A PLAN FOR

Hall's Pond sanctuary

Brookline Conservation Commission • Friends of Hall's Pond

Town of Brookline
Conservation Commission

August 1996
Dear Reader:

The Conservation Commission is very pleased to present the Hall's Pond Sanctuary Plan to the citizens of Brookline. The plan was prepared with enthusiastic participation from a cross-section of the community and we believe it reflects the desires of Brookline residents.

Through the process of preparing the plan, we rediscovered Brookline's ties to the beginnings of the conservation movement in Massachusetts. One hundred years ago, Minna Hall and Harriet Lawrence Hemenway, both Ivy Street residents, conceived the idea of forming a society to protect birds, which were being killed to supply the fashion industry with feathers. That idea led to the formation of the Massachusetts Audubon Society. For more than 90 years, Minna Hall lived at 156 Ivy Street with the pond in her backyard. The pond connected her to nature and inspired her.

Today, Hall's Pond inspires many people. Where it once was the backdrop for conservation history, today it provides a respite from hectic city life and continues to connect urban dwellers to nature. With the Sanctuary Plan, we take this inspiration to consider the possibilities of restoring the Hall's Pond environment and enhancing the sanctuary for its wildlife and its human visitors.

The Commission hopes you will be inspired to join us in the restoration efforts and help us care for this special open space in Brookline. We look forward to your involvement.

Sincerely,

Betsy Shure Gross
Chair

Barbara Mackey
Commission Member
& Project Organizer

John Bolduc
Conservation Director

Friends of Hall's Pond, Inc.

Founded in 1976 to assist the Town of Brookline Conservation Commission in the protection and management of Hall's Pond Sanctuary.

August 1996

Dear Readers:

As the first Friends group organized to support open space in Brookline, the Friends of Hall's Pond are very proud that "our" sanctuary is the first to be so thoroughly analyzed and studied. This broad-based plan helps chart a course for the future.

The Friends have worked as partners with the Brookline Conservation Commission for 20 years to maintain Hall's Pond Sanctuary and to help assure its protection for future generations. With this document we reaffirm our commitment to Hall's Pond Sanctuary.

Until her death just two years ago, Josephine Albrecht led the Friends as founder and president — and as vigilant daily protector of the sanctuary. It has taken many people to begin to fill her place. We believe that she would be very proud of this plan and proud of the extensive community involvement it represents.

This document contains guidelines for the Friends and the Brookline Conservation Commission that should lead to a revitalized and preserved sanctuary for many decades in the future. We welcome old and new Friends to this effort.

Sincerely,

Barbara Mackey
President

A Plan for Hall's Pond Sanctuary

Prepared for

Brookline Conservation Commission
Town of Brookline, Massachusetts

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Friends of Hall's Pond

October 1996

Prepared by
Massachusetts Audubon Society
Environmental Extension Service

Bill Giezentanner and Don Eunson, Planners

DEDICATION

Photo by Liz Linder

Josephine J. Albrecht

1907—1994

Throughout work on this plan there has been the spirit of one who set the standards, set the pace, and set an example for us over nearly 20 years at Hall's Pond Sanctuary. Jo Albrecht's memory and inspiration continue to guide us as we try to fill the great void her death has left. This plan is an outgrowth of our commitment to what Jo Albrecht and the Friends of Hall's Pond have begun. It institutionalizes stewardship policies which will ensure a stable future for a fragile resource. We know Jo would be honored by this work and its plan for her most precious place.

Brookline Conservation Commission
Friends of Hall's Pond

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EXECUTIVE SUMMARY

Hall's Pond Sanctuary preserves and protects its animal and plant life in as natural and wild a condition as possible for the benefit of current and future generations.

This sanctuary plan, prepared by planners from the Massachusetts Audubon Society Environmental Extension Service, is the result of a highly interactive process of community consultation led by the Brookline Conservation Commission and the Friends of Hall's Pond. It analyzes the conditions of the sanctuary today, reviews its history, and proposes a plan for its future. It assumes that the next step will be to develop detailed designs to carry out the plan.

HALL'S POND SANCTUARY is a natural oasis in one of Brookline's most densely settled neighborhoods — a fragment of country in the city. This 3.5 acre parcel was acquired by the Town of Brookline in 1975, the first conservation land purchased by the Town. It is managed by the Brookline Conservation Commission, with significant volunteer assistance from the Friends of Hall's Pond.

Located behind a large block of four-story apartment buildings on Beacon Street, Hall's Pond and the adjacent Amory Park and Amory Woods Sanctuary provide North Brookline's largest green space — almost 14 acres. The sanctuary is a space that captures the imagination of children and lovers of nature and provides respite for those seeking a peaceful haven in their hectic lives.

Its larger significance lies in its setting for the ideas and values that started a national conservation movement 100 years ago, for the two founders of the Massachusetts Audubon Society grew up at the edge of what is today Hall's Pond Sanctuary. Minna Hall and Harriet Lawrence Hemenway grew up on Ivy Street, with the pond, then known as Swallow Pond, as a neighborhood focal point. By 1896, enraged by the killing of birds for their feathers to satisfy the demand for fashionable hats, they created the Massachusetts Audubon Society. The interest stirred by Massachusetts Audubon spread across the country and led to what many consider to be today's conservation movement.

ISSUES. Like many natural areas in urban settings, Hall's Pond has problems of habitat fragmentation, declining water quality, neglect and deferred maintenance, and misuse. It was once part of a larger cedar swamp that was gradually filled in for development. This development left habitat types and areas isolated, truncated, or eliminated. For example, in the 1890s, the pond attracted red-winged blackbirds, brown creepers, and a variety of species that are missing from recent bird lists. Many of the missing species are associated with larger areas of forest or wetlands that no longer exist at Hall's Pond.

Approximately 90 percent of the pond's water comes from storm drains located in its 107- acre watershed. Urban run-off into storm drains is contaminated by road salt, sand, motor oil, precipitates from vehicle exhaust, domestic animal waste, and litter. The result of these contaminants and the destruction of the pond's outflow stream and associated marsh in 1948 is that the pond no longer supports the variety of aquatic plants and animals associated with a more natural pond. Also, grit, sand, and organic material are filling in the pond.

Hall's Pond, benefitting from the vigilence and attention of the Friends of Hall's Pond and the Brookline Conservation Commission, has avoided extremes of neglect and misuse. Nonetheless, over the years, the absence of budgets for maintenance and capital improvements and the lack of a long-term plan have had a negative impact. For example, a confusing network of trails with dead ends has developed from people venturing off in all directions and creating hidden areas that invite misuse such as drinking parties and shelter for an occasional homeless person. These areas not only pose security concerns for legitimate users, but they become degraded habitat where native vegetation cannot easily regenerate. The absence of a vegetation management plan to provide focus also contributes to the spread of nonnative exotic species that further threaten the quality of the habitat.

OPPORTUNITIES. With community support growing, with the potential for restoring the old link between Hall's Pond and its related sanctuary, Amory Woods, and with the energized partnership between the Town and private supporters, Hall's Pond is poised to receive its most beneficial attention ever.

The idea of rejoining the two natural areas, Hall's Pond and Amory Woods, which would diminish the fragmentation of habitat, has broad public support.

Building on a 20-year history, Hall's Pond is well suited for the increased and focused attention of a public-private partnership between the Brookline Conservation Commission and the Friends of Hall's Pond in the management of the sanctuary. This partnership could and should produce private fund raising, grants, increased leverage of public funds through interdepartmental cooperation, and the fielding of a larger volunteer corps of sanctuary stewards. Cooperative efforts begun between the Brookline Conservation Commission, the Department of Public Works, and the Brookline Park and Recreation Commission may yield a park and sanctuary ranger program in the future. And, most significantly, in the past two years, the Town has committed capital funding of $181,000 to Hall's Pond, in recognition of the value of this wildlife sanctuary.

Goals for the Plan. Goals formulated by the Conservation Commission and the community of sanctuary-users guided the development of the plan by the consultants.

Goals for natural resources:

- restore the pond's natural character and water quality
- benefit wildlife
- preserve or replace mature tree canopy
- encourage diverse species of plants and animals
- reduce or eliminate invasive, nonnative plants

Goals for visitor use:

- enhance visitor enjoyment and opportunity to observe nature
- preserve natural character, intimacy, and opportunity for solitude
- limit recreational uses to those that are compatible with natural resource objectives
- entail minimal maintenance

Goals for public education:

- provide opportunities for educational use of Hall's Pond
- foster stewardship of the sanctuary
- contribute to general environmental advocacy

The Sanctuary Plan. Five concepts summarize the plan.

- Reclaim a wet, unused portion of Amory Park as a link between Hall's Pond and Amory Woods and restore some of the habitat continuity of the original cedar swamp.

- Intercept contaminants coming into the pond from the storm drain system by rigorously maintaining existing catch basins and installing oil traps and gross particle separators.

- Construct a wetland along the pond's western edge and in the link to Amory Woods to become a restored wetland that will attract a wide variety of animal species and help remove nutrients and sediments from storm run-off.

- Design new entrances, fences, and a boardwalk and path system that will encourage desirable uses and discourage unwanted uses.

- Plant native plants for improved wildlife habitat and to replace missing tree canopy. Control invasive nonnative plants.

BACKGROUND

Management and proper maintenance of conservation land is an important activity in many communities and it is a critical issue for Brookline. All too often land acquired for the protection and enjoyment of natural resources shows signs of deterioration due to neglect, insufficient funds, lack of attention, abuse, or overuse. The more urban the surroundings and the higher the use, the more likely active management will be required to maintain the site's natural values.

While Hall's Pond Sanctuary shows signs of deterioration, the worst symptoms of neglect have been avoided largely due to the efforts of the Friends of Hall's Pond in concert with the Brookline Conservation Commission.

PURPOSE OF PLAN

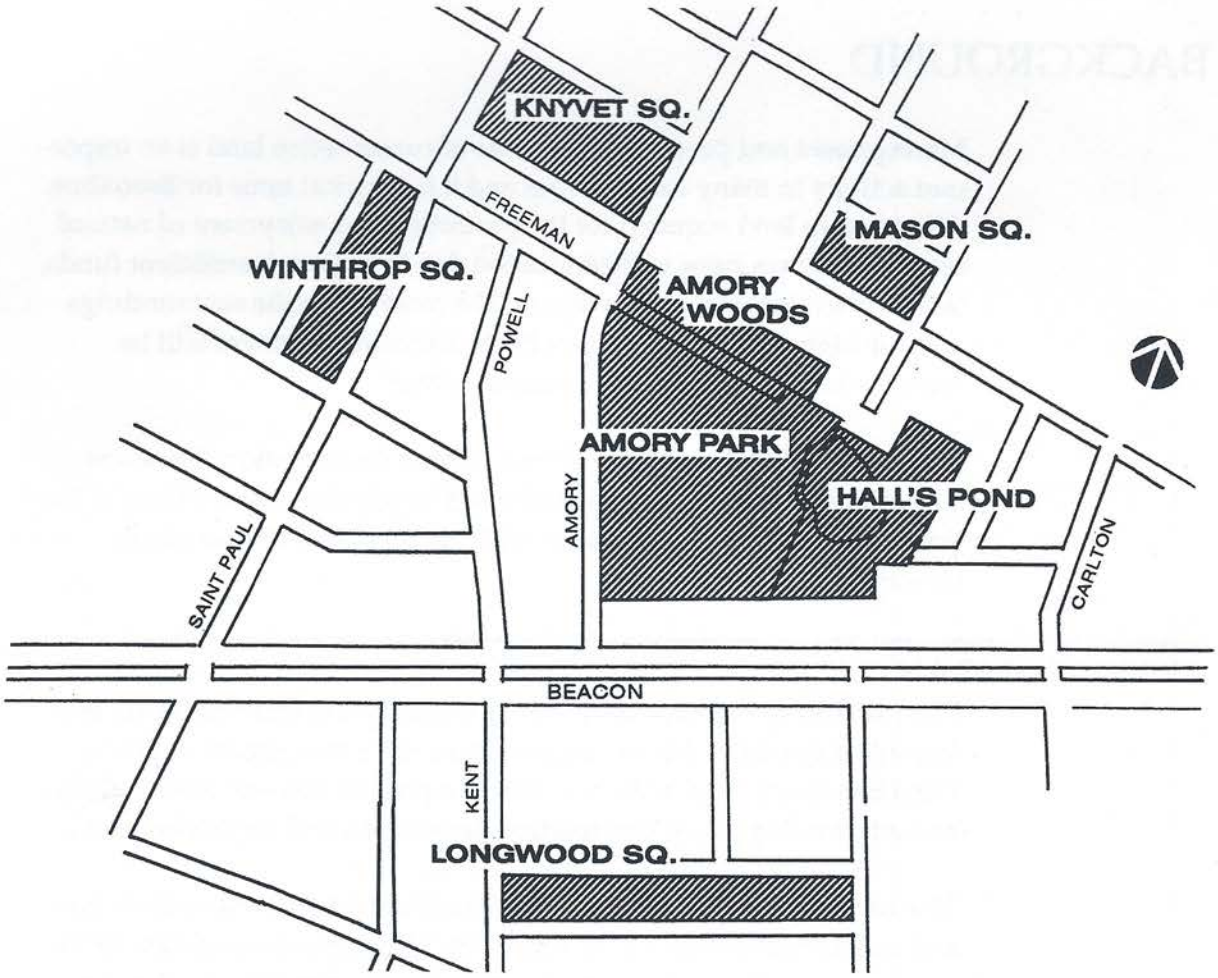
The purpose of this sanctuary plan is to clarify and establish goals and formulate strategies for the improvement and management of Hall's Pond Sanctuary. This is the first step in a process that will lead to design and engineering plans, construction documents, and implementation.

This sanctuary plan is a product of the community's consensus on goals and conceptual design for the sanctuary. The active participation of the community will continue to be important to the planners, landscape architects, and engineers who proceed with implementation.

CONTEXT AND LOCATION

Hall's Pond, owned by the Brookline Conservation Commission, is a secluded natural resource in the Longwood/Cottage Farm section of North Brookline and one of the only two relatively natural ponds in the town. It is set behind a row of apartment buildings at 1080 through 1120 Beacon Street, between Carlton Street and Amory Street. Given the high population density of this neighborhood, the existence of such a natural oasis is an unexpected pleasure.

The pond and its small area of surrounding land total 3.5 acres. It is near Amory Woods (1.6 acres) and adjacent to Amory Park (8.7) acres. The three areas total 13.8 acres of open space, by far the largest greenspace,



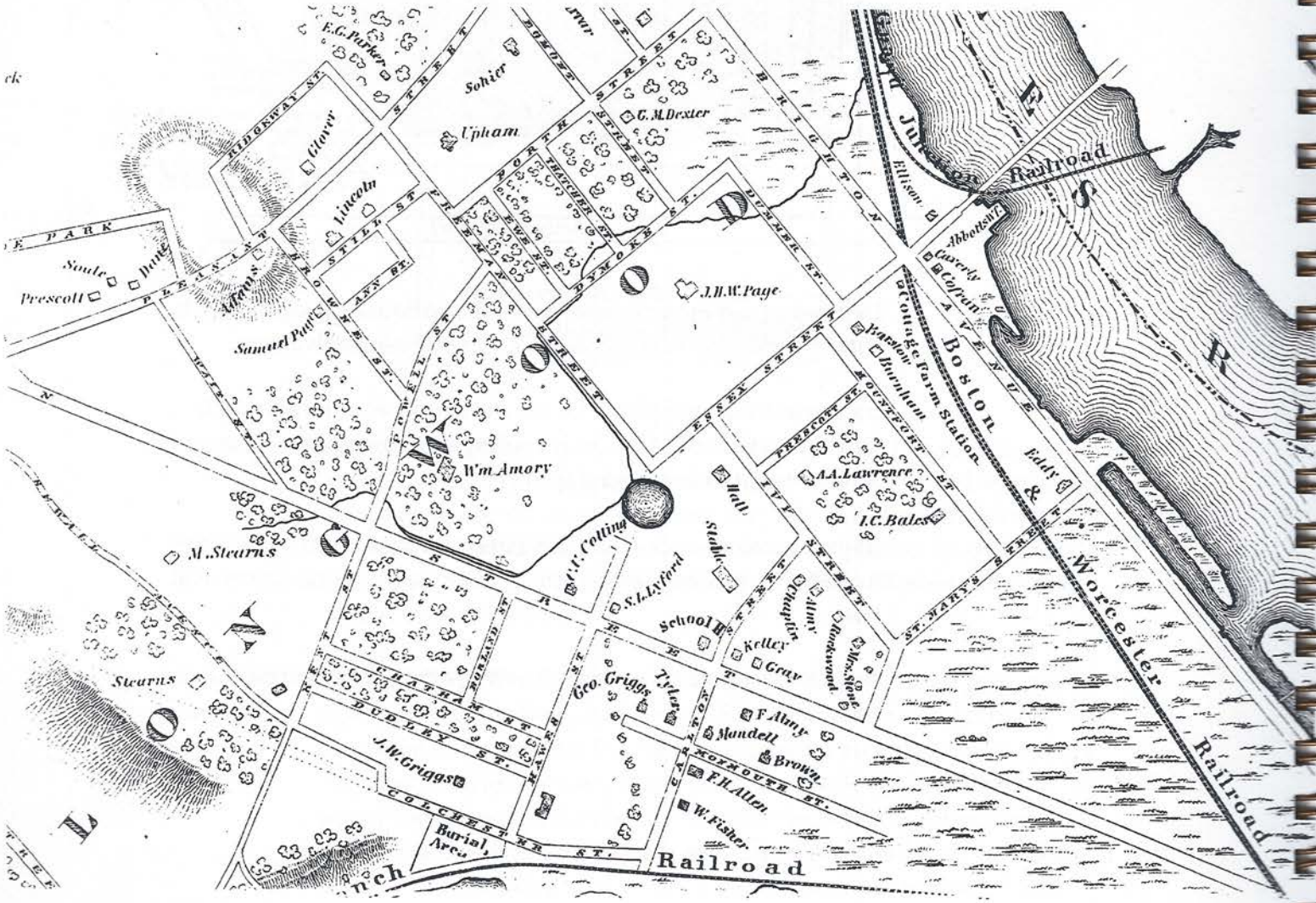
and the only conservation land in North Brookline. This area is surrounded mostly by residences; apartments to the south and west, single family homes to the north, west and east; and the Massachusetts Association for the Blind to the north of Amory Woods. There is also a heavily wooded, undeveloped parcel belonging to Boston University nearby on Amory Street.

The 1994 Brookline Conservation Commission open space plan, titled *Open Space in Brookline, Analysis and Plan for Conservation, Parks and Recreation*, indicates that this planning area has an adequate amount of neighborhood recreation space to meet the needs of its residents (2 acres/1000 persons). Nearby open spaces include Knyvet Square, Mason Square, Winthrop Square and Longwood Mall. This 1994 plan calls for the following studies and actions that relate to Hall's Pond:

HISTORY AND TOWN OWNERSHIP

Until well into the 1800s, Hall's Pond was part of Cedar Swamp, an area of wetland that included most of the low-lying area bordered by Beacon, Amory, Ivy, and Carlton Streets. Most of this area was part of the Amory Estate and had earlier been the site of a Native American fort. In the 19th Century, the pond was known as Swallow Pond and was surrounded by farms. After the Civil War, storm drains were constructed, and drained land was filled and developed intensively as estates and residences.

Shortly before the Civil War, a portion of the pond and surrounding land became the property of the Dexter Hall family who lived at 156 Ivy

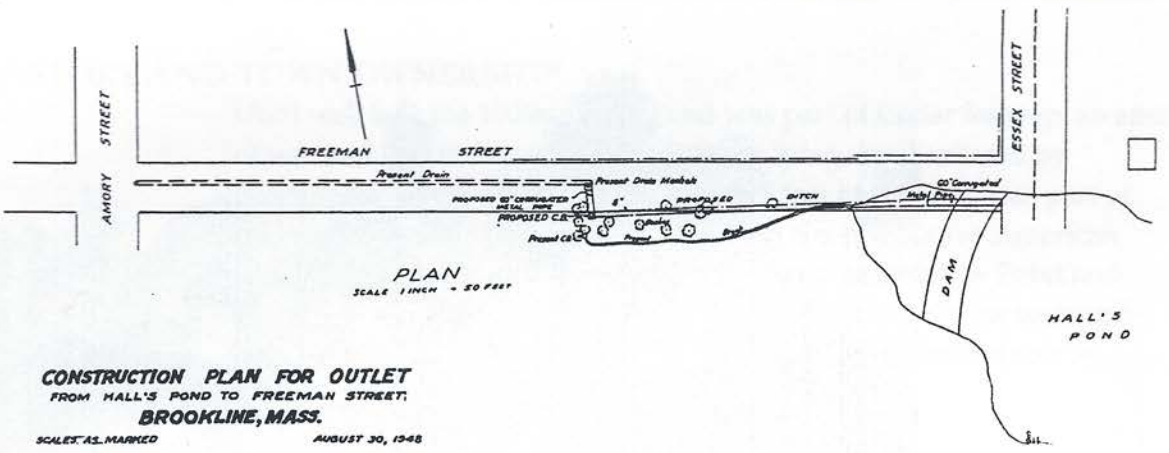


Historic map from 1855.

Minna Hall watched the seasonal comings and goings of birds at the pond behind her home at 156 Ivy Street.

Street. Miss Minna B. Hall developed a passion for nature; undoubtedly the seasonal comings and goings of birds in her backyard pond contributed to her interest and knowledge. Miss Hall and her childhood friend, Harriet Lawrence Hemenway, who lived across the street, plotted a strategy to halt the cruel slaughter of birds for their plumes which were used as decorations for women's hats. Their actions led to the founding of the Massachusetts Audubon Society in 1896, the forerunner of many other state and national Audubon societies dedicated to conservation. Later in life, Minna Hall was concerned that the Pond and its surrounding area be protected for others to enjoy. Her 1951 obituary in the Boston Globe states that she offered the pond to the town but the offer was refused.

About 1910, Charles A. Newhall acquired the land between the pond and Beacon Street and built the Newhall Apartments at 1080 to 1120 Beacon Street and created formal gardens, the remains of which are now part of the Sanctuary. The gardens, cultivated by full-time gardeners, won horticultural awards in the 1960s. In the 1940s, the town proposed filling the pond to extend Essex Street. Hall's Pond was reduced to its present size around 1948 when a dam was constructed to the west of the



pond and the land was filled to create Amory Playground. In 1960, an outlet structure was constructed to control the pond's water level.

In the 1970's the pond was threatened by development when its subsequent owners proposed that the area be subdivided into four house lots. Brookline citizens and the Conservation Commission rallied and on April 10, 1975, Hall's Pond became the Town of Brookline's first acquisition of land for conservation purposes. The purchase was aided by state and federal grants. In 1976 the Friends of Hall's Pond was founded by Josephine Albrecht and other citizens to assist the Conservation Commission manage the Sanctuary. It was Brookline's first friends organization and serves as the model for the more than thirty organizations that now constitute the Brookline GreenSpace Alliance.

During 1996 the Friends of Hall's Pond are celebrating their 20th anniversary as the community stewards of this urban resource.

PRIOR PLANNING

There have been three prior planning studies made of Hall's Pond. Two by landscape design students dealing with vegetation and path layouts, and the other, by an engineering firm, dealing with water quality issues.

Radcliffe Sanctuary Study and Recommendations

In the spring of 1976, at the request of the Brookline Conservation Commission, eight students enrolled in the Radcliffe Seminars Landscape Design Program under instructor John Furlong completed a design plan of Hall's Pond Sanctuary. Their report addressed

maintenance and improvements to the wild area, path system, "park area," and the formal garden with recommendations regarding pruning and planting programs, plant succession in the sanctuary, and habitat protection.

Radcliffe Plant Inventory

In 1984, Radcliffe Seminars student Elizabeth A. Ruth inventoried the trees and shrubs at Hall's Pond and compared its vegetation with Turtle Pond at the Habitat Institute for the Environment in Belmont. This project produced a list of major trees and shrubs and discussed the need for vegetation management to maintain the character of the pond and its surrounding area.

Engineering Study of Water Quality

In 1985 the Town of Brookline engaged Metcalf & Eddy, Inc./Engineers to prepare a *Diagnostic/Feasibility Study of Hall's Pond* addressing restoration alternatives for the pond. This study mapped the pond's water and sediment depths and perimeter, described the watershed, summarized geology, soils, water quality information, habitats, and wildlife. To improve water quality, the study recommended eliminating the storm water source by building a storm drain by-pass around the pond, and providing a new water supply for the pond from wells dug in Amory Park. This recommendation was the basis for the Town's 1988 appropriation to the Conservation Commission of $106,000 as match for a state Clean Lakes program. State funding for the program was subsequently discontinued and the proposed improvements were not implemented.

PROJECT ORIGIN

In 1994, when Josephine Albrecht—champion of Hall's Pond for almost twenty years—died at the age of 87, her death served as the catalyst for discussions about the future management of Hall's Pond Sanctuary. In May 1995, the Town Meeting reauthorized the expenditure of funds for water quality and landscape improvements.

The Conservation Commission issued a request for proposals to prepare a sanctuary management plan for the pond and selected the Massachusetts Audubon Society's Environmental Extension Service as its consultants. It is especially appropriate that Massachusetts Audubon,

in its centennial year, is bringing its sanctuary management experience to this project and working with the Conservation Commission on recommending management improvements for the pond that stimulated Minna Hall's interest in conservation.

COMMUNITY PARTICIPATION

A critical aspect of this planning effort has been to encourage community participation. On Saturday, October 28, 1995, the Friends of Hall's Pond and the Brookline Conservation Commission hosted a Hall's Pond Community Workshop. The purpose of the workshop was to bring together neighbors, Sanctuary users, town officials, and planners, and other professionals to discuss the uses and values of the Sanctuary and to develop a vision and plan for its future. Nearly 40 participants considered the future of the Sanctuary, identified issues and opportunities present at the sanctuary. They highlighted the following:

Issues

Resource Protection

- pollutants in the pond and their source
- sedimentation of the pond
- erosion
- decline of mature trees
- reduction of biological diversity

Human Uses

- inappropriate uses (e.g., beer parties, bicycles, homeless, etc.)
- awkward path system
- lack of seating
- limited access
- vandalism
- possible loss of character, intimate scale, and feeling of sanctuary from future "improvements"

Context

- not regarded as part of larger greenspace with Amory Park
- physically and ecologically disconnected from Amory Woods Sanctuary
- uncertain support among nearby neighbors

Management

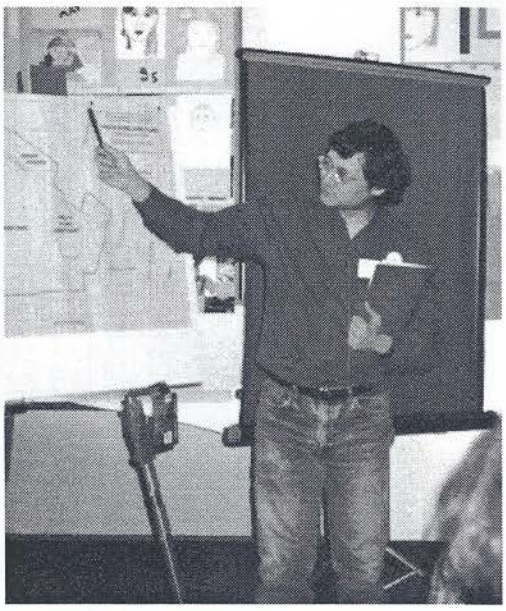
- lack of resources for routine maintenance

Opportunities

On the positive side, the following opportunities for improving Hall's Pond Sanctuary were noted in the workshop and during subsequent discussions:

- town appropriation of $106,000 in FY '96 and $75,000 in FY '97
- public/private stewardship by endowment or similar means
- coordination among town commissions and agencies
- interest in educational uses by schools
- increased police presence available
- unifying Amory Woods and Hall's Pond
- potential program of park and sanctuary rangers
- diversification of habitat

Since the October workshop discussions with many groups and individuals—including the Friends of Hall's Pond, the Board of Selectmen, the GreenSpace Alliance, and neighbors—have honed the initial concepts and produced this plan.



SITE ANALYSIS

This section looks at Hall's Pond Sanctuary as it is today, in the context of what is known of its history. Data ranging from natural environmental characteristics (such as vegetation in the sanctuary) to patterns of use by visitors are considered. Careful site analysis is an essential first step in the development of appropriate plans for the sanctuary's future.

