Natural Resource Management Plan

Piscassic River-Loiselle Conservation Area

Wadleigh Falls Road
Newmarket, New Hampshire

Prepared For

Town of Newmarket
186 Main Street
Newmarket, NH 03857

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NATURAL RESOURCE MANAGEMENT PLAN
Piscassic River-Loiselle Conservation Area

Prepared by NH Soil Consultants 2003
(This is the text only. A full copy of the management plan is at the Newmarket Town Hall

PROPERTY DESCRIPTION

The Piscassic River-Loiselle Conservation Area was acquired by the Town of Newmarket in July 2003, from the Loiselle family. The property is located on Route 152 in Newmarket, New Hampshire and is identified as Tax Map R-5, Lot 91 on town tax maps. The site encompasses 47.3 acres and borders approximately 1900 feet of the Piscassic River (see attached survey plan prepared by Doucet Survey, Inc.). Significantly, this property contains town-designated Prime Wetlands and falls entirely within the Town of Newmarket's municipal source water protection area. A portion of the site is also located within a town wellhead protection area.

An active hay field is located in the southern portion of the property and this field is visible from Route 152 (Wadleigh Falls Road). The field is bordered to the east by the Piscassic River and associated Prime Wetlands. The northern portion of the property is forested. Primary access to the property is available from 274 Wadleigh Falls Road; the house at this address was subdivided from the property and an access easement was established from the existing driveway leading northerly into the field.

The property was protected through the efforts of a number of funding partners including the Land and Community Heritage Investment Program (LCHIP), the Department of Environmental Services Water Supply Program, and the Town of Newmarket. LCHIP holds a "Deed Conveying Executory Interest and Public Access" for the conservation area. This deed described the intended purposes and uses of the property. The intended purposes are centered on the protection of natural resources and provide a framework to define the management goals of the property.

STEWARDSHIP GOALS

Below is a list of management goals based on objectives outlined by the funding partners:

1. Conserve native biological diversity
2. Protect and enhance the habitats of rare plants and wildlife
3. Maintain and enhance exemplary communities and significant habitats
4. Manage forest resources
5. Maintain agricultural uses
6. Protect surface and subsurface water quality, as well as public water supplies
7. Preserve open space
8. Provide public access for low-impact, transitory outdoor recreation

MANAGEMENT OBJECTIVES

NH Soil Consultants, Inc. (NHSC) has prepared this report at the request of the Town of Newmarket, to fulfill the management plan requirements outlined in the "Deed Conveying Executory Interest and Public Access" for the reference property (see Appendix I). NHSC developed specific management objectives for the property, based on general objectives outlined in the "Deed Conveying Executory Interest and Public Access".

The following are specific management objectives and proposed methods to accomplish objectives. These objectives are discussed in further detail within the "Recommended Management Prescriptions" section of this plan on page 11.

1. Protect the Newmarket municipal water supply
    - all agricultural practices should be done in accordance with the Nutrient Management Plan
    - the border of the Piscassic River should be maintained in a forested state to provide a water quality buffer
2. Protect Prime Wetlands and riparian habitat
    - trail development in the forested river corridor should be limited to a small spur trail
    - forestry operations that create openings should be avoided in the Prime Wetland to minimize expansion of invasive species
3. Maintain passive outdoor recreation
    - establish a loop trail on the property to provide hiking and wildlife viewing opportunities
    - designate a small, non-paved parking area within the access easement area to provide parking
    - install a small sign in the parking area
4. Preserve agriculture
    - conduct mowing according to the attached Nutrient Management Plan
5. Maintain and enhance forest resources
    - conduct a timber stand improvement cut to remove low quality trees and release the oaks from competition. This work should be done in consultation with a licensed forester or certified wildlife biologist.
6. Maintain and enhance wildlife habitat
    - maintain a 50-foot "no-cut" buffer around the vernal pool
    - retain all hemlocks and cedar trees for winter cover
    - retain cavity trees
    - tree diversity should be maintained during TSI work to provide diverse wildlife food resources
    - retain shagbark hickory trees for a source of mast crops

ASSESSMENT METHODS

NHSC conducted field evaluations on the property in March, May, and July of 2004. As part of these evaluations, the approximate boundaries of the on-site wetlands were sketched by a Certified Wetland Scientist (James Long). Additionally, habitat types were assessed and mapped by Tracy Tarr, staff Wildlife Biologist (see attached plans). NHSC used existing data sources available through GRANIT (i.e. National Wetlands Inventory) and aerial photographs as an initial basis for mapping. Random traverses where then conducted on the property to refine the habitat maps and develop species lists for the property.

James Long, staff Forester of NHSC, assessed the quality of trees and estimated size of trees (diameter at breast height) during random traverses. NHSC also conducted a site walk with Matthew D. Tarr, UNH Cooperative Extension, Rockingham County Forester to discuss and refine the suggested management prescriptions. Further, NHSC consulted with the Town of Newmarket Open Space Commission and Conservation Commission in the development of the plan. Select data (i.e. prime wetland map) was obtained from the Town Planner and incorporated into the site maps.

During site assessments, all observed wildlife and plant species were noted. This information was used in the development of the management objectives. It is anticipated that further investigations will lead to observations of additional species on the property; however, evaluations conducted during field work for this management plan provide a solid framework for evaluating habitat management needs.

EXISTING CONDITIONS AND NATURAL FEATURES

The reference property includes 45.3 acres of upland and wetland habitat (see enclosed boundary survey by Doucet Survey in Section 8 of this plan). NHSC estimates that approximately 11.77 acres of the site is wetland, while 33.6 acres is considered upland. The northern portion of the property is forested and located on a hill. This area contains large boulder outcrops and slopes range from roughly 8% to 35% (see attached "Wetlands & Soils Plan"). As noted above, the southern portion of the property is an active hay field. The field is exceptionally flat and slopes range from 0% to 3%. The eastern edge of the property is forested and is comprised mainly of the Piscassic River and associated floodplain wetlands. An abandoned scotch pine plantation also occurs on the easterly edge of the field.

