reserve) has been breached, but under typical flow conditions, its remnants still constitute a barrier to upstream fish movement.

River Designations

On November 12, 1996, the U.S. Congress designated an 11.5-mile segment of the Lamprey River as a recreational **Wild and Scenic River**. This designation extended from the Lee town line (bordering Epping) through Lee and Durham to the confluence with the Piscassic River in Newmarket. The Rothwell Reserve lies near and drains into this segment of the river in Lee. An additional 12-mile segment of the Lamprey River, from the Lee/Epping town line to the former Bunker Pond Dam in Epping, was added to this designation on May 2, 2000, increasing the Wild & Scenic River designation to 23.5 miles.

A recreational river in the National Wild and Scenic Rivers System (administered by the National Park Service) is one that is readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past. The Lamprey Rivers Advisory Committee (LRAC), with members from all four towns, has the principle responsibility for development and implementation of a long-range management plan and reviews and comments on projects that could impact the river.

In keeping with its mission and to enhance recreational opportunities, the LRAC acquired a narrow parcel of land in Lee sandwiched between Route 152 and the Lamprey River. LRAC installed a walk-in boat launch at this site, which also supports a small gravel parking area; both are located across from the Rothwell Reserve (Map 2, Appendix 1). LRAC then donated the land and the launch to the Town of Lee.

The Lamprey River and its tributaries--North Branch, Pawtuckaway, North, Little and Piscassic rivers--were nominated to the **NH Rivers Management and Protection Program** (RMPP). Twelve miles of the Lamprey River in Lee and Durham were accepted into the program in 1990. Up-river towns worked to expand that designation to the entire river and all its tributaries; the designation was approved by the state in 2011. For more information on the Lamprey River see http://des.nh.gov/organization/divisions/water/wmb/rivers/index.htm

Conservation Focus Areas

In 2006, The Nature Conservancy, Society for the Protection of New Hampshire Forests, and the Rockingham and Strafford Regional Planning commissions published *The Land Conservation Plan for New Hampshire's Coastal Watersheds* ("The Coastal Plan") (Zankel et al. 2006). The authors identified 75 Conservation Focus Areas that comprise over 190,000 acres or 36% of the coastal watersheds that are of exceptional significance for living resources and water quality. The Rothwell Reserve is considered

"supporting landscape" within the **Lower Lamprey River Focus Area** (Appendix 7 for map of Focus Area—supporting landscape is pale orange in color--from Zankel et al. 2006).

The Rothwell Reserve also lies within an area considered **highest ranked habitat in New Hampshire** by the New Hampshire Fish and Game Department (NHFG) as mapped in the Wildlife Action Plan (WAP). (See Appendix 7 for the NH Fish and Game Department's map of highest ranked habitat for the Town of Lee.) The highest ranked habitat is in pink and encompasses the Rothwell Reserve. All of the lands in this region of Lee are important as wildlife habitat with a designation of highest ranked habitat in the state, **highest ranked habitat in the biological region** (Lee is in the Coastal Plain Lowland biological region or ecoregion), or **supporting landscapes** (upland areas around critical surface waters, that if degraded, might affect the health and quality of the aquatic habitats (NHFG 2010).

Topography and Soils

The topographic map of the Rothwell Reserve (Map 3, Appendix 1) shows a mostly flat area, with slight variations in elevation between 90-100 feet above mean sea level. The highest (and driest) point on the property is a knoll in the southwest corner near Rte. 152. The southern section of the Rothwell Reserve is slightly lower in elevation and is therefore more susceptible to flooding during flood events, which have occurred with some regularity in recent years. Rain or meltwater on the Reserve either seeps into the ground or flows toward the culvert and under Route 152 to the Lamprey River (Map 5). The small undulations in topography throughout the property are not evident on the rather coarse scale of the topographic map.

The dominant soil type on the Rothwell Reserve, a poorly drained Saugatuck loamy sand, is found across 88% (11.8 acres) of the property (Table 2). The 1973 USDA Soil Survey of Strafford County, New Hampshire, describes the soil type this way: "Saugatuck soils are generally too wet for cultivation because they have a high water table above a moderately slowly permeable cemented pan. Wetness is a major limitation for most uses. The hummocky, stone-free surface is a noticeable feature and the soil is typically wet 7 to 9 months of the year." Interestingly, the representative profile for this soil type for Strafford County (USDA 1973) is located in a "wooded area one-third mile north of Wadleigh Falls on Tuttle Road in Lee," not far from the Rothwell Reserve.

The southwest corner is underlain by excessively drained Hinckley loamy sand (1.3 acres). This includes the knoll and is visibly the driest part of the property. Hinckley soils are thick deposits of stratified sand and gravel with rapid permeability; therefore, droughty compared to the rest of the Rothwell Reserve. Hinckley soils are the classic sand and gravel deposits in this region; many are in eskers or similar mounded deposits, and are excavated for roads and other uses. Less than half an acre (0.3 acres) of the Reserve, along the western boundary, has moderately well drained Deerfield loamy sand, which is seasonally wet soil.

