Doe Farm

Stewardship Plan

Prepared for the
Durham Conservation Commission

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Doe Farm Stewardship Plan

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Acknowledgments

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---Ellen Snyder, Ibis Wildlife Consulting

Chapter 1 Property Description

Location and General Description

The 87-acre Doe Farm conservation area is located in Durham, New Hampshire, about 1.5 miles south on Route 108 from the center of town then 1 mile west on Bennett Road (Map 1). Access to the property is via a small gravel parking area on the south side of Bennett Road, just east of the railroad crossing. The property is named after Olinthus N. Doe who bequeathed the property to the Town of Durham upon his death in 1909. The Doe family cemetery and old cellar hole of the family homestead are located in the center of the property and are maintained by the town (Map 2).

A management access road leads from the parking lot, past a metal gate, to a small clearing that also serves as a log landing during forest management operations. It is kept open through periodic mowing. The clearing is just north of the old cellar hole and cemetery and therefore provides management access to these historic resources as well. Several loop trails branch off from this main woods road. The main trail ends at the shore of the Lamprey River; one trail leads from here northwest along the shore and stops at the railroad tracks near the bridge. Another trail leads to the southeast tip of the mainland. From here, at low water, people can walk across to Moat Island, which has no formal trails.

The property consists of mostly upland forest with a mix of red oak, white pine, and red pine and Norway spruce plantations. Small streams and seepages drain in a southeasterly direction toward the Lamprey River. Pockets of shrub wetlands and floodplain forest are found along the stream drainages and along the Lamprey River.

The property is divided into three segments. An 8-acre triangle of upland comprised mostly of red oak lies west of the railroad track. It has frontage on the Lamprey River, but is otherwise isolated from the rest of Doe Farm by a subdivision to the west and the railroad track to the east. The main section of the property is approximately 68 acres with extensive frontage (about 3,700+ feet) on the Lamprey River or its backwaters. Moat Island is approximately 15 acres and is completely surrounded by the Lamprey River, with over one mile of river frontage. A recorded boundary survey has not been completed for Doe Farm. The Durham Tax Maps identify Doe Farm has Tax Map 18 Lot 1-3.

As a community resource Doe Farm offers many benefits and values to residents and visitors. Tucked between Bennett Road to the north and the Lamprey River to the south, Doe Farm offers beautiful woodland trails that lead down to the river and its backwaters. Walking with and without dogs and x-country skiing are popular trail uses. Scouts help maintain some of the trails and bridges. Moat Island, separated from the mainland during high water, is left as a natural area, with no formal trails. The forests of Doe Farm have been harvested in the past, providing income back into a fund for maintaining the property. A forest management plan was prepared by consulting forester Charlie Moreno in 2001. He supervised a forest thinning on Doe Farm in 2000. The property's extensive river frontage helps maintain the water quality of the Wild & Scenic Lamprey River.

History of Doe Farm

Upon the death of Olinthus N. Doe in 1909, the 87-acre Doe Farm was conveyed to the Town of Durham. In his will dated May 3, 1890, Olinthus Doe stated,

> *"……I give, bequest, and devise unto the Town of Durham, aforesaid in trust for the following purposes and uses to wit:*
>
> *'To forever hold and improve all of said property and never under any circumstances to expend any portion of the principle thereof, and first, out of the net income to use and appropriate so much as shall from time to time be needful, fitting and proper to care for and keep in repair the cemetery or burial place on my homestead farm in said Durham in good and neat condition, including the graves and gravestones in said burial place and in all respects properly protected; and secondly all the rest and remainder of the net income of all my said property shall be applied and expended from year to year forever in the support and maintenance of the common schools in said Town of Durham, and I especially stipulate, order and direct that said Town of Durham shall in no event sell my homestead farm in said Durham'.*

Documents related to this will are included as Appendix A. There is little available information on the management of Doe Farm after the town took over ownership in the early 1900s and up until the mid-1990s. Since it was likely an active farm, the land around the homestead was probably, at least partly, in fields and pastures.

In 1995, a group of University of New Hampshire students, under the guidance of Dr. James Barrett, prepared an "Inventory and Management Plan for the Doe Farm," which was provided to the Durham Conservation Commission. This plan included a property map that delineated four different management compartments. In 2001, consulting forester Charlie Moreno prepared a "Forest Management Plan for Doe Farm," under the auspices of the Trustees of the Trust Fund.

A summary of land management on Doe Farm from the early period to the late 1990s was summarized by Moreno (2001). He reported that in the early 1920s, boy scouts planted thousands of red pine, white pine, and Norway spruce seedlings in the remaining field areas. These plantations are still visible today along the main woods roads and in pockets throughout the property. Moreno (2001) goes on to note that records are sketchy about logging and firewood cutting before 1950. He reported that a timber sale was conducted in the early 1950s with the help of Strafford County Forester, Roger Leighton. UNH forestry and wildlife classes began to use the property for labs and other studies.

In 1972, the UNH Thompson School forest class conducted a logging operation in an old forest stand in the northeast corner of the property (Moreno 2001). It appears that no additional forest management that included logging occurred on Doe Farm until the winter and spring of 2000. Moreno supervised this harvest, which involved thinning about 19 acres in the central portion of the property. According to Moreno (2001), weak and poorly-growing trees were harvested to favor the growth of healthier, more valuable trees and to promote forest regeneration (See Appendix B for the Moreno 2001 Plan and documents related to the 2000 harvest).

The Durham Boy Scout Troup 154 holds an annual camp out at Doe Farm to introduce the newest Boy Scouts to basic camping and outdoor skills. They also repair foot bridges, clear brush from the cellar hole and cemetery, and pick up trash.

Stewardship Responsibilities

State statute vests the authority to manage town-owned lands with the Town Council, unless otherwise delegated or governed by other statutes. The Durham Town Charter under section 4-5.H authorizes the Town Administrator "to superintend, manage and maintain all town facilities and property under his control." The Town Administrator can then delegate management responsibilities to another entity. To my knowledge there has been no official such delegation; however, the Trustees of the Trust Fund manage the trust fund for Doe Farm and have taken the lead over the years on the stewardship of the property.

In 2000, the Trustees hired licensed forester Charlie Moreno to conduct a timber harvest and then to prepare a forest management plan for Doe Farm (see Appendix B). At the time there was some confusion about the role of the Trustees in managing the land versus managing the Trust Fund. The Town Administrator at the time was concerned that a proper process be followed in carrying out management, and in the end seemed impressed with the work of the Trustees with respect to the property (see Appendix C for correspondence).

The Trustees of the Trust Funds administer the Olinthus Doe Trust Fund for the stewardship of this property. Any funds derived from the property are turned over to the Trustees; it is their role to see that the funds are properly invested and that beneficiaries of the Trust receive those funds. The balance in the Doe Trust Fund as of September 2009 was $29,858.45, of which more than $23,000 is the principal. Only the net income can be expended. Any funds received from past or future timber harvests are added to the principal.

The primary role of the Trustees is to ensure that

- The Town of Durham does not sell the homestead farm
- Any net income derived from the property is used first to maintain the cemetery on the homestead; and
- All of the remaining net income be used for the benefit of the schools of the Town of Durham

As mentioned earlier, the boy scouts are very involved in helping maintain trails, bridges, and clean-up of Doe Farm. Cross-country ski enthusiasts maintain and groom trails on Doe Farm in winter. These groomed trails extend onto the abutting farm and onto the Lamprey River (when frozen). The Durham Conservation Commission has not been involved, to date, in stewardship of Doe Farm. With the commissioning of this Stewardship Plan, the Conservation Commission expressed an interest in partnering with the Trustees to engage more in land stewardship.