Field:
The field portion of the property totals 11.1 acres. Approximately 2.8 acres of this cover type is classified as wetland and is wet meadow habitat. A small intermittent drainage bisects the northern edge of the field and drains into the Piscassic River. This field has been mowed almost annually by a local farmer and is an active hay field. In most years, two to three crops of hay have been harvested from the property. The field contains a variety of grasses and forbs including: orchard grass (*Dactylis glomerata*), timothy grass

(*Phleum pratense*), quack grass (*Agropyron repens*), reed canary grass (*Phalarus arundinacea*), alfalfa (*Medicago sativa*), goldenrod (*Solidago* spp.), aster (*Aster* spp.), dock (*Rumex* spp.), and milkweed (*Asclepias syriaca*).

As open land, this habitat provides valuable visual aesthetics to visitors of the conservation area. The field is located adjacent to the main access point and provides the only open vista on the property. As an agricultural area and grassland habitat, this field also provides a wildlife habitat that is in decline across the northeast.

White-tailed deer (*Odocoileus virginianus*) browse on the herbaceous plants within the field. Other species such as woodchuck (*Marmota monax*) are associated with field habitats and have been observed within this cover type. Turkey vultures (*Cathartes aura*) have been observed over the field and may forage on the property. Additionally, bobolink (*Dolichonyx oryzivorous*) have also been observed in the field. (NHSC observed one male bobolink displaying in the field during site assessments.) Bobolinks require grasslands for nesting and are in decline throughout the United States[1]. The field does not support a large population of bobolink, however, due to the small to moderate size of the field. Although small to moderate sized, the field is an important cover type on the site and contributes to overall habitat diversity on the property.

Forest Resources:

The property contains three upland forest cover types: oak-pine, white pine (with mixed hardwoods), and Scotch pine plantation (with white pine-mixed hardwoods). These areas total approximately 25.3 acres and are primarily located in the northern and eastern portions of the property. Forested wetlands are discussed in the "Wetland" section of this plan on page 6.

Oak-Pine (20.8 acres)

The Oak-Pine cover type is located in the northern portion of the site and is the largest vegetative cover type on the property. This area contains relatively shallow soils due to the presence of ledge. The cover type occurs on a hill and slopes range from roughly 8% to 35% (see attached Wetlands & Soils Plan). Large boulder outcrops are present throughout this area.

The tree layer within this cover type is dominated by red oak (*Quercus rubra*) and white pine (*Pinus strobus*). Shagbark hickory (*Carya ovata*) is abundant and is a co-dominant species in the tree layer. The canopy is relatively diverse and includes: red maple (*Acer rubrum*), white ash (*Fraxinus americana*), bigtooth aspen (*Populus grandidentata*), black birch (*Betula lenta*), gray birch (*Betula populifolia*), white oak (*Quercus alba*), and black oak (*Quercus velutina*). The understory contains a sapling layer comprised mainly of hophornbeam (*Ostrya virginiana*) and eastern hemlock (*Tsuga canadensis*). Red cedar (*Juniperus virginiana*) is also found in low abundance in the sapling layer. The shrub layer varies from low to moderate density and includes species such as witch hazel

[1] Jones, A.L. and P.D. Vickery. No publication date. Conserving grassland birds: Managing agricultural lands including hayfields, crop fields, and pastures for grassland birds. Department of the Interior, U.S. Fish & Wildlife Service. 17 pp.

(*Hamamelis virginiana*), American beech (*Fagus grandifolia*), and black oak (*Quercus veluntina*).

The red oaks in the oak-pine cover type average 12 to 14 inches in diameter at breast height (d.b.h.) and are of good to excellent timber quality because they have few branches, straight trunks, and appear to be in good health. The white pines in this area average approximately 14 inches d.b.h. and are of moderate quality. Although some of the red oaks are suppressed and exhibit damage typical of gypsy moths, the stand as a whole has excellent potential to develop into a valuable timber stand. Currently, the stand is relatively young and of pre-commercial size.

In addition to forest resources, this cover type provides valuable wildlife habitat. Well-worn white-tailed deer (*Odocoileus virginianus*) trails were observed at the top of the hill and the hill appears to function as a bedding area for deer. The oak-pine cover type has well-developed canopy layers and provides nesting habitat for hermit thrush (*Catharus guttatus*), ovenbird (*Seiurus aurocapillus*), black-throated green warbler (*Dendroica caerulescens*), eastern phoebe (*Sayornis phoebe*) and red-eyed vireo (*Vireo olivaceous*), as well as other woodland songbirds.

Due to the dominance of oak trees, this habitat area provides an important source of hard mast to a variety of wildlife. Hard mast (e.g. acorns, hickory nuts) is utilized as a food source by white-tailed deer, blue jay (*Cyanocitta cristata*), southern flying squirrel (*Glaucomys volans*), and wild turkey (*Meleagris gallopavo*). Although the majority of oak trees in this area have not reached their peak production size (approximately 19-30 inch d.b.h. depending on the species), this is a valuable mast stand due to the presence of multiple oak species. Red oaks tend to yield high acorn crops at 2- to 5- year intervals and white oaks tend to yield their highest acorn crops on 4- to ten year intervals[2]. As a result, a stand with multiple oak species is likely to yield acorn crops in most years. In combination with other mast crops (e.g. pine seeds, hickory nuts), the oak trees provide a regular source of food to woodland mammals such as eastern chipmunk (*Tamias striatus*) and red squirrel (*Tamiasciurus hudsonicus*). In turn, the presence of small mammals provides a stable food source to woodland predators such as broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), and coyote (*Canis latrans*), which likely use the property based on available habitat.

