

NATURAL RESOURCE MANAGEMENT PLAN

INTRODUCTION

This report outlines proposed wetland impact minimization and mitigation measures associated with a pond enhancement project at Mill Pond in Durham, New Hampshire. Mill Pond is approximately 7.5 acres and is located south of Mill Pond Road and west of Route 108. This pond was created in the early 1900's by the construction of the Mill Pond Dam. Since this creation, Mill Pond has been utilized as a public scenic area. Among other activities, local residents utilize the pond area for picnics, wildlife viewing, aesthetics, and skating.

Over time, the pond has partially filled in with sediment and has developed unhealthy algal blooms and dense emergent growth of cattails, reeds and woody shrubs. Additionally, dense vegetation within the pond has reduced the available area for skating and other winter recreation opportunities. As a result, the Town of Durham proposes to dredge 2.04 acres of Mill Pond to restore water depth, water quality, visual aesthetics, and recreational opportunities within the pond. Details of the proposed project are depicted on enclosed site plans prepared by NH Soil Consultants, Inc. (NHSC) titled "Proposed Wetland Impact Plan".

The New Hampshire Natural Heritage Inventory (a.k.a. Bureau) identified the presence of five sensitive plant and animal species within the general vicinity of the project (see NHI letter dated February 28, 2002). Specifically, NHI noted records of large-spored quillwort (*Isoetes macrospora*), large bur-reed (*Sparganium eurycarpum*), star-duckweed (*Lemna trisulca*), water-marigold (*Megaladonta beckii*), and Blanding's turtle (*Emydoidea blandingii*) within Mill Pond. Large-spored quillwort and large bur-reed are listed as State Threatened while star-duckweed, water marigold, and Blanding's turtle are considered to be rare or uncommon. Blanding's turtle are also protected from collection and harvesting in New Hampshire.

To determine and predict the presence of these species within the project site, protected species surveys were performed by NHSC during July and August, 2002 (see Protected Species Report prepared by NHSC for additional details). Habitat preferences and ecology of the species noted by NHI were researched and this information was utilized to focus methodical field searches for the rare plants. Deeper portions of the pond were accessed using a canoe. NHSC also conducted visual searches for Blanding's turtles in May, July, and August, 2002. All protected species locations identified by NHSC are depicted on the "Proposed Wetland Impact Plan". NHSC also contacted the New Hampshire Fish & Game Department to determine appropriate design considerations for Blanding's turtle (see attached letter dated May 28, 2004).

DESCRIPTIONS AND FINDINGS

Large-Spored Quillwort (*Isoetes macrospora*)

Quillworts are aquatic grass-like plants. Superficially, quillworts are identified from other species by the presence of simple linear leaves that are connected by an expanded, spongy base. Features of the plant megaspores are used to differentiate the species of this genus. Large-spore quillwort has up to 30-eight inch long leaves and tends to occur in gravelly, open edges of ponds and lakes.

Large-spored quillwort (a.k.a. lake quillwort) was observed in Mill Pond during 1978. A follow-up survey was conducted by Dr. Garrett Crow of the University of New Hampshire in 1995 and no specimens were located¹. According to Dr. Crow, the botanist who conducted both surveys, large-spore quillwort may have been smothered by the installation of Aquascreen panels (see report referenced above). Additionally, Dr. Crow suggested that the increase in silt (i.e. sediment) within the pond has eliminated preferred habitat of large-spore quillwort within the area of the known location. NHSC thoroughly examined shallow sections of the pond for quillwort and did not observe any quillwort species during protected species assessments. As a result, the proposed project will not have any negative affects on large-spore quillwort, as this species is not known to be currently in Mill Pond.