The Town Council provides funding in the general fund budget for the annual maintenance of town-owned lands including Doe Farm. These funds are requested by the Public Works Department to cover staff time and materials for such activities as winter plowing of the parking area.

Doe Farm is bordered on the west by the Boston-Maine railroad. This corridor is used by both freight and passenger rail service. People also like to walk down this corridor, although this is expressly prohibited by the owners of the rail corridor; access to the tracks is posted against trespassing, with signs posted at several places along the boundary with Doe Farm. It is not within the purview of this Stewardship Plan to address access to or trespass on abutting, private land such as the railroad tracks. One of the actions proposed on page 24, suggests creating a loop trail in the southwest corner of Doe Farm that could help discourage access onto the railroad and bridge.

Purpose of the Stewardship Plan

The goal of this Stewardship Plan is to understand and appreciate the values of Doe Farm and to guide the use and management of these resources over time. This is achieved by identifying the soils, topography, plants, animals, habitats, waters and wetlands, historical features, and public uses that occur on the property. An assessment of the environmental health – the extent of invasive species, water quality, and trail erosion – is included since this can affect management decisions.

The information included in this plan was drawn from field work conducted by the plan preparer, review of previous management plans, particularly the Forest Management Plan by Moreno (2001), discussions with town residents involved with the property, and research of town documents and natural resource plans and resources. The goal of this plan is to build on previous efforts and to create a comprehensive look at the Doe Farm property as an individual town-owned parcel and within the larger context of conserved lands in this region. This Stewardship Plan is a living document that can be amended and updated as new information is gathered and management actions implemented. The text and maps are provided electronically to make this information readily accessible to present and future decision-makers and others interested in this town resource.

The Piscataqua Region Estuaries Partnership (PREP) Community Technical Assistance Program (CTAP) provided a grant to the Town of Durham Conservation Commission to complete this Stewardship Plan. This funding, through PREP, is from the Otto Haas Charitable Trust 2 Fund of the New Hampshire Charitable Foundation**.** This grant, with some additional funding from the Conservation Commission, is supporting the development of stewardship plans on four town-owned properties – Doe Farm, Wagon Hill Farm, Longmarsh Preserve, and Weeks Lot. PREP and the Conservation Commission contracted with Ibis Wildlife Consulting to prepare the Stewardship Plan.

The Stewardship Plan includes the following chapters and materials:

- **Chapter 2 -- Ecological Features** describes the landscape setting, soils, wetlands, habitats, plant communities, and environmental health of Doe Farm.

- **Chapter 3 – Public Access and Uses** describes the trails, allowed and prohibited uses, and other cultural and historic features of the property.

- **Chapter 4 – Stewardship Recommendations** presents potential management actions that can be implemented at Doe Farm to sustain and enhance its ecological features, environmental health, and the public benefits. Some of these actions are a continuation of current management, others include suggested changes to existing management, and some are new actions. Appendix F includes a list of resource people and agencies that can provide further technical assistance or potential grant funding to help implement these actions.

- **A set of maps** is included in the plan to further illustrate the ecological, recreation, and cultural features of Doe Farm.

- **Appendices A-F** provides additional background material and documents associated with Doe Farm**.**

Chapter 2 Ecological Features

Landscape Setting

The Town of Durham lies in the southeastern corner of New Hampshire, in the coastal plain. In this region, land sits just tens of feet above sea level, low, gently rolling hills are the norm, marine sediments are common, and gneiss and schist are the typical bedrock, not granite. The forests of this area lie in a transition zone. To the south grow more oak, hickory, and other southern "Appalachian" species, and to the north and at higher elevations forests begin to shift to northern hardwoods and spruce and fir. Here, at Doe Farm, we find a mix of trees, as we would expect at the southern and northern edges, respectively, of broad forest types.

The town sits on the west side of Great Bay, one of the most significant inland estuaries on the eastern seaboard. Into Great Bay flow seven major rivers – Lamprey, Oyster, Bellamy, Cocheco, Salmon Falls, Winnicut, and Exeter-Squamscot. All of these rivers were dammed at the head of tide in earlier days; some dams, such as the Winnicut, are being removed to restore natural flow. The Lamprey River is the largest watershed and the longest river of the seven that flow into Great Bay. Doe Farm sits along the banks of the Lamprey River, just 1.5 miles upstream of the McCallen Dam in Newmarket. Backwaters formed by the damming of the Lamprey River resulted in extensive river frontage for Doe Farm, including more than one mile of frontage around the shores of the property's Moat Island.

Although not likely thought about by Olinthus Doe when he granted Doe Farm to the town through his will written in 1890, Doe Farm now lies within a larger context of conserved lands that helps protect the water quality, beauty, and other features of the Wild & Scenic Lamprey River (Map 1). Rowing, canoeing, kayaking, and fishing are extremely popular along this stretch of the Lamprey River. Directly across the river from Doe Farm is the 224-acre Lamprey River Preserve owned by The Nature Conservancy. Once slated for a golf course, the conservation of that property adds to the scenic and ecological values of Doe Farm.

The Lamprey River forms the eastern and southern boundary of the Doe Farm town land. A railroad track forms much of the western boundary, with a small 8-acre triangular parcel on the west side of the tracks, adjacent to a subdivision. A working farm abuts Doe Farm to the northeast.

The Lamprey River

After it passes Doe Farm, the Lamprey River flows south into downtown Newmarket before draining into Great Bay. The Lamprey River begins in the Saddleback Mountains of Northwood and meanders 47 miles through eight towns before it reaches the McCallen Dam at the Mills in Newmarket. The Lamprey River drains an increasingly populous watershed of 212 square miles or 135,680 acres.

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, and 1.5 miles upstream of Doe Farm, is the Wiswall Dam in Durham, originally constructed in 1835. This dam has no fish passage creating a barrier to fish movement farther upriver. A third dam at

Wadleigh Falls in Lee has been breached, but under typical flow conditions, its remnants still constitute a barrier.

Boat access to the lower Lamprey River is available at Piscassic Street Boat Launch (also known as Sliding Rock Conservation Area) in Newmarket. Access is off Elm Street via Beech St and Salmon St. The site also has a short nature trail and picnic area. An informal boat access to the Lamprey is located along Route 108 near the rowing club.

Wild and Scenic River Designation
An 11.5-mile segment of the Lamprey River was officially designated as a recreational Wild and Scenic River on November 12, 1996. This designation extended from the southern Lee town line (bordering Epping) through Lee and Durham to the confluence with the Piscassic River in the vicinity of the Durham-Newmarket town line. This includes the stretch that flows past Doe Farm, including Moat Island. A recreational river in the National Wild and Scenic Rivers Program (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. A 12-mile segment of the Lamprey River, from the Lee/Epping town line to the Bunker Pond Dam in Epping, was added to this designation on May 2, 2000, increasing the Wild and Scenic River designation to 23.5 miles. The Lamprey River Advisory Committee, with members from all four towns, has the principle responsibility for development and implementation of a long range River Management Plan and reviews and comments on projects that could impact the river.