Sources of information for site analyses were Betsy Colburn, Massachusetts Audubon Society aquatic ecologist; prior studies by Metcalf & Eddy, Inc./Engineers and by students in Radcliffe Seminars Landscape Design Program (see page 6 in *Background*); *New England Wildlife* by Richard M. DeGraaf, et al; *A Sierra Club Naturalist's Guide to Southern New England* by Jorgensen; and field observations.

THE POND

Hall's Pond itself is the lovely, tree-ringed heart of the sanctuary. It is home to more than 70 species of birds from spring to fall, and is visited briefly by even more birds seeking food, shelter, fresh water and rest

during the weeks of spring and fall migrations. No aquatic plants interrupt the pond's dark surface.

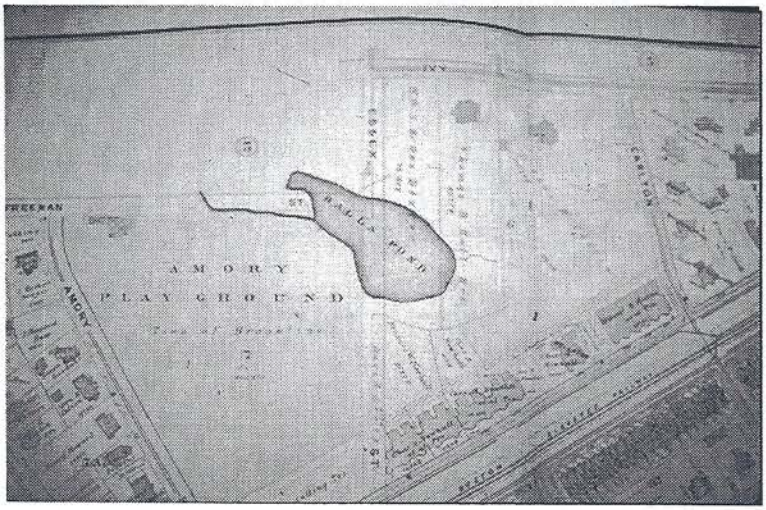
At this time the pond is something under an acre in size. Over the years, observers have noticed the shrinking perimeter of the pond. On occasion, visitors have sensed the unmistakable smell of petroleum at the pond, or had the sad experience of finding oil-soaked birds on the pond. The source of this petroleum is presumed to be street run-off from the storm drain system.

The comprehensive 1986 engineering study by Metcalf & Eddy, *Diagnostic/ Feasibility Study of Hall's Pond*, though over a decade old, remains a valuable source for detailed scientific data on the factors that have a direct impact on the pond and is the primary source for water quality data in this plan.

The Pond Today

	*1985 Survey**
Area	<1.0 acre
Max. Depth	8 feet
Mean Depth	2.8 feet
Volume	2.8 acre-feet
Shoreline length	827 feet

*Source: Metcalf & Eddy/Engineers



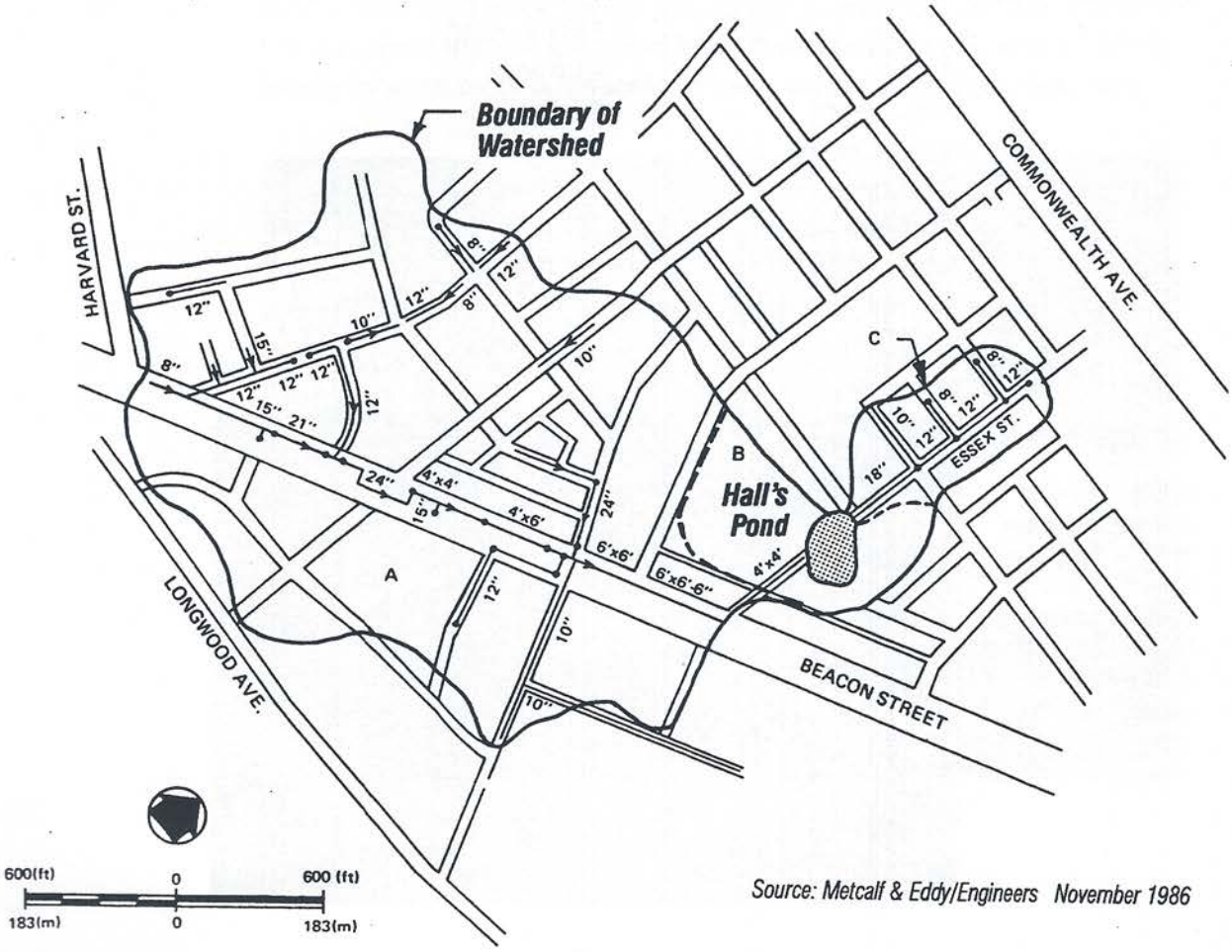
In this 1913 map both the larger size of Hall's Pond and the stream that carried its overflow toward the Charles River are clearly visible.

The Watershed

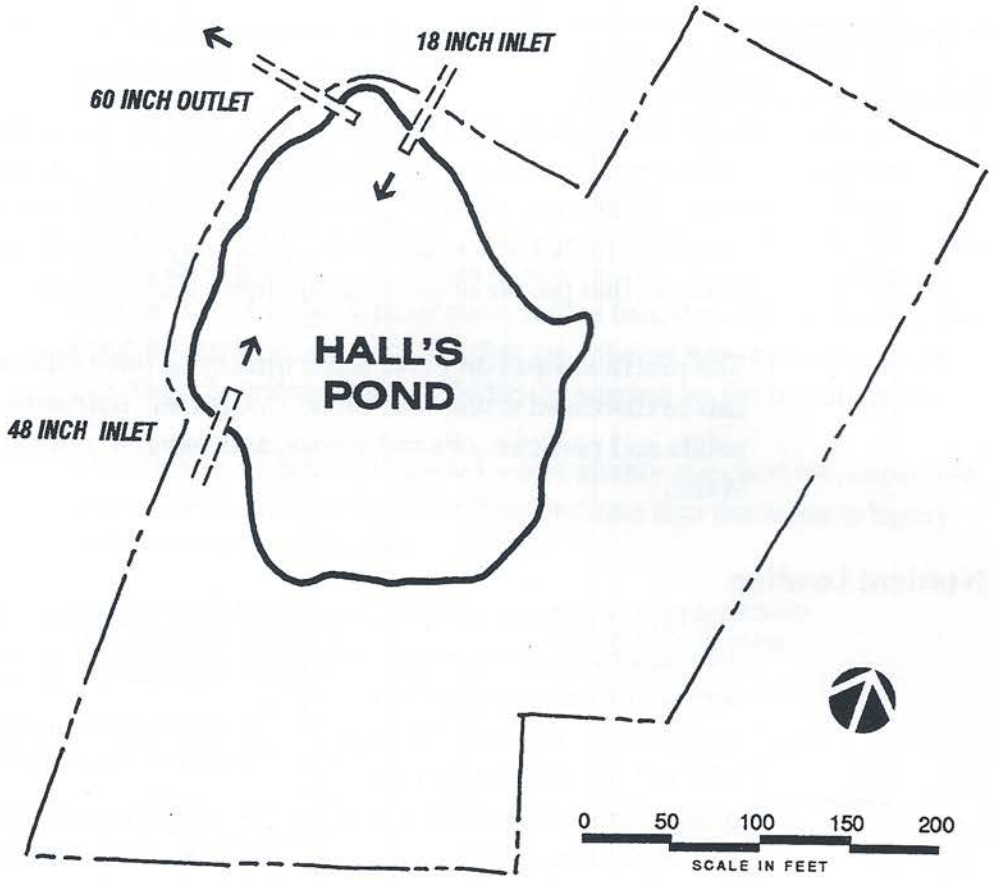
No spring or stream feeds Hall's Pond. The source of water flowing into the pond is rainwater that falls on its watershed, which consists largely of heavily developed urban land. Hence this rainfall washes off the streets and impervious surfaces in the watershed and comes to the pond mostly as road run-off through the storm sewer system. The total drainage area of the watershed is estimated to be about 107 acres. Beacon Street, one of the busiest thoroughfares in the Boston area, runs through the Hall's Pond watershed. Although there is some overland flow from Amory Park, adjacent house lots, and the Sanctuary itself (subdrainage area B in figure below), this contributes only 10% of the pond's water.

The storm water from subdrainage area A enters the pond through a 4' x 4' concrete box culvert (clearly visible as a long berm in the ground

Storm Drain System Within Hall's Pond Watershed



Source: Metcalf & Eddy/Engineers November 1986



Inlets and Outlets at Hall's Pond

near the entrance to the sanctuary) at the southwest corner of the pond. Additional street run-off from streets in the Cottage Farm neighborhood (subdrainage area C) enters the pond through a submerged 18-inch storm drain at the pond's northwest corner.

Hall's Pond is itself part of a larger watershed that supplies the Charles River. The overflow, or outlet, for the pond is another underground pipe (60 inches in diameter) that can be seen in the northwest corner of the pond near the end of the Freeman Street Extension. This drain follows Freeman Street to Amory Street and eventually empties into the Charles.

WATER QUALITY

Pollutants from Storm water

The flow of water into and through Hall's Pond carries with it all the pollutants found on urban streets: road salts, sand, deicing chemicals, motor oil and other automobile fluids, exhaust emission precipitates, domestic animal waste, and litter. There may also be the occasional toxic material that people illegally dump down storm drains.

The practical effect on pond water quality of these different pollutants can be discussed under four broad categories: nutrients, suspended solids and particles, oils and grease, and oxygen content of the pond water.

Nutrient Loading

The organic wastes and landscape fertilizers that wash into storm drains ultimately make their way to the pond. Along with leaves and plant debris from the woods, these water-borne wastes and chemicals increase the nitrogen and phosphorus levels of the water. Although these nutrients are essential for plant growth, an excess plays havoc with an aquatic ecosystem. When human activities in a watershed increase nutrient and sediment loading, the natural process of a pond's gradual transformation to dry land can be greatly accelerated. This is called cultural eutrophication.

Total Phosphorus concentrations in Hall's Pond are 0.03–0.27 mg/l.

At concentrations >0.03 mg/l a lake is considered eutrophic.

Metcalf & Eddy, 1986, page 3-19

In Hall's Pond both nitrogen and phosphorus levels are high enough to stimulate rampant algae growth. Phosphorus levels usually exceed the level at which a pond or lake is considered eutrophic. (Because nitrogen levels in natural water exceed phosphorus by an order of magnitude, it is commonly phosphorus that is the limiting nutrient in ponds.)

Suspended Solids

Particles of silt and sand from yards and roads are carried to the pond suspended in often fast-moving storm water run-off. In the pond the water comes to rest and a portion of these particles settle out of the water and contribute to the gradual filling of the pond.

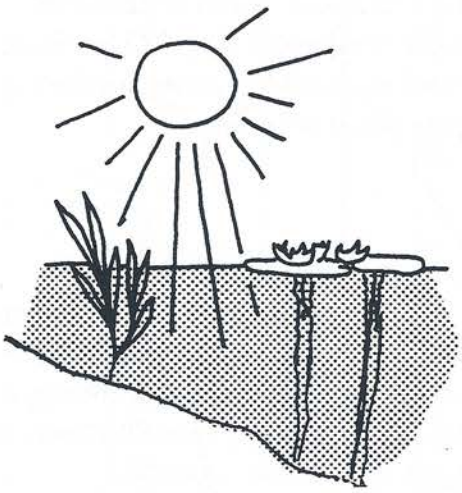
Secchi depth readings in Hall's Pond usually ranged from 0.6–0.9 meters (2–3 feet) indicating that clarity of pond water is usually very poor.

Metcalf & Eddy, 1986, page 3-18

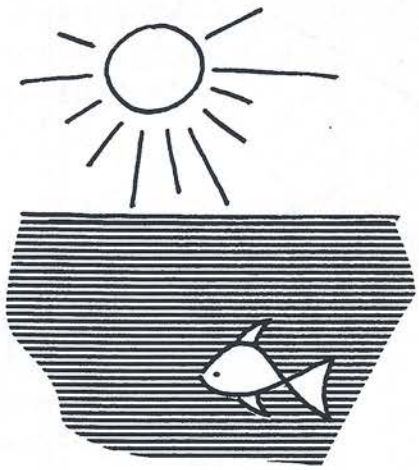
The remaining particles in suspension, along with algae, are what we see as brown, murky water. Excessive turbidity reduces the sunlight that penetrates the pond water, inhibiting the growth of aquatic plants as well as fish species that cannot tolerate turbid water. Unlike many native fish, the carp, released in the pond by humans, are a species that can tolerate very turbid water. In fact, they contribute to the turbidity by stirring up the bottom mud.

Although there is no established water quality standard for suspended solids, measurements at Hall's Pond indicate that the water is highly turbid throughout the year.

Normally turbid ponds allow penetration of sunlight and support aquatic plants.



Because of severe turbidity and carp Hall's Pond has no aquatic plants.



Oils and Grease

Oils and grease that are carried by street run-off and create a slick on the pond surface are rare but pose a special hazard for birds. When larger releases occur, oil-soaked birds perish from exposure, drowning, suffocation and oil toxicity.

Oxygen Content of Pond Water

Oxygen from the atmosphere which has been absorbed into lake water is called dissolved oxygen (DO) and a sufficient level of DO is vital for

all aquatic creatures, such as fish, tadpoles, and insects. In Hall's Pond dissolved oxygen levels tend to be low — well below the state water quality standards for Class B waters such as Hall's Pond — during most of the year, except in the winter when biological activity and demand for oxygen is at a minimum.

The Commonwealth of Mass. water quality standard for dissolved oxygen is 5.0 mg/l minimum.

1985 readings in Hall's Pond were

Autumn	*4.5 mg/l*
Winter	*9.0 mg/l*
Summer	*<1.0 mg/l*

Metcalf & Eddy, 1986, page 3-13

The below-normal levels of dissolved oxygen are caused by decomposition of organic matter, such as leaves and summer algae, on the pond bottom; excessive turbidity which lowers the water's oxygen-holding capacity; and the lack of aquatic plants that would typically release oxygen through photosynthesis.

The important impact of this for the habitat value of the pond is that only species that can tolerate low levels of dissolved oxygen, such as carp, can survive in the pond today. Low DO levels also account for the occasional offensive odors caused by anaerobic decomposition of organic materials during hot summer periods.

Erratic Water Flow

Rain storms are an inconsistent source of water. A natural swamp or wetland has considerable holding capacity, acting like a sponge during times of flood, and releasing water gradually during dry periods. As the swamp surrounding Hall's Pond has been filled over the years, the pond has lost some of this reservoir capacity.

During site surveys conducted in 1986 by Metcalf & Eddy there was no measurable water flowing into or out of the pond, and typically at such times the pond level drops due to evaporation. Conversely, during heavy rainstorms water will flood into the pond and out the overflow with no retention.

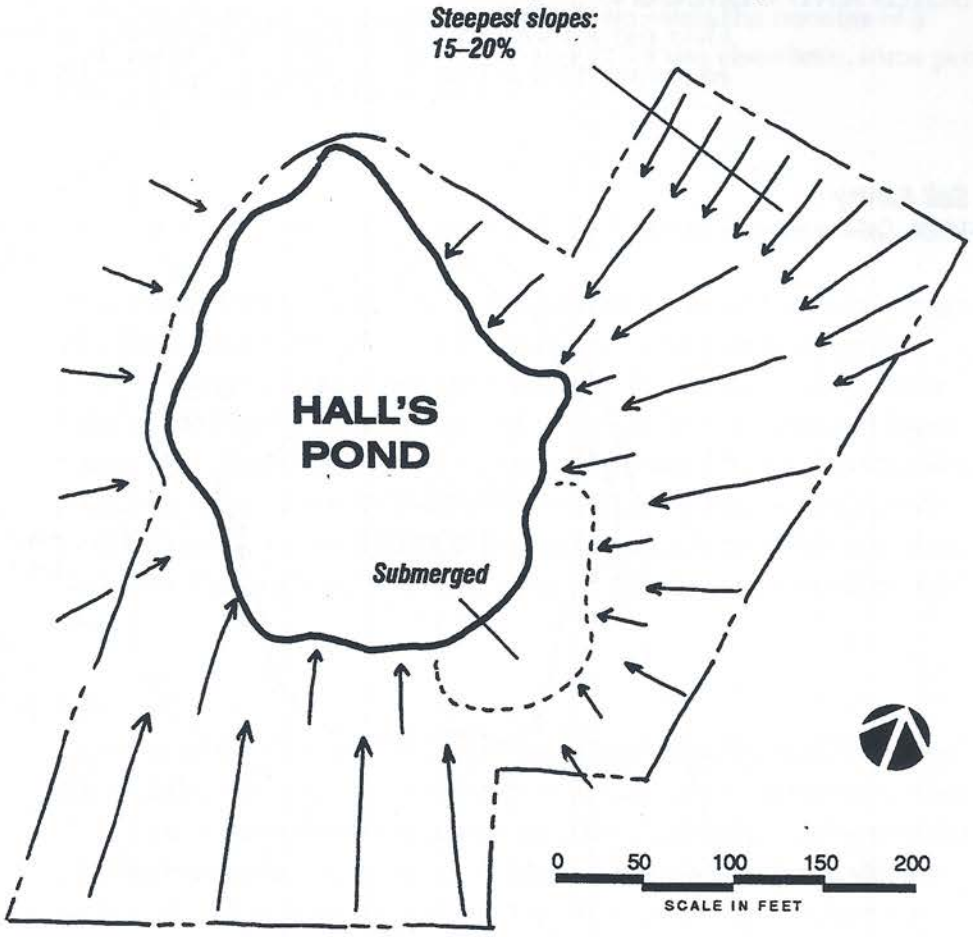
Random, unpredictable disturbances tend to diminish the number of species that can adapt to a habitat. The lack of significant wetland to buffer the pond environment, together with the heavy pollutant loads

from urban run-off, have combined to reduce the species of birds and animals that use the pond.

LAND FORM AND RUN-OFF

Immediately surrounding Hall's Pond the land is low and relatively flat. Further from the pond, in the formal garden and the foot of the shrubs and thickets, the ground ascends at about 3–7% slope. The upland in the northeast corner becomes steeper, to a slope of 20%. The far northeast corner of the sanctuary is approximately 25 feet above the pond edge.

An area to the southeast of the pond is so low relative to the water table that it is wooded swamp. The lawn area to the southwest is very wet after spring melt and during rainy spells. The upland area is well-drained.



Elsewhere slopes generally range from 3–7%

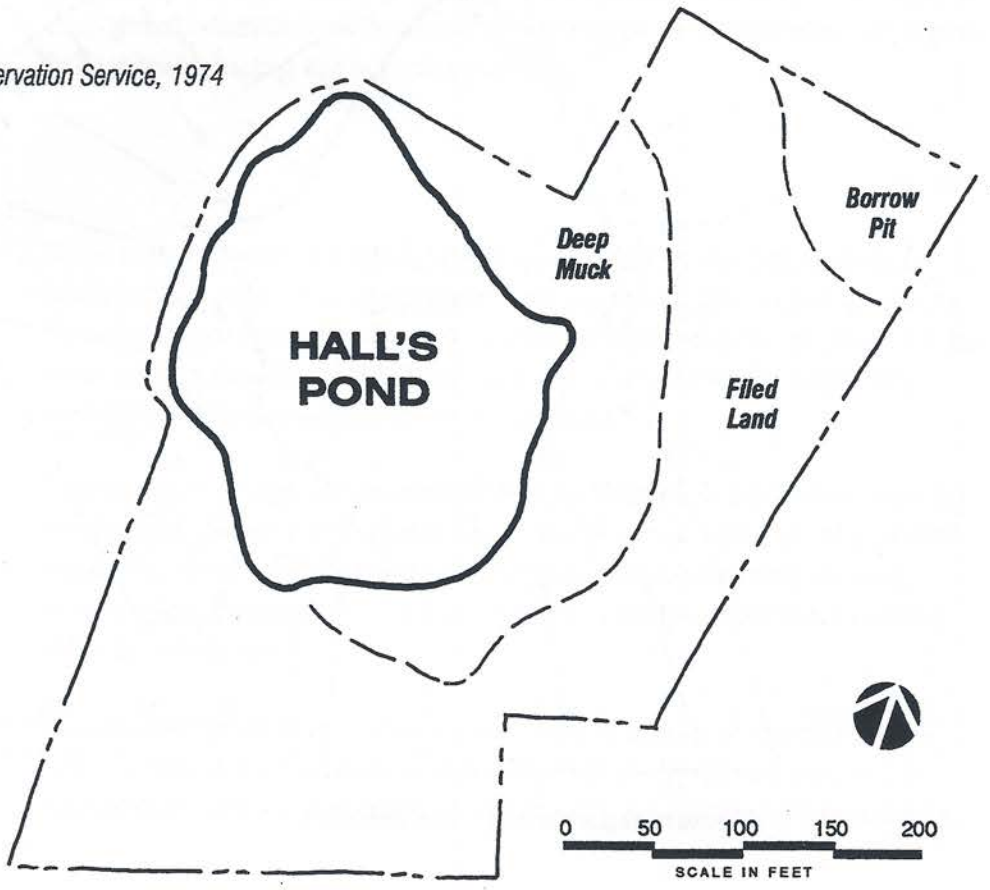
The surrounding land form creates a drainage pattern that carries overland flow into the pond from the Amory Park playing fields to the west, from the parking area behind Beacon Street apartments to the south, and from Churchill Street and abutting properties to the east. In the northwest corner, where the pond's original stream outlet flowed, the filled land continues to be low and wet.

General data for this analysis of land form were taken from the 1976 Radcliffe Seminars landscape plan and the 1986 Metcalf & Eddy engineering study. However, no survey of the three adjoining properties—Hall's Pond, Amory Park, and Amory Woods—is available. A survey showing contours of 2 foot intervals minimum will be needed before detailed planning and design can proceed.

SOILS AND GEOLOGY

Over the years a variety of borings and soils studies have been conducted around Hall's Pond. Boring tests in 1942 found that swamp mud

Soil Survey
USDA, Soil Conservation Service, 1974



underlies the entire sanctuary area. The soils therefore are rich in organic matter and nutrients, but are generally wet. Thus the principal limiting factor on what plants will thrive here is their tolerance of wet soils.

Much of the rest of the sanctuary is filled land, where soil, stone and rock were dumped on the original swamp soil to make the land suitable for either farming or development.

In 1973 a U.S. Department of Agriculture study classified the land immediately adjacent to the pond as wetland soils. These comprise a surface layer of dark gray fine sandy loam 14 inches thick. Below that is a substratum of grayish brown sandy loam, and an 80-inch layer of dark gray silt mixed with oyster shells. Below these layers is the mud of the original swamp.

In the northeast corner of the sanctuary there exists the remains of a "borrow pit" from which soil was removed for use elsewhere, some perhaps for fill in the sanctuary itself.

VEGETATION

Some conservation lands have long histories of protection from human influences. Hall's Pond, however, has been a wildlife sanctuary only since 1975, and its prior uses are evident in the sanctuary's vegetation. Although the property subsequently experienced the woodland regeneration that characterizes land no longer cultivated by people, the plants reflect the Sanctuary's varied uses through time. Plants today include wetland species typical of wooded swamps, plants generally found on abandoned agricultural land, and ornamentals from former estate gardens.

Condition of Woods

The trees of Hall's Pond Sanctuary, though principally deciduous, consist of rather diverse species. The mature trees that create a canopy are in decline. A number of the largest trees that define the character of the pond perimeter are quite old and, because these willows and silver maples are weak-wooded species, cannot be counted on to survive much longer. As they are blown down by wind or cut down for visitor

safety, their absence greatly impacts the appearance of the sanctuary. A combination of factors including smothering vines and trampling by visitors limits the capacity of new seedlings to establish themselves.

Evergreens

Generally, Hall's Pond Sanctuary is lacking in evergreen trees. Today there are no examples of the Atlantic white cedar (*Chamaecyparis thyoides*) for which the swamp was once named. Some years ago a half dozen young white pines (*Pinus strobus*) were planted by the Friends on high ground at the northeast corner of the property, and three or four of these are now well established. As these continue to grow their shade and dropped needles will influence the character and understory of that area.

Invasive Exotics

Plants that are imported intentionally or accidentally from elsewhere in the world, which adapt to conditions in their new environments so well that they proliferate and crowd out native plants, are called invasive non-native species, or invasive exotics. Invasive exotics pose a serious problem for managers of wild lands and nature sanctuaries. By dominating their new landscapes to the exclusion of native species, exotic species threaten biodiversity.

Hall's Pond Sanctuary contains a number of invasive exotics including:

Trees	
Tree of Heaven	*Ailanthus atissima*
White Mulberry	*Morus alba*
Shrubs	
Japanese Barberry	*Berberis thungergii*
Multiflora (Japanese) Rose	*Rosa multiflora*
Tatarian Honeysuckle	*Lonicera tatarica*
Vines	
Porcelain Berry	*Ampelopsis brevipedunculata*
Asiatic bittersweet	*Celastrus orbiculatus*
Hall's Honeysuckle	*Lonicera japonica 'Halliana'*
Herbaceous Plants	
Japanese Knotweed	*Polygonum cuspidatum*

(Continued on page 23)

Table of Existing Species*

Within groups listed alphabetically by botanical name.

**Sources: Metcalf & Eddy, "Final Report to Town of Brookline on Diagnostic/Feasibility Study of Hall's Pond, Brookline, Massachusetts," 1986; Ruth, Elizabeth A., "An Introduction to Native Trees and Shrubs at Hall's Pond, Brookline, Massachusetts," 1984.*

TREES

Botanical Name	Common Name	Native	Ornmntl	Invasive Exotics
Acer palmatum	Japanese Maple		O	
Acer pseudoplatanus	Sycamore Maple		O	
Acer rubrum	Red Maple	N		
Acer saccharinum	Silver Maple	N		
Ailanthus altissima	Tree of Heaven			IE
Betula lenta	Sweet Birch	N		
Betula nigra	Black Birch	N		
Betula papyrifera	White Birch	N		
Cornus florida	Flowering Dogwood	N		
Crataegus crus-galli	Cockspur Hawthorne	N		
Fagus grandifolia	Beech	N		
Fraxinus americana	White Ash	N		
Magnolia	Magnolia	N		
Malus	Flowering Crabapple			
Malus baccata	Siberian Crabapple		O	
Morus alba	White Mulberry			IE
Pinus strobus	White Pine	N		
Prunus	Flowering Cherry		O	
Prunus	Weeping Cherry		O	
Prunus serotina	Black Cherry	N		
Quercus alba	White Oak	N		
Quercus bicolor	Swamp White Oak	N		
Quercus palustris	Pin Oak	N		
Quercus velutina	Black Oak	N		
Salix babylonica	Weeping Willow		O	
Salix fragilis	Crack Willow		O	
Salix nigra	Black Willow	N		
Thuja occidentalis	American Arborvitae	N		
Tsuga canadensis	Canadian Hemlock	N		
Tsuga caroliniana	Carolina Hemlock	N		
Ulmus americana	American Elm	N		
Ulmus rubra	Slippery Elm	N		

Table of Existing Species (continued)
Within groups listed alphabetically by botanical name.