Overall, the Rothwell Reserve has saturated soils for much of the year and, in wet periods, a portion of the property is usually flooded; however, these are not muck soils and thus do not hold standing water for long. The 2006 boundary survey of the property includes a wetland delineation by David Allain that was conducted in 2004 for the Rothwells to identify a potential building site. Presumably the wetlands

delineation by Allain is a more accurate depiction of wetland soils than is the 1973 USDA soil survey, although both are useful (Map 4, Appendix 1).

Table 2. Soils for the Rothwell Reserve (USDA 1973, 2001).

Soil Symbol	Soil Name	Slope	Drainage	Parent Material	Total Acres
Sb (16)	Saugatuck loamy sand	0-3%	poorly drained	outwash	11.8
HaA (12A)	Hinckley loamy sand	0-3%	excessively drained	outwash	1.3
DeA (313A)	Deerfield loamy sand	0-3%	moderately well drained	outwash	0.3

Natural Communities/Habitats

Hemlock–beech–oak–pine forest is the dominant upland forest type on the Rothwell Reserve. Ecologists fondly refer to it as "H-BOP" for short. This is the most common forest community in southern New Hampshire, representing a transition between northern hardwoods and more southerly Appalachian oak and pine forests. Early and mid-successional species--red oak, white pine, and red maple—are the dominant tree species in the forest canopy on the Reserve, a reflection of past land use, such as agriculture (most likely pasturing here).

In time, eastern hemlock and American beech--the dominant late successional species in this forest type--are expected to become more dominant. Currently, beech and hemlock are in relatively low abundance on the property. White oak, an aesthetically attractive tree and great wildlife food source, is scattered throughout as well. One huge white oak (about 5 feet in diameter) sits at the edge of the knoll in the southwest corner of the Reserve. Several **American chestnuts** were discovered on the property, averaging 4-6 inches in diameter. During the September 10th site walk, our group found several burrs (fruits) on the ground (see picture to right). It will be interesting to monitor these trees over time to see if they can avoid succumbing to the chestnut blight.

Given the latitude (in a transition zone between northern and southern forest types), the slight variations in elevation, and the poorly drained soils on much of the property, forest conditions vary across the 13 acres. On the more saturated, poorly drained soils, red maple is more abundant, with black gum scattered throughout the eastern half of the property. **Black gum** is a shade tolerant species that can sprout from a clonal root system or a seed and can survive flood, fire, and drought (picture on page 12). Southern New Hampshire is at the northern edge of the black gum range. The largest black gums on the Reserve (10-14 inches in diameter) are located in the northeast section of the property and extend onto the Aldag conservation easement. This community of red maple and black gum along with highbush blueberry and cinnamon fern could be classified as a **black gum-red maple basin swamp**; this

natural community occurs on acidic, nutrient poor soils that are saturated or seasonally flooded (Sperduto and Nichols, 2012), which describes a chunk of the Rothwell Reserve. The presence of black gum on the Reserve could be an artifact of past land uses, its ability to occupy sites with diverse environmental conditions, and its clonal capabilities. The black gum on the Reserve seemed to be somewhat clustered.

Large, straight white pines (1-2 feet in diameter) are common across the property. Where the elevation dips and the soils become more saturated, a **red maple-red oak-cinnamon fern forest** emerges. As its name suggests, this natural community type is dominated by a mix of red maple and red oak in the canopy. Highbush blueberry is common in the understory and lush stands of cinnamon fern carpet the forest floor.

The shrubs, ferns, and herbaceous plants on the Rothwell Reserve vary depending on whether the microhabitat conditions are dry or moist. At the drier end, the common shrubs include witch-hazel, maple-leaf viburnum, black huckleberry, beaked hazelnut, and lowbush blueberry. Herbaceous plants include wintergreen, partridgeberry, Canada mayflower, starflower, wild sarsaparilla, Indian cucumber-root, trailing arbutus, and bracken fern. Moister sites support goldthread, horsetail, skunk cabbage, sphagnum moss, ferns (sensitive, royal, lady, cinnamon), black elderberry, speckled alder, highbush blueberry, mountain holly, winterberry, sweet pepperbush, northern spicebush, and northern arrowwood. The two most common shrub or understory species on the property are **highbush blueberry** and **witch-hazel**. Various forms of fungi (or mushrooms) are also common throughout the Reserve, most evident after a rainy spell when their fruiting bodies emerge from the soil below.

An interesting wetland shrub community is located in the south-central region of the Reserve, where water flows toward the 15-inch concrete culvert under Route 152 (Map 5, Appendix 1). The overstory is a mix of small trees including red maple and black gum; highbush blueberry, mountain holly, and winterberry comprise the shrub layer. Sphagnum moss, horsetails, skunk cabbage, royal fern, and other wetland-type plants carpet the ground (Map 5, Appendix 1).