Topography and Soils

Doe Farm has a variety of soil types derived from different sources – glacial outwash and till, marine sediments, organic material, and alluvial deposits (see Table 1 and Map 3). This includes a mix of poorly drained soils (Scantic, Swanton, mixed alluvial and freshwater marsh) and well to excessively well-drained soils (Windsor, Hollis-Charlton, and Suncook). Buxton is moderately well-drained, and on Doe Farm tends toward wetter conditions. Approximately 73% of the soils on Doe Farm are well-drained and about 25% are poorly drained. The well-drained, more upland soils tend to be loamier and the wetter, more poorly drained soils tend to have more silt.

Soils are one predictor of the types of vegetation that you would expect to see growing on a given site. For example, on Doe Farm, the poorly drained soils (such as Scantic) and the silt loam soils of marine origin (such as Buxton) support wetland plant communities, including red maple – elm – ladyfern silt forest and red maple – black ash swamp. The well-drained soils support upland forest, such as dry red oak – white forest on Windsor sand soils (Sperduto and Nichols 2004; Sperduto, personal communication, 2009). These relationships are described in more detail under Habitats, Natural Communities, and Forest Cover Types on pages 12-15.

The poorly drained soils are found along the Lamprey River and Moat Island and in a drainage that extends from the northwest corner of the property, and flows southeasterly to the Lamprey River. Some of the trails cross this drainage and in the steeper and lower spots show signs of erosion and compaction from trail use. Many of the soil types found on Doe Farm are considered “farm soils of local importance.” Except for the Hollis-Charlton soils along the northern boundary, which exhibit a lot of rock outcropping, the soils on Doe Farm seem relatively free of stones.

Past and present land uses also have a great influence on the vegetation growing on a site. Sometimes land uses completely change the natural vegetation. This occurred in New England in the 1800s when forests were cleared for agriculture. As farms were abandoned, including Doe Farm, forests began to

reclaim the land. In the case of Doe Farm, some of the land was planted to non-native red pine and Norway spruce. So, today there is a mix of plantations, managed forest, and forests that continue to succeed toward their natural composition of hemlock-beech-oak-pine.

The topography of Doe Farm is gentle, but there is a distinct, although relatively small, drop as you walk south through an "upper terrace" down to a "lower terrace" along the main stem of the Lamprey River. Along the northeastern boundary, a series of small knolls and ridge adds further variety to Doe Farm's topography. This area is also noteworthy for its Hollis-Charlton soils which are very rocky, as evident from lots of exposed rock.

Table 1. Soil types on Doe Farm (from NRCS Strafford County Soil Survey Data, 2001)

Soil #	Soil Name	Acres	Drainage	Parent Material
WdA	Windsor loamy sand, 0-3% slope	33.0	excessively drained; soils of local importance	glacial outwash
HdC	Hollis-Charlton very rocky fine sandy loams, 8 to 15% slope	12.6	well-drained; soils of local importance	glacial till
Sk	Suncook loamy sand	9.0	excessively drained; soils of local importance	alluvial deposits
WdB	Windsor loamy sand, 3-8% slope	8.1	excessively drained; soils of local importance	glacial outwash
MI	Mixed alluvial land, wet	7.3	poorly drained	alluvial deposits
SwA	Swanton fine sandy loam	7.2	poorly drained; soils of local importance	marine
ScA	Scantic silt loam, 0 to 3% slope	5.9	poorly drained; farmland soils of local importance	marine
WfB	Windsor loamy sand, 3-8% slope	2.3	well-drained; prime farm soils	glacial outwash
BzB	Buxton silt loam, 3 to 8% slope	2.0	moderately well-drained; prime farm soils	marine
Fa	Freshwater marsh	1.6	very poorly drained	Organic material
	TOTAL acres	89		

Wildlife Habitats, Natural Communities, and Forest Cover Types

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Wildlife biologists, ecologists, and foresters classify or name assemblages of vegetation that occur together in a particular physical environment. Traditionally each of these professions has used different terminology and features to characterize these plant groups. Wildlife biologists describe different forests, fields, and wetlands as *habitats*. Plant ecologists describe *natural communities* based on the composition of plant species, structure (forest vs. grassland) and site conditions (soils, nutrients, water). Foresters map *forest cover types* based on the dominant tree species.

Each of these terms and methods of classifying plant communities—habitats, natural communities, forest cover types—are useful depending on the scale and purpose of a given management goal or activity. Foresters use cover types since a primary goal is often to manage a certain forest type for forest products or for overall forest health. Wildlife biologists use "habitats" to mean a set of conditions required or used by a given species or set of species. Plant ecologists are often concerned with maintaining or restoring natural biological diversity.

In recent years, many land managers -- biologists, ecologists and foresters -- have begun to integrate all three concepts. For example, mapping of the vegetation on Doe Farm follows a natural community classification. Descriptions of the wildlife associated with each plant community is included along with reference to the forest cover type mapping done by Moreno (2001). This integration has coincided with a shift toward management that restores or mimics natural processes or functions (e.g., disturbances, nutrient cycling, hydrology), and that is guided by natural site capability (e.g., soils, drainage). With this approach a landowner can effectively manage for wildlife, native plant diversity, environmental health, forest products, and recreational uses.

Wetlands and Small Streams

Approximately twenty-five percent of Doe Farm is in some form of wetlands. This includes pockets of shrub and forested wetlands and small streams that flow to the Lamprey River. Several distinct wetland natural communities are identified on Doe Farm: *red maple – elm – ladyfern silt forest, alder – dogwood – arrowwood alluvial thicket*, *red maple – black ash swamp*, and *silver maple – false nettle – sensitive fern floodplain forest*. These natural communities occur on poorly or somewhat poorly drained floodplain soils or silt loam soils of marine origin.

Beaver sign – chewed sticks and vegetation, scent mounds, and pathways – is evident along the shores of the mainland and Moat Island. Mink hunt for small mammals and amphibians among the shrub-dominated wetlands and streams. The northern water snake is also associated with these wetland habitats. Riparian areas – those shrub-dominated zones along major and minor rivers – are critical stop-over areas for migrating songbirds. These habitats often have abundant supplies of fall-bearing fruits and insects that are critical foods for these birds that are continuing on to other locales. Ducks, including mallard, black duck, and wood duck, are often seen along the calm shores of the Lamprey River. Painted turtles, great blue herons, and double-crested cormorants regularly hunt the backwaters.

Red maple - elm - ladyfern silt forest

This forest community occurs on Buxton and Scantic silt loams, intermediate between upland and wetland communities. It has a seasonally high water table and the silty soils have a high water-holding capacity. The dominant tree is red maple with some American elm, white ash, shagbark hickory, white pine, and hemlock. Hop hornbeam, winterberry, northern arrowwood, horsetail, woodferns, and lady fern are in the understory.

Alder - dogwood - arrowwood alluvial thicket

The shrubby wetlands around Moat Island and along the drainages in the main portion of Doe Farm are *alder – dogwood – arrowwood alluvial thickets*. The wetland shrubs include speckled alder, silky dogwood, northern arrowwood, sweet pepperbush, and nannyberry.

Red maple – black ash swamp

A small patch of *red maple – black ash swamp* is found amidst the alluvial thicket in the northwest corner of Doe Farm. Here it is found on Buxton silt loam soils of marine origin. The tree canopy is dominated with red maple, with lesser amount of black ash.

Silver maple - false nettle - sensitive fern floodplain forest

Small patches of silver maple floodplain forest are found at the south end of Moat Island. Although small, these forests are significant since they are relatively uncommon and are in decline regionally due to residential and commercial development on low river terraces. Silver maple forms a tall, arching canopy over other plants that grow beneath such as red maple, silky dogwood, winterberry, sweet pepperbush, and a grass, *Panicum latifolium*. This forest regularly floods and is often inaccessible during high water periods.