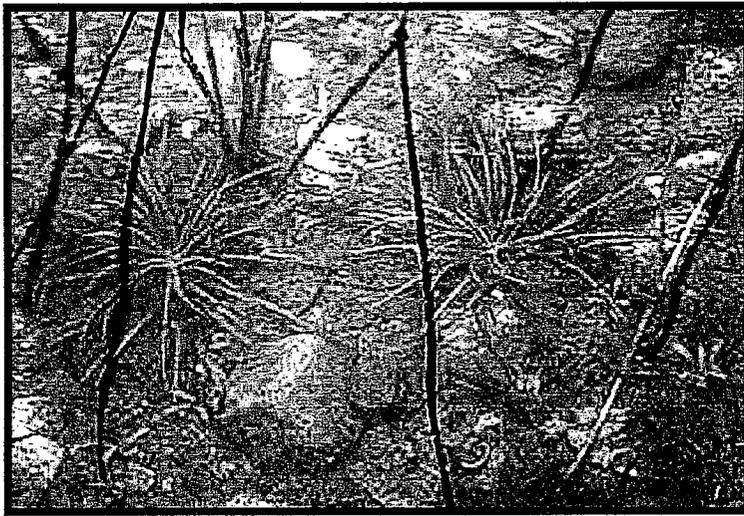


Photo 1. Photo of *Isoetes lacustris* (Source: W. Carl Taylor @ USDA-NRCS PLANTS Database / USDA NRCS. 1992. **Western wetland flora: Field office guide to plant species. West Region, Sacramento, CA.**) This species was not documented at Mill Pond during recent surveys.

Large bur-reed (*Sparganium eurycarpum*)

Large bur-reed is a stout perennial plant that grows to four feet tall and is typically found in non-tidal marshes, river margins, muddy shores, or shallow water up to one foot in depth. The leaves of these plants are stiff and flat, and have a keeled mid-rib. The fruits of large bur-reed are bur-like balls and grow on long stalks from the axils of the plant stem and leaves. This species is distinguished by characteristics of the achenes (i.e. seed covering).

NHSC located large bur-reed in seven areas of Mill Pond (i.e. areas identified as B1/B2 – B9 on the attached plan). Based on the 2002 field survey, large bur-reed covered approximately 10.5 % of the pond (0.79 acre). The largest patch occurs within the north-central portion of the pond in

¹ Crow, G.E. July 10, 1995. An Assessment of the Impact on Sensitive Plant species Relative to the Proposed Removal of Submergent and Floating-leaved Vegetation in a Portion of Mill Pond, Durham, New Hampshire. Report to the Town of Durham, New Hampshire.

association with other herbaceous plants and shrubs on what is referred to as the "island". Four smaller patches occur on the edge of the pond near Mill Pond Road. Two other patches were located within the southern portion of the pond.

As part of the proposed project, the Town of Durham proposes to dredge approximately two acres of the northern portion of the pond (see "Proposed Wetland Impact Plan"). The dredge area has been designed to avoid all of the patches of large bur-reed directly adjacent to the shore of the pond. However, to adequately restore water depths and remove sediment, the project requests to re-locate a portion of the centrally located bur-reed patch (i.e. patch B2) to similar appropriate habitat along the banks of Mill Pond. After pond draining, NHSC recommends that the excavator carefully remove the clumps of bur-reed from the proposed dredge area and move the clumps to a moist section of the pond where shallow water or wet mud persists (see construction sequence for details). While the pond is drained, mud should be applied to the roots of the bur-reed plants by hand. Due to the time of year that the dredging is proposed (fall), NHSC also recommends that seeds be collected from the B2 cluster bur-reed plants and applied to the transplant area. This will help improve germination and bur-reed growth in the mitigation area, and minimize impacts to large bur-reed to the greatest extent possible.



Photo 2. View of large bur-reed within Mill Pond, Durham NH (Source: NHSC).

Star Duckweed (*Lemna trisulca*)

Star duckweed is an aquatic, floating to semi-floating herbaceous plant, often found intermingled with other vegetation in standing water wetlands. This plant has a characteristic branching pattern that is distinct from the other duckweed species known to occur in New Hampshire (see Photo 3). Plants have relatively large leaves and new leaves arise from old leaves to form branching, patterns. This species is associated with wetlands high in nitrogenous matter². As a

² Hotchkiss, N. 1972. Common marsh plants of the United States and Canada. Dover Publications, Inc., New York, N.Y. 124 pp.

result, the population known to occur in Mill Pond likely benefits from the waterfowl population in Mill Pond as ducks and geese can be a significant source of nitrogenous waste.

Small patches of star duckweed (about 6 inches to 1 foot in diameter) were found in seven locations in Mill Pond by NHSC during survey work (see Proposed Wetland Impact Plan prepared by NHSC). Six of these locations are located outside of the proposed dredge area in the northern edge of the pond, and will not be directly impacted by the project. To reduce and prevent impacts to this species, NHSC recommends that all observed star duckweed be removed before the pond is drained, and held in a proper receptacle with pond water. As a floating plant, this species can be removed easily without damage to the plants. These plants could be held during the draining and dredging portions of the project. These plants could then be distributed to their previous locations in the pond, after dredging and pond refilling was completed.



Photo 3. This is a view of a star duckweed plant found within Mill Pond. This specimen measures 2 inches x 2.5 inches (Source: NHSC).

