HILLSIDE WOODS & PARK

TREE INVENTORY & URBAN FOREST MANAGEMENT PLAN

LAND
Beyond the Sea Ecological Design

VILLAGE OF
HASTINGS-ON-HUDSON
NEW YORK

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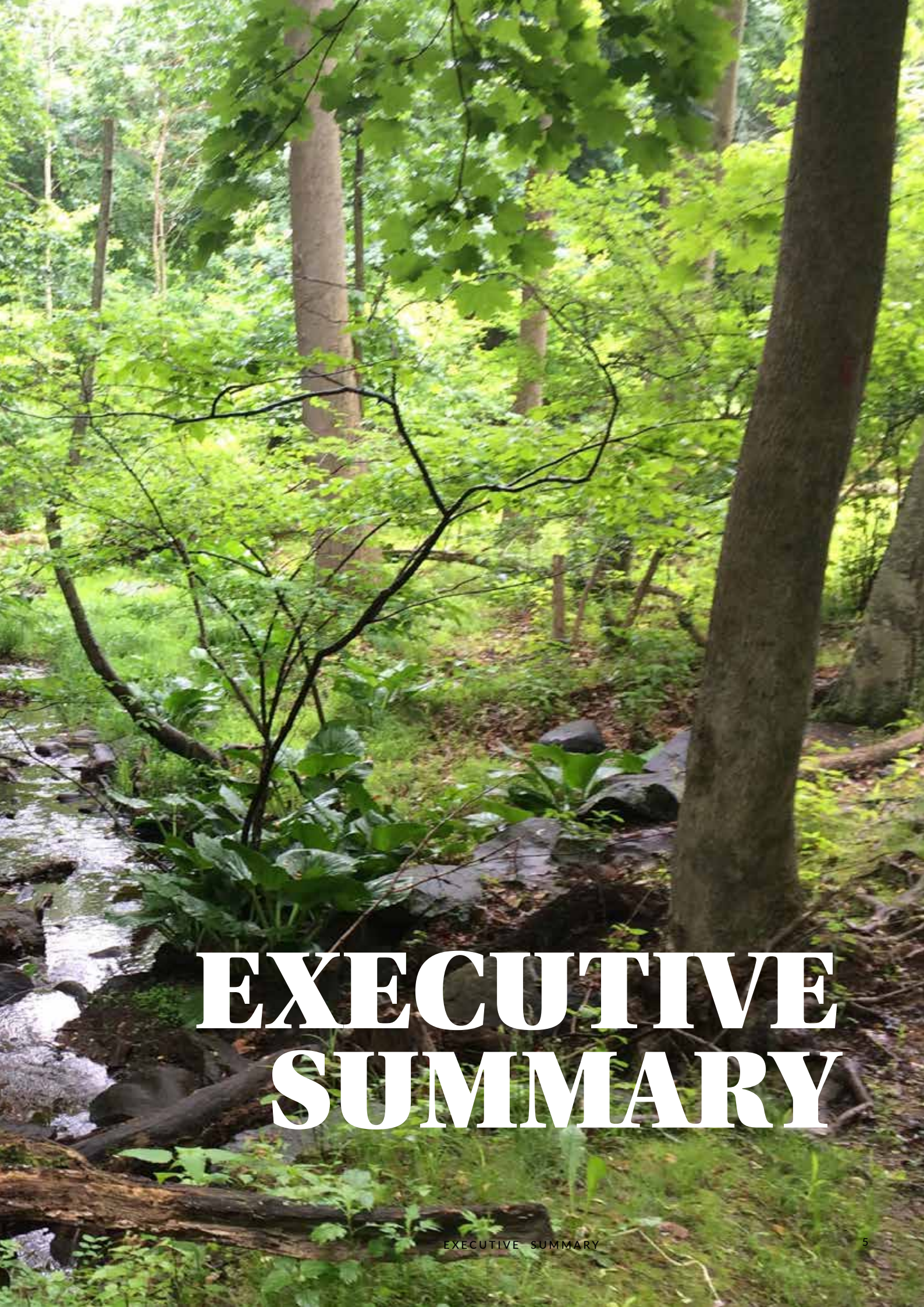
Contents



EXECUTIVE SUMMARY

Executive Summary

[Image 1]
One of the resident deer living in and around Hillside Woods & Park

[Image 2]
Measuring Trees for the Inventory

In April of 2017 the Village of Hastings-on-Hudson hosted the "State of the Woods: Our Local Ecology and What We Can Do to Restore It" panel presentations and guided walk-throughs of the Hillside Woods & Park. Attendees learned of the dire state of the Hillside Woods & Park through assessments of career-experts, some who noted that the Woods were the most unhealthy woodland they'd ever seen. This forum set the groundwork for the Village to begin the restoration and management of the Woods & Park.