SHRUBS AND VINES

Botanical Name	Common Name	Native	Ornmntl	Invasive Exotics
Alnus	Smooth Alder		O	
Amelanchier	Shadblow	N		
Ampelopsis brevipedunculata	Procelain Berry			IE
Aronia	Chokeberry	N		
Berberis japonica	Japanese Barberry			IE
Celastrus orbiculata	Asiatic bittersweet			IE
Celastrus scandens	American Bittersweet	N		
Cornus sericea	Red-osier Dogwood		O	
Cornus sericea	Yellow-twig Dogwood		O	
Ilex glabra	Inkberry	N		
Ilex verticillata	Winterberry	N		
Kalmia latifolia	Mountain Laurel	N		
Lindera benzoin	Spicebush	N		
Lonicera japonica 'Halliana'	Hall's Honeysuckle			IE
Lonicera tatarica	Tartarian Hoeysuckle			IE
Rhododendron catawbiense	Catawba Rhododendron	N		
Rhododendron hybrid	Azalea, Del. Valley Wht		O	
Rhododendron maximum	Rosebay Rhododendron	N		
Rhododendron viscosum	Swamp Azalea	N		
Rhus typhina	Staghorn Sumac	N		
Ribes	Currants			
Rosa multiflora	Japanese Rose			IE
Rubus	Raspberry or Bramble			
Salix discolor	Pussy Willow	N		
Smilax rotundifolia	Common Greenbrier	N		
Taxus	Yew		O	
Vaccinium corymbosum	Highbush Blueberry	N		
Viburnum dentatum	Arrowwood	N		
Viburnum trilobum	American Cranberrybush	N		
Vitis	Grape	N		

Invasive exotics pose different kinds of problems. Asiatic bittersweet, for instance, strangles trees and is particularly devastating at Hall's Pond. All invasive exotics, however, displace native plant species and contribute to what one plant ecologist calls the "homogenization" of natural areas, where conservation lands lose the species that make them ecologically unique — and uniquely beautiful.

Although many invasive exotics provide food for birds (which is often why they spread so quickly) they are not superior to the many native food-producing species, merely more aggressive.

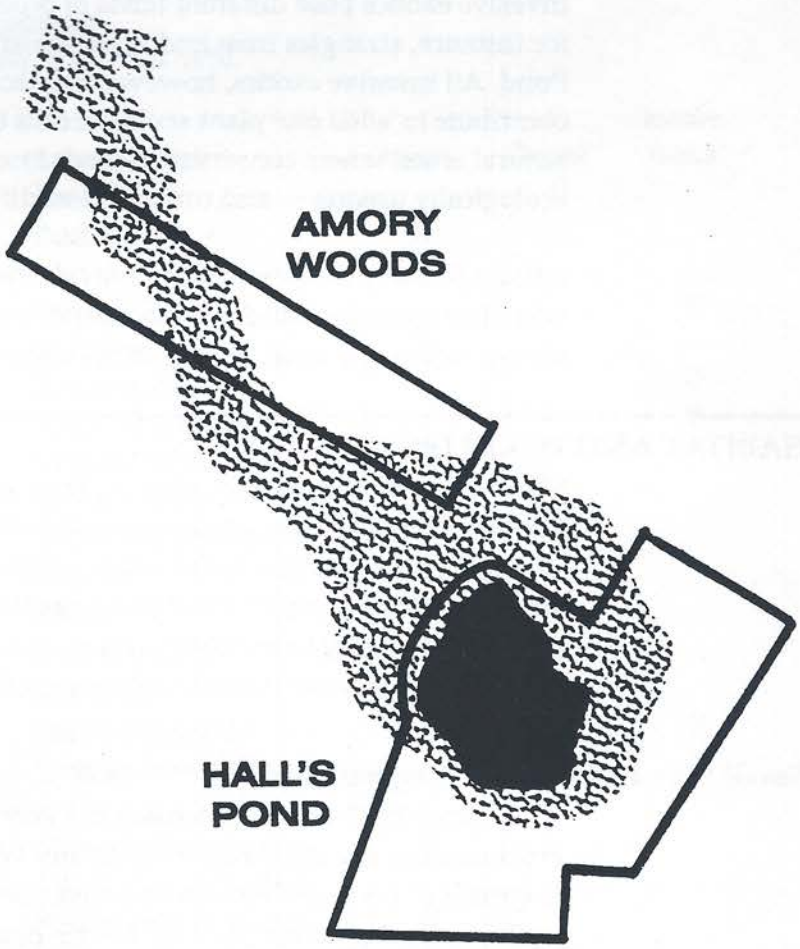
HABITAT AND WILDLIFE

The richness and attraction of Hall's Pond as a sanctuary are a result of the diversity of its habitats, and its relatively unique position as an island of natural habitat in the urban environment. Nonetheless, its value to wildlife is diminished by its small size, habitat fragmentation, poor water quality in the pond, and by the overall degradation of the woodland ecosystem because of human activities.

Small Size and Habitat Fragmentation

At 3.5 acres Hall's Pond Sanctuary is a very small ecological unit. Furthermore, it is separated from Amory Woods, the other remaining fragment of the larger colonial-era Cedar Swamp. Much of the total natural area has been destroyed by human development.

Small size and habitat fragmentation limit both sanctuaries' ability to support wildlife. In *On The Birds' Highway*, published in 1899, naturalist Reginald Heber Howe Jr. records red-winged blackbirds, brown creepers, and a variety of other species at the pond, which are missing from more recent bird lists. These particular species are normally dependent upon larger areas of forest or wetland than are found at Hall's Pond today.



Habitat Fragmentation
Approximate area of 19th-century swamp showing subsequent habitat fragmentation.

Food Sources

Food includes not only the fruits, seeds, and insects that are essential to many bird species, but also other plant parts — leaves, bark, stems, flowers — eaten by various insects, amphibians, reptiles, and small mammals, as well as decaying organic matter that feeds microorganisms. The richer the diversity of potential food, the greater the number of animal species.

Hall's Pond Sanctuary has an abundance of fruiting plants for song birds, and adequate food sources for a wide variety of other creatures.

Water

The availability of water for drinking is important to many terrestrial species. In a wetland habitat, the quality of water is also crucial to aquatic species such as toads, salamanders, and turtles, for breeding, feeding, and over wintering.

Although the availability of water in Hall's Pond Sanctuary is more than adequate, the often poor *quality* of water has an impact on wildlife and may explain, for example, the diminishing sightings of turtles and frogs in the pond.

Cover

Cover — be it vegetation, cave or man-made structure — provides an animal with protection from weather and refuge from predators. Animals also typically have needs for specialized cover when mating, nesting, and sleeping. A well managed woodland must provide for the diverse cover requirements of the species one hopes to attract.

For birds, Hall's Pond Sanctuary offers abundant low cover of roses and dense vines, and good, though deteriorating, woodland upper canopy, but relatively little understory or undisturbed ground habitat.

Wildlife Occurrence

The Brookline Conservation Commission pamphlet for Hall's Pond Sanctuary lists the following species that can be observed in the sanctuary:

Mammals
Cottontail Rabbits
Gray Squirrel
Skunk
Raccoon
Moles
Voles
Bats

Amphibians/Reptiles
Painted Turtles
Snapping Turtless
various non-poisonous snakess

Fish
Carp

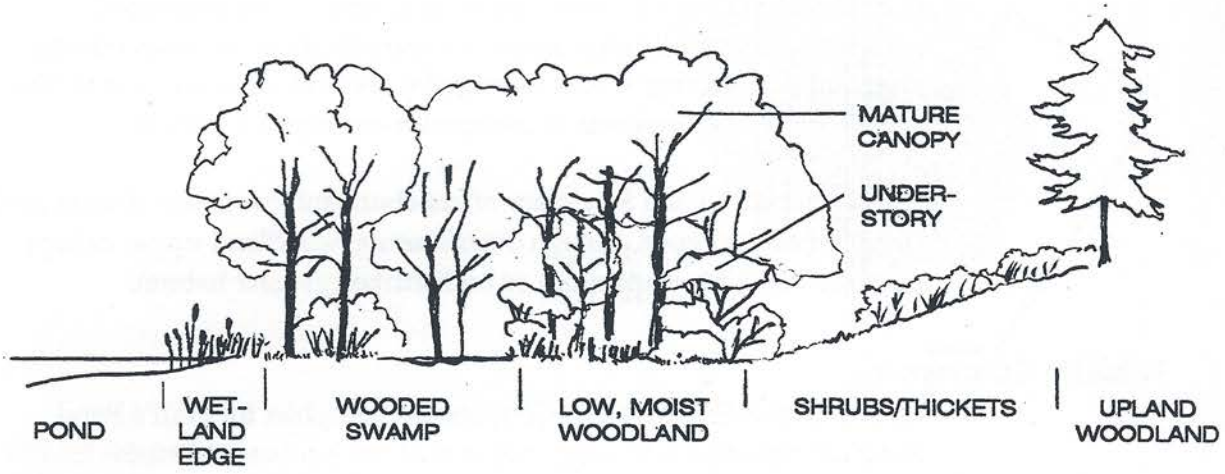
The list of sighted (or heard) **Waterfowl, Wading Birds, Seabirds, Non-perching Landbirds,** and **Songbirds** exceeds 70 species.

Habitat Diversity

For its small size Hall's Pond Sanctuary offers considerable diversity, containing five different habitat types:

- Pond
- Wooded Swamp
- Low, Moist Woodland
- Shrubs / Thickets
- Upland Woodland

Two other habitat types — shallow marsh and wet meadow — once occurred in the area of the cedar swamp and could, if replaced, further enrich the habitat diversity within the sanctuary.



The following descriptions are based on *New England Wildlife* by Richard M. DeGraaf, et al, *A Sierra Club Naturalist's Guide to Southern New England* by Jorgensen, and field observations.

Pond

Small permanent bodies of water under 20 acres in size are classified as ponds. Shallow ponds are normally characterized by emergent vegetation such as cattails (*Typha*), and floating-leaved plants such as pond lilies (*Nymphaea, Nuphar,* and *Brasenia*). The absence of most of these species at Hall's Pond is thought to be a consequence of disturbance and the feeding habits of the carp.

Shallow Marsh

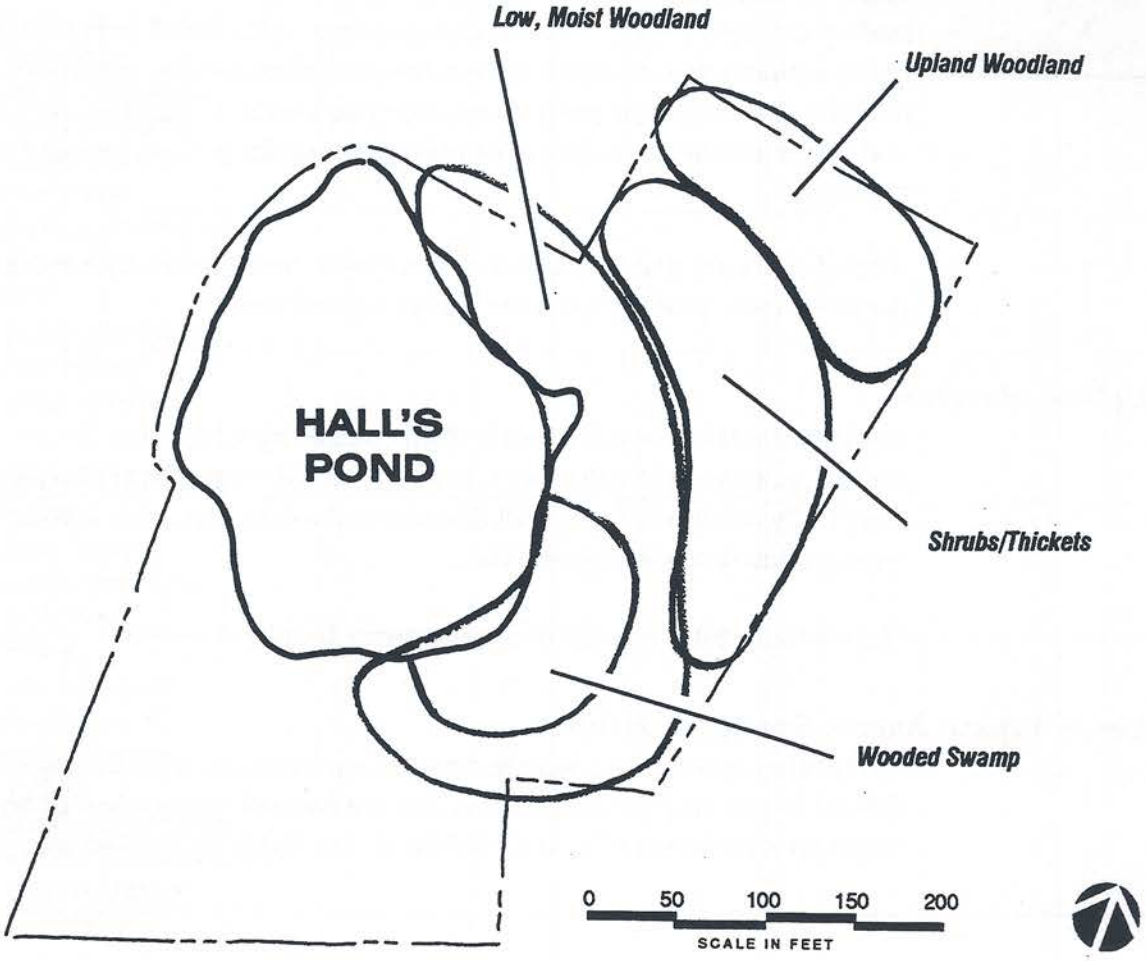
This habitat is characterized by peristent emergent vegetation such as cattails (*Typha*) and *Pontederia*, and a combination of sedges, grasses, and rushes, and water depths up to 1.5 feet. This habitat may also have areas of shrubs such as red osier dogwood (*Cornus stolonifera*), bog rosemary (*Andromeda polifolia*), and willow (*Salix candida*).

At Hall's Pond shallow marsh habitat is presently limited to the narrow pond edge on its eastern side where water depth is too shallow for carp.

Wooded Swamp

This habitat is characterized by red maples (*Acer rubrum*) and other vegetation typical of a wooded lowland subject to flooding, such as skunk cabbage (*Symphiocarpus foetidus*), and false-hellebore (*Veratrum viride*).

Existing Natural Habitat Types



Wooded swamp is present at the southeast corner of Hall's Pond where the main path becomes a boardwalk. It is an area of approximately 7,500 square feet.

Low, Moist Woodland

Characterized by ample soil moisture, but not standing water, the low, moist woodland has greater diversity of vegetation than the wooded swamp and typically supports red maple, black ash (*Fraxinus nigra*), swamp white oak (*Quercus bicolor*), and a well-developed understory of shade-tolerant species.

Low, moist woodland makes up much of Amory Woods and borders Halls' Pond along its northeast perimeter, but is generally lacking the understory that is typical of this habitat type.

Shrub and Thicket

Cleared areas that are reverting to forest go through a stage characterized by old-field grasses, shrubs such as sumac (*Rhus* spp.) and blueberry (*Vaccinium* spp.), brambles (*Rubus* spp.), and small trees. In New England shrubs are generally a temporary successional stage unless natural fire or management practices prevent the saplings from growing to maturity.

A band of shrubs and thickets ocurrs in Hall's Pond Sanctuary between the low, moist woodland and the higher upland woods.

Upland Woodland

The transitional oak-pine forest is characterized by white pine (*Pinus strobus*), northern red oak (*Quercus rubra*) and red maple (*Acer rubrum*). It typically occurs on deep, well drained fertile soils and often follows regeneration on once-cleared lands.

The northern-most portion of the sanctuary is upland woods.

List of Typical Animal Species by Habitat

While other species may be seen from time to time, the table on page 29 lists birds and other animal species that are normally dependent upon relatively small areas of healthy habitat or are highly associated with it.

Table of Typical Animal Species by Habitat

Source: New England Wildlife by Richard M. DeGraaf, et al

	Pond	Shallow Marsh	Wooded Swamp	Moist Woods	Shrub & Thicket	Upland Woods
Birds						
American Coot	X					
Spotted Sandpiper	X					
Green-backed Heron	X	X	X			
Black Duck	X	X				
Mallard	X	X				
Wood Duck			X			
Canada Goose	X	X				
Eastern Screech Owl		X	X	X		X
Eastern Phoebe	X					
Tree Swallow	X	X				
Hairy Woodpecker			X	X		X
Downy Woodpecker			X	X		X
Swamp Sparrow	X	X				
Song Sparrow	X		X		X	
Yellow-rumped Warbler	X		X	X	X	X
Yellow Warbler	X				X	
Common Yellowthroat	X	X				
Red-Winged Blackbird	X	X				
American Goldfinch		X	X	X	X	X
Carolina Wren			X	X	X	X
Black-capped Chickadee			X	X	X	X
Blue-gray Gnatcatcher			X	X	X	X
Veery			X	X	X	X
Northern Mockingbird			X	X	X	X
Cedar Waxwing			X	X	X	X
Northern Cardinal			X	X	X	X
Other Animals						
Bullfrog	X	X				
Spring Peeper	X	X				
Eastern Painted Turtle	X	X				
Water Shrew	X	X				
Muskrat	X	X				
Little Brown Myotis	X					
Eastern Pipestrelle	X					
Virginia Opossum	X	X	X	X	X	X
Raccoon	X	X	X	X	X	X
Meadow Jumping Mouse		X				
Woodland Jumping Mouse			X	X		X
White footed Mouse					X	X
Striped Skunk					X	X
Eastern Cottontail		X	X	X	X	X

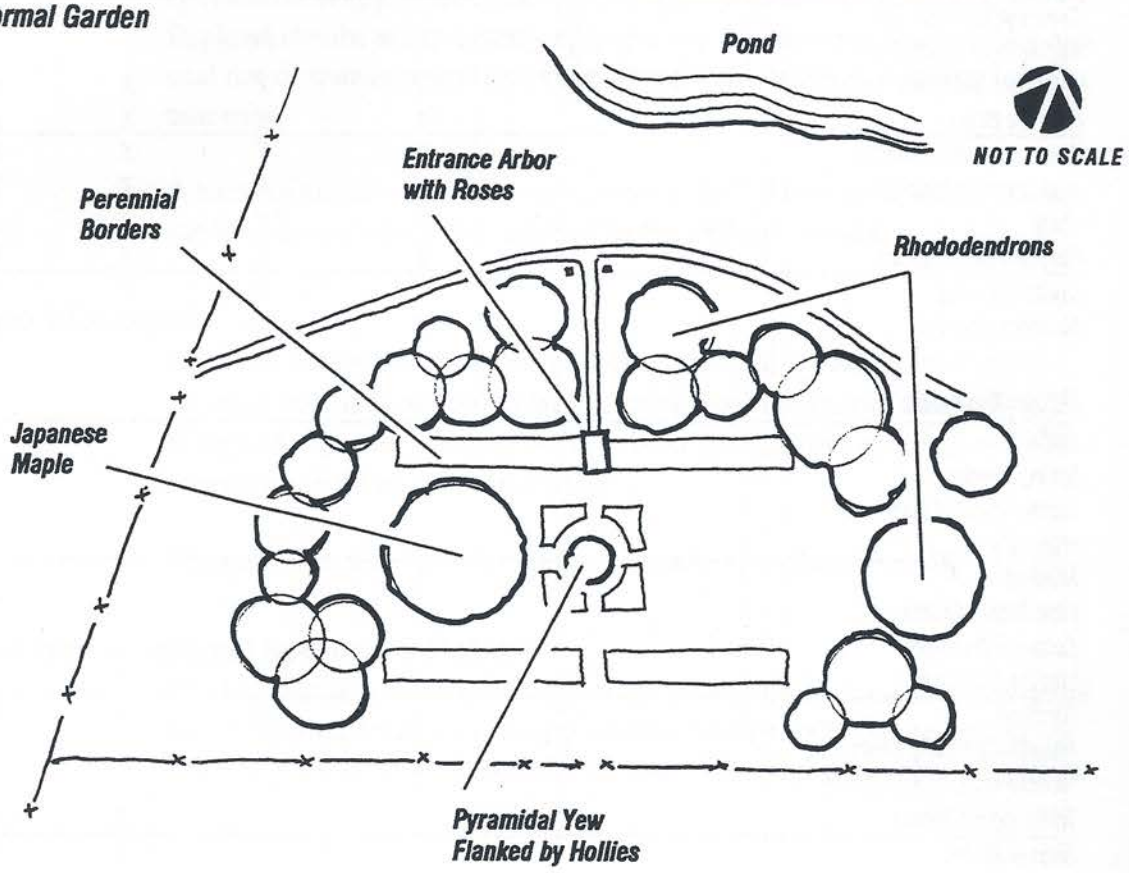
FORMAL GARDEN

Along the sanctuary's southern boundary, immediately behind apartments along Beacon Street, is the remains of the award-winning formal garden created by Charles Newhall earlier this century. Approximately 6,000 square feet in area, the garden is approached from the main sanctuary path through tall rhododendrons and a rose arbor.

A formal garden is an unusual feature in a wildlife sanctuary. Unlike woodland, meadow and wetland, a formal garden's habitat value is limited to those creatures that adapt to an artificial environment of mown lawn and geometric planting beds which offer minimal potential for food, or cover from predators or for nesting.

Plants in formal gardens typically are chosen for their aesthetic appeal rather than their value to wildlife, and are likely to be collections of non-native species bearing little resemblance to the native plant communities that, in a particular area, evolved along with its animal and insect residents.

The Formal Garden



Nonetheless, one need not assume that a formal garden with historic or cultural value cannot be preserved and made relatively more compatible with the goals of a nature sanctuary. Modifying the formal garden's planting and maintenance plans to conform to sanctuary criteria is one of the interesting challenges of the Hall's Pond Sanctuary.

Vegetation

The old formal garden has a simple axial design with 4 corner beds framing a central oval. The oval contains a 15-foot pyramidal yew flanked by four Japanese holly (*Ilex crenata*) that are so large they obstruct the oval, pottery-shard path.

Two long beds, bisected by the garden's path, run parallel to Beacon Street on either side, to the north and south, of the central oval. The southern bed has some moderate sized rhododendrons, though from the garden their three- to five-foot height fails to hide views of the cars parked behind the Beacon Street apartments. Roses planted in the northern linear bed do not appear to be thriving, probably due to the combination of insufficient sunlight and insufficient care for such sun-loving, high-maintenance shrubs.

Maintenance of the garden is an all-volunteer effort. The beds are liberally planted with robust tulips and other spring-flowering bulbs that were planted by Jo Albrecht's friends and family in 1994.

The symmetry of the garden is interrupted by a magnificent 35-foot, multi-trunk Japanese maple (*Acer palmatum*) on the west side.

At the east end of the old formal garden are some handsome, large (18± feet) rosebay rhododendrons (*Rhododendron maximum*) that separate the garden from, and largely define the character of, the remaining space to the east.

Sun and Shade

The garden's hours of full sun are limited dramatically by large trees along the perimeter fence. The Beacon Street apartments themselves, while 5 stories high, are approximately 65 feet away from the garden. Only in mid-winter do they shade the center of the garden at noon. If the large perimeter trees shading the garden were removed, the long lin-

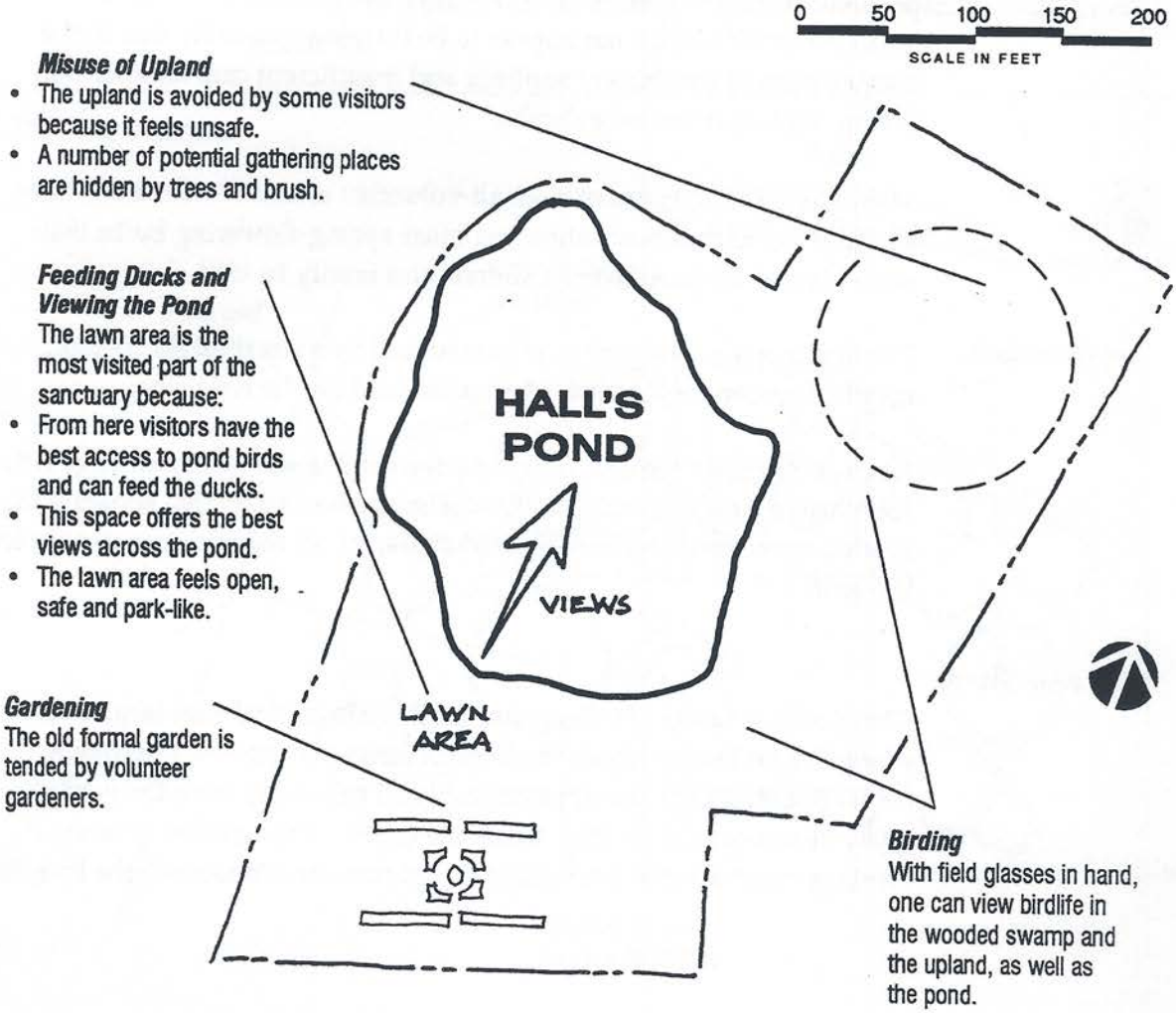
ear bed of rhododendrons closest to the buildings would receive at least four hours of sunlight in April and August. From May through July the buildings really have little impact on the sun that reaches the formal garden.

USES AND USERS

Because Hall's Pond Sanctuary is a unique resource — the only relatively "wild" greenspace in densely developed north Brookline — it attracts a broad range of visitors. Young children, school groups, university art students, parents with strollers, and birders of all ages visit the sanctuary. The old formal garden behind Beacon Street even attracts garden enthusiasts.

Birding, of course, is a particular attraction, as the sanctuary is home or

Human Uses



stop-over to many species (see *Habitat and Wildlife*). But many visitors who know little about birds come to the sanctuary for solitude and quiet, for its peaceful pond views, and for the sense of being away from the urban hubbub. The beauty of the pond also offers great subject matter for artists and photographers; Boston University and Brookline students take advantage of its proximity for class projects.