This cover type also provides important wintering habitat to wood frog (*Rana sylvatica*). Wood frogs require forested habitat with cover such as leaf litter and woody debris for fall foraging and over-wintering habitat. Adult wood frogs seasonally migrate from upland areas to vernal pools in the spring for breeding and spend only a week to a few weeks within the pool. After breeding, adults disperse into surrounding woodlands. In late fall, a high proportion of male wood frogs may overwinter within 65m (213 feet) of

[2] Reviewed *In* NH Division of Forests & Lands, DRED. 1997. Good Forestry in the Granite State, Recommended voluntary forest management practices for New Hampshire. Published by the Society for the Protection of New Hampshire Forests. Sant Bani Press, Tilton, NH.

the breeding pool, although most females may overwinter farther away[3]. For instance, wood frogs have been recorded migrating as far as 3,835 feet from their breeding pools[4].

NHSC located one vernal pool on the property, in the center of the cover type. This pool provides breeding habitat to wood frogs and may support spotted salamanders. In it's current state, the conservation area provides a minimum 280-foot upland buffer to this vernal pool. Forested buffers around pools are important because they help regulate water temperatures of the pool and help maintain water quality. Buffers also contribute an important nutrient base to the pool through falling leaves. These nutrients support algae and zooplankton, two important food sources to larval amphibians. Although the pool buffer provides valuable foraging and overwintering habitat, it is likely that juveniles and adults travel outside of this buffer in the summer and fall.

White Pine (2.9 acres)
A stand of white pine is located within the northeastern portion of the property, on the edge of the oak-pine cover type. This area is dominated by white pine but includes a mix of species including red maple and red oak. This habitat area has relatively flat topography and lacks the boulder outcrops typical of the oak-pine cover type.

Large white pine trees in this cover type provide valuable perch trees to raptors and provide winter cover to resident birds such as black-capped chickadee (*Poecile atricapillus*). Fox tracks were observed in this area and the cover type contains at least one den, potentially used by foxes.

Scotch Pine Plantation /White Pine-Mixed Hardwoods (1.6 acres)
The scotch pine/white pine-mixed hardwoods cover type is located in the eastern portion of the property, adjacent to the Piscassic River and within the Prime Wetland boundary. This cover type is dominated by mature Scotch pine (*Pinus sylvestris*), white pine, and pitch pine (*Pinus rigida*). Other plants found in the tree layer include white spruce, red cedar, black cherry (*Prunus serotina*), American elm (*Ulmus americana*), red oak, and grey birch. The westerly edge of this cover type borders the on-site field and contains a dense shrub layer. Species growing in the shrub layer include American hazelnut (*Corylus americana*), American beech (*Fagus grandifolia*), lowbush blueberry (*Vaccinium angustifolium*), alternate-leaf dogwood (*Cornus alterniflora*), and white ash (*Fraxinus americana*). Invasive species such as autumn olive (*Elaeagnus umbellate*), firebush (*Euonymus* spp.), Japanese barberry (*Berberis thunbergii*), European barberry (*Berberis vulgaris*), and common buckthorn (*Rhamnus cathartica*) are well established in this cover type.

[3] Regosin, J.V. B.S. Windmiller, and J.M. Reed. 2003. Terrestrial habitat use and winter densities of the wood frog (*Rana sylvatica*). Journal of Herpetology 37(2):390-394.
[4] Reviewed *In* Calhoun, A.J.K. and M.W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Although scotch pine is a non-native species, vegetation within this area is providing a dense and valuable buffer to the Piscassic River. Additionally, this cover type provides excellent wildlife cover. The plantation may function as a day roost for owls and provides additional winter cover to resident species.

Wetland:

The property contains a diversity of wetland cover types including wet meadow (2.8 acres), riverine/prime wetland (4.1 acres), forested swamp (4.34 acres), scrub-shrub swamp (0.5 acres), and seasonal pond (0.03 acres). These wetlands provide a diversity of functions and values, and enhance the natural resource values of the property.

Wet Meadow (2.8 acres)

The northerly portion of the existing hay field contains a wet meadow and intermittent drainage. The wet meadow contains a diversity of herbaceous plants including: sensitive fern (*Onoclea sensibilis*), jewelweed (*Impatiens capensis*), fringed sedge (*Carex crinita*), dark green bulrush (*Scirpus atrovirens*), poison ivy, and swamp candles (*Lysimachia terrestris*). The edge of the wet meadow also contains a few shrubs including meadowsweet (*Spiraea latifolia*) and silky dogwood (*Cornus amomum*).

This wet meadow provides a variety of wetland functions including water filtration (e.g. nutrient removal), production export, and wildlife habitat. The meadow contains a dense herbaceous layer that helps to filter runoff water from adjacent uplands before it is eventually discharged into the Piscassic River. This meadow is part of an active hay field and products from the meadow and adjacent dry field are exported from the site on an almost yearly basis. The meadow also provides wildlife food sources. White-tailed deer browse in the meadow and berries from the dogwood shrubs provide a food source to frugivorous song birds.

Riverine/Prime Wetland – Piscassic River and Floodplain (4.1 acres)

The riverine cover type is associated with the Piscassic River and is located within the eastern edge of the property. This habitat type includes the river channel and adjacent floodplain wetlands. This entire cover type is part of a town designated Prime Wetland identified as "NE-06" on the plan titled "Prime Wetlands", prepared by the Strafford Regional Planning Commission.