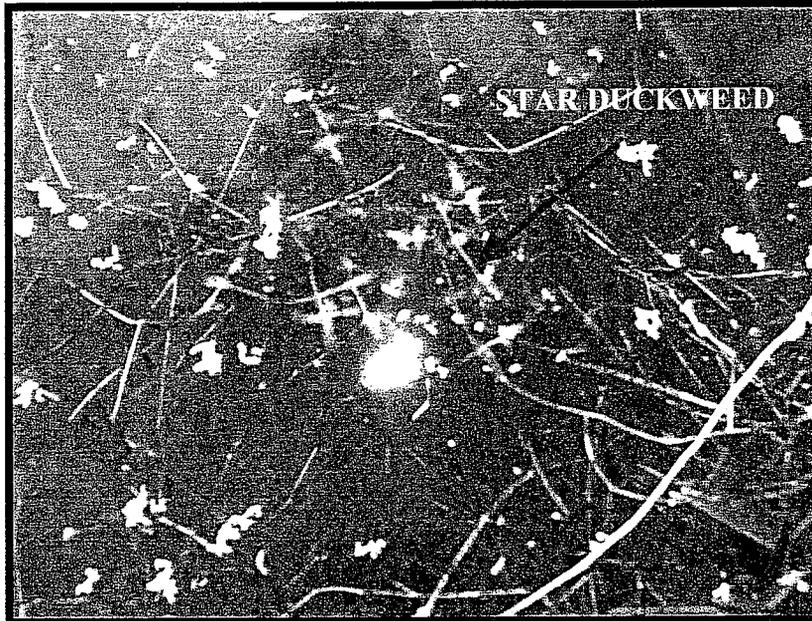


Photo 4. This is a view of a star duckweed location within Mill Pond. As seen in the photo, this plant is often intermingled with other vegetation (Source: NHSC).

Water-marigold (*Megaladonta beckii*)

Water marigold is an aquatic, perennial herbaceous plant. This plant is characterized by underwater leaves that are opposite, finely divided, and fan-like. Unlike the genus *Cabomba*, the leaves encircle the entire stem of the plant. Above-water portions of the plant have toothed leaves. The flower of water marigold is distinct and grows above the surface of the water, similar to the bladderworts (*Utricularia* spp.). However, unlike the bladderworts, the flower of water-marigold is daisy-like. This species is generally found in ponds, slow rivers or streams.

NHSC located one water marigold plant in Mill Pond, near the majority of the star duckweed clusters in the northern edge of Mill Pond. This plant occurs outside of the proposed dredge area and will not be directly impacted by the proposed project. However, because this species is suspected to be more sensitive to the draining of the pond (as compared to large bur-reed) because it is a submersed aquatic plant, NHSC recommends that this specimen could be removed from the dredge area during the dredging project.



Photo 5. This is a view of the water-marigold specimen observed in Mill Pond (Source: NHSC).

Blanding's Turtle (*Emydoidea blandingii*)

The Blanding's turtle is a dark olive to black colored turtle that measures up to 11 inches in length in adulthood. This species has tan to yellow colored markings. Blanding's turtles are differentiated in part from the spotted turtle by having irregular shaped markings as compared to the round spots of the spotted turtle. Blanding's turtles also have a helmet-shaped carapace, bright yellow throats and necks, and long serpentine necks. This species typically prefers wetlands with dense vegetation³ and deep organic substrates⁴ for feeding and breeding. The Blanding's turtle is primarily aquatic⁵ but also require upland habitats for nesting and dispersal.

A Blanding's turtle was last observed basking in Mill Pond, during 1966. However, no observations of this species have been documented in the pond since this time. NHSC conducted basking surveys in the pond and did not observe any Blanding's turtles during these and other visits to the site. To minimize impacts to Blanding's turtles should they still occur in Mill Pond, the NH Fish & Game Department has requested that any observed Blanding's turtles be removed from the dredge area until work is completed.

³ Kofron, C.P. and A.A. Schreiber. 1985. Ecology of two endangered aquatic turtles in Missouri: *Kinisternum flavescens* and *Emydoidea blandingii*. *Journal of Herpetology* 19(1):27-40.

⁴ Ross, D.A. and R.K. Anderson. 1990. Habitat use, movements, and nesting of *Emydoidea blandingii* in central Wisconsin. *Journal of Herpetology* 24:6-12.

⁵ Rowe, J.W. and E.O. Moll. 1991. A radiotelemetric study of activity and movements of the Blanding's turtle (*Emydoidea blandingii*) in northeastern Illinois. *Journal of Herpetology* 25(2):178-185.