Activities

The sanctuary is dedicated to "passive recreation," which is to say, nature study, quiet walks, reading, and solitary contemplation, in addition to activities like painting and birding. Ball games and Frisbee throwing, boom boxes, and dogs, are not permitted because they will frighten away the principle sanctuary residents: the birds and other animals. Immediately adjacent, Amory Park is intended for active and noisy recreation.

Patterns of Use

The most heavily used area is the open lawn at the southwest corner of the pond. This is probably due to a number of factors. The best views of the pond and water birds are from this area; a large fallen log offers a place to sit; there is enough space here for a small group to gather; and this area, because the lawn is mown, is the part of Hall's Pond Sanctuary that is most like a park.

The open lawn area is also the gathering space for the Friends of Hall's Pond semi-annual clean-up days, as well as the occasional wedding, theatrical, or religious event that is permitted by the Conservation Commission. The lawn area may contribute to the perception that park activities are equally appropriate in a sanctuary.

CIRCULATION AND SECURITY

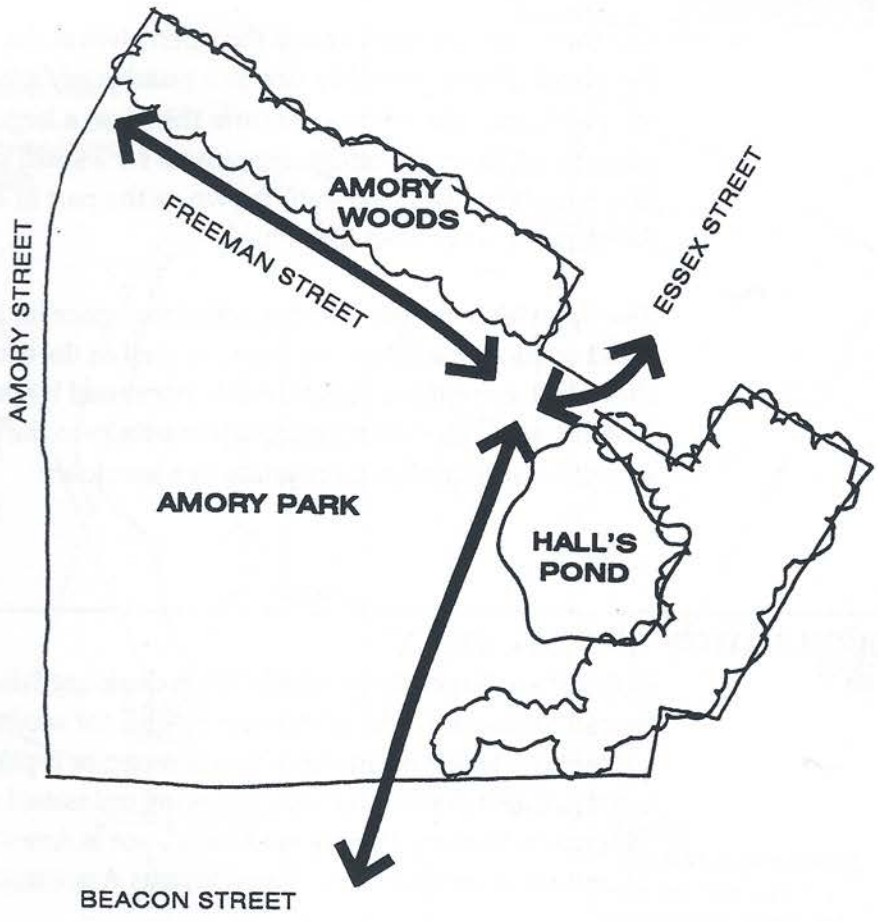
Hall's Pond Sanctuary is closed from dusk until dawn. The perimeter is fenced with chain link of varying heights for security and for habitat protection. Much of the fence needs repair or replacement and the entrance gate is often left ajar, allowing unleashed dogs to enter the sanctuary. (Amory Park is not fenced, nor is Amory Woods' northern boundary adjacent to the Massachusetts Association for the Blind.)

Currently there are two main circulation patterns affecting Hall's Pond Sanctuary: 1) the road and paths that serve the larger greenspace of Amory Park, and 2) The visitor path system within the sanctuary.

Amory Park Circulation

The main pedestrian paths through the Town of Brookline property, taken as a whole, form a giant "Y," with Freeman Street Extension and a private way from Essex Street at the top, and the long path along the western edge of Hall's Pond connecting to Beacon Street forming the tail of the Y.

Most people coming to (or going through) the park use one of these routes, so that Freeman Street, the Essex Street private way, and the private way between 1120 and 1126 Beacon Street become the three "entrances" to the park. People coming by car enter by Freeman Street Extension and leave their cars in the 23-car parking area.

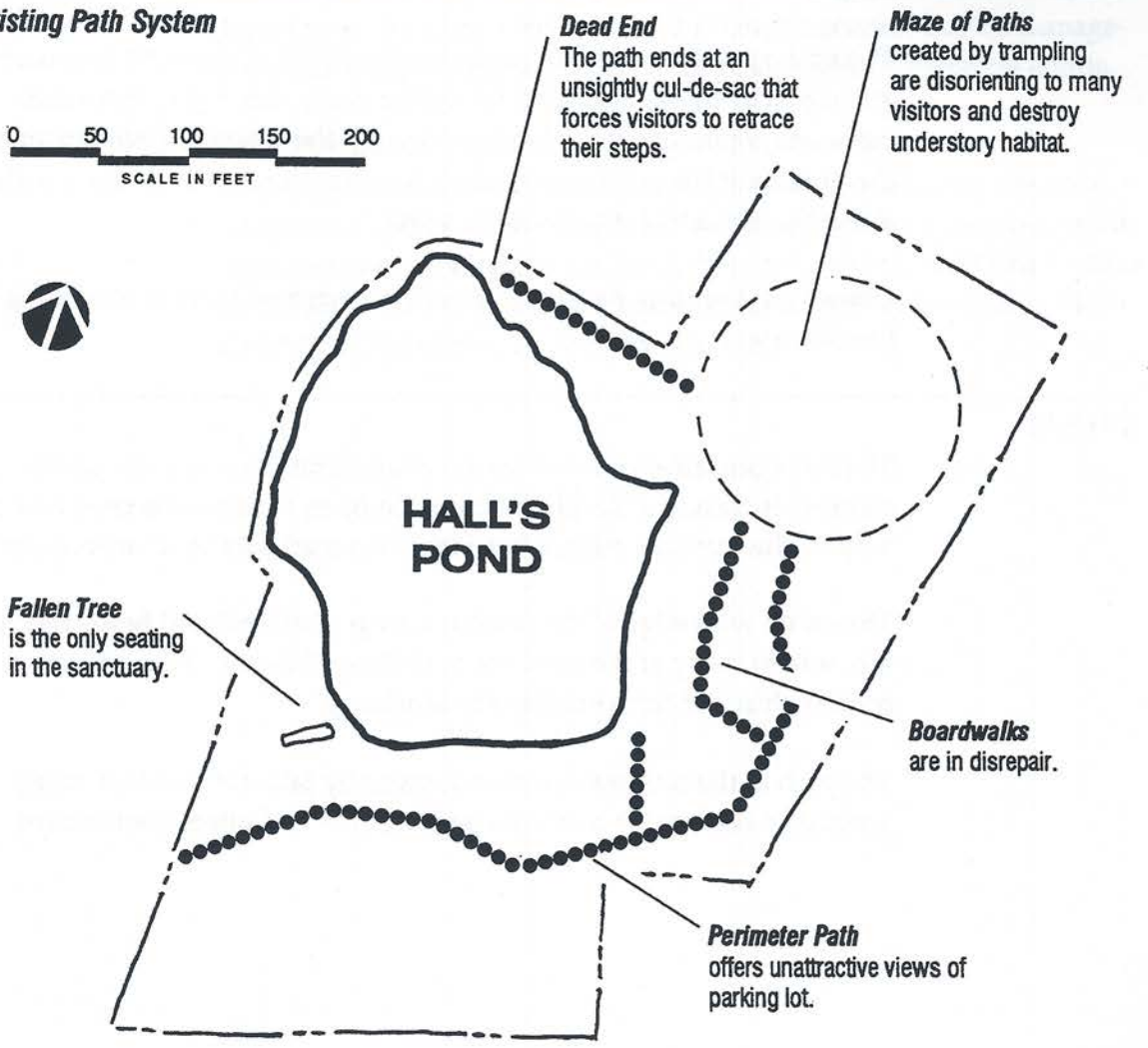


The impact of this circulation pattern is two-fold. The Essex Street private way — which gets considerable use as a shortcut from Cottage Farm neighborhood to Beacon Street — literally separates the two sanctuaries and contributes to the perception that they are different and unrelated.

Freeman Street Extension extends an additional 300± feet beyond the parking area and separates Amory Woods from the other two parcels. Thus the main paths and the road somewhat arbitrarily cut this town land into three separate sections.

Circulation within Hall's Pond Sanctuary

From the entrance, the sanctuary path curves toward the pond and the open lawn area, then turns away from the pond and takes visitors into the woods and around the east side of the pond. There are several side



paths. A few sections of boardwalk carry visitors over shallow swamp, one nearly to the pond edge.

The wilder portion of the sanctuary particularly attracts visitors who seek solitude in a wild place. Unfortunately, a maze of trails has developed where some visitors create new paths, trampling undergrowth, compacting the soil, and degrading habitat. Some paths end in hidden places among the trees, which are good for birding, but also provide places where homeless people have on occasion made camps, and teens have held drinking parties.

The pond is hardly visible from the paths in this part of the sanctuary. The path itself immediately ahead of and behind a visitor is often hidden from view, so that visitors can come upon one another quite suddenly. Such poor sight lines in a wild environment can cause a feeling of unease and create real security issues. There are at present no staff or rangers in the sanctuary to address this issue.

The path system terminates at the far north end of the pond in a narrow and ugly cul-de-sac bounded by rusting chain link fence. From this point one must retrace one's steps through the sanctuary. No circuit of the pond itself is possible as there is no path, nor any room for a path, along the fenced west edge of the pond.

Other than the large downed tree in the lawn area there is no seating in the sanctuary.

VIEWS

The most beautiful views of the pond are from the open area at the southwest corner of the pond across the open water to the trees and cattails on the opposite edge, often struck dramatically by afternoon sun.

The entire west edge of the pond is a strip of dilapidated fence and rip rap, where many of the trees are in decline. This edge is unattractive from within and from outside the sanctuary.

The path at the southeast corner, apparently laid out to avoid soggy ground, is adjacent to a private parking area and offers unattractive

views of cars and the alley behind the Beacon Street apartments.

Along with the lack of occasional planned views of the pond and the unsightly cul-de-sac at the pond's north end, the perimeter paths represent opportunities for improvement.

LEGAL, POLITICAL AND REGULATORY REQUIREMENTS

Conservation Commissions in Massachusetts have complete control over town conservation lands whose deeds say "to be managed or controlled by the Conservation Commission under Mass. General Laws Chap. 40. sec. 8C," or equivalent language. Under that statute, the Conservation Commission may adopt rules and regulations that govern how such lands are used.

The management of Hall's Pond Sanctuary has involved cooperation between the Conservation Commission, the Friends of Hall's Pond, the Department of Public Works, and other town agencies. Future management will attempt to increase and strengthen these cooperative efforts.

Hall's Pond is subject to state regulations governing water quality. These regulations, administered by the Department of Environmental Protection, limit the uses of polluted waters and encourage programs to improve water quality. For example, there are current initiatives to clean up the water flowing into the Charles River as part of the federal Clean Water Act. (See section on *Support*, page 62.)

THE SANCTUARY PLAN

MAJOR ACTIONS

The sanctuary's continued existence in the next century requires an ecosystem approach. Plans must minimize the damage caused by human activities, preserve the resources at Hall's Pond, and replicate as nearly as possible a natural pond and wetland habitat.

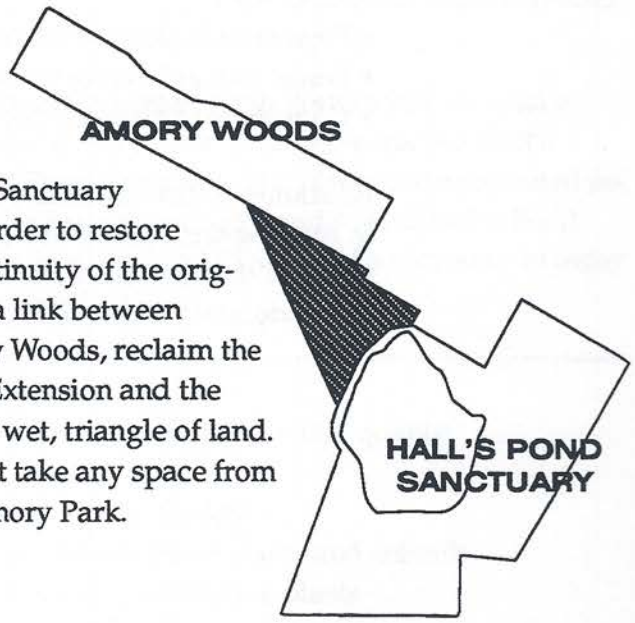
The main actions presented in this plan are as follows:

- **Connect Hall's Pond Sanctuary and Amory Woods.**
- **Mitigate water pollution due to street run-off.**
- **Construct wetland.**
- **Plant native vegetation. Control invasive exotics.**
- **Design formal garden for habitat value.**
- **Develop new path system.**
- **Create new entrance(s) and gateways.**
- **Erect new fences.**
- **Dedicate an area to Josephine Albrecht.**

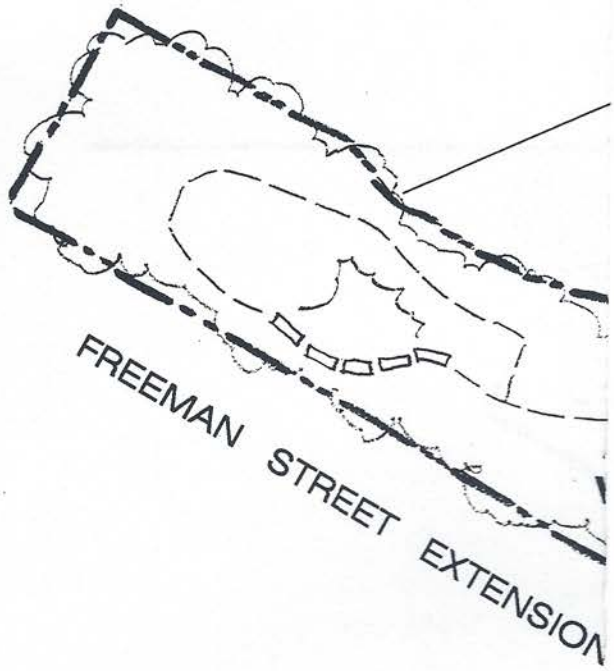
Connect Hall's Pond and Amory Woods.

Objectives:

- *Increase habitat size.*
- *Restore habitat continuity.*



Reconnect Hall's Pond Sanctuary and Amory Woods in order to restore some of the habitat continuity of the original Cedar Swamp. As a link between Hall's Pond and Amory Woods, reclaim the end of Freeman Street Extension and the adjacent, unused, often wet, triangle of land. This connection will not take any space from the playing fields of Amory Park.



TOWN OF BROOKLINE
CONSERVATION COMMISSION

◆

FRIENDS OF
HALL'S POND

HALL'S POND SANCTUARY

ILLUSTRATED PLAN

Prepared by
MASSACHUSETTS AUDUBON SOCIETY
ENVIRONMENTAL EXTENSION SERVICE,
BILL GIEZENTANNER AND
DON EUNSON, PLANNERS

OCTOBER 1996

Cattail Marsh
Restore wetland connec
between Amory Woods
Hall's Pond.

Boardwalk or
Provide connec
Essex Street o
(if private way

AMORY PARK

Water Quality
- Install new sec
control device
traps in storm
- Use new mars
additional filtra
sediments and

Entrance Gateway
- Prevent dogs entering by installing self-closing gates.
- Announce sanctuary with gateway structure.
- Post use regulations.

Formal Garden
- Plant and manage for habitat value.
- Screen views of alley and parking.

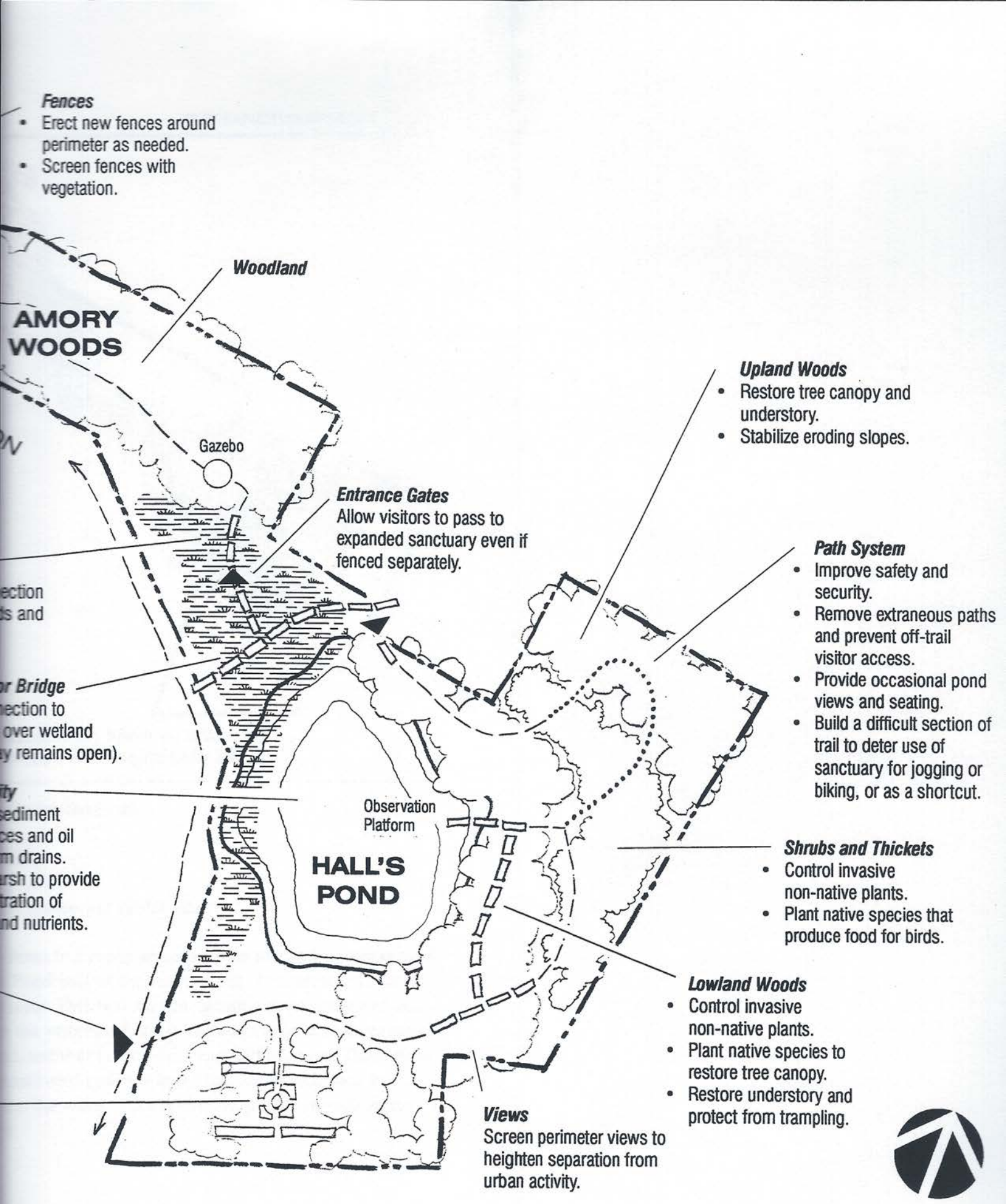
LEGEND

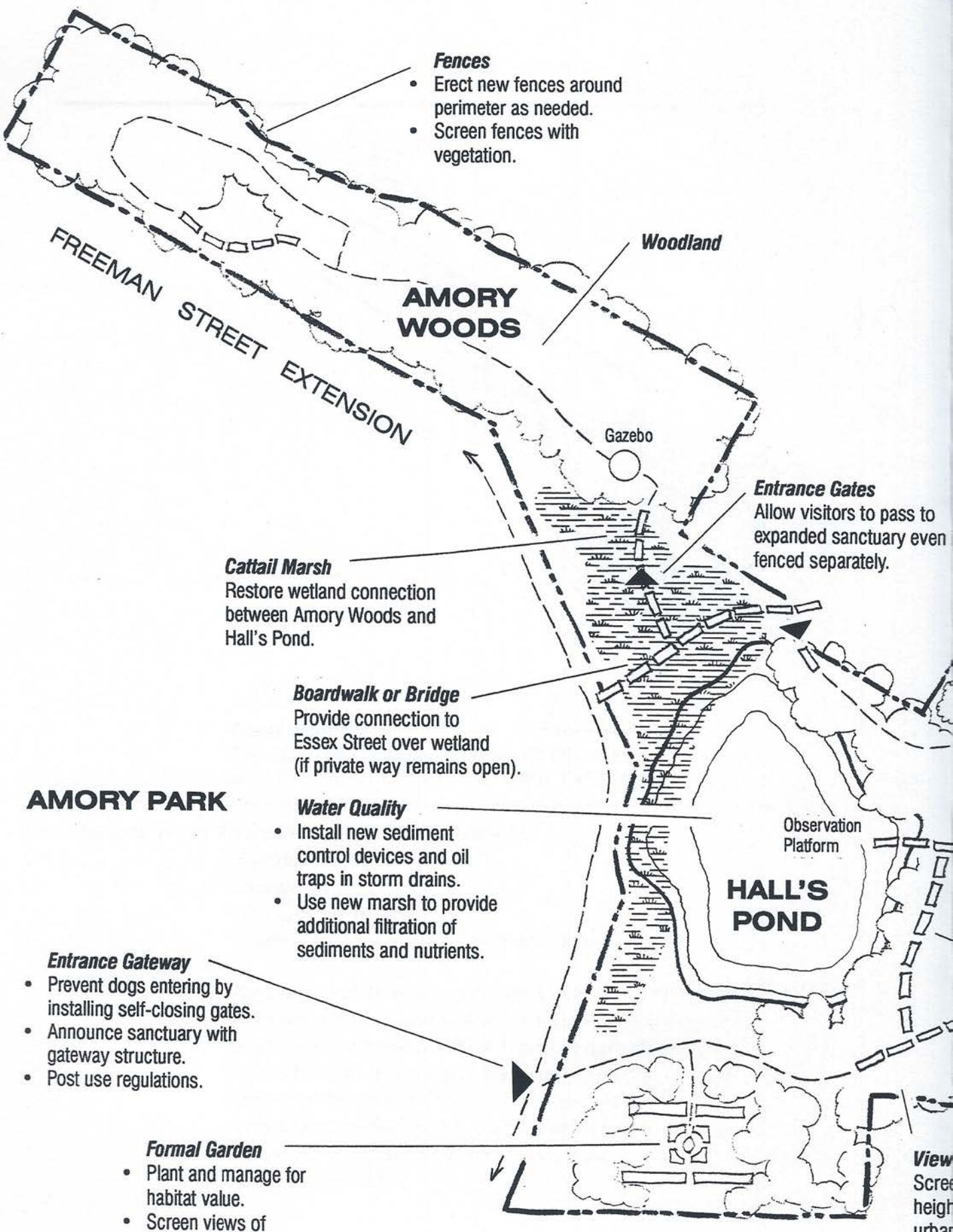
- Path (Handicapped Accessible)
- Boardwalk (Handicapped Accessible)
- Difficult Path, designed to deter jogging and mountain bikes

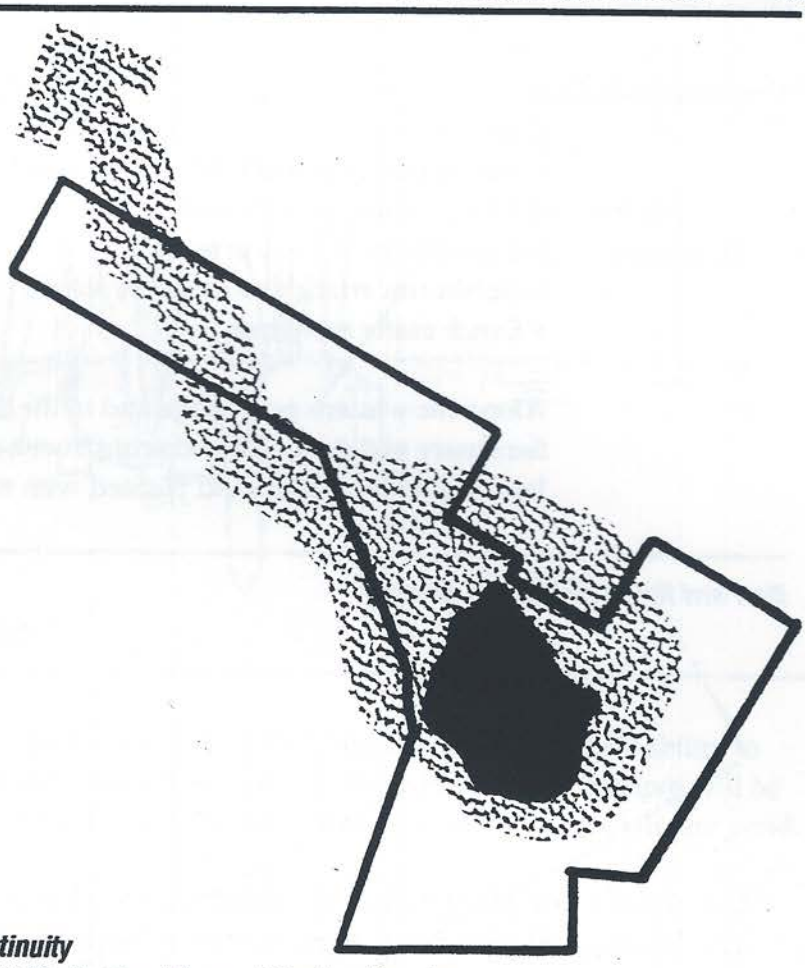
SCALE

0 50 100 150 200

SCALE 1" = 100'


Fences
• Erect new fences around perimeter as needed.
• Screen fences with vegetation.
Woodland
AMORY WOODS
Gazebo
Upland Woods
• Restore tree canopy and understory.
• Stabilize eroding slopes.
Entrance Gates
Allow visitors to pass to expanded sanctuary even if fenced separately.
Path System
• Improve safety and security.
• Remove extraneous paths and prevent off-trail visitor access.
• Provide occasional pond views and seating.
• Build a difficult section of trail to deter use of sanctuary for jogging or biking, or as a shortcut.
Observation Platform
HALL'S POND
Shrubs and Thickets
• Control invasive non-native plants.
• Plant native species that produce food for birds.
Lowland Woods
• Control invasive non-native plants.
• Plant native species to restore tree canopy.
• Restore understory and protect from trampling.
Views
Screen perimeter views to heighten separation from urban activity.


Fences
• Erect new fences around perimeter as needed.
• Screen fences with vegetation.
Woodland
AMORY WOODS
FREEMAN STREET EXTENSION
Gazebo
Entrance Gates
Allow visitors to pass to expanded sanctuary even fenced separately.
Cattail Marsh
Restore wetland connection between Amory Woods and Hall's Pond.
Boardwalk or Bridge
Provide connection to Essex Street over wetland (if private way remains open).
AMORY PARK
Water Quality
• Install new sediment control devices and oil traps in storm drains.
• Use new marsh to provide additional filtration of sediments and nutrients.
Observation Platform
HALL'S POND
Entrance Gateway
• Prevent dogs entering by installing self-closing gates.
• Announce sanctuary with gateway structure.
• Post use regulations.
Formal Garden
• Plant and manage for habitat value.
• Screen views of alley and parking.
View
Scree
heigh
urban



Habitat Continuity
Connecting Hall's Pond and Amory Woods will restore some of the habitat continuity of the original Cedar Swamp.

Mitigate Water Pollution Due to Street Run-off.