The floodplain wetlands are classified as a palustrine, broad-leaved deciduous and needle-leaved evergreen system that is seasonally flooded or saturated. The canopy of this forested floodplain system is dominated by red maple. White pine, eastern hemlock, and musclewood (*Carpinus caroliniana*) are also found in moderate densities within the canopy and sub-canopy of the wetland. The floodplain contains a well-developed shrub layer consisting of highbush blueberry (*Vaccinium corymbosum*), winterberry holly (*Ilex verticillata*), silky dogwood (*Cornus amomum*), northern arrowwood (*Viburnum recognitum*), and common elderberry (*Sambucus canadensis*). The edges of the floodplain also contain relatively high densities of shrubs considered to be non-native invasive plants. Non-native shrubs found in the wetland include Japanese barberry

(*Berberis thunbergii*), European barberry (*Berberis vulgaris*), and common buckthorn (*Rhamnus cathartica*). These species are well established throughout the understory of the floodplain and likely escaped from cultivation and colonized the river banks. The wetland also contains a well-developed herbaceous layer dominated by ferns. Species found in the herbaceous layer include: royal fern (*Osmunda regalis*), sensitive fern, cinnamon fern (*Osmunda cinnamomea*), hayscented fern (*Dennstaedtia punctilobula*), tall meadow rue (*Thalictrum polygamum*), jewelweed, poison ivy, Virginia creeper (*Parthenicissus quinquefolia*), nettle (*Urtica gracilis*), horsetail (*Equisetum* spp.), and Jack-in-the pulpit (*Arisaema triphyllum*).

The river channel has well vegetated banks and dead trees are present in portions of the channel. Additionally, slow portions of the channel are vegetated with floating leaved plants such as yellow water-lily (*Nuphar advena*). All of these features increase cover available to wildlife and enhance the wildlife habitat value of this portion of the river. Logs provide potential sunning locations to species such as painted turtle (*Chrysemys p. picta*) and green frog (*Rana clamitans*). As a persistent watercourse, the river functions as a travel corridor to a variety of wildlife. Further, the watercourse provides valuable fish and mussel habitat.

A number of migratory warblers migrate along natural features such as rivers. Additionally, mammals such as mink and otter are highly dependant on large wetland complexes and are often associated with riverine systems. Although not observed by NHSC, the prime wetland on-site provides valuable food and cover to species such as mink. Pockets of shrub cover also border the river and these "scrub-shrub" habitat inclusions are being utilized as nesting and feeding habitat by common yellowthroat (*Geothlypis trichas*) and other migratory birds.

In addition to wildlife habitat, the Prime Wetland provides valuable shoreline stabilization and flood protection. The forested floodplain receives excess flood water and slowly detains and releases excess water. This system also helps to protect downstream drinking water sources by filtering water from adjacent upland areas. As discussed below, the Piscassic River also provides potential habitat to at least two special concern wildlife species. Due to presence of Prime Wetland, the system provides uniqueness/heritage value to the Town of Newmarket.

Forested Wetland (4.34 acres)
The property contains three additional forested wetlands not associated with the Piscassic River. These areas are located in the central portion of the site and in the northern "arm" of the property. All three of these wetlands are part of drainages or larger wetland complexes. One small, forested area (0.14 acres) is located on the northern boundary of the site and drains onto an adjacent house lot. Only a small portion of the entire complex is present on the property.

A second forested wetland is located adjacent to the on-site wet meadow and is part of the drainage that flows through the central portion of the property towards the Piscassic River, from the southwest to the northeast. This wetland area totals approximately 2.0

acres. Similar to the other on-site wetlands, red maple is the dominant species in the canopy. White pine, red oak, and shagbark hickory are also present within the tree layer.

The third forested wetland is located in the northwestern corner of the site and totals approximately 2.2 acres. This wetland drains to the west and is part of the headwaters to an off-site stream that drains into Folletts Brook (see attached "Wetlands & Soils Plan"). This wetland has well-developed vegetative layers and is dominated by red maple. White pine and American elm is also present in the canopy. The shrub layer is dominated by speckled alder (*Alnus rugosa*), northern arrowwood, meadowsweet, and silky dogwood. This wetland provides valuable nesting habitat to woodland warblers. Species such as veery (*Catharus fuscescens*) prefer to nest in forested wetlands and have been observed in the on-site wetland complex.

Scrub-shrub (0.5 acres)
The forested wetland located in the northwestern corner of the property transitions into a scrub-shrub wetland in the southerly on-site portion of the wetland complex. This wetland contains a dense shrub layer comprised of buttonbush (*Cephalanthus occidentalis*), winterberry holly, maleberry (*Lyonia ligustrina*), and speckled alder. The wetland also contains a sapling layer consisting of red maple. This scrub-shrub wetland borders a pond and contains standing water, as well as very poorly drained soils. This wetland appears to dry infrequently, if at all, and contains a diversity of aquatic plants including bladderwort (*Myriophyllum vulgaris*), burreed (*Sparganium* spp.), coontail (*Ceratophyllum*), and duckweed (*Lemna minor*). Vegetation within the wetland is exceptionally dense and hummocks covered in sphagnum moss are present.

NHSC observed adult green frogs and gray tree frogs (*Hyla versicolor*) within this system. Additionally, four-toed salamander egg masses were located in the sphagnum hummocks of the wetland. While the wetland did not contain vernal pool indicator species such as spotted salamander or wood frog, the wetland does provide valuable breeding habitat to species associated with semi-permanent to permanent wetlands. NHSC also observed red-winged blackbirds (*Agelaius phoeniceus*) calling from the wetland. The habitat value of this wetland is enhanced by the adjacency of emergent and open water habitat on the bordering property.