Other Turtle Species

To minimize direct impacts to all turtle species, turtles observed in the drained dredge area could be removed from the dredge location prior to dredging, and placed in the southern portion of the pond near the Lamprey River. However, extreme caution should be taken when moving snapping turtles. This species is aggressive when handled and should only be picked up from the back side of the animal, if at all. Both painted turtles and snapping turtles likely overwinter in Mill Pond, in the muck of the pond. As a result, to prevent injury to overwintering turtles or turtle habitat, the water depth within Mill Pond should be re-established by early November. This will re-establish turtle overwintering habitat by the appropriate time period.

Waterfowl/Geese

Mill Pond supports a relatively large waterfowl and geese population. Species such as mallard (*Anas platyrhynchos*) and mute swan (*Cygnus olor*) are commonly observed in the pond. In fact, mute swans regularly return on an annual basis to breed within the pond. Many residents visit the pond to feed and watch these species. In an effort to reduce impacts to natural resources including waterfowl, the project is proposed in mid to late fall. By this time, most ducklings and cygnets (i.e. young swans) have fledged and are able to disperse to nearby waterbodies and/or migrate for the winter.

To minimize impacts to nesting habitat, the project proposes to leave a small portion of the "island" intact. Currently, this "island" is utilized by a pair of mute swans for nesting. Although the project will alter the area associated with the island and reduce the available area for nesting, the project will preserve the current location of a portion of the large bur-reed island and maintain some nesting habitat. The secluded edges of the pond provide additional potential nesting locations to swans and ducks. Importantly, the project has been designed so that the pond will continue to contain shallow marsh habitat, as well as open water and deep marsh habitat. The maintenance of shallow marsh habitat in a portion of the pond will maintain important feeding habitat for dabbling ducks.

It should be noted that although attractive, mute swans are considered an introduced, exotic species. Mute swans are also very aggressive and can out compete native species for nest sites. As a result, the project team has focused on maintaining waterfowl habitat as a whole, rather than simply maintaining current mute swan nesting habitat.



Photo 7. Mill Pond provides habitat to a variety of waterfowl and geese. The area referred to as the island is visible in the background of the photo (Source: NHSC).

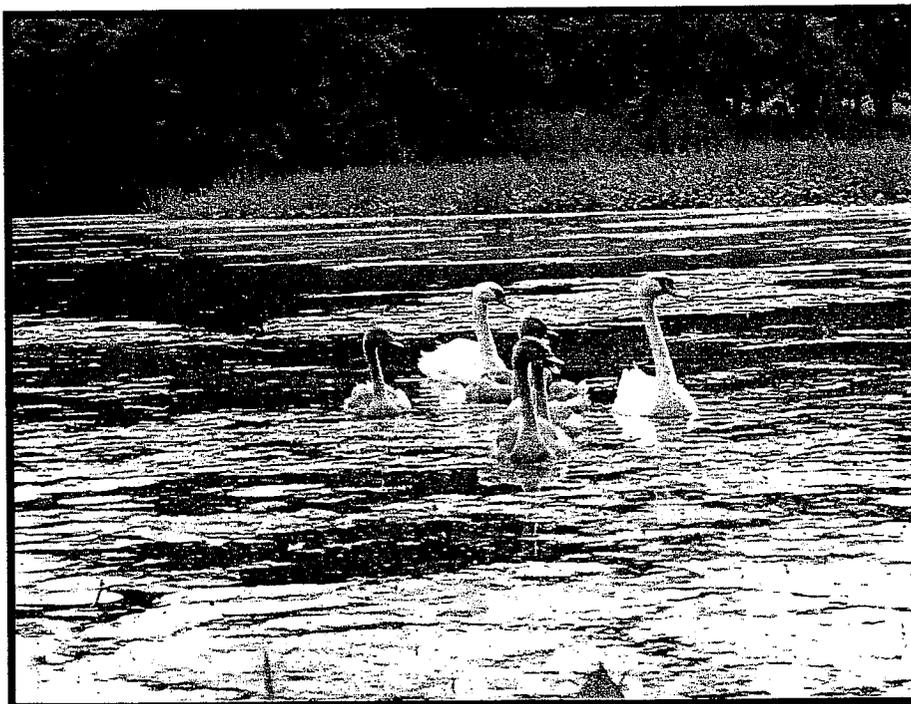


Photo 8. A pair of mute swans typically nests in Mill Pond. This is a view of mute swans in Mill Pond, during late July 2002. By mid-summer, the cygnets are already considerably large (Source: NHSC).