Objectives:

- *Reduce sediment load.*
- *Intercept oils and grease.*
- *Improve pond water quality and habitat value.*

The first line of defense in a comprehensive plan to improve water quality entering Hall's Pond will be the interception of contaminants from the storm drain system. This will require rigorous maintenance of existing catch basins in the watershed and installation of at least three new, appropriately sized, sediment control devices and oil traps. These traps consist of multi-chambered concrete tanks that allow sediment and oil to be separated from the water and removed as part of regular storm drain maintenance.

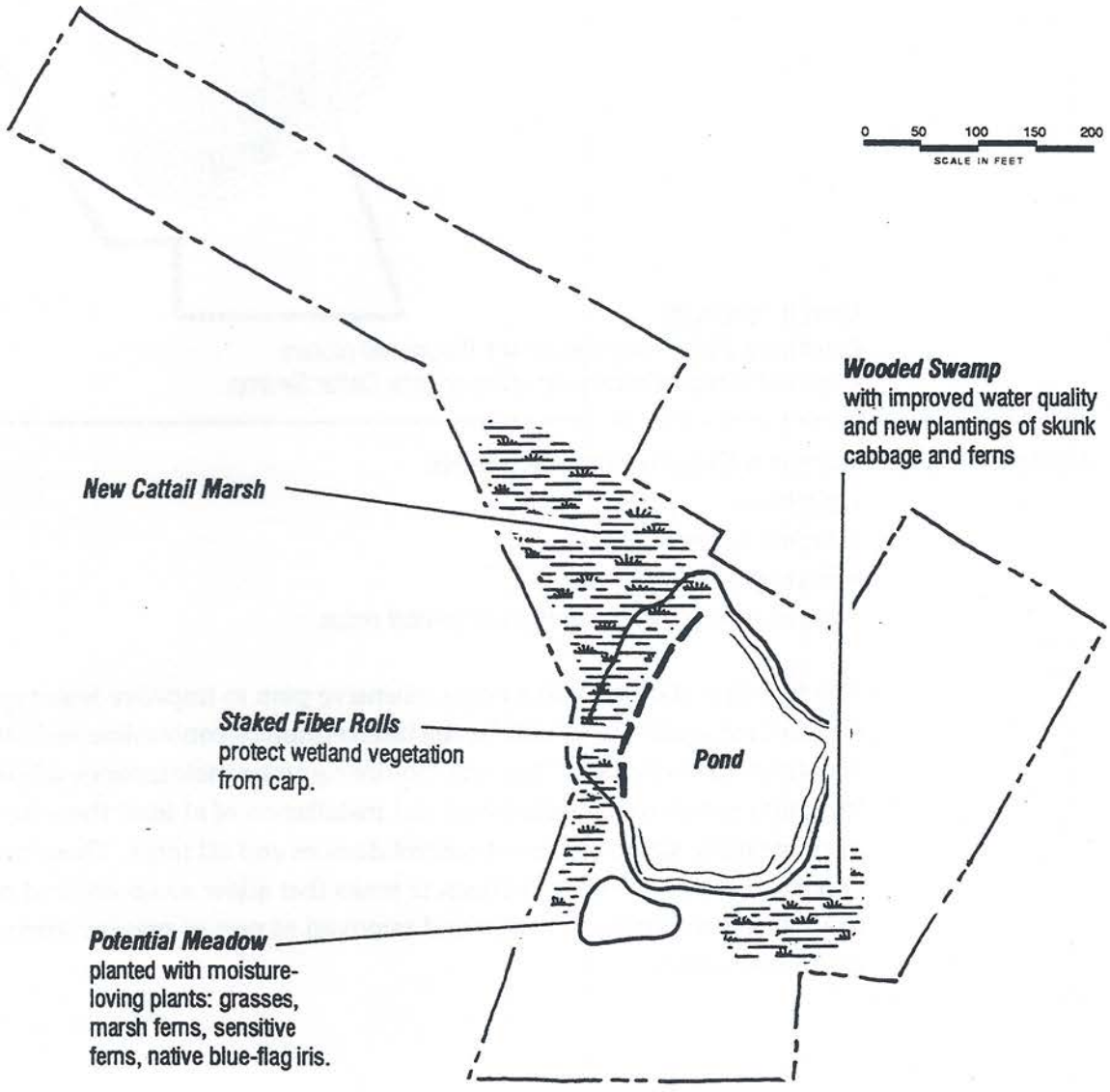
Construct Wetland.

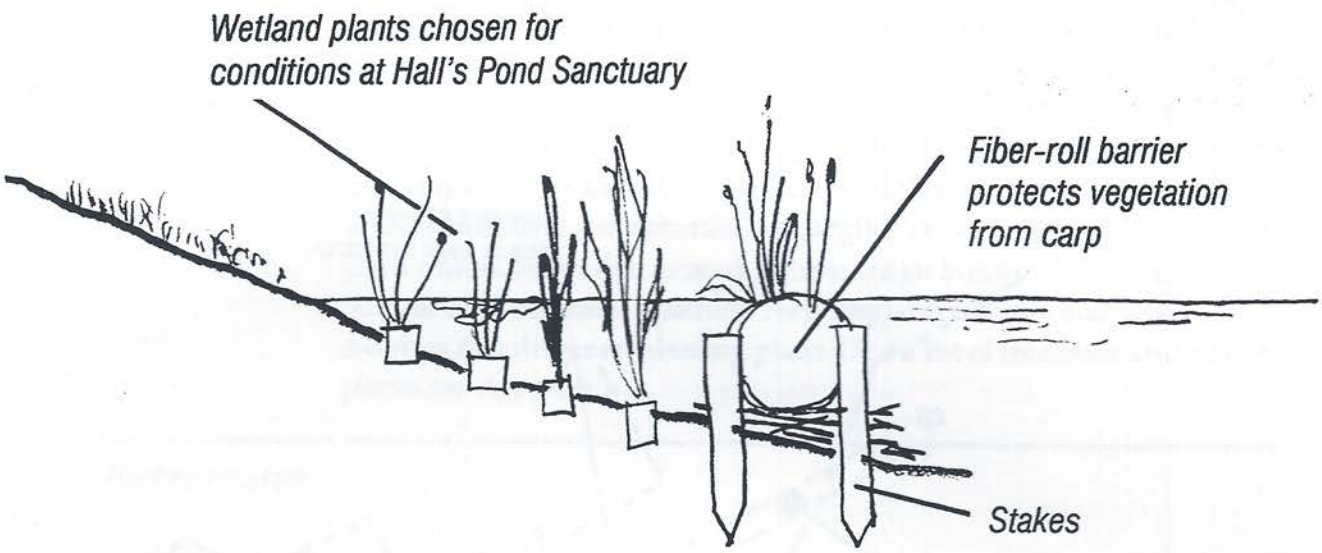
Objectives:

- *Restore marsh wetland habitat to Sanctuary.*
- *Further reduce sediment load.*
- *Reduce nutrient levels in pond.*
- *Stabilize the erratic flow caused by storms.*
- *Enrich visitor experience.*

Along the western pond edge and in the area that links Hall's Pond Sanctuary and Amory Woods construct a new shallow marsh. The wetland will be excavated and planted with native wetland species, such as

New and Restored Wetland Areas



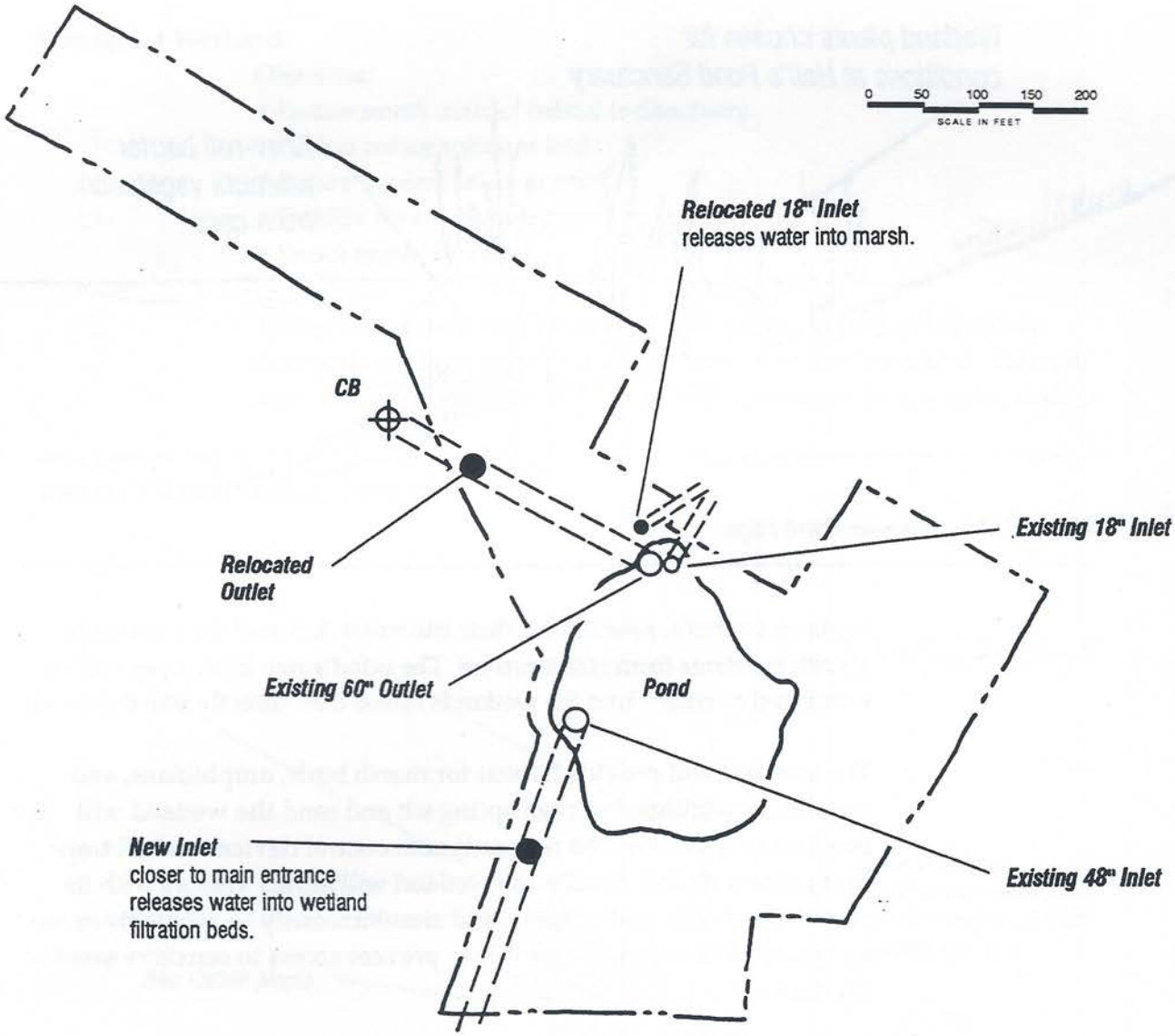


Wetland along Western Pond Edge

reeds and cattails, selected for their site suitability and their ability to absorb nutrients from street run-off. The pond's two inlet pipes will be redirected to empty into the wetlands rather than directly into the pond.

The wetland will provide habitat for marsh birds, amphibians, and reptiles. In addition, by intercepting silt and sand the wetland will provide an adjunct to the new sediment control devices and oil traps in the storm drains. Finally, the wetland will attract visitors with its varied vegetation and wildlife, and simultaneously — where there are no boardwalks — act as a barrier to prevent access to sensitive sanctuary areas.

The Danehy Park Wetland Wildlife Study Area in Cambridge is an example of a very successful constructed cattail marsh on urban land.



Approximate Locations of Proposed Inlets and Outlet

Plant Native Vegetation. Control Invasive Exotics.

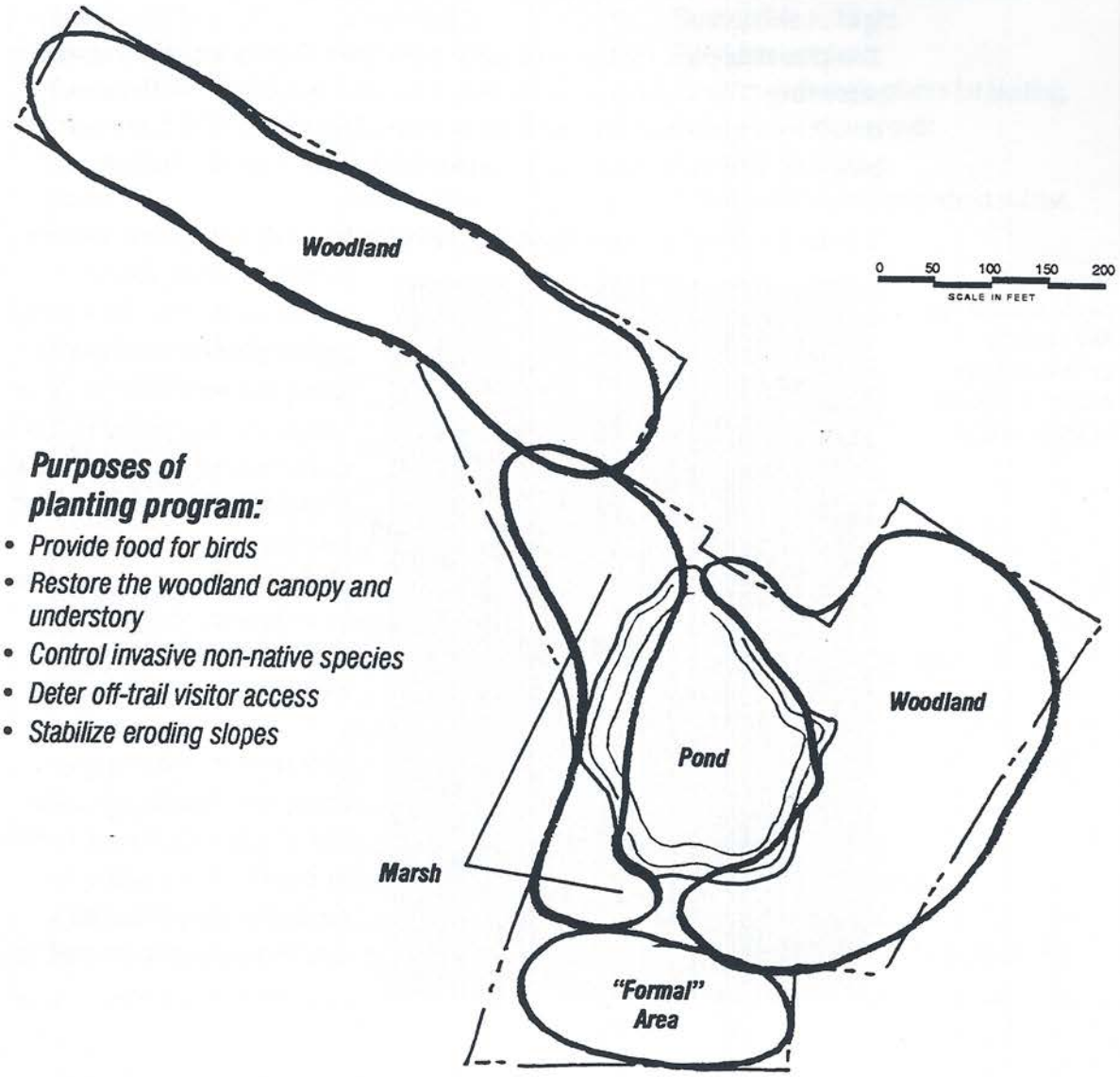
Objectives:

- *Replicate natural habitat as closely as possible.*
- *Provide plentiful food sources for birds.*
- *Restore tree canopy.*

An extensive planting program will improve wildlife habitat and restore tree canopy. With the exception of the pond's west edge where willows

may be replanted for their picturesque form and scenic value, the intention of the planting program is to replicate as nearly as possible a natural habitat. This means that new planting should be restricted to native species — not merely American species, but, ideally, species that are uniquely appropriate to the specific site. Research into historical records of early botanists and naturalists may give valuable clues to the original plant communities that existed prior to major human disturbance. Studies of comparable southern New England marshes and wooded swamps should guide planting plans. (For a list of recommended native plants see *Appendix*.)

Planting Program



An additional objective of the sanctuary plan is to remove or limit the many invasive non-native species. Complete eradication is generally impossible with species that are by definition tough and fast-spreading. However, by repeatedly removing exotics, replanting with native species, and protecting natives as they get established, some measure of success is possible. Whatever level of success is attained will benefit the overall plant community and habitat value of the sanctuary.

A planting plan should avoid the use of exotic species even though they may have beneficial qualities such as erosion control or high-quality food source. There are abundant native food sources for birds that can replace the invasive white mulberry, multiflora rose, porcelain berry and Asiatic bittersweet. (See table on facing page.)

The planting plan for the sanctuary perimeter should include vegetative screening. The areas in front of fences should be planted with mixed deciduous and evergreen shrubs which will both hide the fences and, by blocking wind and noise, reduce the "edge effect" on the habitat.

The native Virginia rose (*Rosa virginiana*), widely distributed in eastern North America, can be grown as an effective thorny barrier plant in sunny areas along the perimeter fence or within the sanctuary to block visitor access in certain areas. It spreads vigorously, its red rose hips provide food for birds into the winter, and its June flowers and fall color are attractive to visitors as well.

Skunk cabbage and fern crosiers contribute to the beauty of a healthy wooded swamp.

Management Programs — Long-term management of the woods will involve selection and thinning of self-seeded saplings for the healthiest specimens and the

maintenance of understory. A diverse woody understory of young trees and shrubs with herbaceous plants is the goal if the sanctuary is to support a range of birds and animals. The standing trunks of dead trees (snags) and fallen limbs provide important food and cover for numerous species, and should be left in place.

Native Plants that Provide Food for Birds
Source: Sierra Club Naturalists Guide to Southern New England, Jorgensen

Trees

Common Name	*Botanical Name*	*Notes*
Shadblow	Amelanchier canadensis	Tolerates wet soil.
Birch	Betula spp.	Small seeds eaten by winter birds.
Flowering Dogwood	Cornus florida	Susceptible to blight.
Hawthorne	Crataegus spp.	Good barrier plant.
American Holly	Ilex opaca	Need male/female plants for fruiting.
Eastern Red Cedar	Juniperus virginiana	Full sun. Excellent cover.
Black Gum or Tupelo	Nyssa sylvatica	Tolerates wet soil.
White Pine	Pinus strobus	Small seeds eaten by birds in winter.
Black Cherry	Prunus serotina	

Shrubs and Vines

Common Name	*Botanical Name*	*Notes*
Chokeberry	Aronia spp.	Thrives in wet soils.
Silky Dogwood	Cornus amomum	Thrives in wet soils.
Grey Dogwood	Cornus racemosa	Thrives in wet soils.
Huckleberry	Gaylussacia spp.	
Inkberry	Ilex glabra	Thrives in wet soils.
Winterberry	Ilex verticilata	Thrives in wet soils.
Spicebush	Lindera benzoin	Wet soils.
Bayberry	Myrica pennsylvanica	Tolerates poor sandy soil.
Virginia Creeper	Parthenocissus quinquefolia	Fruits best in full sun.
Virginia Rose	Rosa virginiana	
Elderberry	Sambucus canadensis	
Blueberry	Vaccinium spp.	
Witherod Viburnum	Viburnum cassinoides	Tolerates wet soils.
Arrowwood	Viburnum dentatum	Partial shade; dry soils.
American Cranberrybush	Viburnum trilobum	Tolerates wet soils.
Grape	Vitus spp.	Attracts many birds. Already on site.

Design Formal Garden for Habitat Value.

Objectives:

- *Provide wildlife habitat, both food and cover.*
- *Preserve structure of historic formal garden.*

The formal garden is something of a special case in planning for Hall's Pond Sanctuary. While there is clear community consensus on the desire to preserve the garden in some form, the details of its plan are still evolving. Whether it is tended and groomed to maintain some measure of its original formality (which today would be very costly) or whether it is allowed to become a "romantic ruin" (which still requires a guiding hand and some commitment to maintenance) has not been decided. Its potential as a butterfly garden or fragrance garden depends largely upon decisions concerning the perimeter trees that shade it. What is clear is that any plans for the garden must satisfy the criteria that guide plans for the sanctuary as a whole.

Certainly herbicides, pesticides and chemical fertilizers should not be used in the garden. The impact on wildlife habitat of lawn mowing both in noise and air pollution should be carefully weighed. No invasive exotic plant species should be used in the garden, and a compelling case can be made for the habitat value of planting the garden with native plants.

Develop New Path System.

Objectives:

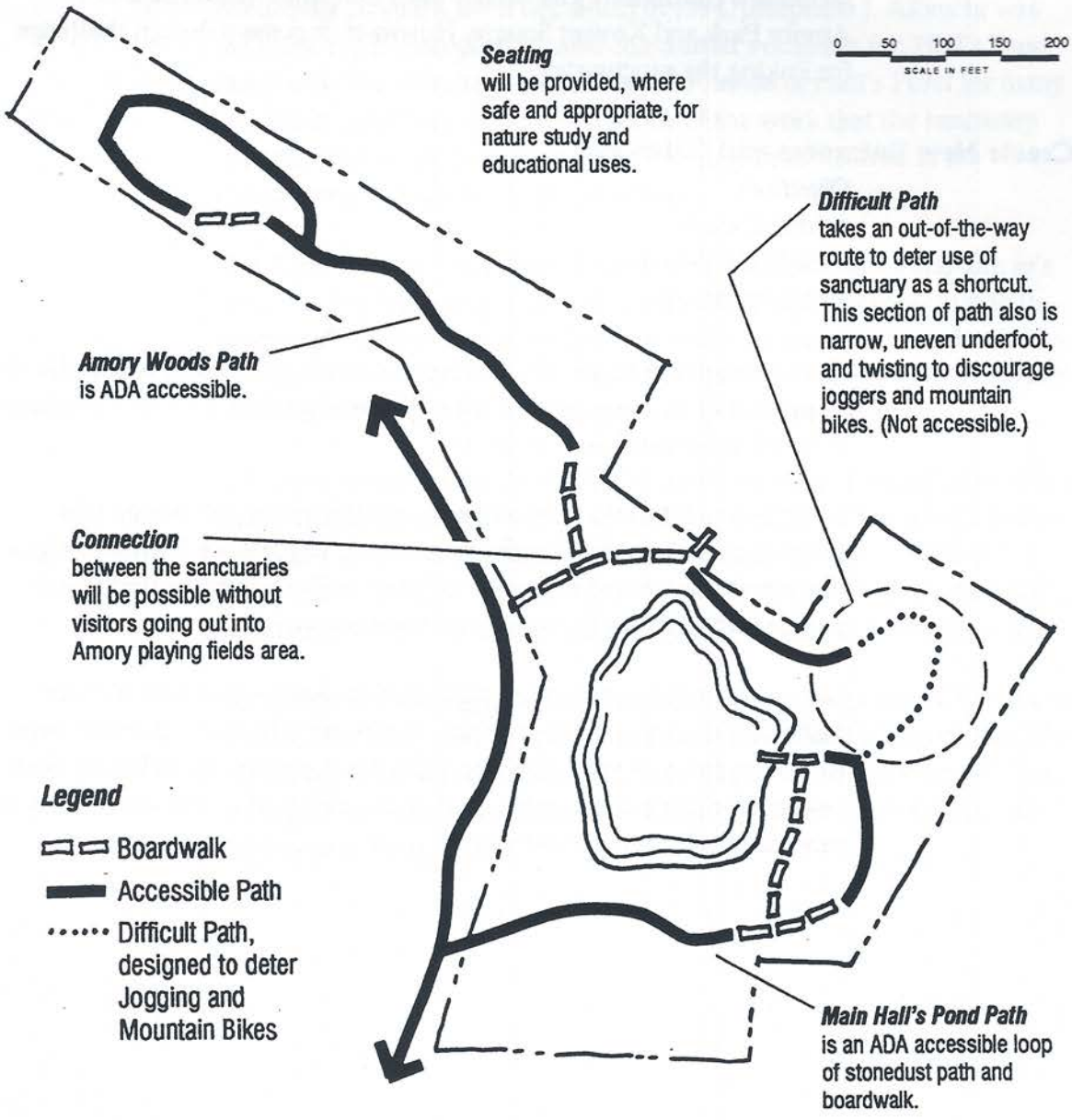
- *Provide opportunities for quiet solitude.*
- *Provide access to different habitats for birding and nature study.*
- *Encourage use of paths. Protect undergrowth from trampling.*
- *Promote safety and security. Minimize potential hiding places.*
- *Discourage use of sanctuary for jogging or biking, or as a shortcut.*
- *Offer occasional pond views and seating.*
- *Allow visitors to explore entire area without leaving the sanctuary.*

The new path system should be designed to capitalize on the sanctuary's expanded habitat areas, providing access to views and opportunities for wildlife observation. It should encourage appropriate visitor uses, and discourage misuse of the sanctuary. The paths, for example, should have clearly defined edges so that visitors do not trample under-

growth. The paths should have adequate sight lines for safety and security, yet preserve the feeling of solitude and wildness.

To deter use of the sanctuary as a shortcut or for jogging or bicycling, a portion of the path should be designed and surfaced to discourage misuse. The path should have sharp turns, abrupt changes of grade, and narrow clearances between trunks and rocks, yet be walkable. Because it is intended that most of the path system be accessible to the elderly and disabled, these deterrents should be confined to one area.

Sanctuary Plan Path System



Wherever possible the paths should avoid the sanctuary's edges. Where perimeter paths are unavoidable, vegetation should screen the fences, alleys, and parked cars that detract from the sanctuary experience.

Boardwalks can provide access to wetland areas and opportunities to view wildlife while minimizing the impact of human presence on sanctuary resources. Massachusetts Audubon Society has developed several boardwalk systems that would be appropriate for Hall's Pond.

Neighbors wish to preserve access from Essex Street into Amory Park via the private way. As long as this connection is available, it would facilitate a continuous greenspace path that links Mason Square to Amory Park and Knyvet Square. However, it poses a design challenge for linking the sanctuaries.

Create New Entrances and Gateways.

Objectives:

- *Control access.*
- *Highlight entrances.*
- *Post regulations.*

The existing entrance at the southwest corner of the pond is popular for its proximity to the pond and the old formal garden. This will continue to be the main sanctuary entrance.

Entrances will benefit from a clearly visible "gateway" design that announces and symbolizes the sanctuary's importance. Entrance signs that inform visitors of sanctuary rules — and the logic behind them — will be important in day-to-day management of use.

New gates at the entrances should provide easy access for sanctuary visitors and people in wheelchairs, but be self-closing to prevent dogs from slipping into the sanctuary. Whether the gates are locked at dusk or not is a management decision that can be based on the availability of sanctuary volunteers or rangers.

Erect New Fences.

Objectives:

- *Prevent dogs from entering sanctuary at all times.*
- *Discourage night-time access.*
- *Protect wildlife from disturbance.*

In order to protect wildlife and habitat, dogs are never permitted in the sanctuary and the property is closed to visitors at night. The entire sanctuary perimeter will be fenced, with new fencing where needed.

Honoring Josephine Albrecht.

For almost 20 years, until her death in 1994, Josephine J. Albrecht was the most vocal champion of, and committed volunteer for, Hall's Pond Sanctuary. She was the president of the Friends of Hall's Pond for many years and personally supervised much of the work that the sanctuary annually needs. She served as an Associate Commissioner of the Conservation Commission for 20 years.

The Conservation Commission and the Friends of Hall's Pond join Jo's family in their desire to honor her indomitable spirit somewhere in the sanctuary. Perhaps the formal garden could be named and dedicated to Jo. Plans are in the formative stages and this sanctuary plan will suggest some approaches to guide appropriate planning and design.

Jo's commitment to Hall's Pond was based on many personal interests that included her appreciation of wildlife, her love of the pond's beauty, her belief in nature education, and her recognition of the value of a quiet, green space in the heart of the city. It will be useful to articulate which aspects of Jo's contributions to Hall's Pond will be emphasized.

Furthermore, we suggest that plans be evaluated by the same criteria by which other sanctuary proposals are considered. Will it benefit bird life? Will it improve habitat value? Will it enhance visitor enjoyment? Then, whatever form the plans take, Jo's memory and her spirit will be honored with a living legacy.

IMPLEMENTATION

The implementation of this plan will require several steps over a period of three to five years. This section describes those steps and outlines a sequence of actions for implementation and includes a preliminary budget to achieve the goals outlined in the preceding sections.