Wildlife Observations and Rare Species

A systematic inventory of all plants and animals was not completed as part of this planning effort; however, as a result of my site visits, I was able to document some wildlife and plant species which are listed in Appendix 9. Some of the bird species observed in summer 2014 included broad-winged hawk; ruffed grouse; pileated, downy and hairy woodpeckers; hermit thrush (picture of nest below); ovenbird; pine warbler; blue jay; American goldfinch; white-breasted nuthatch; tufted titmouse; and black-capped chickadee. Signs of deer are plentiful on the Reserve. Tree frogs and wood frogs were observed.

Maintaining an active list of plant and animal sightings is useful in understanding the diversity of the site as well as assessing any changes over time. A visit in winter with fresh snow cover would yield more information about mammal activity. Amphibian searches in spring are most productive, and a more concerted search for turtles during their active nesting season in June might reveal if turtles are crossing the road from the Lamprey River. The Rothwell Reserve would be a great location for a biothon, where professionals and laypeople gather for half a day to record any and all plants and animals discovered.

Statewide Significant Wildlife Habitat and Rare Species

The New Hampshire Natural Heritage Bureau (NHNHB, Bureau) tracks rare species and exemplary natural community locations throughout the state. Although no rare plants or animals or exemplary communities are documented on the Rothwell Reserve according to the NHNHB report (NHNHB 2014, Appendix 8), it is important to note that a detailed search for rare plants and natural communities has not been conducted.

Several rare plants and animals and exemplary communities are known to occur within one mile of the property as noted in the NHNHB Report for the Rothwell Reserve (Appendix 8). These include several species of fish, a freshwater mussel, three uncommon turtles--spotted, wood, and Blanding's--and several plants. Since the Rothwell Reserve is fewer than 50 feet from the Lamprey River, it is quite feasible that turtles, including these species, might cross the road onto the Reserve in search of food, resting sites, or nest sites. In addition, since water flows from the Rothwell Reserve into the Lamprey River via a culvert, the Reserve plays a role in maintaining water quality for riverine life.

Wildlife Habitat Features

Wildlife needs food, water, cover, and space to live and reproduce--collectively known as *habitat.* Each species has unique habitat requirements and the presence of a given species in an area varies depending on the availability of resources within the habitat that they depend on. Wildlife *food resources* include aquatic and upland plants, fruits, seeds and nuts, insects and other animals, and nectar. All wildlife requires *water*, almost daily, yet aquatic organisms clearly depend on it more than upland species. *Cover* provides protection from weather and predators and sites for nesting, resting, travel, and other activities (DeGraaf et al. 2006).

The abundance of food, water, and cover largely determines the wildlife community that occurs in a given area. The ability of wide-ranging animals to move across the landscape—known as wildlife connectivity—is also important. Although the Rothwell Reserve is a small property at just over 13 acres, it is an important piece within the Lamprey River watershed and specifically around Wadleigh Falls, providing connectivity to the river from undeveloped lands to the north.

The diversity and abundance of wildlife species in a given area is often dependent on elements of *habitat structure* such as horizontal and vertical habitat diversity, the presence of cavities, other nest trees, woody debris, and the variety of food resources. These habitat features are described below in the context of the Rothwell Reserve.

Horizontal vegetation diversity

This refers to the horizontal arrangement of different plant communities (including type and age) in a given area. Areas with aquatic habitats and non-forest habitats such as fields, as well as forest, are more horizontally diverse than an area that is just forested. A 100-acre forest that has a mix of tree ages that includes herbaceous openings, young forest, saplings, mature trees, and old trees is more diverse than a 100-acre forest with just sapling and pole-sized trees. A wetland that has concentric rings of open water, emergent marsh, shrub thicket, and tall trees is more horizontally diverse than an open-water pond edged by mowed lawn.

The Rothwell Reserve is entirely forested, so at first glance it would seem to have little horizontal diversity; however, considering the property's small size, it is strikingly diverse in its plant communities as noted above. The saturated soils, slight undulations in topography, and lack of disturbance in recent times have enabled a diverse assemblage of plants to thrive.

Vertical vegetation diversity

Vertical diversity refers to the extent of layering within a forest or other habitat. Layering within a forest includes the arrangement of ground cover (lichens, moss, ferns, herbaceous plants), vines and shrubs, and trees (including sizes and ages). More vertical layers create a greater diversity of habitat, which typically supports more wildlife diversity. These layers provide cover from predators, nest and den sites, foraging surfaces, food sources, shade, and more. Vertebrate wildlife, especially birds, typically respond more to vegetation structure than to the presence of specific plant species. Vertical and horizontal structure that is varied, lush, and "messy" is a boon to wildlife. Forests that lack ground cover, dead wood, shrubs, and understory have fewer wildlife species.