Aquatic habitat

The Lamprey River becomes sluggish below the rapids at Packers Falls, which is just upstream of Doe Farm. The main stem and the backwaters around Moat Island are slowed, undoubtedly because of the dam downstream in Newmarket. A study by Sperduto and Crow (1994) documented many aquatic and emergent marsh plants in the shallow waters around Moat Island. They documented extensive populations of wild celery, Robin's pondweed, and water marigold, as well as the rare knotty pondweed. Sperduto and Crow (1994) recorded more than a dozen other aquatic species from around Moat Island.

Upland Forests

Doe Farm has several distinct natural community forest types: *dry red oak – white pine forest*, *dry Appalachian oak forest*, and *hemlock – beech – oak – pine forest*. These forests are found on the well or excessively well drained sand or sandy loam upland soils. Stands and patches of planted red pine and Norway spruce are found scattered among the natural forest types.

Except for the dense stands of Norway spruce, the upland forests have a well-developed understory structure of herbaceous plants (such as wintergreen, partridgeberry, and ferns), shrubs and regenerating trees, and "coarse woody debris" -- fallen branches and trees.

Wildlife that occur on Doe Farm move through and use all three natural community forest types. The mature oak-pine forest habitats produce oak acorns, a valuable fall food source. Nuts, seeds, and fruits from shagbark hickory, white pine, black cherry, birches, and other hardwoods add to the seasonal food supplies. These forests are home to gray squirrel, white-tailed deer, wild turkey, and many songbirds such as scarlet tanager, red-eyed vireo, ovenbird, hairy and downy woodpeckers, white-breasted nuthatch, black-capped chickadee, eastern wood pewee, great-crested flycatcher, blue jay, among others.

The Norway spruce plantations support a high population of red squirrels, which draw in mid-sized predators including fisher and fox. The forest edges around the log landing and Doe foundation attract

indigo bunting, American goldfinch, and ruffed grouse. The mix of softwoods (white pine, hemlock) and hardwoods is important as winter cover for songbirds and habitat for barred owl, black-throated green warbler, brown creeper, and bats. Red-shouldered hawks use the mixed forests along the Lamprey River.

About 19 acres of the upland forest in the central region of Doe Farm was thinned in 2000 (Moreno 2001). The area treated has released a relatively dense understory of glossy buckthorn, an invasive plant species. Buckthorn has done particularly well in areas with heavier (i.e., silt or clay) soils. Future timber harvests will need to consider the impact of existing and expanding buckthorn. This plant creates a dense canopy and shades out native plants, including regenerating tree seedlings.

Dry red oak – white pine forest

This natural community is dominated by red oak and white pine. It is the prominent forest community on the Windsor sand soils of the "upper terrace" and the knolls comprised of Hollis – Charlton very rocky fine sandy loams. These forests are often found on old fields that were once pastured, which may be the case at Doe Farm (Map 4). *Dry red oak – white pine forest* will persist on droughty soils or with recurring fire regimes. In place of fire, forest management can maintain the mix of oak and pine. Without some such disturbance these forests tend to succeed to *hemlock – beech – oak – pine forest* over time. This is evident in some places on Doe Farm, where the shade tolerant American beech is becoming more common in the understory. A few pitch pines grow here. In spring, the forest floor is bright with pink lady's slippers.

The associated mid-story and understory plants in the dry red oak – white pine forest include hop hornbeam or ironwood, lowbush blueberry, black huckleberry, maple-leaved viburnum, beaked hazelnut, and witch hazel. Shagbark hickory, a more southern species, is found scattered among the overstory red oak.

Moreno (2001) described this forest as a white pine cover type, given the prominence of white pine. He estimated much of the white pine at 65-85 years old, with older, better developed white pine growing along the Lamprey River and in the northeastern corner of Doe Farm. As part of the 2000 harvest, Moreno removed poor quality white pine and weak overstory pine to give remaining white pine and red oak more space to grow healthier and better quality. Some of these areas that were thinned, have responded with extensive invasive buckthorn in the understory.

Dry Appalachian oak forest

The southern portion of Moat Island is dominated by red oak, with low abundance of shagbark hickory and white oak. The understory is relatively open, with sparse densities of shrubs and ground cover including lowbush blueberry, beaked hazelnut, and Pennsylvania sedge. Scattered seedlings of beech, white pine, red and white oak are also growing in the undertstory. The north end of Moat Island narrows and supports more white pine and thickets of black huckleberry, winterberry, bracken fern, and sweet pepperbush. The entire Moat Island is relatively free of invasive plant species.

Moreno (2001) classified Moat Island as an upland hardwood cover type, noting the prevalence of red, white, and black oaks and scattered shagbark hickory, black birch, white birch, and American beech. The narrow, north end of Moat Island supports more white pine and is described as a white pine-hardwood cover type. Moreno (2001) recommended that Moat Island be left as an ecological reserve, with no active management.

The 8-acre triangle west of the railroad tracks is also an upland hardwood cover type, and tends toward more droughty soils characteristic of dry Appalachian oak forest. The dominant trees include red, black,

and white oak along with some shagbark hickory and beech. Since there is no access to this site, it was also recommended as an ecological reserve by Moreno (2001).

Hemlock – beech – oak – pine forest

This is a common broad forest community in central and southern New Hampshire. On Doe Farm it occurs on the Swanton fine sandy loam, the Suncook soils of the lower terrace, and in smaller patches on Windsor and other soils. Hemlock is in low abundance, which is typical on more sandy soils. Without disturbance or active management these forests will typically succeed over time to more beech and hemlock. The *dry red oak – white pine* community can also succeed to *hemlock – beech – oak – pine*, especially on the less droughty soils and without disturbance.

The "lower terrace" along the Lamprey River is currently dominated by red oak and white pine, with an advanced understory of beech, and a few hemlock. This, along with the sandy loam soils indicates a trend toward the *hemlock – beech – oak – pine forest* over time. Natural disturbance and forest management can direct it toward more oak and pine.

The forests that border the Lamprey River and its backwaters include a narrow band of shrubs – sweet pepperbush, black huckleberry, maleberry, nannyberry, and blueberry. This shrubby transition between the forest and regularly flooded lower riverbanks probably reflects a combination of the moist, high riverbank setting, occasional flooding, and extra light coming in from the river's edge. The sweet pepperbush is an indication of this property's location in the coastal plan as it does not occur more than 30 miles or so inland from the coast.

Much of the *hemlock – beech – oak – pine forest* is described by Moreno (20012) as white pine cover type. He noted that the forest around the Doe family cemetery and old foundation is a mix of hardwoods and white pine, likely a successional stage that has been repeatedly disturbed to maintain openings around the historic sites. This small patch (about 2.5 acres) is a mix of bigtooth aspen, red maple, American elm, black birch, white birch, white pine, white ash, and some non-native planted cottonwoods.

Norway spruce and red pine plantations

According to Moreno (2001) the plantations of non-native Norway spruce and red pine were planted in the 1920s. A dense stand of Norway spruce was planted along the Lamprey River. This stand, now more than 80 years old, has shaded out all understory shrubs and herbaceous plants, creating an open, monoculture stand of spruce. Nearly a century of fallen spruce needles has created a deep, dense duff layer that further prevents any native plants from taking hold. The Norway spruce plantation extends from the lower terrace uphill to a section of the "upper terrace."