Restoration of Hillside Woods & Park to a healthy eastern woodlands must begin with a full understanding of its severely deteriorated condition, which was in large part triggered by the combination of overpopulation of deer, competing invasive plants, and light on the forest floor. As recently as twenty-five years ago, the parks had dense bramble, shrubs, and vegetation at ground level. A diversity of species lived in the understory and the next generation of trees was nurtured there. In the last two decades, however, the deer have decimated almost everything native from six feet high down to ground level. Deer browse is a severe threat to the woods, as the next generation of trees is consumed before they can mature. Therefore, a whole ecology of species that existed in the understory is gone. Lack of understory has allowed invasive vines, shrubs, and trees to proliferate, further jeopardizing the health of the ecosystem. Outside of their native habitats, without any pests or other control measures, these invasive plants have established and proliferated rapidly, extirpating native flora and threatening fauna that relies on the native plants. The large trees in the forest are also thinning, as erosion and rocky ground result in shallow root structures, unable to anchor large trees during severe storms. As trees fall, the remaining trees are even more susceptible to being toppled by strong winds, and the increased sunlight reaching the forest floor has exacerbated the invasive plant problem, giving a competitive advantage to these sun-loving, deer-browse resistant plants.

Considering the severe deer over-browse in Hillside Woods & Park, a deer exclusion fence is strongly recommended. Additionally, findings from several studies in the greater New York City area suggest that combinations of site interventions (tree planting, invasives removal etc.), paired with a full-canopy forest, may be most effective for promoting regeneration of native species, thus resulting in healthier, more self-sustaining urban forests (Doroski et al. 2018). These studies have also shown that, compared with unrestored sites, improvements in species diversity, greater forest structure complexity, and evidence of the regeneration and retention of native tree species is found in restored sites (Simmons et al. 2016, Johnson and Handel 2015). Using what has been learned in these exemplar studies, we can confidently progress forward with the restoration of Hillside Woods & Park through similar site improvements.

This Urban Forest Management plan outlines a process to restore Hillside Woods & Park. The restoration process will begin with the removal of invasive plants threatening to overrun the forest. After these plants have been controlled, a deer exclosure fence will be erected to keep the deer population from over-browsing the understory and decimating native plants. Lastly, select native trees, shrubs, and herbaceous plants will be planted to restore diversity and aid in the regeneration of the forest.

In order to catalyze and create the capacity required to implement this plan over the longterm, the Plan offers additional general administrative and park planning and design recommendations as well.

[Image] (left)
Skunk Cabbage, a native plant that is doing well in the wet areas of the forest, specifically because it is inedible to deer.

[Image] (right)
Wild Leeks (or ramps) still exist in very small numbers, though could soon be extirpated from the forest due to deer browse and invasive plant competition.

(next spread)
A forest opening that is regenerating with invasive plants only. Notice the Norway Maple, invasive vines, and Tree-of-Heaven thriving and almost no native plant re-growth.

CHAPTER ONE

INTRODUCTION

Introduction

HOW IT STARTED

The Village of Hastings-on-Hudson has a long legacy of promoting environmentalism and is currently stewarding an urban forest that has been growing each year. Hastings-on-Hudson has been part of Tree City USA for many years, and residents value the aesthetics and community lifestyle that is characterized by the trees that grace the Village. Residents and the municipality recognize that urban trees improve air quality, reduce greenhouse gas emissions, cool the urban environment, reduce stormwater runoff, encourage attractive and safe public space, and bolster property values.

To better understand the trees in Hastings-on-Hudson, the Village completed a Street Tree Inventory in 2013. The Street Tree inventory has provided critical information that was needed to determine which Village trees needed maintenance and where new trees could be planted. The inventory used i-Tree to record species, location, diameter, canopy spread, and visual observations of trees on village streets, parks, and some public wooded areas (not including Hillside Woods & Park). A stocking percentage per street was evaluated to determine how many trees should be planted annually. The inventory also revealed the composition of tree species within the Village. New trees were chosen to improve species and canopy diversity. Projections of tree heights in relation to overhead wires were considered along with the species' resilience to street salts and pollutants. Over the last five years, this planning has helped save the Village money, as careful species selection has reduced maintenance needs. The resulting database included tree identification numbers with GPS location tags for each tree and available planting spaces.