The Rothwell Reserve has a rich understory of plants, especially in the wetter portions, where a thick carpet of cinnamon ferns creates a dense "overstory." Herbaceous plants, other ferns, mosses and fungi grow beneath the ferns. The mid-level supports highbush blueberry and other shrubs along with tree saplings. The tree canopy is a diverse mixture of hardwoods—oaks, red maple, beech, black gum—and softwoods (white pine and hemlock). As described below, cavity trees and fallen trees are present throughout the Reserve.

Cavity trees (live and dead and dying) and other nest trees

More than two-dozen bird and mammal species depend on tree cavities for nesting, roosting, or denning. One species, the brown creeper, nests under the loose bark on standing dead or dying trees and some bats roost beneath loose bark. These species require a range of cavity tree size classes and rely on a mix of dead or partially dead standing trees (called "snags") as well as live trees with cavities. In addition, a mix of softwood and hardwood cavity trees benefits more species.

Woodpeckers, chickadees, and nuthatches are primary excavators (i.e., they make the holes), while others use existing holes. Some species require large trees for nesting. These include broad-winged hawks, northern goshawks, and barred owls. Typically these large woodland hawks and owls require large trees with three-pronged branching where they can build a large stick nest. During my visits to the Reserve, I heard the piercing call of a broad-winged hawk.

Typical cavity tree sizes (in diameter at breast height, dbh) required by various wildlife species are listed below (Bennett 2010). All of these species do occur or are likely to occur on the Rothwell Reserve, as least sometime during the year.

<u>6-8"</u>
black-capped chickadee
downy woodpecker
winter wren
tufted titmouse

<u>6-12"</u>
brown creeper
hairy woodpecker
red-breasted nuthatch
white-breasted nuthatch
northern flying squirrel

<u>12-18"</u>
great-crested flycatcher

<u>>18"</u>
barred owl
fisher
gray squirrel
porcupine
long-tailed weasel
pileated woodpecker

<u>>24"</u>
big brown bat
black bear
gray fox
little brown bat
raccoon

Given past land uses, including logging and farming, many of our forests have a shortage of large, old trees (> 24" dbh). The Rothwell Reserve has not been farmed or logged in many years, so it has retained some large trees including white pine, hemlock, and white oak.

Dead and down woody material

Dead and down woody material (often called "coarse woody debris") on the forest floor is important for many reasons. Woody material in various stages of decay includes logs, stumps, branches, upturned roots, and fallen trees. These provide wildlife habitat, serve as nurse logs for regenerating plants, and contribute to nutrient cycling. As with cavity trees, the larger the fallen log or stump, the greater the biological diversity. Decaying wood supports many insects and other invertebrates which are food sources for shrews, woodpeckers, and black bears. Snakes, fishers, and weasels hunt among the woody debris. Many species, including mice, voles, salamanders, snakes, chipmunks, red squirrels, weasels, and black bears, use coarse woody debris for cover, den sites, or escape areas. The winter wren nests in upturned tree roots. Mosses, fungi, and lichens are often associated with decaying wood. Fallen logs and other woody debris are also important in aquatic environments.

Since the Rothwell Reserve has been left relatively undisturbed for many years, this has allowed natural processes to occur, resulting in the accumulation of standing dead trees, fallen logs, and other coarse woody material that is so beneficial to the forest and its denizens.

Hard and soft mast and other food resources

The availability of food resources for wildlife is a key component of their habitat needs and often varies seasonally. Breeding birds depend on a flush of insects to feed their young nestlings, while later in summer and into fall and winter they switch to berries, nuts, and seeds. Deer, moose, and other browsers rely on herbaceous vegetation during the growing season and woody growth in winter. Other mammals such as coyote, fox, and fisher prey on other animals as well as eating fruits when available. Seeds are favorites of squirrels, nuthatches, mice, and voles.

Fruits, nuts, and seeds from woody plants that are food for wildlife are collectively known as "mast." *Hard mast* includes nuts and seeds which are typically high in fat, carbohydrates, and protein. This food source is both high in energy content and available into the winter. *Soft mast* includes fruits and berries such as cherries, raspberries, blueberries, winterberry, grapes, apples, and the fleshy fruits of other trees, shrubs, and vines. Soft mast is more perishable and is often high in sugar, vitamins, and carbohydrates. These fruits are a source of moisture for wildlife during drought years and are a crucial energy source for some migrating songbirds.

A diversity of trees and shrubs that produce hard and soft mast is important. Different mast species are available at different times of year which is critical to wildlife. Also, some species, such as oak, only produce heavy acorn crops every 3-5 years or more and this varies among oak species. Seed production varies with age as well. For example, peak acorn production for red oak occurs when the trees are 19-22 inches in diameter at breast height (dbh), while white oak acorn production peaks when the trees are bigger, about 26 inches in dbh.