Seasonal Pond – Vernal Pool (0.03 acres)
The Piscassic River-Loiselle Conservation Area contains one isolated, seasonal wetland in the northern portion of the property. This wetland is depicted as a circular depression on the U.S. Geological Survey map of the site (see attached Site Locus). This small wetland is an open water system that seasonally fills with water and dries by mid-summer.

During a site walk on May 1, 2004, NHSC and town representatives observed wood frog egg masses and tadpoles in this isolated wetland. Wood frogs use seasonal wetlands for breeding and are considered to be a vernal pool "indicator species". Vernal pools are seasonally inundated bodies of water (usually) that provide breeding habitat for certain

amphibians and invertebrates[5]. In New Hampshire, vernal pool "indicator species" are wood frog, mole salamanders (*Ambystoma* spp.), and fairy shrimp. These habitats are important because most indicator species (i.e. wood frog) cannot coexist successfully with fish, and are generally limited to habitats that do not contain them. The vernal pool on the property may also support fairy shrimp and spotted salamanders, although none were observed during the spring of 2004.

Special Concern Species:

Brook Floater
According to the New Hampshire Natural Heritage Bureau (NHB), the site is within an area "flagged for possible impacts on brook floater (*Alasmidonta varicosa*) mussel", a state endangered species (see attached NHB memo dated 2/12/04). On the property, potential brook floater habitat occurs in the Piscassic River. Brook floaters utilize flowing water habitats that contain stable substrates such as coarse sand and gravel[6]. In some cases, this species is also found in association with rooted aquatic vegetation, within flowing water habitats. The closest known population of brook floater mussel population occurs approximately 10 miles upstream from the property site.

Wood Turtle
The property also has potential to support wood turtle (*Glyptemys insculpta*). Wood turtles are associated with clear streams and rivers with sandy, cobbled, and gravelly substrates. Riverine habitats with undercut banks, emergent cover, and clumps of alder and dogwood provide valuable habitat. Wood turtles also utilize the wooded upland edges of riverine systems for feeding and basking, especially in areas that have openings in the canopy. Female wood turtles nest in exposed upland soils, along stream edges, roads, as well as in hayfields and abandoned gravel pits. Wood turtles are omnivorous and eat a variety of items including fungi[7], blackberries[8], blueberries, raspberries, strawberries insects, leaves, grasses, algae, mollusks, earthworms, tadpoles, dead fish, and newborn mice[9].

The wood turtle does not have a state or federal listing for rarity, though this species is protected from collection and harvesting. This species is considered special concern due to the likelihood that populations have declined in New Hampshire as a result of habitat loss, collection for the pet trade, and low reproductive rate. Recreationists may also

[5] Tappan, A. (ed.). 1997. Identification and Documentation of Vernal Pools in New Hampshire. NH Fish & Game Department, Nongame and Endangered Wildlife Program.
[6] Nedeau, E. J., M. A. McCollough, and B. I. Swartz. 2000. The Freshwater Mussels of Maine. Maine Department of Inland Fisheries and Wildlife, Augusta ME.
[7] Strang, C.A. 1983. Spatial and temporal activity patterns in two terrestrial turtles. Journal of Herpetology 17:43-47.
[8] Farrell, R.F. and T.E. Graham. 1991. Ecological notes on the turtle Clemmys insculpta in northwestern New Jersey. Journal of Herpetology 25:1-9.
[9] Harding, J.H. and T.J. Bloomer. 1979. The wood turtle, *Clemmys insculpta*…a natural history. Herp: Bulletin of the New York Herpetological Society 15:9-26.

unintentionally affect wood turtles by interrupting their activities. Nesting females will abandon a nest excavation after even the slightest disturbance[10].

The Piscassic River and adjacent prime wetland, as well as upland forest, provide potential feeding and basking sites to wood turtle. Currently, on-site the river has an intact wooded edge and no significant openings are present; as a result, this buffer does not provide nesting habitat. However, potential nesting habitat occurs in the adjacent field.

STEWARDSHIP AND MONITORING

NHSC recommends that the town establish a Stewardship and Monitoring Committee. This group could coordinate regular stewardship activities such as trail maintenance and annual cleanups, as well as assist with monitoring. Final monitoring responsibility lies with the Newmarket Conservation Commission or its successor; this commission is required to prepare and submit an annual monitoring report to the LCHIP Authority, Department of Environmental Services Water Supply Program, and Newmarket Town Council (see recommended monitoring form, Appendix VI). This report should include a description of the status of the property, as well as all management activities that have occurred. At a minimum, the report is required to include:

1. A description of the results of a boundary inspection
2. A description of any major changes to the property (e.g. natural disturbance or activities of abutting landowners)
3. A description of any issues or concerns about management and use of the property
4. Photographs of the property

RECOMMENDED MANAGEMENT PRESCRIPTIONS

Field:

The existing field on the property should be maintained to preserve the visual, agricultural, and wildlife habitat value of this cover type. As required, a Nutrient Management Plan has been prepared to guide field maintenance activities (see Appendix V). This plan has been reviewed and approved by the Department of Environmental Services and LCHIP. All agricultural practices, such as amendment applications, are required to be conducted according to the "Manual of Best Management Practices (BMPs) for Agriculture in New Hampshire" (see Appendix V). Due to the lack of a large grassland bird population in this field, NHSC recommends that the Town of Newmarket solicit a local farmer to mow the field two to three times annually (as allowed by site conditions), as has been done in the past. This arrangement will likely avoid maintenance costs. Although a portion of the field occurs in the town buffer to Prime Wetlands,

[10] Hunter, Jr. M.L., A.J.K. Calhoun, and M. McCollough, eds. 1999. Maine Amphibians and Reptiles. The University of Maine Press, Orono, Maine. p. 142.

agricultural uses are allowed, as long as activities conform to relevant Best Management Practices.