> *"The village of Hastings-on-Hudson hosted the "State of the Woods" panel presentations and guided walk-throughs of the Hillside Woods & Park. Attendees learned of the dire state of the Woods through assessments of career-experts, some who noted that the Woods were the most unhealthy woodland they'd ever seen. This forum set the groundwork for the Village to begin the restoration and management of the Woods."*

With information from the Street Tree Inventory in-hand, the next logical step for the Village of Hastings-on-Hudson was to begin to inventory and promote the sustainable management of it's parks and green spaces. The largest forest and open-space area that exists in the Village is the Hillside Woods & Park, where the Village has now begun to make efforts to more effectively manage it's forest and tree resources.

(***Previous page***)
A deer is camoflaged in the forest of Hillside Woods & Park. It is notable that understory vegetation is extremely scarce and there's little to no regeneration of tree seedlings due to deer browse.

[Image 1]
Street Trees were inventoried in Downtown Hastings-on-Hudson.

[Image 2] Flyer from the "State of the Woods" Presentation

VISION FOR HILLSIDE WOODS & PARK

In April of 2017 the Village of Hastings-on-Hudson hosted the "State of the Woods: Our Local Ecology and What We Can Do to Restore It" panel presentations and guided walk-throughs of the Hillside Woods & Park. Attendees learned of the dire state of the Woods through assessments of career-experts, some who noted that the Woods were the most unhealthy woodland they'd ever seen. This forum set the groundwork for the Village to begin the restoration and management of the Woods. This forum was sponsored by the Hastings-on-Hudson Conservation Commission, the Hastings-on-Hudson Parks & Recreation Commission, Hastings Historical Society, Hastings High School Environmental Club, the Hillside Nature Guides Program, the Hastings Vine Squad, the Hudson River Audubon Society, and Dobbs Ferry Conservation Advisory Board.

Later in 2017, the Village of Hastings-on-Hudson received a New York State Department of Environmental Conservation (DEC) Urban and Community Forestry (U&CF) Grant to complete a Tree Inventory and Urban Forestry Management Plan for Hillside Woods & Park, for which they put out an Request For Proposals to solicit work. In April of 2018, the Village hired Land Beyond the Sea, Ecological Design (LBS Ecological) to complete that work, which included an inventory of hazard trees along trails and trafficked areas of the Woods & Park, and development of the Village's first Urban Forest Management Plan.

This document is the culmination of that work, as well as the efforts of the Village of Hastings-on-Hudson and its Parks and Recreation Department over the last several years to improve the Village's urban forest management operations. The Tree Inventory and Urban Forest Management Plan will serve as a road map to improve the Village's urban forest management efforts with the added goal of enhancing the quality of life for Village residents.

[Image] DEC logo

[Image] Heavily browsed understory is found nearly everywhere in the forest

[Image] A frog found near the Ephemeral Pool

DEC PROGRAM

This project was funded by the NYS Department of Environmental Conservation's Urban and Community Forestry Program. The Program is a partnership between DEC forestry professionals, public and private individuals, and volunteer organizations who care about trees in urban settings. It supports and assists communities in comprehensive planning, management, and education to create healthy urban and community forests to enhance the quality of life for urban residents. Funding for this program is provided in part by the State of New York and the U.S. Forest Service.

The NYS Urban and Community Forestry Program provides technical assistance to communities through local DEC Urban Foresters and ReLeaf volunteers. Technical assistance includes presentations, training workshops, brochures, booklets, information on their website, and helpful links to other U&CF related websites. Financial assistance is available from the State through competitive cost-share grants. Eligible project categories included tree inventories and management plans, tree planting, and maintenance and educational programming. Funds are made available from the Environmental Protection Fund and managed and allocated by the DEC. Grant proposals are evaluated for cost effectiveness, projected benefits, use of recommended standards in implementation, community outreach and education, support, and regional impact.