The primary mast species on the Rothwell Reserve are the acorns of red and white oaks and the seeds of white pine, hemlock, and hardwoods (e.g., maples). Pine and hemlock seeds are a boon to squirrels, grouse, chickadees, and grosbeaks. The catkins of birches and alders are used by many birds, especially ruffed grouse. Fruit-bearing shrubs on the Reserve include high and lowbush blueberries, huckleberry,

winterberry, elderberry, and mountain holly. The Rothwell Reserve lacks openings that support herbaceous plants, such as goldenrods, asters, and milkweed that are important seed producers or food for pollinators; however, nearby lands offer plants suited to pollinators and insects important to foraging birds.

Environmental Health

Environmental health, or *ecological integrity*, can be measured in several ways, such as the quality and quantity of surface waters, degree of erosion and runoff, amount of impervious surface, quality of air, and presence of forest pests or invasive species. Some environmental stressors, such as mercury deposition, air pollution, extreme weather events, and climate change, are large in geographic scope and largely outside the influence of land stewardship decisions on individual ownerships.

The Rothwell Reserve appears to be in good health, although I did not test water quality or take soil samples. Given the mostly level ground, the lack of human disturbance and no impervious surfaces, it is not surprising that the Rothwell Reserve shows no signs of erosion or runoff. In addition, the existing footpath is not showing signs of over-use.

Invasive Plants

One issue related to environmental health that I documented was the presence of invasive plants. This is not uncommon for any property in this region. Invasive glossy buckthorn seedlings are scattered throughout the property, likely transported by birds and mammals and perhaps during flood events. The seed source is likely the large berry-producing buckthorns along Route 152 and the Lamprey River corridor. A mix of invasive plants is also growing in the southwest corner of the property. These might have come in on landscaping materials on the abutting property as the variety and density suggests a specific source. Invasive plants in this area include oriental bittersweet, glossy buckthorn, multiflora rose, Norway maple, Japanese barberry, and bush honeysuckle. Invasives, including a stand of Japanese knotweed, are also growing in the right-of-way along Route 152 and along the Lamprey River shoreline (Map 5, Appendix 1).

The State of New Hampshire defines an "invasive species" as "*a naturalized, non-native plant taxon (species, subspecies, variety, form or cultivars) that invades native plant communities and proliferates, out-competes native species, disrupts ecological processes by threatening imperiled species and decreasing biological diversity. In addition, invasive species can also include plants, insects or fungi that cause economic harm to agricultural and forests crops or pose a serious health hazard."* In essence, it is any non-native plant, whose introduction causes or is likely to cause economic or environmental harm or harm to human health (NHDA 2006).

Invasive species typically have certain traits that give them an advantage over most native species. These traits include producing many offspring, early and rapid development, and being adaptable and highly tolerant of many environmental conditions. Studies show that invasives can reduce natural diversity, impact endangered or threatened species, diminish wildlife habitat, affect water quality, stress and reduce forest and crop production, damage personal property, and cause health problems.

Humans and wildlife often unintentionally transport invasive plants. Many were planted purposefully in the past for wildlife, erosion control, or as landscape plantings, before it was commonly known about their invasive qualities. Others came in via international commerce. Many invasive plants appear first in disturbed areas such as along roadsides and trails, in gravel pits, or edges of fields. They can be moved along roadways by plowing, mowing, roadwork, landscaping, as well as by animals.

The NH Department of Agricultural maintains a list of prohibited plant species for the state (see Appendix 10). Seven of the plants on the list—glossy buckthorn, Japanese barberry, multiflora rose, oriental bittersweet, bush honeysuckle, Norway maple, and Japanese knotweed are growing on the Rothwell Reserve or in the right-of-way.

Public Access, Trails, Structures, and Other Cultural Features

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The Rothwell Reserve has no visible structures, old foundations, or stone walls. In the 1960s, this property was part of a larger 29-acre parcel and, thus, part of a larger homestead at one time. Given the extent of saturated soils on the property, it is not surprising that this 13+ acre section was carved out and shows no recent evidence of agriculture, logging, or development. According to the 2006 boundary survey by McEneaney, the northern property boundary is marked by the remnants of an old fence line, although those remnants are not readily visible today.

In a communication to the town, Mr. Rothwell indicated that the property is "classified as a wetland and once had drainage work done many years ago." It is not clear what sort of drainage work was done, but there is evidence of an old, shallow ditch running north-south near the property's eastern boundary. In addition, there is an iron cistern or dug well in the southwest corner of the property (photo right; also see Map 5, Appendix 1). I am not sure of the purpose of this structure, but perhaps it is related to the afore-mentioned drainage work or was installed by NH DOT. The Rothwells researched the feasibility of a building lot, which indicated 3-4 acres of upland in the western section of the property could be used for a house lot, although getting a driveway access across wetlands to Route 152 would have been problematic.