However, NHSC recommends that mowing be avoided in the wet meadow portion of the field, especially during spring and early summer. The wet meadow has poorly drained soils and is very susceptible to rutting. Currently, it is illegal to stump or grub wetlands without a permit. As a result, mowing should not be conducted in the wet meadow during wet periods, when rutting is likely to occur. Mowing may be practical during the second to third annual cut, when soils are likely to be driest. Regardless of the time of year mowing is conducted, any persons conducting work in wetlands on the property should be well-versed in current New Hampshire Wetlands Bureau policies; relevant information can be obtained from their website (http://www/des/state.nh.us/wetlands/).

To improve the habitat value of the field, the Town of Newmarket should consider creating a "soft edge" in the wet meadow. Soft edges are field borders that have a mix of vegetation heights and variable width. To accomplish this, vegetation clearing could be conducted in the wet meadow every three years, rather than annually. This would maintain the northern portion of the field in a relatively open state, but would improve habitat to songbirds associated with field edges and would help prevent rutting in the meadow. After the shrub layer develops in the meadow, the town could manually cut larger shrubs or utilize a "brontosaurus" machine[11] during the winter to clear shrubs.

If the Public Works Department does not have the machinery or staff to conduct this habitat improvement work, the town can apply for a Small Habitats Grant from the NH Fish and Game Department, to offset the costs associated with habitat maintenance. Currently, the department offers up to $2000.00 per year to successful applicants (not to exceed $6000.00 over a ten year period). Because the wet meadow encompasses roughly 25% of the field, the town should consult with the farmer that hays the field about this suggested management option.

Forest Management:

The property contains four major upland and wetland forest types: Oak-Pine, Scotch Pine Plantation with White Pine-Mixed Hardwoods, Red Maple Swamp, and Red Maple-White Pine floodplain swamp. The Oak-Pine cover type also includes an inclusion of white pine cover. These cover types vary in timber value and harvesting potential.

To maintain the buffer to the Piscassic River and to minimize disturbance to a town-designated Prime Wetland, NHSC does not recommend any timber harvesting in the Red Maple-White Pine floodplain swamp associated with the "Riverine-Prime Wetland" cover type. The floodplain swamp contains poorly drained soils susceptible to rutting and lacks high value timber. NHSC also does not recommend timber harvesting in the Scotch Pine Plantation. This cover type is overstocked; however, it provides valuable winter cover and potential owl roost areas. Further, timber harvesting in this area could

[11] A "brontosaurus" is a large piece of equipment used for land clearing. The brontosaurus head is a spinning drum that grinds shrubs and small diameter trees into wood fiber mulch.

open the canopy and enhance the spread of non-native plants found in the wetland adjacent to the river.

On the contrary, the Town of Newmarket may wish to consider timber harvesting in the Oak-Pine cover type. This cover type contains good to excellent quality oak trees averaging 12 to 14 inches in diameter at breast height. A number of these trees have potential to develop into veneer-quality trees. If managed correctly, this stand could provide a small source of income to the town. However, it should be noted that this work is not required to maintain the cover type. The stand currently provides high quality wildlife habitat and recreational opportunities and does not require any timber harvesting to maintain it's current values. If this work is not conducted, the stand will simply grow at a slower rate.

To increase the growth of these trees, the town should consider conducting a timber stand improvement (TSI) cut in approximately 10 years. Specifically, the town could conduct an improvement harvest and crown-thinning. This work could be conducted sooner, although the costs associated with timber harvesting may exceed the profit from the timber at this time. The goal of the TSI work would be to remove a portion of the low quality trees and provide small gaps in the canopy. The gaps would increase the amount of light and nutrients available for healthy, high quality trees. In addition to improving the monetary value of this stand, this work will also likely improve seed crops available to wildlife. As discussed in the "Existing Conditions and Natural Features" section of this report, most oaks do not produce peak acorn crops until individual trees measure 19-30 inches in diameter at breast height. As a result, TSI work that enhances the growth of oaks should help to increase acorn production over time.

When the town is ready to conduct TSI work, a licensed forester should be contacted to assess the current status of the stand, mark trees targeted for harvest, and determine appropriate points of equipment access. Additionally, the town should consult with a certified wildlife biologist when reviewing and updating management prescriptions on the property. Due to the presence of a wetland drainage at the main property access point, it will likely be preferable to conduct TSI work during the winter, when wetland soils are frozen. As part of any TSI work, a concerted effort should be made to maintain the current tree diversity within the stand. Maintaining high tree diversity will help to limit insect outbreaks that may harm trees and will help to maintain diverse food sources for wildlife. If possible, all cedar and hemlock trees should be maintained for winter cover. To maintain important mast crops, all healthy shagbark hickory trees should be retained. Additionally, if feasible, all snags (i.e. dead trees), cavity trees (i.e. live trees with cavities) and dead limbs should be maintained to provide nesting locations, feeding areas, and cover to wildlife. Over the long term, improvement harvests could be conducted on a 10-15 year cycle when the stand is mature.

Recreation:

As outlined in the "Deed Conveying Executory Interest and Public Access," the town and conservation easement funding partners wish to maintain low impact, transitory recreational uses on the property. These uses include walking, hunting, fishing, nature

viewing, and cross-country skiing (see Table 1). However, wheeled vehicles including mountain bikes and all-terrain vehicles are not allowed in the conservation area.