Red pines were planted throughout the western section of Doe Farm, from north of the log landing all the way to the Lamprey River. Patches of planted red pine are also found in the red oak-white pine forest east of the main access road/trail. Moreno (2001) indicated that some of the white pine scattered throughout the red pine stands was also planted. The presence of red oak, American beech, black birch, white pine, and other hardwoods in the understory of the red pine-white pine plantations indicate that over time these areas will succeed to a *red oak – white pine* community type or to the *hemlock – beech – oak – pine forest* community.

Rare Plants and Animals and Exemplary Natural Communities

The New Hampshire Natural Heritage Bureau (NHNHB) finds, tracks, and facilitates the protection of rare plants and exemplary natural communities. They also maintain information on rare wildlife in cooperation with the NH Fish and Game Department (NHFG). Natural Heritage defines a natural community as "recurring assemblages of plants and animals found in particular physical environments." Each type of natural community has a unique set of environmental conditions that support certain species adapted to those conditions. Exemplary natural communities include nearly all examples of rare types and high-quality examples of common types (Sperduto and Nichols 2004).

Landowners can request from the NHNHB a list of known rare species and exemplary natural communities for their property. However, unless a property has been specifically surveyed for rare and exemplary elements, then such a list may be incomplete. There are currently no known records of exemplary natural communities in the Natural Heritage database for Doe Farm. Two rare species are documented for Doe Farm – brook floater (*Alasmidonta varicosa*) and knotty pondweed (*Potamogeton nodosus*). Both species are New Hampshire endangered species and are associated with the Lamprey River (see Appendix D for NHNHB Report).

In addition to the rare species, Doe Farm supports habitat for several wildlife species that are considered as "species of greatest conservation concern" by NHFG and as described in the NH Wildlife Action Plan (WAP) (NHFG 2006). Fish and Game identified 123 wildlife species and 27 habitats in the WAP that deserved special management attention given risks to their populations and/or habitats in New Hampshire. Doe Farm supports several species on this list. The shrub wetlands associated with the Lamprey River may be home to Blanding's and spotted turtles. The large white pines along the river serve as perch sites for bald eagle, osprey, and great blue heron. Migrating black ducks use the Lamprey River. Palm warblers stop over during migration in the upland shrub and forest habitats along the river. The forests along the Lamprey River offer nesting and foraging areas for red-shouldered hawk.

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, presence of forest pests or invasive species, presence of native species and associated habitat elements. 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 environmental health of Doe Farm is relatively good, although some stresses including invasive plants should be addressed. The property remains undeveloped with no impervious surfaces. The extensive undeveloped river frontage on Doe Farm and several nearby properties is unique and critical to protecting water quality.

The two impacts to environmental health on Doe Farm are some soil compaction and erosion from trails and unauthorized camping and campfires, and the presence of invasive plant species that degrades native habitats. In general though, Doe Farm's long history under town stewardship has helped to protect the health of the uplands, wetlands, and aquatic habitats.

Soil Compaction and Erosion

Much of the trail network on Doe Farm is underlain by well-drained sandy or sandy loam soils. A bed of needles and leaves provides a soft trail underfoot. The lack of stones in these soil types also helps maintain nice trails in good condition. A few places are showing signs of compaction and erosion, generally where trails cross wetland or seepage areas. As the main trail descends to the lower terrace, the trail has compacted, eroded, and exposed tree roots. At the bottom of the slope, a series of logs provides an unsteady crossing of the wetland drainage.

The trails that parallel the Lamprey River show some signs of erosion. Beavers actively use the shorefront; some of their trails are further widened through use by people and/or their dogs. This is not yet a serious problem, but should be monitored over time. As the loop trail on the lower terrace loops back to the main trail it passes a low seepage area, that likely will require some sort of boardwalk or bog bridge to prevent further compaction, and to provide a drier passage for pedestrians walking this trail. A similar situation is found along the loop in the upper terrace as it loops back to the main trail.

Although camping and campfires are not allowed on Doe Farm, several “permanent” campfires are located on the property. The Boy Scouts are permitted to camp annually on Doe Farm. Presumably the Scouts remove any sign of their camp, which is consistent with “Leave No Trace” camping ethics. A major campfire is located in the northeast corner of Doe Farm in a large clearing overlooking the Lamprey River backwaters. Several smaller campfires are located on Moat Island – one at the south end accessible from the main stem and one along the island where it narrows. The latter two are obviously accessed by boats. Some trash is evident at both of these sites on Moat Island.

The recommendations in Chapter 4 address improvements to trails and camping and campfires.

Invasive Plant Species

An "invasive species" is defined as a species that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (National Invasive Species Council 2001). One report estimates the economic cost of invasive species in the U.S. at $137 billion every year (Pimentel et al. 2000). Up to 46% of the plants and animals federally listed as endangered species have been negatively impacted by invasive species (Wilcove et al. 1998, National Invasive Species Council 2001).

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. Such traits give them an edge over native species. 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.

The New Hampshire Invasive Species Act states that *“no person shall knowingly collect, transport, sell, distribute, propagate or transplant any living or viable portion of any listed prohibited invasive plant species including all of their cultivars, varieties, and specified hybrids.”* Appendix C includes the list of prohibited species referenced in this Act. For more information on New Hampshire’s invasive species program see http://www.nh.gov/agric/divisions/plant_industry/plants_insects.htm and http://www.nh.gov/agric/divisions/plant_industry/documents/booklet.pdf.

Invasive plant species are transported by humans and wildlife; many were planted purposefully in the past for wildlife, erosion control, or as landscape plantings. 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 or other roadwork.

Doe Farm has several invasive plant species (see Table 2). The most common invasive plant on the property is glossy buckthorn. It occurs prominently in the strip of forest that parallels the management access road/trail extending all the past the Doe cemetery. Buckthorn is growing in dense stands in the red pine/white pine plantations and around the Doe cemetery and homestead foundation; perhaps aided by the light created as a result of the forest thinning in 2000. Buckthorn is also scattered in the understory of the other forests, especially those on silty, heavy soils.

The other invasive plants listed in Table 2 are scattered throughout the property. A small stand of Japanese barberry is growing alongside the main trail where it descends to the lower terrace.

Table 2. Invasive plant species on Doe Farm.

Common Name	Scientific Name
Autumn olive	*Elaeagnus umbellate*
Burning bush	*Euonymous alatus*
Bush honeysuckles	*Lonicera spp.*
Common barberry	*Berberis vulgaris*
Common buckthorn	*Rhamnus cathartica*
Glossy buckthorn	*Frangula alnus*
Japanese barberry	*Berberis thunbergii*
Multiflora rose	*Rosa multiflora*
Oriental bittersweet	*Celastrus orbiculata*

Wildlife Habitat Features

Wildlife need food, water, cover, and space to live and reproduce--collectively known as their *habitat.* Each species has unique habitat requirements, and the presence of a given species in an area varies depending on the availability of the habitat features that they depend on. Wildlife food resources include aquatic and upland plants, fruits, seeds and nuts, insects and other animals, and nectar. All wildlife require 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. The juxtaposition of food, water, and cover determines the wildlife community that occurs in a given area.

An area with many different kinds of food, water, and cover typically supports a greater diversity of wildlife. This reflects *habitat structure*, an important concept in understanding the distribution and abundance of wildlife. Habitat structure is measured in several ways:

- *Horizontal vegetation diversity*—Much of Doe Farm is upland oak-pine forest. The pockets of shrub and forested wetlands and stream drainages, floodplain forest, bands of shrubs in the riparian area along the Lamprey River, and the small log landing provide more horizontal diversity.