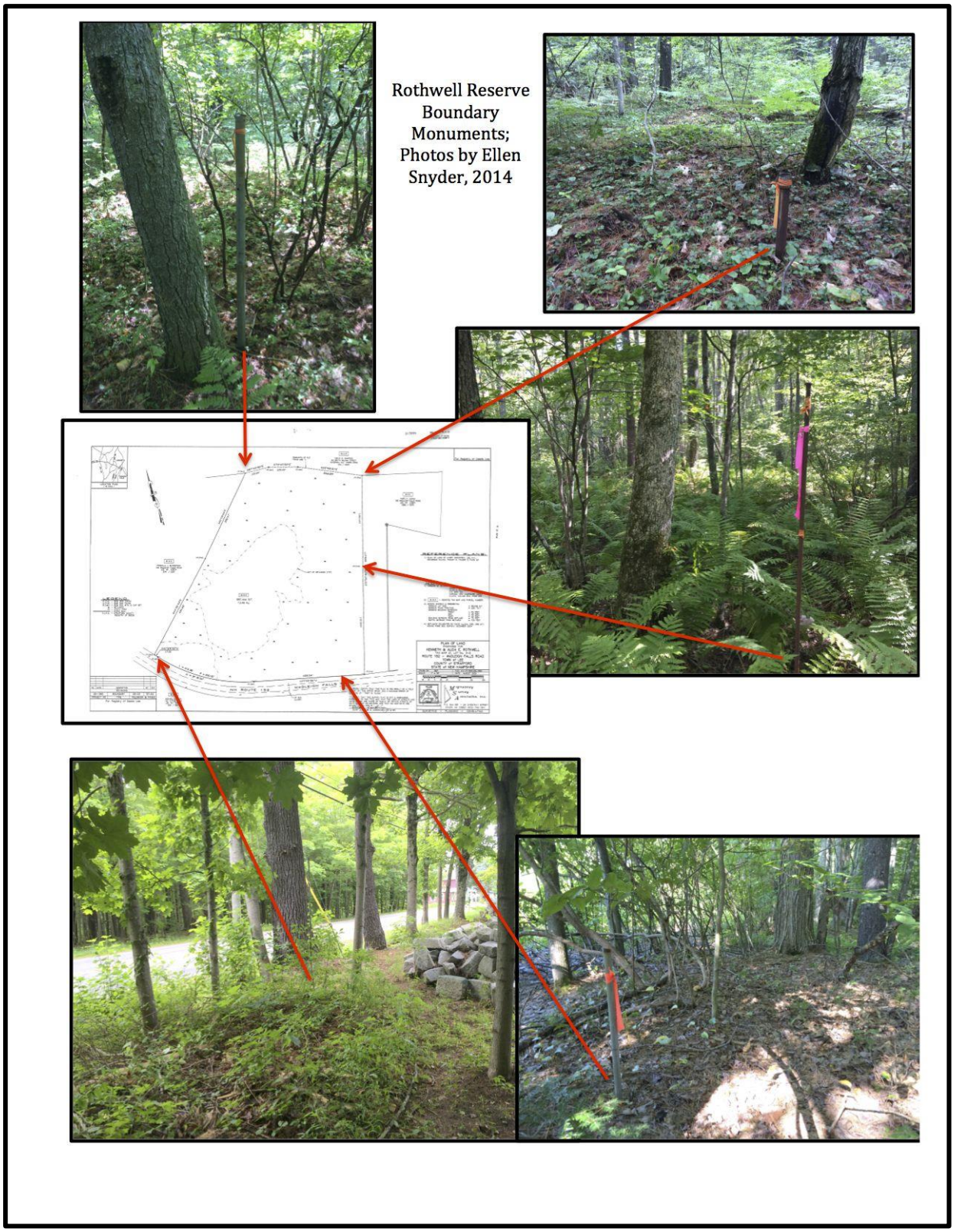
An informal network of trails winds through the undeveloped lands in this part of south Lee, including on the Rothwell Reserve (Map 5, Appendix 1). Given the condition of the trail (a narrow footpath), most users seem to be on foot (or snowshoes or skis), but I sis see evidence of horses. The trail that passes through the Rothwell Reserve begins on Tuttle Road just north of the Aldag property and winds roughly east-west through the northern edge of the Rothwell Reserve, and then continues west onto other private property. The "Rothwell trail" turns south near the property's northwest corner and winds

through the property, eventually emerging at the southwest corner of the property. A series of side trails branch off from this south-north trail segment onto the neighbor's property.

There currently is no other access onto the Rothwell Reserve. The parking area associated with the canoe/kayak launch is close to the Reserve, but traffic on Route 152 tends to be fast and steady, making a crossing somewhat problematic.

Trail through the Rothwell Reserve.

Figure 3. Property boundary monuments for the Rothwell Reserve.