Amphibians

Mill Pond provides habitat to a variety of common species, including amphibians such as spring peeper (*Pseudacris crucifer*) and bullfrog (*Rana catesbeiana*). Spring peeper breed in early spring and juveniles disperse from breeding ponds by late summer. Species such as bullfrog have a long larval period and may take up to three years to completely develop. To minimize impacts to this common species, the Town of Durham may wish to dipnet the dredge area for tadpoles as the pond is drained. Tadpoles could then be transferred to water filled-buckets for the remainder of the project. Buckets should be filled with water and placed in the shade, outside of the work area. If the dredging lasts for more than a few days, tadpoles should be fed a mixture of mashed rabbit chow and fish food flakes daily. If tadpoles are fed, a portion of the water in the buckets should be changed each day to replenish dissolved oxygen and maintain adequate water quality. Bullfrog and green frog tadpoles are relatively hardy and a portion of the tadpole population will naturally survive in the mud of the pond (outside of the dredge area) if some water persists.

Tadpoles that have four legs could be caught with a hand net and placed in the adjacent river; juvenile and adult bullfrogs utilize rivers and do not require special care during the dredging project. Red-spotted newts observed in the dredge area should also be removed and placed in the southern portion of the pond near the river. Adult newts do not require special care, but should be removed outside of the dredge area and placed in or near moist soil so they do not desiccate. The Town of Durham, Durham Conservation Commission and/or Mill Pond Dredge Committee may wish to care for the tadpoles, as the species found in Mill Pond are relatively easy to care for and are not considered rare.

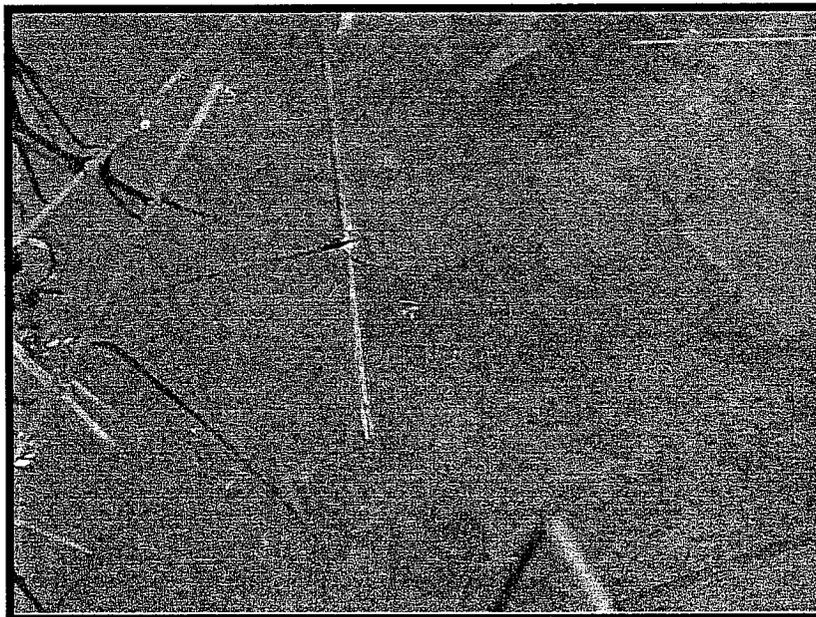


Photo 9. View of a bullfrog tadpole. Bullfrog tadpoles can be distinguished from other species by the presence of large black dots (Source: NHSC).

Fish and Mammals

The project team has been working with New Hampshire Fish and Game on non-game resources. A correspondence dated May 28, 2004 from New Hampshire Fish and Game stated that “ The October 31 end date should be selected so that fish ladder can be opened to allow fish displaced by draining the pond opportunity to return upstream to Mill Pond before cooling water inhibit their movement”. This correspondence and others from New Hampshire Fish and Game have been included as part of the NHDES wetland application related to occurrences and management during dredge.

SUMMARY

The Mill Pond project has been designed to restore and improve open water habitat, recreation, aesthetics, and minimize impacts to natural resources found within the pond. Currently, the pond supports three rare or State listed plant species and a variety of wildlife. The project team has designed the dredge area to avoid as many protected species locations as is feasible. Additionally, the project team has designed this proposed Natural Resource Management Plan to provide ways to reduce and avoid impacts to listed species and other resources. The Durham Conservation Commission/ Mill Pond Dredge Committee may use this project for public education and outreach.



Photo 10. View of Mill Pond from the public access area located adjacent to Mill Pond Road.