- *Vertical vegetation diversity*—the extent of layering within a forest or other habitat. Layering within a forest includes ground cover (fungi, mosses, ferns, woodland wildflowers), vines and shrubs, and trees (including sizes and ages). The town has owned Doe Farm for 100 years, a long time for the once cleared lands to succeed to forest and develop a new forest structure with lots of fallen, dead wood, a diversity of ferns that colonize quickly through wind-dispersed spores, and

shrub layers. Forest management, including the thinning in 2000, created sunlit openings allowing a flush of new growth. All of these contribute to a relatively high vertical diversity at Doe Farm.

- *Food resources*—this often varies seasonally and includes insects, berries, nuts, seeds, nectar, other animals. The extensive oak and pine forests offer a ready supply of acorns, hickory nuts, cones, and other seeds. The shrub community includes berry-producing dogwoods, winterberry, blueberries, viburnums. Insects are plentiful in the sunny openings. The diverse emergent and aquatic vegetation provides habitat for a diverse invertebrate community, which is food for ducks, fish, turtles, and other aquatic creatures.

- *Cavity and other nest trees*—nearly two dozen birds and mammals depend on tree cavities for nesting, roosting, or denning, such as bats, woodpeckers, chickadees, nuthatches, squirrels, raccoons. These species rely on a range of cavity tree sizes and on a mix of dead or partially dead standing trees (called "snags") as well as live trees with cavities. Doe Farm has a good supply of large dead or dying cavity trees, a result of the long ownership by the town that did not involve heavy extraction of forest products. Over time additional cavity trees will be created through natural processes, except for trees removed for human safety or through logging or other management.

- *Dead and down woody material*—also called "coarse woody debris," this includes fallen logs and trees, stumps, and upturned roots in various stages of decay on the forest floor. This material provides homes for salamanders, snakes and invertebrates, hiding or hunting grounds for mice, voles, chipmunks, squirrels, coyotes, foxes and weasels, and nutrients for lichens, fungi, and other plants. Similar to cavity trees as noted above, coarse woody debris is in relatively good supply, compared to many other properties. Fallen wood is important to wildlife and for nutrient cycling and should be left on the forest floor and in the water.

These habitat features are also a measure of ecological integrity as their presence contributes to the overall biological diversity of a place. For example, dead and dying trees and fallen logs are not only important to wildlife, but are critical components of nutrient cycling and serve as *nurse logs* for regenerating plants. In contrast, the presence of invasive shrubs is detrimental to wildlife and also degrades natural communities by out-competing native plants. Overall, Doe Farm appears to have a great diversity of habitat structure important to wildlife.

Chapter 3 Public Access and Uses and Other Resources

Doe Farm is easily accessible off of Bennett Road. A gate blocks vehicle access onto the property beyond the parking area. A main management woods road/trail starts here and parallels the railroad track as it leads south toward the Lamprey River. Several pedestrian loop trails spin off from the main trail.

Access and Parking

As noted, Doe Farm is easily accessible off Bennett Road. The small, gravel parking lot, suitable for up to 6-8 cars is maintained by the town and plowed in winter. The gravel entrance off of Bennett Road can be a bit slippery in winter and other icy conditions. The parking area is adjacent to the Boston and Maine Railroad, which is posted “no Trespassing.”

Trails

From the parking area, visitors walk past an iron gate that blocks vehicle access onto the property. This gate is opened for management purposes and for other permitted activities. The main trail parallels the railroad track for approximately 1,500 feet, before turning southeast and continuing another 575 feet to a small clearing that also serves as a log landing during timber harvests.

The Doe family homestead is just beyond the clearing, off to the left of the main trail. A few feet farther along sits the Doe cemetery, also on the left side of the main trail. The woods trail continues south to the main stem of the Lamprey River. Between the cemetery and the main stem, the trail descends from the upper terrace to the lower terrace. At this transition, the trail is compacted and eroding, and is in need of a bridge where it crosses a wetland drainage at the base of the slope.

Several loop trails branch off from the main woods road/trail. One trail loops east around the upper terrace, another trail loops east around the lower terrace. Along the Lamprey River, a spur trail follows the shore west and dead ends at the railroad tracks. Although prohibited by the Boston-Maine Railroad, people climb up the slope to the railroad bridge. This side trail should be discouraged and an alternative trail created that loops back through the property to the main woods road.

In the northeast corner of the property the boy scouts have re-built a bridge across a wetland drainage. This trail leads to one of the “permanent” camping spots including a camp fire ring of stones. In this corner of the property a couple trails head northerly and continue onto the abutting properties. These two trails appeared to be used primarily in winter for cross-country skiing. They currently do not form a loop on Doe Farm.

Public Uses

The most popular activities at Doe Farm appear to be walking (especially with dogs), nature observation, and x-country skiing. Mountain bikers and horseback riders also use the property, but to a much lesser extent. Doe Farm is used by boy scouts and by some University of New Hampshire programs.

Doe Farm is also visited from shore; kayakers, canoeists, and other boaters land at several places, sometimes for a picnic lunch. Doe Farm is free of unauthorized motorized vehicle traffic, likely due to the lack of access given the river, railroad track, gate, and abutting properties.

As with other town lands, Doe Farm is open from dawn to dusk. Camping, campfires, and hunting are not permitted, although some unauthorized camping and campfires is evident, particularly on Moat Island. Some trash is also associated with these sites. The Boy Scout Troop 154 holds an annual camp-out at Doe Farm, under a special use permit. The goal of these trips is to introduce the newest boy scouts to basic camping and outdoor skills. The last camp-out in May 2009 attracted 21 scouts and several adult leaders and parents. The scouts practice setting up a camp, map & compass skills, knot tying, fire building, outdoor cooking, and safe knife, hatchet and axe use. During these camp-outs the scouts repair foot-bridges, clear the Doe cemetery and foundation of brush, and pick up trash.

Historical Resources

As noted earlier in this Stewardship Plan, Olinthus Doe donated this property to the town, with the stipulations that it not be sold and that the town *"….care for and keep in repair the cemetery or burial place on my homestead farm in said Durham in good and neat condition, including the graves and gravestones in said burial place and in all respects properly protected…"*

There are two prominent historic features associated with the Doe family. The Doe family cemetery, with gravestones that date to the early 1800s, is surrounded by an iron fence. The foundation of the Doe family homestead sits just north of the cemetery. The Doe will states that the cemetery is to be kept in a good and neat condition, which the town certainly maintains. There is no specific reference in this will to maintaining the foundation, although it is an important companion to the cemetery.

Surprisingly few stone walls are located within Doe Farm, an indication of the fine soils located here. To my knowledge there are no other known historical resources on this property.

Chapter 4 Stewardship Recommendations

As a community resource Doe Farm offers many benefits and values including scenic beauty, walking trails, wildlife habitat, protection of the Lamprey River, public space for nature observation, historic features, among others. In addition to the directive by Olinthus Doe for the town to maintain the family cemetery, the will states, "…*To forever hold and improve all of said property*…." This offers a clear opportunity for the town to actively steward Doe Farm.

The will of Olinthus Doe also established the Doe Farm Trust Fund, which is administered by the Trustees for the Trust Funds. Olinthus stated that the town can never spend any of the principal, only the net income. However, other funds could be used to help with stewardship of Doe Farm if needed. Conservation funds, grants, volunteer labor are all potential sources of funds or help that could augment the trust fund expenditures. Certainly volunteer activities by the boy scouts have been important to Doe Farm.