Chapter 4 Land Stewardship Recommendations

Land Stewardship Objectives

The purpose of this Wildlife Habitat and Land Stewardship Plan was to assess the soils, topography, plants, animals, habitats, wetlands, cultural features, environmental health, and landscape setting of the property as a means of guiding the stewardship activities to benefit wildlife and other ecological values and to identify recreational opportunities.

Given the relatively small size of the parcel, the wet soils, proximity to Route 152, the Lamprey River and Wadleigh Falls, and existing ecological features, the following stewardship objectives seem best suited to the Rothwell Reserve:

- Allow natural processes to continue to occur without active management (except to control invasive species or other specific management issues that might arise).

- Provide for additional low-impact recreational opportunities, when and where feasible.

- Encourage use of the Reserve for environmental education and nature interpretation and develop interpretive materials that highlight the property's features and its context within the historically, culturally, and ecologically significant Wadleigh Falls region of south Lee.

Stewardship Recommendations

Property Boundaries and Related Issues

Based on the 2006 Rothwell boundary survey and the 2009 Aldag boundary survey, I created a more accurate polygon of the two properties (the tax parcels were not accurate in relation to the surveys). I also located three of the four corner monuments for the Rothwell Reserve (Figure 3). I was not able to confirm the location of the monument in the southeast corner near Route 152. The only clear boundary is the southern boundary with Route 152. The northern boundary, indicated by remnants of an old fence on the survey, is not evident and I could not locate the iron rods that were apparently set by McEneaney Survey Associates, Inc. in 2006. Along the eastern boundary I located the 6' iron road that is about half way along the boundary with Aldag. Otherwise, there are no obvious identifying features along the eastern or western boundaries.

Recommendations:

- Locate the monument in the southeast corner, during a snow-free, frozen ground period, if possible.

- In collaboration with abutters, locate the respective boundaries during leaf-off and erect small boundary signs indicating Town of Lee Conservation Area.

- Annually walk the property, ideally at different times of the year.

- Plan a volunteer cleanup effort to collect debris that has accumulated in the roadside ditch in spring before vegetation emerges and before spring rains fill the ditch with water.

Trails and Access and Education/Interpretation

The existing footpath on the Rothwell Reserve is part of a larger informal network of trails in this region of Lee. Since the trail passes through other private lands, it seems important to work collaboratively with neighbors to ensure that a "public" trail is okay with them. Given the Reserve's small size and lack of access, it was determined that any new trails would not be feasible or appropriate at this time.

A pedestrian crossing from the boat launch across Rte. 152 to the Rothwell Reserve is also not feasible at this time. Walking across and along the road shoulder requires caution as traffic moves swiftly along this stretch of highway. I spoke with the NH DOT assistant district engineer, Kevin Russell, about a designated road crossing and a small footbridge across the road ditch onto the Rothwell Reserve. NH DOT does work with communities on these types of projects, but I got the impression that they need to conform to certain specifications including the Americans with Disabilities Act (ADA) and the town is responsible for maintenance and liability. Given the small size of the Rothwell Reserve and the often-saturated soils, it is not conducive or feasible at this time to create a formal crossing and bridge access given those constraints.

Recommendations:

- Work with abutters to ensure that the existing trail network is okay with them. Encourage the existing informal "neighborhood" trail maintenance as the trails look to be well-kept and encourage "no wheeled vehicles" given the site characteristics.

- Assess the existing trail on the Rothwell Reserve for need for small bridge crossings in low spots.

- Visit the Rothwell Reserve in winter when the ground is frozen.

- Consider creating a larger interpretive site in the Wadleigh Falls area, perhaps on the east side of the Wadleigh Falls bridge, that describes the historical, cultural, and ecological significance of this area, identifying public spaces and trails and uses. Consider options for ADA accessible sites in this area. Funding is available to assist with such projects. (Contact the NH DOT Bureau of Planning and Community Assistance.) Expanded trail opportunities might be feasible on the Rothwell Reserve if additional lands are conserved with the support of interested landowners.

- Build support for this and other conservation areas by engaging community members and other volunteers in projects such as trail maintenance, roadside cleanup, and invasive plant control.

- Consider hosting a biothon or "bioblitz" where resource professionals and lay people are invited to spend part of a day scouring the property to record all plants and animals (from spiders to mosses to other organisms, large and small) that are encountered. These are fun, educational, and informative events.

- Officially name the site "Rothwell Reserve" to reflect the recent ownership history, its ecological significance, and as a site for nature interpretation and education. In the future, if any additional lands are conserved in this part of Lee, the lands could be collectively known as the Wadleigh Falls Conservation Area (even if they are disjunct). This would also create the opportunity for a larger interpretive program at Wadleigh Falls.

- Encourage local schools, UNH programs, and outdoor environmental education groups to use the Rothwell Reserve as a site for guided field trips to study unique plant communities and their associated wildlife.