To enhance and guide low-impact recreation on the site, the town should consider establishing a loop trail on the property. This trail could lead from the easement access area off of Wadleigh Falls Road, across the edge of the field, to forested areas in the northern and western portions of the site (see enclosed "Cover Type & Proposed Trail Plan" for proposed trail layout). The trail would serve to direct the public away from sensitive areas of the property and provide an enjoyable hike that encompasses a variety of scenic areas. The trail is proposed on the edge of the field to minimize disturbance to the field while also avoiding significant tree clearing in the adjacent Prime Wetland. As part of a mowed field, the trail in this section of the property will not require any special maintenance.

To provide a view of the river, the town may wish to create a small spur trail, as shown on site plans. The spur trail was sited in a natural opening in the canopy and should only require the cutting of a few small trees and/or limbs within the southerly arm of the spur. The Town of Newmarket's Wetland Protection Overlay District 5.03 (C) (2) does not allow for "vegetation clearing" within the 75 foot prime wetland boundary, except when such vegetation clearing is associated with forestry, agriculture, or access to surface water. As a result, the proposed spur trail appears to meets town buffer requirements because the trail will provide a form of public access to surface water. This spur trail is entirely located in upland as identified by NHSC, although the upland is a habitat inclusion within the prime wetland boundary delineated by West Environmental, Inc., on behalf of the Town of Newmarket.

The main trail continues into a patch of white pine cover and heads northwesterly into the Oak-Pine cover type. At the outer extent of the white pine cover type, the trail requires one wetland crossing for appropriate trail design. This crossing is cited in the narrowest section of the wetland, in an area of gentle grades. This wetland crossing requires a wetlands permit from the Wetlands Bureau and qualifies for a Notification of Trail Development application.

The trail continues into the Oak-Pine Cover type and is cited near large boulder outcrops. The outcrops provide visual interest to the trail. Instead of tree cutting, NHSC suggests that the town install the trail around trees and mark the location of the trail with trail markers. This will minimize disturbance to the forest floor and clarify the locations of the trail. The trail has been specifically sited away from the documented vernal pool and deer bedding area at the top of the hill, to minimize disturbance to these resources. The trail has been designed to loop back to the proposed wetland crossing, to eliminate the necessity for more than one wetland impact. The trail concept provided by NHSC is a general guideline and it is anticipated that the exact location of the trail will be determined with a geographic positioning system (G.P.S.), after the trail location has been reviewed and marked in the field.

To provide appropriate access to the public, the town has designated a small non-paved parking area in the existing access easement adjacent to Wadleigh Falls Road. One requirement of the Project Agreement with LCHIP, is that a sign provided by LCHIP be erected at the entrance of the conservation area. At a minimum, this sign is required to include the LCHIP logo and the following statement, "This property has been protected with assistance from the NH Land and Community Heritage Investment Program". Further, as outlined in the purchase agreement with the Loiselle family, the sign should also include the following recognition, "Sold to the Town of Newmarket for conservation purposes by the Loiselle family in loving memory of their parents, Robert M. and Estelle T. Loiselle".

Table 1. List of activities and their status (allowed versus not allowed).

Activity	Allowed	Not Allowed	Condition of Use
Cross-country skiing	X		
Hunting	X		This activity will occur close to houses and should be monitored over time.
Fishing	X		
Wildlife viewing	X		
Hiking	X		Trails will be designated for hiking.
Camping		X	
Overnight use		X	
Nighttime use		X	Except for hunting purposes.
Swimming		X	
All-terrain vehicles		X	
Bicycles		X	

Education Opportunities/Future Studies:

This management plan provides baseline information to conduct short-term and long-term management activities on the property. However, further studies could be conducted to complement the information provided within this report and enhance future management of the natural resources on the property. Below is a list of possible future studies and activities.

1. Survey for brook floater mussel
   The brook floater mussel is a State Endangered species that may occur on or near the site, within the Piscassic River. The town may wish to have a survey conducted for this species, to better understand the distribution of this endangered mussel within the Piscassic River.

2. Survey for wood turtle

The wood turtle is a special concern species that may utilize the riverine, wooded, and field portions of the site. To determine the presence of this species, the town could conduct turtle nesting surveys in the spring. Additionally, visual searches could be conducted periodically along the river, to document turtles on the site. This information would be valuable for assessing potential impacts of recreation on the site, and guiding future recreation on the property.

3. Educational Opportunities
   The vernal pool on the property provides a potential educational area and outdoor classroom. The local middle/high school could conduct supervised yearly amphibian egg mass counts and invertebrate sampling. This would provide valuable long-term data on amphibian use of this wetland and provide a valuable "outdoor classroom" to local students. This wetland is easily accessed and surveys could be conducted from the edge of the wetland to minimize and avoid disturbance to vernal pool species.

RECOMMENDED MANAGEMENT SCHEDULE

Before any management takes place, this plan should be reviewed by the LCHIP Authority, DES Water Supply Program, Town Council, and the Conservation Commission. Below is a recommended schedule for management implementation after this plan has been reviewed and approved (see Table 2 for complete list).

1. The property has been recently surveyed and is well marked with temporary flagging. To prevent boundary disputes, the town should consider permanently marking the boundaries with permanent blazing. Additional information on marking is provided in an attached fact sheet (see Appendix IV, "Woodlot Boundary Line Marking".
2. The town should establish a sub-committee responsible for stewardship and monitoring of the property. This sub-committee could coordinate contractors and volunteers, as well as monitoring activities. At a minimum, it is anticipated that this group will consist of one member of the town Conservation Commission, Open Space Committee, and Public Works Department.
3. After the town has approved and marked a trail location, the trail should be located with a G.P.S. and added to site plans.
4. The town or it's representative should prepare a wetlands application to permit the proposed wetlands crossing associated with the trail.
5. The town should clear the proposed trail of logs and other large debris.
6. The trail should be monitoring at least twice annually (once in the spring) to determine the condition of the walking trail.
7. If Timber Stand Improvement work is desired, the town should contact a licensed forester in approximately 10 years to reevaluate forest resources, mark trees, and oversee logging.
8. The town should have a qualified professional review and edit this management plan at least once every ten years to re-examine management prescriptions for the conservation area.