The stewardship of a community resource such as Doe Farm is a long-term commitment by dedicated community members working together. The following stewardship recommendations were developed by conducting site assessments in summer 2009; reviewing historic documents and previous management plans, consulting with ecologists, and discussions with town decision-makers. The recommendations are not exhaustive but represent the author's ideas for the most significant actions for the town to consider, given the existing site conditions and the capacity of the resources to provide the desired benefits.

Several of the recommended action items suggest further consultation with or assistance from other resource professionals and agencies or organizations. A detailed list of resource contacts is included as Appendix F.

General Stewardship

- **Boundary Survey and Monitoring**

  Much of Doe Farm is bounded by the railroad track, Lamprey River, a stone wall, and barbed wire; although some stretches have no such clear boundaries. A boundary survey was never completed and recorded for Doe Farm. Although much of the Doe Farm boundary is discernable by natural or cultural features, a recorded survey offers an accurate determination of the acreage and provides a permanent record of the property boundaries.

  ***Action*:** Hire a licensed surveyor to complete and record boundary survey for Doe Farm

  ***Action*:** Annually or periodically walk the entire boundary to re-affirm boundaries and assess conditions. This includes shoreline conditions, unauthorized camping and campfires, and any boundary encroachments.

  ***Action*:** Place small metal signs along the property boundary (on trees) indicating "Durham Public Land" or "Durham Conservation Land" or whatever is appropriate.

- **Land Stewardship**

  As the administrator of the Doe Farm Trust Fund, the Trustees of the Trust Fund also took on the role as land stewards for Doe Farm. They have worked closely with the Public Works Director and boy scouts, and contracted with a licensed forester to implement a harvest and prepare a management plan. Given that the will of Olinthus Doe did not specify how or who should assume this role, it is admirable that the Trustees took on the responsibility.

  To my knowledge, the Conservation Commission has not been involved in stewardship of Doe Farm. As with all Conservation Commissions in New Hampshire, the Durham Conservation Commission can serve an important role in the stewardship of town-owned lands. Numerous educational programs, workshops, conferences, and publications on land stewardship are made available to Conservation Commissions throughout the state. Some deeds transferring land to town ownership specifically indicate that the Conservation Commission is the responsible town entity for that parcel. An example is the Longmarsh Preserve that was acquired with conservation funds.

  Other lands, not specifically acquired with conservation funds, can still be managed by the Conservation Commission, if given this directive by the Town Council and/or Town Administrator. There is some benefit to having the conservation entity in town at least involved in the stewardship decisions on town lands, especially lands that have a conservation purpose. I would suggest this includes Doe Farm, Wagon Hill, the tract that includes the transfer station, and perhaps others. A critical part of acquiring and conserving lands is the follow-on responsibility of long-term stewardship. The Conservation Commission has funds that can be used to assist with stewardship and often has members with land stewardship experience.

  One of the great resources of Durham is the excellent work of the Public Works Department that works tirelessly with all town boards and spends time and resources to help manage town-owned lands. Land stewardship often involves working with many different community groups and individuals, but also many other resource agencies, funders, and other cooperators. The Conservation Commission could assist with this networking by serving as a key lead on stewardship of town lands. For example, Charlie Moreno prepared a forest management plan for Doe Farm, which calls for another harvest in about 2015. It is possible that Charlie could be contacted by three different entities in Durham to help manage three different town-owned parcels, if the town desires a harvest on these other lands as well. It might be more efficient and cost-effective for the consultant, and result in more consistent long-term stewardship, if there was one point of contact. The Conservation Commission could serve this role.

  These recommendations do not imply in any way that land stewardship to date has been sub-par. Rather the Conservation Commission has expressed an interest in helping create and implement land stewardship plans for town-owned lands that have conservation purposes. This creates a great opportunity to share ideas, resources, and expertise among the various boards and committees about land stewardship.

  Action: At the Conservation Commission discuss the use of some conservation funds for implementing land stewardship

  Action**:** Consider a joint meeting between the Conservation Commission and the Trustees of the Trust Fund to discuss opportunities for collaborating on land stewardship at Doe Farm. Include the Parks and Recreation Committee in this and related discussions as they have an interest in and are involved in trails.

***Action*:** Discuss with the Town Council the opportunity for an expanded role for the Conservation Commission in land stewardship of town-owned lands with conservation purposes. Identify which lands have a "conservation purpose" – this includes conservation (and therefore stewardship) of habitats, historic resources, water, forests, trails, etc.

Managing Public Uses

- **Trail Improvements**

Doe Farm has a wonderful network of pedestrian trails that are interesting in all seasons. The trails pass by the historic Doe foundation and cemetery, lead down and along the shores of the Wild & Scenic Lamprey River, and meander through beautiful forests of red oak and white pine.

The boy scouts have been of great service by maintaining foot bridges and generally maintaining a clean trail network. There are places along this trail network that need some improvements to prevent further compaction and erosion and to provide a safer, more enjoyable passage down a slope and across some low, wet spots. To ensure the best possible solution to the steep passage and wetland crossing, I would encourage the town to take advantage of a free consultation offered by the Appalachian Mountain Club (AMC). The AMC is experienced at designing, building, and maintaining trails. They offer a free consultation (and follow-up fee services if desired) to landowners and are especially helpful with trail design, including location and materials. The AMC built a bridge over a wetland on the new Sweet Trail that runs from Durham to Newmarket.

Action: Consult with AMC on the best design for improving the main trail where it descends to the lower terrace and crosses the stream drainage. Also consider hiring them to design and install the structure, if appropriate.

***Action*:** During the consult on the main trail, ask AMC how to improve the two wet spots on the loop trails on the lower and upper terraces. This will likely require some sort of bog-bridge or boardwalk. The boy scouts recently installed a new hefty bridge across a wetland. I would encourage the scouts to participate in any consult with AMC as it would be a great educational "workshop" on trail and bridge design.

***Action*:** Close the "trail" in the southwest corner near the Lamprey River that is used by people to reach the railroad bridge. As access onto the railroad tracks is considered trespass, discouraging people from traversing that slope is in the best interests of the town. Place brush along the slope and create a new loop trail that re-directs people back through the property to the main trail.

***Action*:** Consider connecting the two trails in the northeast corner of the property that currently lead onto an abutter's property. These trails are used most often in winter by x-country skiers. The connector would cross a few streams and would therefore require a bridge or two. Ask AMC to look at this connector as well before laying out the route.

Action: Continue to leave Moat Island without any formal trails. Evaluate whether town wants to create formal landing spots for boaters to have a picnic lunch, or leave as informal.

Action: Continue to monitor impact of trails along riparian areas; modify or re-locate trail inland as needed to protect shoreline and riparian vegetation.

Action: Once trail routes are updated and finalized, create a new trails map for proposed kiosk, town website, and other materials.

- **Camping and Campfires**

  As on other town properties, camping and campfires are prohibited on Doe Farm. The one exception, to my knowledge, is the boy scouts, which are permitted to hold their annual camp-out. Camping is a great outdoor activity and the boy scouts teach many important outdoor skills. Given that camping is otherwise prohibited, the town may want to develop a set of criteria to evaluate when and where camping is allowed on Doe Farm (and perhaps other town properties). There may be other groups that would like to also have a camp-out for educational or civic purposes. I am not sure how the town handles other such requests. Since the town does allow some camping, it should develop some criteria to evaluate potential impacts of camping, camp fires, and related activities.