Invasive Plant Control

As described earlier, invasive plants are harmful to native plants and animals and degrade natural systems. The recommendations provided here are to help control invasive plants and to prevent further establishment of prohibited plants.

Recommendations:

- Engage volunteers to pull small glossy buckthorn seedlings that are scattered throughout the Rothwell Reserve. These plants can be pulled and hung on nearby trees or shrubs to air dry and die.

- Plan a volunteer workday to clear the cluster of invasive plants growing on the knoll in the southwest corner of the Reserve. Do this in collaboration with the abutter since the landscaping materials on that property might be one of the sources of the invasive plants. Encourage local residents to participate in the workday to raise awareness about invasive plants which easily spread among properties. Some plants need to be bagged and disposed of in a landfill (not composted); these includes bittersweet roots and Japanese knotweed plants. The large Norway maples can be girdled.

- Avoid introducing any non-native, invasive species that are prohibited by the State of New Hampshire (Appendix 10 for this list). For more information on invasive plants: http://www.agriculture.nh.gov/divisions/plant-industry/invasive-plants.htm. If the town plans any new plantings in the Wadleigh Falls area, consider the following native sources:
    - New Hampshire State Forest Nursery (http://www.nhnursery.com/)
    - Wetland Plants Inc. (http://www.newp.com/)
    - New England Wildflower Society (http://www.newenglandwild.org/)
    - Pierson Nurseries, Inc. (www.piersonnurseries.com)

- Work with NH DOT and the Lamprey Rivers Advisory Committee (LRAC) to control invasive plants along Route 152 and the Lamprey River, respectively. Invasive plants growing along this road/river corridor are serving as a large seed source, spreading the plants to other lands.

- Annually or periodically monitor the property for invasive plants; specifically look out for new infestations, especially along trails and boundaries and at access points. Invasive plants are difficult to eradicate once well established. For more information on identifying invasive plant species in New Hampshire, see the following publications and resources at http://www.agriculture.nh.gov/divisions/plant-industry/invasive-plants.htm.

Other Conservation Issues

Recommendations:

- Work with interested landowners in the Wadleigh Falls region of south Lee to conserve other important lands and culturally important sites. This includes the large undeveloped region north of the Rothwell Reserve.

- Pursue permanent protection of the Rothwell Reserve by placing a conservation easement on the property. This could be done as a match for another conservation project. The Rothwell Reserve has the following features that make it worthy of permanent protection:

    - drainage into and close proximity to the Wild & Scenic Lamprey River
    - location within the historically and culturally significant Wadleigh Falls region of south Lee
    - scenic backdrop along Route 152 with 875 feet of frontage
    - part of a large block of undeveloped land that abuts the 13-acre town-held Aldag conservation easement
    - rich diversity of trees including black gum, American chestnut, red and white oak, red maple, sugar maple, hemlock, and white pine
    - lush understory of ground flora and shrub community
    - high percentage of wetland and poorly drained soils (11.8 acres; 88%)
    - "supporting landscape" within the Lower Lamprey River Focus Area and "highest ranked habitat in New Hampshire" according to NH Fish and Game
    - relatively undisturbed for many years, allowing natural processes to occur, resulting in the accumulation of standing dead trees, fallen logs, and other coarse woody material that is so beneficial to the forest and its denizens
    - part of an informal network of neighborhood walking paths
    - a diverse natural ecosystem that provides excellent opportunities for nature interpretation and study for local schools, colleges, and other groups

Summary of Stewardship Recommendations

Land Conservation

- Work with interested landowners in the Wadleigh Falls region of south Lee to conserve other important lands and culturally important sites.
- Pursue permanent protection of the Rothwell Reserve.

Property Boundaries and Related Issues

- Locate the monument in the southeast corner.
- Locate the respective boundaries and erect small boundary signs.
- Annually walk the property, ideally at different times of the year.
- Plan a volunteer trash cleanup effort.

Trails and Access and Education/Interpretation

- Work with abutters to ensure that the existing trail network is okay with them.
- Assess the existing trail on the Rothwell Reserve for need for small bridge crossings in low spots.
- Consider creating a larger interpretive site in the Wadleigh Falls area that describes the historical, cultural, and ecological significance of this area, identifying public spaces and trails and uses.
- Build support for this and other conservation areas by engaging community members and other volunteers in projects such as trail maintenance, roadside cleanup, and invasive plant control.
- Consider hosting a biothon.
- Encourage groups to use the Rothwell Reserve for nature study.

Invasive Plant Control

- Engage volunteers to pull small glossy buckthorn seedlings.
- Plan a volunteer workday to clear invasive plants growing on the knoll.
- Work with NH DOT and the Lamprey Rivers Advisory Committee (LRAC) to control invasive plants along Route 152 and the Lamprey River.
- Monitor the property for invasive plants; specifically look out for new infestations, especially along trails and boundaries and at access points.

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