It is recognized that implementation is dependent upon many factors. Engineering feasibility analysis of the two-part recommendation to treat storm water, sediment control devices and the proposed wetland, will result in more detailed layouts and cost estimates. Design steps including schematic design, design development, and construction documents will be required to determine the final layout, design and cost of the path system, boardwalks, entrances, fences, and tree and shrub planting. These final designs will more accurately determine the costs both of construction and of annual maintenance. Still, preliminary budgeting is necessary to begin to define costs and judge the efficacy of these recommendations.

PROJECT COMPONENTS

The following list provides a series of steps necessary to implement this plan.

- Fundraising and allocation of funds by town
- Design
  (detailed engineering and landscape design to proceed concurrently)
- Design review
- Construction documents
- Construction
- Management plan
- Monitoring

Steps for Implementation

Fundraising

Fundraising will be a continuous activity during implementation.

- Details on raising the funds necessary to implement this plan are included in the section on Support.

Design

The detailed engineering and landscape design need to proceed concurrently and to include the following:

- Survey topography of entire area of combined sanctuaries (Amory Woods and Hall's Pond Sanctuary) including Essex and Freeman Street Extensions.
- Mitigate Water Pollution caused by Street Runoff. Engineering design, to determine optimal locations, types and sizes of sediment and oil traps to be installed in storm drains. Expect to define criteria of minimum volumes of sediments and oil to be removed at various flow rates. Design to be approved by town engineers and Conservation Commission.
- Connect Sanctuaries, Restore Wetland Habitat, and Enhance Visitor Experience. Develop detailed design and construction documents for grading, planting, marsh and wetland filtration beds, paths, fences, gateways, and boardwalks in accordance with the design objectives stated in this sanctuary plan.

Design review

- Review of schematic design by Conservation Commission, community, and project ecologist.
- Cost estimates will be developed at the end of the schematic design phase and at the end of design development.
- Continue to have Conservation Commission and ecological review of design development phase and construction documents.

Construction documents

- Proceed to working drawings and construction scheduling for new combined sanctuary including grading plan, planting plan (phased), construction drawings for built features, lighting design, as needed.

Construction

- Install sediment control devices, by town DPW, or contractor.
- Schedule aggressive periodic maintenance of both new traps and existing catch basins.
- Issue bid packages and hire contractor for wetland construction, pathways, fences, and plantings. Wetland construction should be scheduled during dry season.

Management plan

- A detailed management plan, based on the final design, needs to be developed and then implemented

Monitoring

- Monitor results carefully for first two or three years and adjust maintenance plan as needed.

PRELIMINARY CAPITAL BUDGET

Topographic Survey	$5,000 – $8,000
Sediment and Oil Traps (min. of 3 traps)	$50,000 – $100,000
Constructed Wetland (approx. 1 acre)	$100,000 – $200,000
Entrances (2 with gates)	$15,000 – $20,000
Fences (5750 linear feet)	$35,000 – $50,000
Boardwalks and Wildlife Viewing Areas	$20,000 – $30,000
Pathways (400')	$2,400 – $3,200
Tree, Shrub and Ground Cover Replacement	$20,000 – $40,000
Design and Engineering (15%)	$37,100 – $67,700
Contingency (30%)	$85,400 – $155,700
Total	**$369,900 – $674,600**

The preliminary budget is a rough estimate based on quantity take-offs from preliminary sketches. For this reason it is prudent to carry a relatively large contingency until more final design development has been completed. While no budget based on the level of drawings presented in this plan can be accurate, the use of ranges and a large contingency has proven effective for initial planning and fundraising purposes on dozens of similar projects developed by the Massachusetts Audubon Society.

PHASING

All projects are implemented through a sequence of steps or phased over time. The following is a recommended scheme for phasing the Hall's Pond Sanctuary project.

Year 1

- Design fundraising campaign and begin
- Complete engineering and landscape design
- Begin rigorous storm drain cleaning and marking program

- Begin program to remove and control unwanted vegetation and replanting

Year 2
- Construct gross particle separators and oil traps
- Construct wetland
- Continue programs to remove unwanted vegetation, replanting and rigorous storm drain maintenance
- Begin park ranger program
- Continue fundraising campaign

Year 3
- Complete construction of trails, boardwalks, seating, entrances, fences, and signs
- Continue programs to remove unwanted vegetation, replanting and rigorous storm drain maintenance
- Continue fundraising campaign

MAINTENANCE

The recommended capital projects to improve water quality and the visitor experience at Hall's Pond will require ongoing management and maintenance activities. The diverse wildlife habitats and visitor areas each require different maintenance activities. The recommended plan is a delicate balance between wildlife and visitor requirements that will need sensitive maintenance and expert leadership. The major maintenance activities are summarized below.

Storm Drain Maintenance

Each year there should be a rigorous effort to clean all of the storm drain traps in the water shed and the sediment and oil traps installed as a part of this project.

Estimated time and equipment: 5 days with a crew of two and specially equipped truck.

Storm Drain Painting

All of the storm drains in the watershed should have a sign stenciled on the curb or adjacent pavement stating that they drain into Hall's Pond. Such a sign with a picture of a duck could help prevent the disposal of chemicals and oil down the drains. A similar program has been implemented by the Brookline Conservation Commission and the Friends of

the Muddy River for the Muddy River watershed. The Boston Conservation Commission has recently found that cast bronze plaques are a more durable and cost effective method of marking drains. Brookline may want to investigate this alternative.

Estimated time and equipment: 5 days with a crew of volunteers, paint and stencils

Wetland Maintenance

The constructed wetland should be monitored to assure that it is working as intended. The town should contract with a qualified aquatic ecologist to monitor and manage this experimental application of bio-engineering.

Estimated time and equipment: 1 day four times a year

Path, Signs, Entrances, Fences, and Boardwalk Maintenance

Each of these constructed elements will need periodic repair. It has been the experience at Massachusetts Audubon Society Sanctuaries that using the highest quality materials and good design greatly reduces the need for maintenance.

Estimated time and equipment: 1 day three times a year or as required

Lawn and Garden Management

The small area of lawn and the garden at Hall's Pond can be mowed in conjunction with the Park Department mowing at the adjacent fields.

Estimated Time and Equipment: 1-2 hours weekly during the growing season. Note: Maintenance of a formal garden would take significantly more time and could only be accomplished with the labor of dedicated volunteers or town personnel who do plantings in parks and traffic rotaries.

Control of Invasive Non-native Vegetation

For a period of several years there will need to be a sustained effort to remove and eventually control the spread of the most offensive non-native plants such as porcelain berry and buckthorn.

Estimated Time and Equipment: 1 day four times per year, plus volunteer assistance at spring and fall clean-ups.

Sanctuary Ranger Program

There will still be a need for a variety of other management tasks especially during the busy season, from May to October. A sanctuary ranger program has been suggested to provide more of a presence in the town's open spaces and help accomplish some of these management and maintenance tasks. These rangers would provide regular educational programs on the cultural and natural history of the open spaces, enforce rules and regulations and assist with the organization and management of volunteer activities. They would also work on habitat enhancement projects, such as the placement and maintenance of bird nest boxes to help attract a larger diversity of songbirds, and sunning floats for turtles.

A typical job description for a Massachusetts Audubon ranger/naturalist, that might serve as a model for Brookline, includes the following tasks: Environmental education/visitor services – 55%, property management/maintenance – 35%, and administration – 10%.

If two rangers were hired, their tasks might be divided differently based on the strengths of the individuals.

Estimated Time and Equipment: 200 person days (1600 hours) per year, plus volunteer assistance at spring and fall clean-ups. Truck to haul away debris.

Security and Prevention of Vandalism

Preventative Maintenance One of the most important maintenance strategies for the Hall's Pond Sanctuary is prevention of misuse and vandalism. Having one town employee assigned the responsibility for the maintenance of Hall's Pond and a limited number of other nearby open spaces would go far toward assuring accountability and pride for good and timely maintenance.

Timely Repairs Prompt repairs show that the area is cared for, and they reduce the temptation for others to copy acts of defacement.

Positive Uses Positive uses will prevent misuse. The active, regular use of Hall's Pond by visitors will discourage negative uses and reduce maintenance associated with vandalism. A corps of park rangers who would provide educational programs would help establish these positive uses and promote stewardship of the sanctuary. Efforts should also be made to encourage use by school groups, adult and family education programs run by Audubon and other educational organizations and by youth organizations.

Security The Brookline Police Department currently does periodic patrols of Hall's Pond and Amory Park and has expressed a willingness to work with the Conservation Commission, Friends of Hall's Pond, and community to assure that the area is safe.

ESTIMATED MAINTENANCE BUDGET

Task	Estimated Cost	Responsibility
Storm Drain Management		Part of DPW responsibilities
Storm Drain Marking	$200/year	Volunteers
Wetland Management	$1,000/year	Contract
Path, Signs, Entrances, etc.	$500/year	Park Department
Lawn and Garden Management		Park Department and Volunteers
Control of Non-Native Vegetation	$1,000/year	Park Department and Volunteers
Other Management/Rangers	$10,000/year Seasonal salary for two rangers	Conservation Commission

Total Hall's Pond Management Budget:

$12,700/year

plus assistance from other departments and volunteers.

USE REGULATIONS

Regulations need to be posted at the entrances and be stated in as positive and clear way as possible. The following is a set of regulations recommended for Hall's Pond Sanctuary:

To Protect Wildlife

Please....

Enjoy from Dawn to Dusk

No Jogging or Biking

No Removal, Cutting, or Damaging of Plants and Animals

No Alcoholic Beverages

Stay on the Established Paths

Carry in / Carry Out – No Littering

No Dogs or other Pets

Enjoy the Sounds of Nature – Do Not Disturb Others with Music or Noise

SUPPORT

Gaining support for the implementation of this plan and the on-going maintenance of the Hall's Pond Sanctuary will involve creative use of a variety of sources of funding, support from friends, and a lot of hard work. Hall's Pond is an opportunity to practice the adage to: *Think globally and act locally.*

Raising the support envisioned will require a fund-raising and friend-raising strategy that assures that each potential source is matched to the type of activity that is most appropriate. The strategy for gaining support will also require a campaign plan, to be developed in the coming months, that involves people, town staff, and communication tools, such as letters, brochures, and one-to-one talks. The following sections discuss funding sources and provide a strategy for developing on-going support.

TOWN OF BROOKLINE

The Town of Brookline has provided important but limited support for maintaining Hall's Pond Sanctuary through the Public Works and Park Departments and through the special appropriation requested by the Conservation Commission in 1988. The town can do much to help support Hall's Pond Sanctuary through the annual operating budget, special appropriations, and by applying for state and federal assistance programs.

Annual Operating Budget

Each year, the town appropriates funds for the services it provides and for the facilities it maintains through its operating budget. There has never been a line item in the budget for the care of Hall's Pond Sanctuary. It is clear that Hall's Pond Sanctuary, needs operating budget support to implement the level of maintenance described in the Implementation section of this plan. (See Implementation Section.)

Special Appropriations

The town has appropriated funds for special projects such as the $106,000 in 1988 for matching the state Clean Lakes Program. Special appropriations are also used for capital improvements like some of those described in the Implementation Section of this report.

STATE AND FEDERAL PROGRAMS

This planning effort has identified several existing state and federal sources of funds that are appropriate for assistance in making the recommended improvements to Hall's Pond Sanctuary.

Section 604 of the Clean Water Act

Section 604 (b), Water Quality Management Planning, of the Federal Clean Water Act provides funds that may be used to determine the nature, extent and causes of water quality problems. Funds are administered by the Massachusetts Department of Environmental Management (DEM), which prefers to contract with regional planning agencies working cooperatively with communities. Approximately $170,000 is available in 1996. Typical grant amounts in the $30,000 to $50,000 range. No match is required, but it is desirable.

Section 319 of the Clean Water Act

Section 319 (h), Non-point Source Implementation, of the Federal Clean Water Act provides funds that are directed toward achieving, encouraging, and requiring implementation of projects that prevent non-point source categories of pollution through land use controls and proper siting of new land uses. It is administered by the Massachusetts Department of Environmental Protection (DEP), which prefers comprehensive, watershed-based projects. The Hall's Pond watershed appears to be a likely candidate. Approximately $570,000 is available in 1996. Last year, grant amounts ranged from $50,000 to $250,000. A 40% match is required.

Section 104 of the Clean Water Act

Section 104 (b) (3), Water Quality, of the Federal Clean Water Act provides funds for water quality demonstration projects with a primary emphasis on watershed protection. The Massachusetts Department of Environmental Protection submits recommended project proposals to the New England Office of the Environmental Protection Agency, which makes the final selections. Approximately $1,600,000 is available in 1996. Last year Massachusetts received $330,000 to fund four projects ranging from $60,000 to $100,000. No match is required, but one is preferred.

ISTEA Funding

The Intermodal Surface Transportation Efficiency Act (ISTEA) provides funds for municipalities wanting to sponsor projects which fall under its enhancement category. Proposals would be submitted to the Metropolitan Area Planning Council (MAPC) which would evaluate the projects and submit a prioritized list to the Massachusetts Highway

Department. Funds may be used for storm water runoff mitigation together with resource protection and habitat restoration, making Hall's Pond an almost perfect match for this program. Approximately $24,000,000 is available. The program requires a 10% match.

Section 603 of the Clean Water Act

Section 603 (d) of the Federal Clean Water Act sets up a State Revolving Fund that is administered by the Department of Environmental Protection which authorizes loans for water pollution abatement programs with a subsidy equivalent to a 25% grant. DEP is preparing to supplement its FY 1996 Project Priority List to include non-point source projects like Hall's Pond. Two million dollars could be available for the state this year. No local match is required.

Other State and Federal Programs

There are numerous on-going efforts to improve water quality and natural habitats in urban areas. These efforts will continue to generate new sources of funding that the town will be eligible to apply to Hall's Pond management.

There are also state and federal agencies that will provide support in the form of information and advice.

COMMUNITY SOURCES

Brookline is fortunate in having many community minded citizens who are interested in acting locally to help improve the quality of the natural experience offered by Hall's Pond Sanctuary. These community sources include local business, non-governmental organizations, and friends and private individuals. Some businesses, organizations and individuals would support a campaign to raise funds for a new boardwalk that might have their name carved in the handrail, but would not be interested in contributing to an endowment for annual maintenance, while others will understand the importance of annual support but not be interested in making a contribution to a capital campaign. Each of these groups should be approached in several different ways. The following presents a brief strategy for each major group.

Local Businesses

Local businesses have become sponsors of maintenance and capital improvements to open spaces in other communities. Various public agencies have had success with an "Adopt-A-Park" program, where

local businesses are given recognition for their contributions to on-going maintenance or for sponsoring special events. Newton, at its Nonantum Park, and other communities have had successful partnership programs, where local businesses or organizations support a nearby city open space. Radio station WRNX, in Amherst, has adopted Puffer's Pond for an annual fundraising effort, including T-shirt and soda sales and a special week-long broadcast from the pond. Businesses benefit by getting their names associated with a project that benefits the community in general and their customers in particular. The town and neighborhood benefit by having better maintained and managed open spaces, while the improved management of the open spaces enhances property values and helps bring customers into the neighborhood.

A successful effort to enlist business support for the management of Hall's Pond Sanctuary will require an active outreach to local businesses. One strategy can be to provide a copy of this report and/or its summary to selected businesses in the area along with a written request for a pledge of assistance, followed up by a visit from a member of the Friends of Hall's Pond or the Conservation Commission. Recognition of support could be acknowledged in several different ways. For example, for a donation of:

- Up to $100/year - Name and address of business printed in Friends of Hall's Pond Annual Report or Newsletter.

- Up to $500/year - Name and address of business placed on a brochure available at the sanctuary entrance and printed in the Friends of Hall's Pond Annual Report or Newsletter.

- More than $1,000 - Name and address of business printed in the Town Annual Report, placed on a brochure available at the sanctuary entrance and printed in the Friends of Hall's Pond Annual Report or Newsletter.

In addition, each contributing business would receive a certificate suitable for displaying on their wall that states that they are supporters of the Hall's Pond Sanctuary. There may be many other forms of recognition that would be inducements for gaining support from local businesses.

Non-governmental Organizations and Institutions

Local colleges, universities, community organizations, churches, synagogues, and other local institutions can all be resources for support of the Sanctuary. Many of these organizations are always looking for support for themselves, and they may not be the most likely sources of direct financial support. However, they can be an important source of volunteers for special events and they may be willing to share their mailing lists for specific causes that may interest their members and supporters.

Friends and Private Individuals

Residents who have an interest in acting locally on behalf of the environment may be the most important sources of both volunteers and financial support. The Friends of Hall's Pond can approach individuals and request contributions to make capital improvements or to an endowment fund that will assure the future maintenance of these natural resources. Individuals can be asked to remember Hall's Pond in their annual charitable giving and in their wills. Individuals also work for corporations and businesses that often have donation programs that match the gifts of their employees. Or these same individuals may be a gateway to a large corporation's charitable giving program.

OTHER SOURCES OF SUPPORT

There are other sources of support outside of the Town of Brookline. These sources may include environmental organizations and private foundations and trusts.

Environmental Organizations

Environmental organizations such as the Massachusetts Audubon Society, the Appalachian Mountain Club, the New England Wildflower Society, and The Nature Conservancy all provide information or share their expertise in different ways. For example, The Nature Conservancy maintains information on methods to control invasive exotic plants and animals.

Private Foundations and Trusts

There are a variety of resources that provide information on foundations and trusts that might support the Hall's Pond work.

The *Directory of Environmental Grantmaking Foundations*, published by the Environmental Data Research Institute in Rochester, New York, lists foundations by their interests in environmental topics and activities. The 1995 edition lists 600 foundations that awarded $425 million to environmental projects. The following is a list of areas of interest applicable to Hall's Pond and the number of foundations that provided funding in each:

Area of Interest	# of Foundations Providing Support
Youth: Urban	17
Wildlife: Sanctuary	48
Wildlife: Management	9
Wildlife: Conservation	184
Wetlands	86
Watershed: Management	11
Water Quality/Pollution	96
Gardens: Urban	26
Ecosystem Restoration	26

This directory, which is available at the Massachusetts Audubon Society, Development Office, has a brief description of each foundation and information on how to obtain more information and guidelines for preparing grant proposals.

The Associated Grantmakers of Massachusetts publish *Massachusetts Grantmakers*, a directory of foundations and trusts that focus on Massachusetts. The 1993 edition included eight foundations that list Brookline as their primary geographic focus. This organization, located at 294 Washington Street in Boston, will also provide assistance to its members who are seeking funding for a particular cause.

The Brookline Public Library may also have a list of local foundations and trusts that do not get listed in these larger publications.

FUNDING STRATEGIES PLAN

The following is a brief description of the steps that are required to develop the support necessary to realize the proposals outlined in this plan.

The Plan —The Basis of a Campaign

A major tool for gaining support is this sanctuary plan . It can be used as a tool for communicating the goals and specific recommendations of the plan to public agencies, business, organizations, and individuals. It can also be used as the basis for other communication tools such as letters, more targeted brochures, and verbal presentations.

People — A Campaign Committee

Once the plan has been finalized, a campaign committee, consisting of a broad spectrum of the community, should be formed. Such a committee should have representation from the neighborhood, various types of users of Hall's Pond, local businesses, people familiar with fundraising in Brookline and with individuals who may be willing to donate to the implementation of the plan, and representatives of the town government. All members of the campaign committee should be committed to implementing the plan and enthusiastic about the future of Hall's Pond.

One of the first decisions of the campaign committee may be to decide what aspects of the plan will be most successful for a fundraising effort. Should the campaign seek funds for both capital improvements and a management endowment or for just capital improvements? It is the experience of Massachusetts Audubon that it is generally much easier to raise capital funds than it is to raise funds for a management endowment. This decision will also determine the amount to be sought during the campaign.

One of the first activities of the campaign committee is to develop lists of businesses, individuals, trusts and foundations, and government funding programs that are good prospects for providing support. Some attempt should also be made to determine how much the potential foundation, donor, or program might be expected to provide. The committee can then decide which members can best request support from each listed donor or group. For example, a letter requesting a contribution signed by a neighbor is much more effective than the same letter signed by someone not living in the neighborhood. Or a business owner going to

visit other business owners and asking them to follow his example by supporting Hall's Pond, can be much more persuasive than a town official. In some cases, only the town will be eligible for sources of funds provided by government programs. In other cases, only a non-governmental organization like the Friends of Hall's Pond will be eligible.

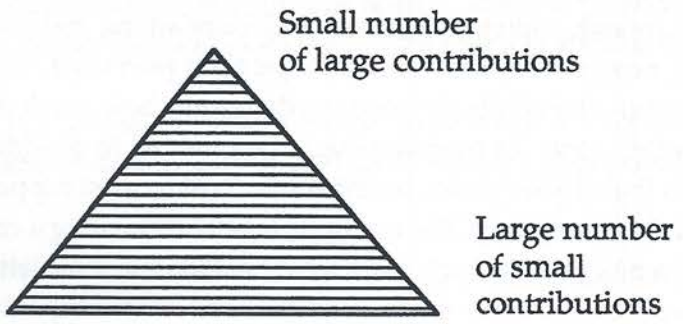
Communication — Telling About the Plan

After the lists are developed the next step is to prepare the communication tools that will be best suited to each category. Letters, summaries of the plan, a discussion book with photos and highlights of the plan, brochures, and grant proposals for specific aspects of the plan, may all play a role in helping tell people on the lists about the plan and convince them to contribute.

Campaign Structure

A typical campaign will have two phases and last three years. The first phase usually precedes the public phase of the campaign. It consists of very targeted approaches to a small number of groups and individuals that are likely to provide large contributions so that when the public phase is begun 25% to 50% of the goal has already been achieved. A special event near the end of this phase could be planned to give this select set of contributors a sense of being "insiders." This event might coincide with the completion of the landscape and engineering designs. This phase may also include applications to some of the government programs listed above.

Most campaigns are structured like a triangle, with a large number of small contributions, a small number of large contributions and an intermediate number of contributions in between.



Some large contributors may wait until after the public phase of the campaign has begun to see that there is strong public support. Therefore, it is important to begin the public campaign in the first year.

After the first year of highly targeted appeals to potential large donors, the campaign continues with public appeals and with on-going appeals to individuals, businesses, foundations, and government programs. During the second and third year, individual appeals may focus on friends referred by individuals contacted during the first year.

The public campaign may consist of mailings to a broad list of potential supporters; press coverage, letting everyone in town know about the needs; and special events, that give the community of supporters an opportunity to celebrate and share in their collective efforts. One of these special events could coincide with one aspect of the construction like a ground breaking, with opportunities for press coverage.

The third year of the campaign would continue with public appeals and with on-going appeals to individuals, businesses, foundations, and government programs. The campaign should include a "ribbon cutting" ceremony near its end that provides an opportunity to celebrate success and recognize individual efforts.

APPENDIX

ACKNOWLEDGEMENTS

The Brookline Conservation Commission acknowledges the helpful assistance of many people who participated in workshops, discussions, and reviews of this plan, or otherwise provided important counsel and perspective and support for this effort. They are:

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Martha Hoffheimer
Alice Hutter
Gerry Izzi
Dvora Jonas
Susana Lannik
Kathryn Lasky
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Ruth & Ken Scheer
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Nan St. Goar
Bob Styemist
Ronny Sydney
Terry Ann Vigil
Joanna Wexler
Dedie Wieler
John & Shiyoung Weiter
Paul Willis
and many others...

LIST OF RECOMMENDED NATIVE TREES AND SHRUBS

Marsh Community

Common Name	*Botanical Name*	*Food for Birds*
Cattail	Typha species	✔
Burr Reed	Sparganium species	
Arrowhead	Sagittaria species	
Pickerelweed	Pontederia cordata	
Sweet Flag	Acorus calamus	
Blue Flag	Iris versicolor	

Specific species for biological wetland filtration to be designated by wetland specialists.

Plants for Marsh Hummocks

Common Name	*Botanical Name*	*Food for Birds*
Tussock sedge	Carex stricta	
Joe-Pye Weed	Eupatorium species	
Summersweet	Clethra alnifoila	
Buttonbush	Cephalanthus occidentalis	
Silky Dogwood	Cornus amomum	✔

Trees and Shrubs for Wet Soils

Common Name	*Botanical Name*	*Food for Birds*
Red Maple	Acer rubrum	
Atlantic White Cedar	Chamaecyparis thyoides	✔
Chokeberry	Aronia spp.	✔
Buttonbush	Cephalanthus occidentalis	
Summersweet	Clethra alnifolia	
Silky Dogwood	Cornus amomum	✔
Grey Dogwood	Cornus racemosa	✔
Huckleberry	Gaylussacia spp.	✔
Inkberry	Ilex glabra	✔
Winterberry	Ilex verticilata	✔
Rhodora	Rhododendron canadense	
White Swamp Azalea	Rhododendron viscosum	

Trees and Shrubs for Moist to Moderate Soils

Common Name	*Botanical Name*	*Food for Birds*
Silver Maple	Acer saccharinum	
Shadblow	Amelanchier canadensis	✔
Yellow Birch	Betula lutea	✔
Black Ash	Fraxinus nigra	
Black Gum or Tupelo	Nyssa sylvatica	✔
Swamp White Oak	Quercus bicolor	
Spicebush	Lindera benzoin	✔
Sweet Azalea	Rhododendron arborescens	
Rosebay Rhododendron	Rhododendron maximum	
Elderberry	Sambucus canadensis	✔
Highbush Blueberry	Vaccinium corymbosum	✔
Witherod Viburnum	Viburnum cassinoides	✔
Arrowwood	Viburnum dentatum	✔
American Cranberrybush	Viburnum trilobum	✔

Trees and Shrubs for Dry Soils

Common Name	*Botanical Name*	*Food for Birds*
Eastern Red Cedar	Juniperus virginiana	✔
White Pine	Pinus Strobus	✔
Scarlet Oak	Quercus coccinea	
Red Oak	Quercus rubra	
Black Oak	Quercus velutina	
Witchhazel	Hamamelis virginiana	
Mountain Laurel	Kalmia latifolia	
Bayberry	Myrica pennsylvanica	✔
Coast Azalea	Rhododendron atlanticum	
Virginia Rose	Rosa virginiana	✔
Staghorn Sumac	Rhus typhina	
Steeplebush	Spirea tomentosa	
Lowbush Blueberry	Vaccinium angustifolium	✔

Vines

Common Name	*Botanical Name*	*Food for Birds*
Virginia creeper	Parthenocissus quinquefolia	✔

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INVASIVE NON-NATIVE SPECIES FOUND AT HALL'S POND SANCTUARY

Tree of Heaven

Ailanthus altissima
China (reportedly introduced in U.S. in 1784)
Grows to 100'

Status Common and invasive primarily in urban areas in Massachusetts.

Description Usually an urban weed tree with a very tropical and clumsy appearance. **Leaves** alternate, pinnately compound, to 36" long, with 7 to many leaflets. **Leaflets** 2"- 6" long, ovate-lancelet to oblong; margin with a few coarse teeth at base (sumacs are regularly toothed); teeth with a prominent gland on the under surface; rank smelling when crushed; stalklets present. **Flowers** J yellowish-green, sexes on separate trees; clusters to 12" long, terminal. Male flowers have a vile smell. **Fruit** about $1\frac{1}{2}$" long, twisted, winged, with a central, single seed; clusters large, conspicuous. Fruit clusters or "keys" are similar to maples except that the seed is in the center of the wing. **Bark** grayish, smooth, with shallow, pale, interlacing stripes.