  Doe Farm lies on the shores of the Wild & Scenic Lamprey River, an attractive draw for any would-be camper. This inevitably leads to unauthorized camping and campfire rings, especially on Moat Island. If the town wants to continue to prohibit camping and campfires it may need to consider more pro-active steps such as signage, more regular remove of campfire rings, etc.

  Action: Survey all the existing authorized and unauthorized camp sites and fire rings. Remove and eliminate all signs of unauthorized camp sites and fire. Periodically check for and remove as necessary.

  Action: Develop a set of criteria for when and where camping is allowed. Considerations might include dealing with human sanitation and waste disposal, risks from campfires, effects of collecting wood for fires, compaction and erosion. Ensure that any signs of camping and campfires are removed at the end of each permitted camping session.

Habitat and Forest Management

- **Invasive Species Management**

  Non-native invasive plant species thrive in disturbed areas. Exposed soils offer prime sites for invasive species to colonize and spread. Trails, forest edges, and recently thinned forest stands are often places where invasive plants first establish, either dispersed by animals and wind or carried unintentionally by people, pets, or vehicles. Invasive species are one of the major threats to the integrity of natural communities, second only to direct habitat loss.

  Control and removal of invasive plant species is one of the most difficult management challenges and requires collaborating with others on technical and financial support. Mechanical, chemical, and biological techniques are effective depending on the specific invasive plant. The use of chemicals to control invasive plants requires a pesticide applicators license and requires careful consideration, especially in wetlands. Physical removal can be effective, but usually requires repeated cuttings. Volunteers are often eager to help with the latter.

  Doe Farm has a spreading understory stand of glossy buckthorn that is most prevalent along the main trail and in the forest stands that were thinned in 2000. Small patches or individual stems of other invasive plants are less menacing, but require attention and monitoring so that they do not spread. Repeated cuttings by volunteers might be a feasible option for controlling some of the invasive plants.

This should be pursued as a primary goal, especially prior to any future forest harvest in 2015 or thereafter.

Eleven state and federal agencies and nonprofit organizations formed an alliance called the Coastal Watershed Invasive Plant Partnership to work collaboratively on invasive species control. The mission is *to protect the ecological integrity of natural habitats and economic vitality of managed lands in New Hampshire's coastal watershed through activities that reduce the threat of invasive plants*. As part of their effort they have developed methods for mapping the distribution of invasive plants on their respective lands. For more information see http://des.nh.gov/organization/divisions/water/wmb/coastal/cwipp/index.htm

For more information on identifying invasive plant species in New Hampshire see the following publications and resources at http://extension.unh.edu/forestry/Docs/invasive.pdf; http://www.nashuarpc.org/envplanning/documents/SoRLAC/invasiveplants.pdf, and http://nbii-nin.ciesin.columbia.edu/ipane/index.htm

Action: Host a workshop for volunteers at Doe Farm on invasive plant identification and control. Contact UNH Cooperative Extension for assistance in arranging such a workshop – they have access to experts who can lead such a workshop.

Action: Engage the boy scouts in assisting with physical removal of invasive plant species. Given the propensity of these species to spread, proper removal and disposal is essential. Plants should be bagged and disposed of in landfills or burned and should not be cut or moved while they are fruiting.

Action: Contact UNH Natural Resources Department to see if a student project could include mapping with GPS the extent of invasive species on Doe Farm. This could be used as a baseline to track future control efforts.

Action: Avoid introducing any non-native species onto Doe Farm when possible. Several local or regional sources of native plants are available if plantings are needed for any future restoration. Consult the New Hampshire State Forest Nursery (http://www.dred.state.nh.us/nhnursery/), New England Wildflower Society (http://www.newfs.org/), New England Wetland Plants Inc (http://www.newp.com/), or other sources of native plants.

- **Forest Management**

Charlie Moreno, a licensed consulting forester, prepared a simple forest management plan for Doe Farm in 2001, following a harvest in 2000 to thin and reinvigorate the forests. Forest management as a sub-set of overall land stewardship is also a long-term commitment. As Charlie described in his plan, the next harvest is timed for about 2015, with scheduled harvests at specified intervals thereafter.

I concur with most of Charlie's recommendations. I think he, or any other forester, will find the information in this Stewardship Plan helpful in refining any future harvests on Doe Farm. Based on this current work, I would recommend a few slight modifications or perhaps additional considerations to the forest management planning:

  - Evaluate the presence of invasive glossy buckthorn in the understory and determine how to minimize its impact following future harvests

- Given the ability of invasive shrubs to rapidly colonize an area, especially sites with silty or heavier soils, I would avoid harvesting in any of the natural community types on poorly drained soils in the northwest corner of Doe Farm, on the east side of the main woods road/trail.

- Consider the removal of more of the non-native red pine and the Norway spruce in the upper terrace. Although I recommend over time that all the Norway spruce and red pine be gradually replaced with native species, I am concerned about the removal of the spruce on the lower terrace in the southwest corner along the Lamprey River. Since there is no regeneration or understory growth, any tree removal may simply provide sites for invasive plants to take hold.

- As specified in Moreno (2001) leave Moat Island and the 8-acre triangle west of the railroad track as unmanaged natural areas.

- Follow the Moreno (2001) for wildlife habitat recommendations, including leaving old trees, continue to diversify forest structure, promote a mix of native tree species, and retain mature nut-producing oaks and hickories. I would deviate from his recommendations, by removing more Norway spruce and red pine, with a shift over time toward native species. And as mentioned above, avoid cutting in wetland areas to prevent invasion by non-native shrubs and trees.

- Leave a 50-foot no-cut zone along the main stem and the backwaters of the Lamprey River. Outside this zone, follow Moreno's (2001) silvicultural practices. Maintain a minimal harvest buffer along and around all stream drainages and wetlands (see above regarding invasive plants in wetlands).

***Action*:** A new version of *Good Forestry in the Granite State* will be published in 2010 and should be consulted prior to future timber harvests.

***Action*:** Continue to work with consulting forester, Charlie Moreno, on implementing future timber harvests according to his 2001 forest management plan, with consideration of the suggestions presented here.

Action: Consider clearing more of the forest around the Doe foundation and cemetery to create a more open condition and provide greater visibility to these sites from the main trail. This would help control the extensive glossy buckthorn population around these sites. This could be done in conjunction with a future timber harvest and adding interpretive information about the Doe family and history of the site.

Education and Interpretation

The management actions proposed in this Stewardship Plan are more likely to succeed if the community is made aware of and given the ability to help with implementation. The town has created and erected nice signs on all of its town-owned lands. This provides a consistency between all the town properties. Some parcels also have a kiosk for posting educational information, maps, and other pertinent information. A kiosk at Doe Farm would help inform visitors about the property, its history and ecology, and the stewardship of its resources. Information about Doe Farm can also be shared on the town website.

Action: On the Town of Durham website, add folders for each of the town-owned properties. For each property include a trail map, property description, history of acquisition, site-specific rules, and related documents such as management plans, and photos. The more information that people have about a property, the better they are able to help with its stewardship.

Action: Erect an informational kiosk at the entrance to Doe Farm, somewhere near the gate. Include a trail map, rules, description of the habitats and any ongoing management, history of the property.

Action: Consider erecting a sign at the south end of Moat Island at the site of a camping/camp fire. The sign should explain the rules for this site and ask people to carry-out what they carry-in.

Action: Collaborate with The Nature Conservancy, owners of the 224-acre tract across the river, on potential joint educational materials and programs.

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