Table 2. Recommended schedule of management activities for the next 10 years (2004-2014).

Management Action	Time Line	Comments
Blaze the property boundaries	2004	See Appendix IV
Establish a prime town contact person	2004	This should be done immediately.
Establish the Stewardship Subcommittee	2004	
Prepare a NHDES Wetlands Bureau application for the proposed trail bridge.	Winter 2004	This should be completed before work begins.
Acquire a contractor to install the bridge	Winter 2004	This should be completed before work begins.
Install the trail bridge	Winter 2004	Review the trail notification application first.
Finalize the kiosk and parking lot design	Fall 2004	These items should be reviewed by Public Works.
Develop/acquire trail signs	Fall 2004	Mark with signs.
Mark the trail location	Fall/winter 2004	
Clear the trails	Twice annually	This task should be done more often if necessary.
Mow the field (to be done by a local farmer)	Up to 3 times annually	The town should discuss the suggested wet meadow management with this farmer.
Review the soil amendment records	Annually	
Assess the condition of the proposed trail bridge	Annually	Evaluate the status of erosion at the bridge.
Conduct monitoring and prepare a report	Annually (by Nov. 15)	See the "Stewardship and Monitoring" section.
Conduct a volunteer clean up on the property	Annually	
Consult with a licensed forester or certified wildlife biologist about the feasibility of conducting a timber harvest (if increasing timber value on the property is a current goal)	2014	See "Forest Management" Section on page 12 of this plan.
Have a qualified professional review the Plan	2014	The plan should be reviewed every 10 years.

CONCLUSION

The Piscassic River-Loiselle Conservation Area contains a variety of natural resources including an active hay field, scenic view, important wildlife habitats, a diverse wood lot, Prime Wetland, and a portion of the Piscassic River. This site is part of the Follett's Brook Watershed and is part of the Town of Newmarket's municipal source water protection area. As a result, the property contributes significant natural resource value to the local community.

This plan provides management recommendations and prescriptions to maintain existing views, enhance/protect wildlife habitats, protect Prime Wetlands, and foster low-impact recreational opportunities. To meet the long-term conservation goals of this property, this plan should be reviewed and amended by a qualified professional, at least every ten years.

REFERENCES AND SUGGESTED READING

Cobb, B. 1984. A Field Guide to the Ferns and Their Related Families of Northeastern and Central North America. Houghton Mifflin Company, Boston.

DeGraaf, R. M. and M. Yamasaki. 2001. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England, Hanover, 482 pp.

Gleason, H.A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada, 2nd ed. The New York Botanical Garden, Bronx, NY.

Kanter, J., R. Suomala, and E. Snyder. 2001. Identifying and Protecting New Hampshire's Significant Wildlife Habitat: A Guide for Towns and Conservation Groups. New Hampshire Fish and Game Department, Nongame and Endangered Wildlife Program. 144 pp.

Kenney, L.P. and M.R. Burne. 2001. A Field Guide to the Animals of Vernal Pools. Massachusetts Division of Fisheries & Wildlife, Natural Heritage & Endangered Species Program & Vernal Pool Association. 77 pp.

Lam, Ed. 2004. Damselflies of the Northeast: A Guide to the Species of eastern Canada and the Northeastern United States. Biodiversity Books, Forest Hills, New York.

New Hampshire Department of Environmental Services. May 1994. Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials. NHDES-WSPCD-94-2. AMANUENSIS, Manchester, NH. 33 pp.

Nikula, B., J.L. Loose, M.R. Burne. 2003. A Field Guide to the Dragonflies and Damselflies of Massachusetts. Massachusetts Division of Fisheries & Wildlife, Natural Heritage & Endangered Species Program. 197 pp.

Peterson, R.T. and M. McKenny. 1968. A Field Guide to the Wildflowers of Northeastern and Northcentral North America. Peterson Field Guides. Houghton Mifflin Company, Boston.

Petrides, G.A. 1986. A Field Guide to Trees and Shrubs. Peterson Field Guides. Houghton Mifflin Company, Boston.

Society for the Protection of New Hampshire Forests. 1997. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire. NH Division of Forests and Lands and Society for the Protection of New Hampshire Forests. 65 pp.

Smith, S. and S. Whitney. 2000. Guide to New Hampshire Timber Harvesting Laws. University of New Hampshire Cooperative Extension, New Division of Forests and Lands, and New Hampshire Timberland Owners Association.

Sperduto, D.D. 2000. A Classification of Wetland Natural Communities in New Hampshire. New Hampshire Natural Heritage Inventory, Division of Forests and Lands. 156 pp.

State of New Hampshire, D.R.E.D, Division of Parks and Recreation, Bureau of Trails. 1996. Best Management Practices for Erosion Control During Trail Maintenance and Construction.

Tappan, A. 1997. Identification and Documentation of Vernal Pools in New Hampshire. New Hamsphire Fish and Game Department, Nongame and Endangered Wildlife Program. 72 pp.

Taylor, J.T. 1993. The Amphibians & Reptiles of New Hampshire. New Hampshire Fish and Game Department, Nongame & Endangered Wildlife Program, Concord, NH.

Wood, S.A. No Date. Woodlot Boundary Line Marking. University of New Hampshire Cooperative Extension. 2 pp.