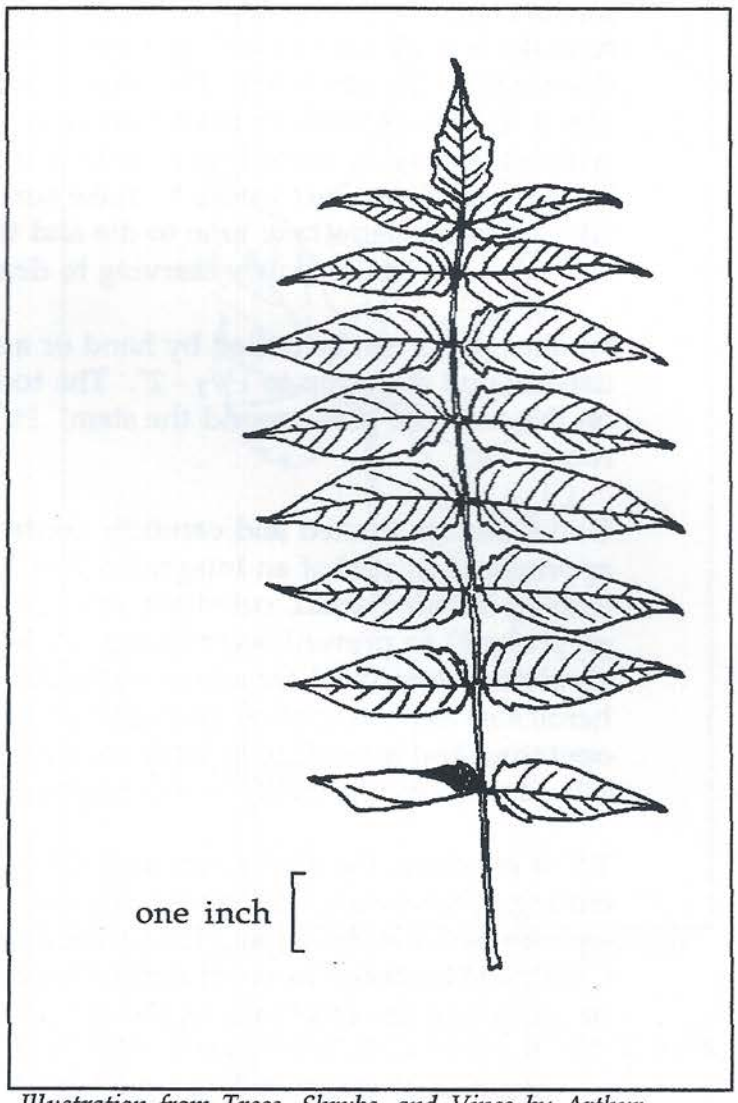


Illustration from Trees, Shrubs, and Vines by Arthur T. Viertel, Syracuse University Press, 1971.

Habitat Probably the most common tree growing in urban areas of the U.S. Has the ability to withstand trying urban conditions where it can grow in situations where practically nothing else will grow. It will also withstand seaside growing conditions.

Seasonal cycle Tree of Heaven is a deciduous tree. It flowers in June-July and fruits (on the female tree) appear in Sept.-Oct.

Distribution This tree is native to temperate China. Supposedly introduced in the U.S. in 1784 it is now wide spread from coastal Maine and southern N.H. south.
Other points of interest Contact with leaves has been reported to cause dermatitis.

Control Care should be exercised in disposing of Tree of Heaven to prevent it from spreading, as the plant can root from seeds and root cuttings. Larger stems can be cut or girdled and resprouts clipped as they occur. For girdling to be effective, use an ax or saw to make two parallel cuts 4" to 5" (10-12 cm) apart, cutting through the bark slightly deeper than the cambium. The bark then should be either knocked off using a blunt object like an ax head, or peeled away using an ax blade. Phloem should be removed without damaging the xylem to reduce the chance of new bark growth. Girdles should be checked after a few weeks to make sure that bark does not develop over the cut area. Girdled large stems take time to die and the results may not be seen until a year later. Basically, the tree is slowly starving to death. All sprouts should be cut.

Smaller stems can be pulled by hand or a special tool, called a "weed wrench", can be used to pull stems up to $1^1/_2$ - 2". The tool consists of a long metal rod with a pincher on the end that goes around the stem. Pulling back on the rod, pulls up the stem and its roots.

Under certain limited and carefully controlled circumstances herbicides may be appropriate as part of an Integrated Pest Management (IPM) program. As a last resort, in heavily invaded areas, cut stems can be treated with Roundup (a formulation of glyphosate) to prevent resprouting. A 50% solution of Rodeo (a formulation of glyphosate approved for use in wetlands) can be used in wetland areas. In some states, herbicides may be applied on public properties only by licensed herbicide applicators or operators and according to label instructions. Roundup and Rodeo are nonspecific and kill all photosynthetically active vegetation.

To be effective, the above mentioned herbicides must be applied immediately after cutting. These chemicals can be applied either by spraying individual cut stumps with a squeeze bottle or by wiping the herbicide on each cut surface with a sponge applicator. Care must be taken to avoid herbicide contact with non target plants; native plants will be important for recolonizing the site after the tree is eliminated.

Adapted from *Wyman's Gardening Encyclopedia* by Donald Wyman, The MacMillan Company, New York, 1972.

Porcelain Berry

Ampelopsis brevipedunculata
N. E. Asia
Climbs to 30'

Status Common and invasive in Massachusetts.

Description A vigorous vine, member of grape family, climbing by means of attaching tendrils to support. **Leaves** alternate, simple, lobed, rarely only shouldered above middle, 2"- 5" long, broad-ovate; lobes 3 - 5, usually deep, coarsely toothed; apex taper-pointed; base heart-shaped; green on both sides, bristly-hairy at least on veins beneath; stalk long, hairy. **Flowers** July-Aug., inconspicuous; clusters compound, hairy. **Fruit** Sept.-Oct., $^1/_4$" to $^1/_3$" across, suggestive of porcelain, lilac, green, turquoise or rarely whitish, colors often mixed in same small cluster, finally bright blue, a berry. **Stems** with continuous white pith, hairy when young. **Bark** close, spotted.

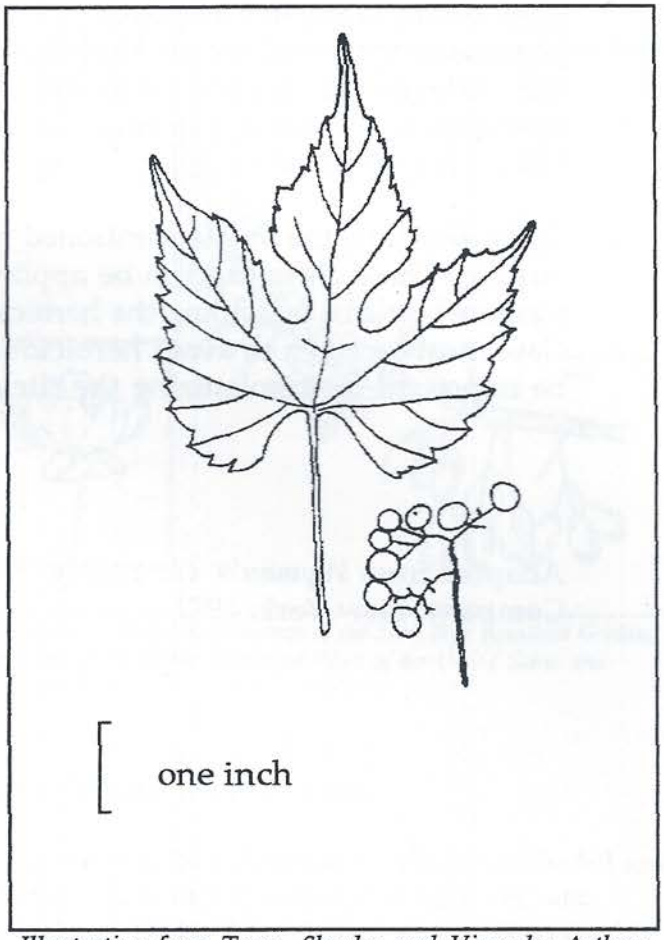


Illustration from Trees, Shrubs, and Vines by Arthur T. Viertel, Syracuse University Press, 1971.

Distribution This tree is native to northeast Asia. Supposedly introduced in the U.S. in 19th cent. it is now wide spread from coastal Maine and southern N.H. south.

Other points of interest The berries are about the size of peas, borne in cluster, but in ripening they change color from pale lilac to yellow to porcelain blue (rarely whitish). It is a vigorous climber, climbing by means of tendrils.

Control Care should be exercised in disposing of Porcelain berry to prevent it from spreading as the plant can root from seeds, cut stems, and root cuttings. Larger stems can be cut by a saw or large lopers. Smaller stems can be pulled by hand or a special tool, called a "weed wrench", can be used to pull stems up to $1^1/_2$ - 2". The tool consists of a long metal rod with a pincher on the end that goes around the stem. Pulling back on the rod, pulls up the stem and its roots.

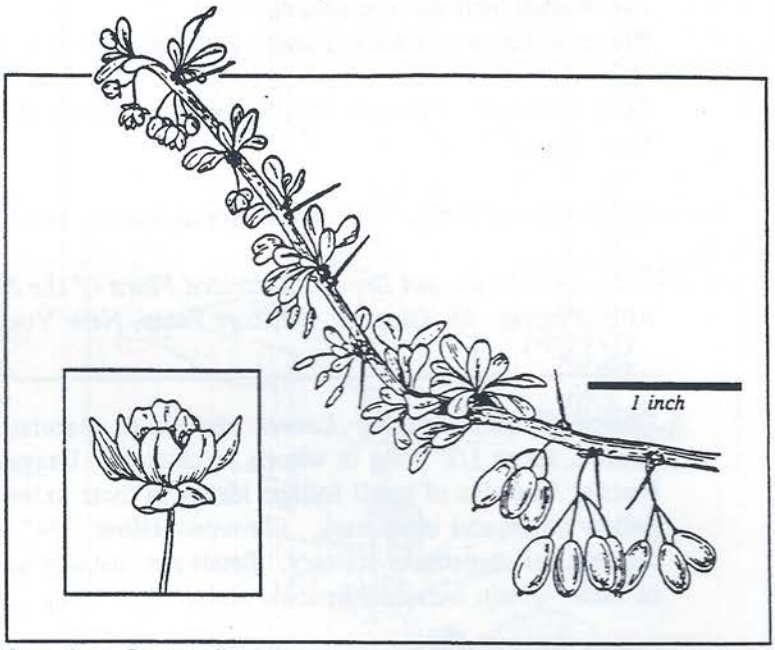
Under certain limited and carefully controlled circumstances herbicides may be appropriate as part of an Integrated Pest Management (IPM) program. As a last resort, in heavily invaded areas, cut stems can be treated with Roundup (a formulation of glyphosate) to prevent resprouting. A 50% solution of Rodeo (a formulation of glyphosate approved for use in wetlands) can be used in wetland areas. In some states, herbicides may be applied on public properties only by licensed herbicide applicators or operators and according to label instructions. Roundup and Rodeo are nonspecific and kill all photosynthetically active vegetation. A 50% solution has proven effective.

To be effective, the above mentioned herbicides must be applied immediately after cutting. These chemicals can be applied either by spraying individual cut stumps with a squeeze bottle or by wiping the herbicide on each cut surface with a sponge applicator. Care must be taken to avoid herbicide contact with non target plants; native plants will be important for recolonizing the site after the vine is eliminated.

Adapted from *Wyman's Gardening Encyclopedia* by Donald Wyman, The MacMillan Company, New York, 1972

Japanese Barberry

Berberis thunbergii
Barberry Family (Berberiidaceae)



Inset shows flower. (Illustration courtesy of the New York Botanical Garden, from "New Britton and Brown Illustrated Flora of the United States and Adjacent Canada©")

Status: Common and invasive in Connecticut.

Description: Japanese barberry is a compact, woody shrub with arching branches. Most commonly it is two or three feet high, but can grow to six feet in height. On the stems, there is a single spine below each rosette of wedge-shaped, untoothed leaves.

The yellow flowers are bisexual, have four sepals (modified leaves below the petals), and the sepals and petals are similar in appearance. The flowers produce small, oblong red berries that are borne singly or in clusters from the stem. The inner bark and roots of Japanese barberry are yellow.

Preferred habitat: It is found along roadsides, fences, old fields and open woods.

Seasonal cycle: Japanese barberry flowers in May and the fruits hang from the shrubs during the fall and into the winter. In autumn, the leaves of Japanese barberry turn varying shades of orange, red, and crimson. The woody stems of this shrub persist through the winter. Reproduction may be primarily through seeds, although there are reports of resprouting from roots remaining in the ground.

Distribution: Japanese barberry is native to Asia. Its range in North America extends from Nova Scotia south to North Carolina, and west to Montana.

Other points of interest: Japanese barberry was discovered in the mountains of Japan and sent to St. Petersburg Botanic Gardens by the Russian botanist Carl Maximowicz in 1864. About 1875, seeds from St. Petersburg were received at the Arnold Arboretum in Massachussetts and, from there, introduced to North America. Japanese barberry has been extremely popular for ornamental hedges because of its scarlet fruit, fall leaf color, and ease of cultivation. As its fruits are often eaten by birds, the plant has easily naturalized.

Common barberry (*Berberis vulgaris*) is another invasive plant that is less common than Japanese barberry in Connecticut. Similar in general appearance to Japanese barberry, common barberry has toothed leaves, and spines that are double- or triple-branched.

Control: Mechanical removal of the plant is recommended because it is effective and minimally intrusive. In early spring, this is one of the first plants to leaf out and can be distinguished easily from other shrubby vegetation. The use of a hoe, weed wrench, or mattock is suggested to uproot the entire bush and associated roots; gloves will help protect hands from the spines. The uprooted shrubs can be piled as cover for small animals. Plants growing in rock piles, which are difficult to dig out, can be treated with

the herbicide glyphosate. Because it is a non-selective herbicide, great care must be taken when using it in order not to harm native plants.

Additional information sources:

Plants Invasive in Rhode Island. L.L. Gould and I. H. Stuckey. The Rhode Island Wild Plant Society.

Gray's Manual of Botany. Eighth edition, corrected printing. M. Fernald. D. Van Nostrand Company, New York, 1970.

The Barberry Family. American Horticulturist **64**: April 1985.

The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada. fifth printing. H. Gleason. Haffner Press, New York, 1974.

Diagnostic information: *Leaves:* abovate to spatulate, usually obtuse, entire, narrowed at base to a short petiole, about 1/2" long in whorls or clusters. Leaves of the shoots metamorphosed into simple spines, bearing fascicles of small foliage leaves in their axles. *Stems:* woody, slender, with straight single spines; yellow wood and inner bark. *Flowers:* yellow, 1/4" wide, in elongate racemes, contracted umbel-like clusters, or sometimes solitary. Petals six, usually smaller than the sepals and with two glands at the base of each. *Fruit:* berries ellipsoid, scarlet, 1/2" long.

H. Brunelle and B. Lapin / Revised April 1, 1996

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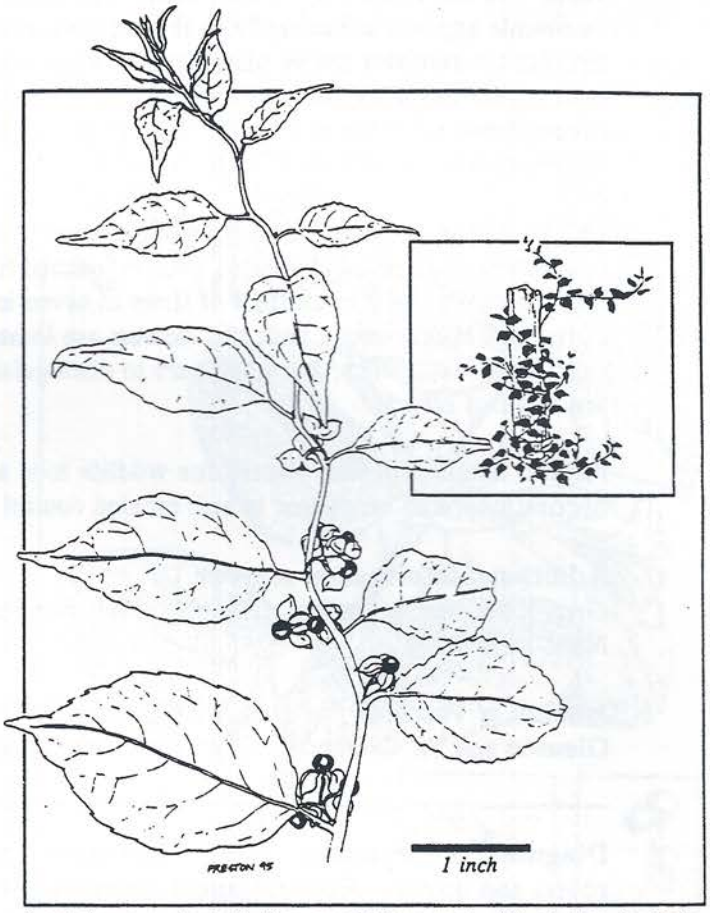
Invasive Plant Information Sheet

Asiatic Bittersweet

Celastrus orbiculatus Thunb.
Staff Tree Family (*Celastraceae*)



Inset shows a plant climbing an old fencepost. (Illustration by Judy Preston)

Status: Common and invasive in Connecticut.

Description: Asiatic bittersweet is a non-native woody vine with yellow fruits which split to reveal showy bright red seeds. It is also commonly referred to as Oriental bittersweet. This highly invasive species entwines its round, brown stems about other plants and structures, climbing as high as sixty feet. Approximately two weeks after autumn foliage's peak, the leaves turn golden-yellow and are easily sighted.

Habitat: In its native Asia, this species dominates lowland slopes and thickets. Here in North America, Asiatic bittersweet is extremely successful in almost any habitat type, such as disturbed edges, abandoned fields, along coast, and the edge of salt marshes. It prefers utility corridors, fence rows, railroads, and roadways (for example, it is prolific along the Merritt Parkway).

Seasonal cycle: Asiatic bittersweet is a deciduous perennial plant. There are typically separate male and female plants, which bloom in May and June. Bees aid in pollination. The fruit (on the female plant) ripens by September and remains on the vine through winter. Numerous bird species, such as black-capped chickadee, northern mockingbird, European starling (non-native), and blue jay, small mammals, and human activity (such as composting ornamental cuttings) widely disperse the Asiatic bittersweet's seeds. Rootsuckering, the ability to send up shoots from the roots, contributes to the vine's high density once established at a site.

Distribution: Asiatic bittersweet is native to temperate East Asia (Japan, Korea, and China). Introduced to North America in the mid-nineteenth century, it quickly became established from Louisiana to Maine. Asiatic bittersweet reached Connecticut as early as 1916 as an ornamental and is now found throughout the state.

Control: Due to its high reproductive rate, long-range seed dispersal, and rootsuckering abilities, Asiatic bittersweet can quickly disperse through an entire area, threatening upland meadows, thickets, young forests, and beaches alike. Growth of native vegetation is extremely limited beneath bittersweet's dense shade, and it tends to strangle small trees and shrubs by growing around their stems, constricting the flow of the plant's fluids. Many supporting plants also succumb to wind and ice storms with the added weight of the vine. Asiatic bittersweet also has the capacity to hybridize with American bittersweet (*Celastrus scandens*), cross-pollinating to the extent of modifying the genetic differences between the two species.

The Connecticut College Arboretum, Connecticut Department of Transportation, and The Nature

Conservancy are working to improve the control and management of Asiatic bittersweet. Low patches can be removed by cutting the vine and applying triclopyer herbicide (the active ingredient in Ortho's Brush-B-Gone®) to the regrowth a month later. For taller patches, the main stems can be cut and triclopyer herbicide applied immediately to the cut stem and to any subsequent regrowth. Care must be taken to protect the remnant native plant species when cutting to ensure that they revegetate the area. Asiatic bittersweet has a substantial seed bank, and successful removal of the species requires perseverance through two or three years. The Nature Conservancy Connecticut Chapter currently manages Asiatic bittersweet at its Griswold Point Preserve.

Other points of interest: Asiatic bittersweet is similar in appearance to the native species American bittersweet. Asiatic bittersweet is distinguished from American bittersweet by the fact that its fruit and flowers are located in clusters of three to seven in the axil of the leaves (between the leaf and the stem). American bittersweet's fruit and flowers are located at the branch tips only. It is very important for land managers, naturalists, and gardeners to distinguish between the native species and the invasive species in any control efforts.

Asiatic bittersweet was planted for wildlife food and cover, cultivated to use the fruit-covered vines for decorations, and employed in soil erosion control.

Additional information sources:

Gray's Manual of Botany. Eighth edition, corrected printing. M. Fernald. D. Van Nostrand Company, New York 1970.

Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Second edition. H. Gleason and A. Cronquist. The New York Botanical Garden, Bronx 1991.

Diagnostic information: *Roots:* outer surface is characteristically bright orange. *Stem and branches:* round and brown. *Flowers:* small, greenish-yellow, with 5 sepals and 5 petals, clustered in the axil of the leaves. *Fruit:* 1/4" diameter, change from green to bright yellow as mature, bright scarlet arils. *Leaves:* 3/4" to 4-3/4" long and 5/8" to 3-1/4" wide, margin is crenate to serrate, base is cuneate to obtuse, tip is acute to rounded, change from green to golden-yellow as mature.

Christopher Shepard / Revised February 26, 1996

This fact sheet has been prepared by The Nature Conservancy Connecticut Chapter, in cooperation with The Natural Diversity Data Base of the Connecticut Department of Environmental Protection. Funding provided by the Carolyn Foundation.

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Japanese Honeysuckle

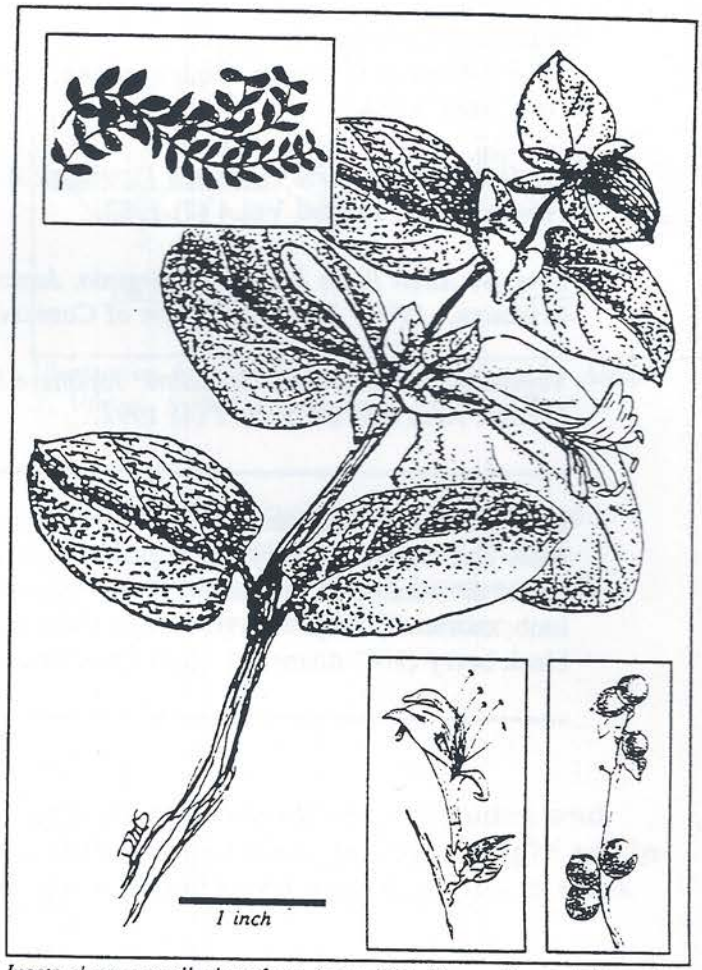
Lonerica japonica Thunberg
Honeysuckle Family (*Caprifoliaceae*)

Status: Common and invasive in Connecticut.

Description: Japanese honeysuckle is a woody perennial trailing or twining vine. Its individual runners can grow more than 30 feet in length; it roots at the nodes of the pubescent runners. Leaves are simple, opposite and oval to oblong in shape. Occasionally, young leaves are lobed. Japanese honeysuckle's flowers are fragrant, two-lipped, one to two inches in length, and white, changing to yellow with age. Fruit is a many-seeded, purple-black, pulpy berry.

Preferred habitat: Japanese honeysuckle is found in thickets, borders of woods and roadsides, and meadows. It occurs primarily in areas where natural or human disturbances have provided a light gap in the canopy. It can also be found in shaded areas, but most rapid growth occurs in areas exposed to sun.

Seasonal cycle: Japanese honeysuckle flowers from late May through the summer, and fruits from July through the fall. Late in the season, it continues photosynthesis after most associated native plants have become dormant. The stem and some of the leaves persist through the winter, resulting in an evergreen or semi-evergreen plant.



Insets show overall plant form (upperleft), flower (lower left), and berries (lower right). (Illustration by Donna Smith, courtesy of the Virginia Department of Conservation and Recreation)

Distribution: In North America, Japanese honeysuckle is naturalized from Maine, Massachusetts, and New York, south to Texas and Florida and west to Missouri and Indiana.

Other points of interest: Not native to this area, Japanese honeysuckle was introduced to North America from Japan in the 1800s as an ornamental shrub and vine. It has also been used for soil erosion control along railroads and highways. The berries of Japanese honeysuckle are a source of food for wildlife, especially mockingbirds, and other birds that disperse seeds. It is a serious threat to native plant species because of its capacity to strangle and destroy supporting trees and shrubs.

Japanese honeysuckle is distinct from two other trailing honeysuckles, the trumpet honeysuckle (*L. sempervirens*) and wild honeysuckle (*L. dioica*), found in Connecticut. The fruits of the other honeysuckles are red to orange-red berries, and their uppermost pair of leaves are joined together.

Control: Being semi-evergreen, Japanese honeysuckle is easier to detect during the fall when most native species have dropped their leaves. Control methods for Japanese honeysuckle in areas of heavy and light

infestations include mowing, grazing, prescribed burning, and the application of herbicides. Mowing and grazing reduces the spread of vegetative stems but does not completely remove the vegetation; instead, vigorous resprouting increases stem density. Small populations may be controlled by careful hand pulling, grubbing with a hoe or shovel, and removing trailing vines. Glyphosate herbicide (1.5-2% solution, applied during the fall before a hard freeze) is recommended to control Japanese honeysuckle. Care must be taken not to harm native species as the glyphosate herbicide is non-selective.

Additional information sources:

Gray's Manual of Botany. Eighth edition, corrected printing. M. Fernald. D. Van Nostrand Company, New York 1970.

Japanese Honeysuckle (Lonicera japonica): A Literature Review of Management Practices. J. Evans. Natural Areas Journal Vol.4 (2) 1982.

Invasive Alien Plant Species of Virginia, Japanese Honeysuckle (Lonicera japonica Thunberg). C. Williams. 1994. The Department of Conservation and Recreation and the Virginia Native Plant Society.

Vegetation Management Guideline: Japanese Honeysuckle (Lonicera japonica Thunb.). R. Nyboer. Natural Area Journal Vol.12 (4) 1992.

Diagnostic information: *Leaves:* ovate or oblong (1-1/2" to 3" long); roundish or broadly cuneate at base; glabrescent or hairy; short petioled, green. Young leaves may be pinnately lobed. *Flowers:* two-lipped flowers (1"-2" in length); borne in pairs in axils of young branches; the tube about equaling the limb; extremely fragrant; opposite, white, changing to yellow with age. *Fruit:* a many-seeded, purple-black berry (1/4" diameter). *Stems and branches:* trailing or twining woody vine. Stems are pubescent.

Heather J. Brunelle / Revised February 26, 1996

This fact sheet has been prepared by The Nature Conservancy Connecticut Chapter, in cooperation with The Natural Diversity Data Base of the Connecticut Department of Environmental Protection.

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Tartarian Honeysuckle

Lonicera tatarica
S. Russia (reportedly introduced in U.S. in 1752)
Grows to 10'

Status Common and invasive in Massachusetts.

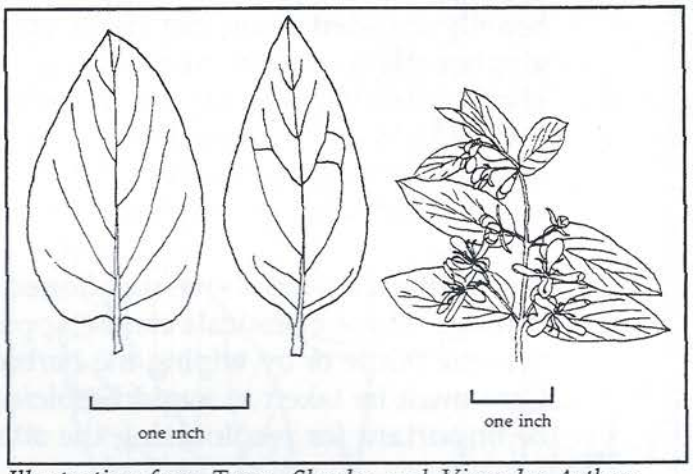


Illustration from Trees, Shrubs, and Vines by Arthur T. Viertel, Syracuse University Press, 1971.

Description A medium sized, upright, bushy, twiggy shrub of vigorous growth; very variable. **Leaves** opposite, simple, entire, to $2\frac{1}{2}$" long, ovate to oblong-ovate; apex usually pointed; base slightly heart-shaped or rounded; green above, paler beneath, essentially hairless. **Flowers** May-June, about $\frac{3}{4}$" long, pink to white, not becoming yellow with age, irregularly divided or two lipped, in pairs on slender stalk much longer than leaf stalk; tube shorter than spreading lobes. Very fragrant. **Fruit** late June-Aug., small, globular, red, sometimes slightly united at base, a berry that is attractive to birds. **Twigs** hairless; pith brown, usually hollow in center.

Habitat Tartarian Honeysuckle is found along borders of woods and roadsides, and meadows. It occurs primarily in areas where disturbances have provided a light gap in the canopy. It can be found in shaded areas, but its most rapid growth occurs in areas exposed to full sun.

Distribution This shrub is native to southern Russia. Supposedly introduced in the U.S. in 1752 it is now wide spread from coastal Maine and southern N.H. south in New England.

Other points of interest Shows a great variation in both flowers and fruits. It has become naturalized in many parts of the eastern U. S. for birds readily distribute the seeds.

Control Care should be exercised in disposing of Honeysuckle to prevent it from spreading as the plant can root from seeds, cut stems, and root cuttings. Larger stems can be cut by a saw or "brush hog" mower. Smaller stems can be pulled by hand or a special tool, called a "weed wrench", can be used to pull stems up to $1\frac{1}{2}$ - 2". The tool consists of a long metal rod with a pincher on the end that goes around the stem. Pulling back on the rod, pulls up the stem and its roots.

Under certain limited and carefully controlled circumstances herbicides may be appropriate as part of an Integrated Pest Management (IPM) program. As a last resort, in heavily invaded areas, cut stems can be treated with Roundup (a formulation of glyphosate) to prevent resprouting. A 50% solution of Rodeo (a formulation of glyphosate approved for use in wetlands) can be used in wetland areas. In some states, herbicides may be applied on public properties only by licensed herbicide applicators or operators and according to label instructions. Roundup and Rodeo are nonspecific and kill all photosynthetically active vegetation. A 50% solution has proven effective.

To be effective, the above mentioned herbicides must be applied immediately after cutting. These chemicals can be applied either by spraying individual cut stumps with a squeeze bottle or by wiping the herbicide on each cut surface with a sponge applicator. Care must be taken to avoid herbicide contact with non target plants; native plants will be important for recolonizing the site after the shrub is eliminated.

Adapted from *Wyman's Gardening Encyclopedia* by Donald Wyman, The MacMillan Company, New York, 1972

White Mulberry

Morus alba
China
Grows to 45'

Status Common and invasive in Massachusetts.

Description A round-topped, dense tree that was often planted in the 19th century but now escaped. Very attractive to birds who spread its seeds. **Leaves** alternate, simple, toothed, often lobed, 2"- 4" long, mostly somewhat orbicular to oblong-ovate, sometimes mitten-shaped; lobes blunt if present; apex pointed or rarely short taper-pointed; coarse teeth; light to bright green, shiny above, usually hairless except for main veins or axillary tufts beneath. **Flowers** with leaves, catkin-like, sexes on either same tree or different trees. **Fruit** July-Aug., usually white to pinkish although sometimes dark, 1/2" to 1" long, blackberry-like, very sweet.

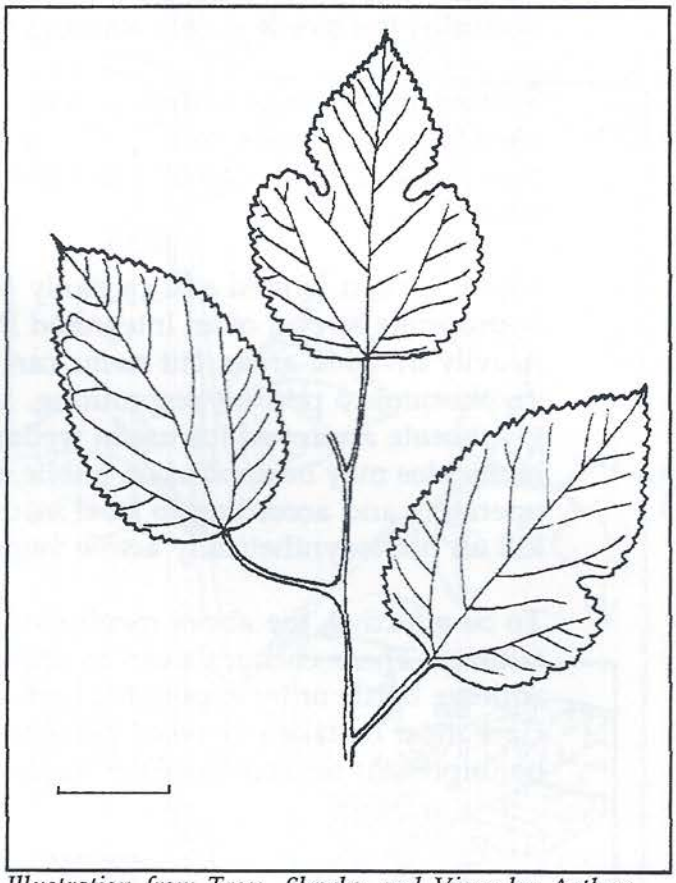


Illustration from Trees, Shrubs, and Vines by Arthur T. Viertel, Syracuse University Press, 1971.

Distribution This tree is native to temperate China. Supposedly introduced in the U.S. in 19th cent. it is now wide spread from coastal Maine and southern N.H. south.

Other points of interest This species of Mulberry was often planted as the food tree for silkworms, but since raising of silkworms in America did not prove popular, and since the fruits cannot be kept long, or shipped, these trees are not planted much any more. The fruit can be used for jellies and preserves.

Control Care should be exercised in disposing of Mulberry to prevent it from spreading, as the plant can root from seeds and stem cuttings. Larger stems can be cut or girdled and resprouts clipped as they occur. For girdling to be effective, use an ax or saw to make two parallel cuts 4" to 5" (10-12 cm) apart, cutting through the bark slightly deeper than the cambium. The bark then should be either knocked off using a blunt object like an ax head, or peeled away using an ax blade. Phloem should be removed without damaging the xylem to reduce the chance of new bark growth. Girdles should be

checked after a few weeks to make sure that bark does not develop over the cut area. Girdled large stems take time to die and the results may not be seen until a year later. Basically, the tree is slowly starving to death. All sprouts should be cut.

Smaller stems can be pulled by hand or a special tool, called a "weed wrench", can be used to pull stems up to $1^1/_2$ - 2". The tool consists of a long metal rod with a pincher on the end that goes around the stem. Pulling back on the rod, pulls up the stem and its roots.

Under certain limited and carefully controlled circumstances herbicides may be appropriate as part of an Integrated Pest Management (IPM) program. As a last resort, in heavily invaded areas, cut stems can be treated with Roundup (a formulation of glyphosate) to prevent resprouting. A 50% solution of Rodeo (a formulation of glyphosate approved for use in wetlands) can be used in wetland areas. In some states, herbicides may be applied on public properties only by licensed herbicide applicators or operators and according to label instructions. Roundup and Rodeo are nonspecific and kill all photosynthetically active vegetation. A 50% solution has proven effective.

To be effective, the above mentioned herbicides must be applied immediately after cutting. These chemicals can be applied either by spraying individual cut stumps with a squeeze bottle or by wiping the herbicide on each cut surface with a sponge applicator. Care must be taken to avoid herbicide contact with non target plants; native plants will be important for recolonizing the site after the tree is eliminated.

Adapted from *Wyman's Gardening Encyclopedia* by Donald Wyman, The MacMillan Company, New York, 1972.

Japanese Knotweed

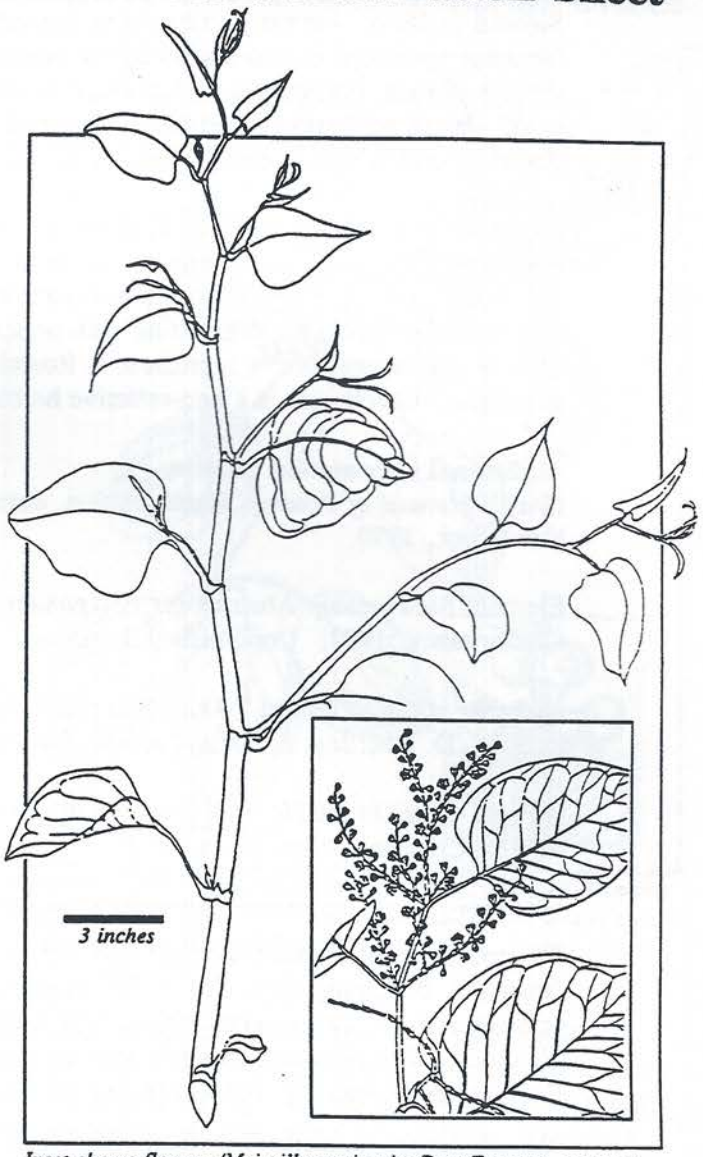
Polygonum cuspidatum Sieb. & Zucc.
Buckwheat Family (Polygonaceae)

Status: Increasing and invasive in Connecticut, primarily at disturbed sites.

Description: Japanese knotweed is a fast-growing herbaceous perennial that grows in large clumps three to six feet in height. It has hollow stems similar to bamboo, with swollen joints along the stem. Leaves are broadly egg-shaped, with pointed tips and squarish bases. The flowers are greenish white and profuse, growing in slender fingerlike clusters where the leaves meet the branches.

Preferred habitat: This plant occurs in a wide variety of habitats, in many soil types, and a range of moisture conditions. It appears to be found primarily in disturbed open areas with plenty of sun; shade depresses its growth. Edges of roadways and streambanks are common locations at which to find Japanese knotweed.

Seasonal cycle: In Connecticut, leaves appear on Japanese knotweed in April. Flowers, which develop in August and September, are pollinated by bees and other insects. The seeds mature about two weeks after the plant flowers and are dispersed by wind. Once established, the species reproduces primarily through its extensive rhizomes, which may reach 45-60 feet in length.



Inset shows flower. (Main illustration by Dott Emmett, courtesy of Blackwell Scientific, Inc.; inset illustration from "An Illustrated Flora of the Northern United States and Canada," 1913, Dover Publications)

Distribution: Native to Japan, Japanese knotweed was introduced into the United States in the late 1800s as an ornamental. The species has been widely cultivated and has escaped and naturalized. It is now widely distributed throughout the eastern United States and is found as far north as Nova Scotia and Newfoundland and as far south as North Carolina. It is also found in much of the midwest and in the coastal areas of Washington and Oregon.

Other points of interest: The early emergence of Japanese knotweed leaves in the spring and its stand-forming habit produce a dense canopy beneath which few other plant species can survive. In addition, the persistent accumulation of stem litter within established stands also reduces species diversity and damages wildlife habitat.

Japanese knotweed is a wild edible. Young shoots up to one foot in height can be harvested early in the spring, then steamed or boiled for four to five minutes and served like asparagus. Slightly older stems can be used to make a rhubarb-like jam by peeling and boiling the sour rind with sugar and pectin.

This plant was classified as *Reynoutria japonica* by Houttuyn in 1777 and as *Polygonum cuspidatum* by Siebold in 1846. Recently, it has been suggested that it should be reclassified as *Fallopia japonica*. Japanese knotweed is also known by the common names Mexican bamboo and Japanese fleece flower. A similar species, *Polyganum sachalineuse*, is much less common and appears to escape only infrequently, if at all. It can be distinguished from *P. cuspidatum* primarily by its larger size, greenish flowers, and heart-shaped leaves which gradually taper to the tip.

Control: It is extremely difficult, if not impossible, to eradicate large established stands of Japanese knotweed. However, establishment can be prevented fairly easily by removing plants before they become firmly entrenched. Current control methods include both mechanical and herbicidal treatments. Mechanical control includes cutting with persistence, at least three cuts in one growing season. Herbicides such as glyphosate (active ingredient in Roundup®) may be more effective when applied to the regrowth of cut stems. Glyphosate is a non-selective herbicide and great care should be taken in its usage.

Additional information sources:

Gray's Manual of Botany. Eighth edition, corrected printing. M. Fernald. D. Van Nostrand Company, New York, 1970.

Element Stewardship Abstract for *Polygonum cuspidatum*, Japanese knotweed. Leslie Seiger. The Nature Conservancy, 1992. Unpublished document.

Fallopia japonica (Houtt.) Ronse Decraene (*Reynoutria japonica* Houtt., *Polygonum cuspidatum* Sieb. & Zucc.). D. Beerling, J. Bailey, and A. Conolly. Journal of Ecology, 1994, 82, 959-979

A Field Guide to Edible Wild Plants (Eastern and Central North America). L. A. Peterson. Houghton Mifflin Company, New York, 1977.

Diagnostic information: *Leaves:* Petioled, round-ovate, truncate to slightly cuneate at base, abruptly cuspidate, becoming firm, and 2"-10" long. *Flowers:* Greenish-white, dioecious, in forking axillary panicles. *Fruit:* Calyx wing-angled, 1/3" long; achene shining, trigonous, about 1/5" long. *Stems:* Erect, glaucous, often mottled, widely bushy-branched, 3' - 8' high; ocreae membranous, tubular; rhizomes are stout, subterranean (up to 45 to 60 feet in length).

H. Brunelle and B. Lapin / Revised March 25, 1996

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Common Buckthorn

Rhamnus cathartica

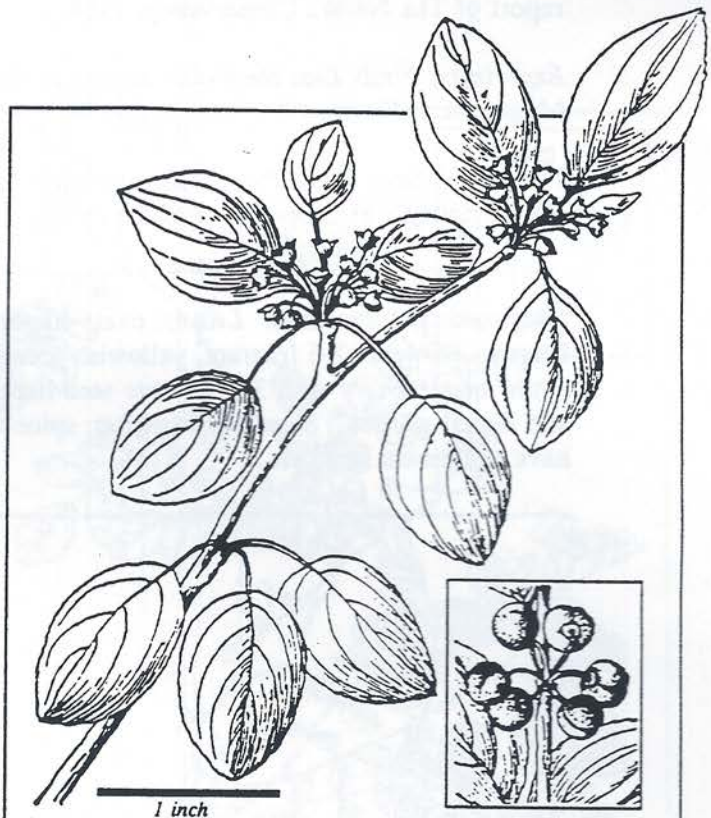
Buckthorn Family (Rhamnaceae)

Status: Invasive in Connecticut.

Description: Common buckthorn is a deciduous perennial shrub or small tree that reaches up to 20 feet in height. The leaves are mostly opposite, smooth, dull green and one to two-and-a-half inches in length. Flowers are fragrant with four greenish-yellow petals, and stems that appear to originate from the same point to form a flat or rounded umbrella-shaped cluster (umbel). Gray-black bark and twigs have prominent raised areas (lenticels), and twigs may be tipped with sharp, stout thorns.

Buckthorn can establish dense stands, choking out native shrubs and herbaceous plants.

Preferred habitat: Common buckthorn occurs in a variety of habitats, including woodland borders and wet areas. It has a preference for neutral or alkaline soils, and can be found in limestone wetlands.



Inset shows berries. (Illustration courtesy of the New York Botanical Garden, from the "New Britton and Brown Illustrated Flora of the United States and Adjacent Canada")

Seasonal cycle: Buckthorn has a long growing season, with leaf-out in late April to mid-May, prior to most woody deciduous species. Each shrub typically bears either male or female flowers May through June. The female plants produce rounded black fruits, each with three or four grooved seeds, that ripen in August through September. Buckthorns retain their leaves late into the fall, and stems persist through the winter, as does much of the fruit. Seeds are spread by birds and mice, which eat the fruit.

Distribution: In North America, common buckthorn has naturalized from Nova Scotia to Saskatchewan, south to Missouri and east to Virginia.

Other points of interest: Native to Europe and Asia, common buckthorn was probably introduced to North America before 1800 and became widespread and naturalized in the early 1900s. It was cultivated for hedges, forestry uses, and wildlife habitat.

Control: Control methods include cutting/mowing, girdling, excavation, and chemical control. Seedlings or small plants may be pulled by hand or removed with a grubbing hoe. Excavation is most useful in areas with low density invasions. Repeated cutting, which reduces plant strength, is recommended twice each season for two or three successive years. Girdling may be done all winter, does not disrupt the soil, and does not affect sensitive wetlands. Combining cutting with herbicide use may also be effective; it is recommended the stems be cut in the spring at leaf expansion and again in August or September, at which time a 20% solution of glyphosate can be applied to the stump. (Glyphosate is a non-selective herbicide and great care must be taken when using it in order to not harm native plant species.)

Additional information sources:

Common Buckthorn and Glossy Buckthorn Element Stewardship Abstract. C.K. Converse. Unpublished report of The Nature Conservancy, 1984.

Experiment Finds Less Herbicide Needed to Control Buckthorn (Wisconsin) S. Glass. Restoration & Management Notes, 12:1, Summer 1994.

The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada. Fifth printing. H. Gleason. Haffner Press, New York, 1974.

Diagnostic information: *Leaves:* ovate-elliptic or subovate, glabrous and minutely serrate, 1" to 2-1/2" in length. *Flowers:* 2-6 fragrant, yellowish-greenish, 4 petals, perfect, in axillary or supra-axillary umbels. *Fruit:* black, berry with 3-4 separate seed-like nutlets of cartilaginous texture, the plump seeds with a deep and dorsal groove. *Stem and branches:* spine-tipped long shoots and branches, gray-black bark, twigs have prominent lenticels.

H. Brunelle and B. Lapin / Revised April 18, 1996

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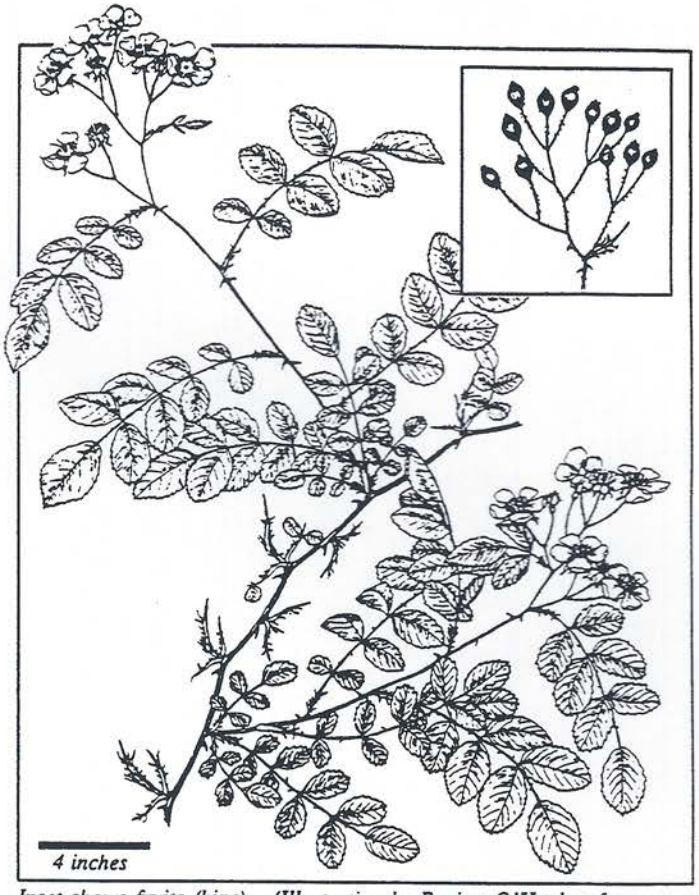
Invasive Plant Information Sheet

Multiflora rose

Rosa multiflora Thunb.
Rose Family (Rosaceae)



Inset shows fruits (hips). (Illustration by Regina O'Hughes from "Common Weeds of the United States," Dover Press)

Status: Common and invasive in Connecticut.

Description: Multiflora rose is a shrub with nine- to twelve-foot-long arching stems (canes) rising directly from the ground. These stems are generously studded with stiff thorns. Leaves are usually made up of seven or nine leaflets, each sharply toothed. The stipule, which is the covering at the base of each leaf, is deeply fringed.

The plant produces clusters of fragrant white (or occasionally pink) flowers three-quarters of an inch to one-and-a-half inches across, which are replaced by red rose hips (fruit).

Preferred habitat: This plant is abundant in pastures, reverting fields, and roadsides. It has been planted as a "living fence" to control livestock, to stabilize soil, and to create barriers for highways. Multifora rose endures a wide range of soil and environmental conditions, preferring sunny areas and well-drained soils.

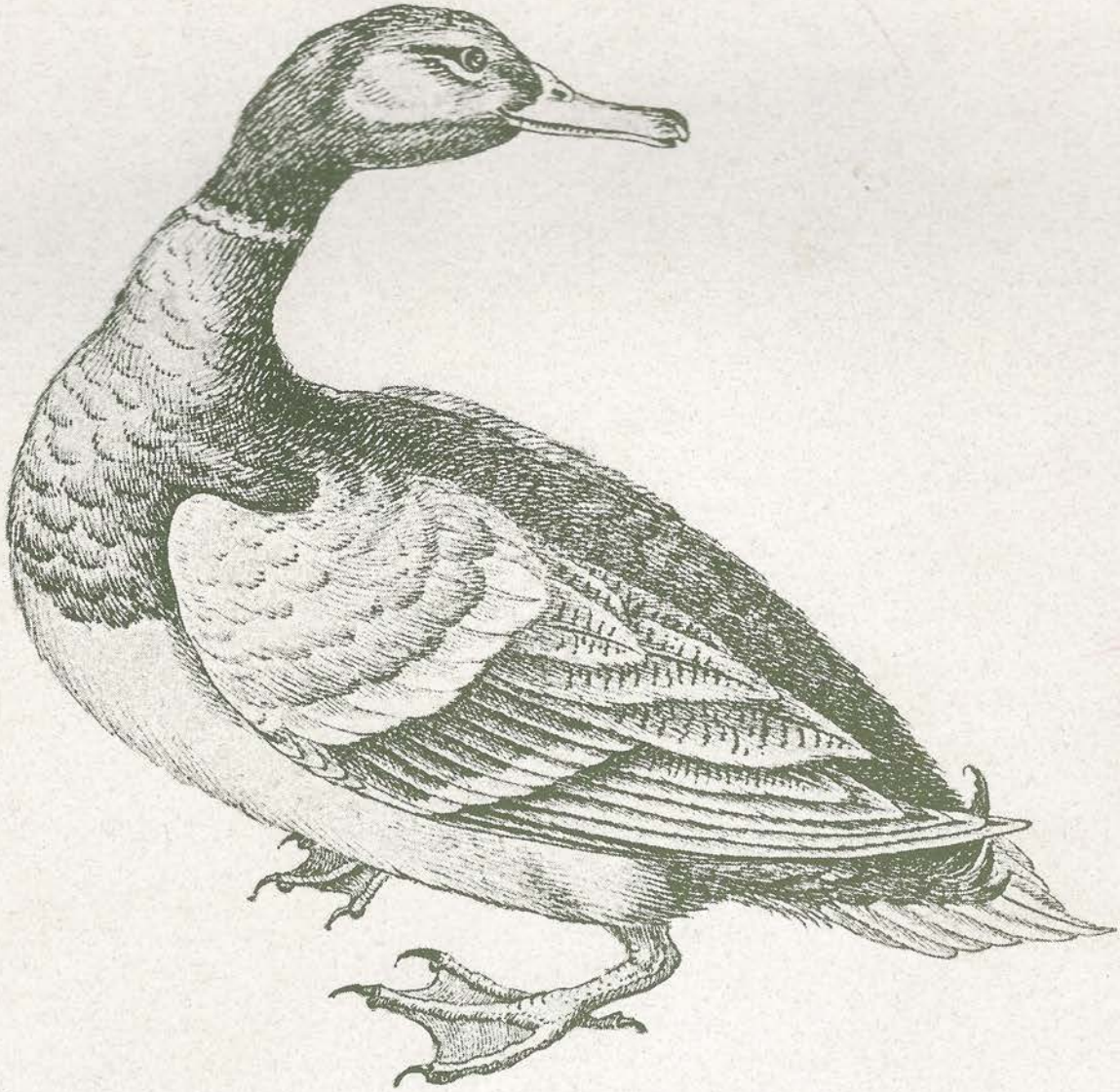
Seasonal cycle: Multiflora rose is a perennial shrub that flowers in May or June in Connecticut; fruits (hips) develop in the late summer. The plant reproduces by seed as well as by rooting at the tips of the drooping canes. Although the leaves drop off each fall, the stems persist through winter and releaf in the spring.

Distribution: Native to eastern Asia, multiflora rose is a common, naturalized pasture weed in most of the northeastern and midwestern United States. It is found throughout the United States with the exception of the Rocky Mountain area, southeastern coastal plains, and the Nevada and California desert areas.

Other points of interest: Multifora rose is named for the clusters of many white or occasionally pink flowers borne on this bramble during May or June. It was introduced to the United States for wildlife cover and food, and has now become a serious invader of agricultural lands, pastures, and natural areas. Its dense growing habit prevents establishment of native plant species.

The great majority of plants develops from seeds, which remain viable in the soil for ten to twenty years. Birds and mammals consume the fruits, dispersing seeds over great distances. Rose hips are an important winter food for many birds, including mockingbirds, bluebirds, wintering robins, cedar waxwings, etc.

Control: Cutting three to six times per growing season for several years can be effective in controlling this species. Herbicide application is also possible, particularly application to regrowth of cut material. The application of glyphosate (Roundup®) has been successful when used as a 1% volume/volume (v/v)



the dedication of

HALL'S POND SANCTUARY

BROOKLINE, MASSACHUSETTS

SUNDAY · 15 JUNE 75 · 4 O'CLOCK

Mallard by William Bartram

poster by Merrill H.Diamond

Reproduction of the poster that announced the dedication in 1975 of Hall's Pond Sanctuary.