URBAN FORESTRY INFORMATION (from www.dec.ny.gov)

What is Urban and Community Forestry? Forestry is traditionally associated with management of large tracts of timberland and smaller woodlots. Often these forests are quite distant from the daily lives of most people. However, all of the trees within a town, village, or city make up the "community forest." The community forest can include street and yard trees, parks, cemeteries, school grounds, and undeveloped green spaces. Urban and Community Forestry is the management of community forests to establish and maintain healthy trees for air and water quality benefits, energy savings, environmental health, as well as to enhance the quality of life for urban residents. The urban and community forests also contain wildlife, waterways, built roads and structures, and people.

Why is Urban and Community Forestry Important? Trees provide numerous environmental, social, and economic benefits for people, yet urban areas present challenging environments for trees to grow and survive in. The urban environment and human actions cause different stresses to urban trees, some of which include: restricted root-growth area, road-salt exposure, soil moisture extremes, compacted soil, reduced soil fertility, pollution, improper pruning, trenching, and damage from lawn-care equipment, snow plows, or vandalism. These stressful growing conditions can cause a decline in tree health and may eventually result in death, if not corrected in time. By actively managing community forests, these valuable resources can be protected and preserved, and enhance the resulting benefits.

What are Benefits of Trees in Urban Areas? Studies show that trees improve air and water quality, reduce flooding, reduce cooling and heating energy needs, increase property values and improve the quality of life for people and wildlife around them. Trees remove air and water pollutants through both their root systems and their leaves. Tree canopies shade buildings, sidewalks, streets and other structures keeping them cooler which reduces air conditioning and other energy needs in summer. Strategically placed trees, and correct tree species selection, can shelter buildings from cold winds in winter months reducing heating costs. The positive effects trees have on human health and well-being are numerous. Studies have found that exposure to trees reduces the symptoms of stress and depression, can aid in the recovery from surgery, and reduce the incidence of domestic violence. People are more likely to exercise if parks are nearby. When people utilize parks and shady street trees, they are more likely to meet and establish bonds with their neighbors, which helps to create a sense of community. When people enjoy spending time in their neighborhoods, they develop pride and a sense of ownership in their communities. The presence of trees and the proximity to parks can also increase residential and commercial property values.

PURPOSE, PROCESS, & SCOPE

Land Beyond the Sea, Ecological Design (LBS Ecological), on behalf of the Village of Hastings-on- Hudson, NY has prepared this Urban Forestry Management Plan as a technical and planning document for trees and forest stands located within the Hillside Woods & Park. As a technical guidance document, the Urban Forestry Management Plan identifies current conditions of trees and forested areas within the Woods & Park. As a planning document, the Urban Forestry Management Plan provides a baseline of information regarding the issues, opportunities, and constraints for Urban Forestry in Hillside Woods & Park, and identifies and provides management recommendations. Ultimately, the purpose of this document is to provide a framework within which the Village of Hastings-on-Hudson can wholly manage the forest and trees of Hillside Woods & Park.

The Village of Hastings-on-Hudson Parks and Recreation Department strives to serve citizens by providing quality parks, recreation facilities and programs, thereby ensuring that the Village continues to be a livable place where all citizens can enjoy a wide range of leisure and recreation activities. The Parks and Recreation Department oversees Hillside Woods & Park. This park area provides opportunities for hiking, biking, group events, organized and recreational sports, and as an outdoor classroom for children.

Currently, the maintenance of Hillside Woods & Park has consisted mainly of reactive maintenance (cutting downed trees after storms, trail maintenance, etc.). Establishing procedures and protocols for the management of the forest resources under the care of the Parks and Recreation Department is critical to providing a safe and sustainable experience for the citizens of Hastings-on-Hudson. The consideration of arboricultural issues through

the development of a forest management plan and tree inventory is an integral part of accomplishing this goal.

Although the Parks and Recreation Departments is the primary collaborator for the development of this Plan, its impacts extend throughout the entirety of the municipal government and the citizens of Hastings-on-Hudson. The Plan influences economic development, emergency response, and education. For this reason, the Urban Forest Management Plan was presented to the Village of Hastings-on- Hudson Trustees and several Boards, the members of which were provided the opportunity to comment on the Plan. Additionally, the Plan was presented to the community via two public presentations. Village leaders' and public comments and suggestions were incorporated into the final Urban Forestry Management Plan document.

[Image] A common view of the forest at Hilllside Woods & Park

Hillside Woods & Park Background

History Hillside Woods is an approximately 52 acre woods that adjoins Hillside Park. The 48-acre Hillside Park, which envelopes Hillside Elementary School, Chemka Pool, the Village tennis courts and Sugar Pond, was acquired by the Village in the mid-1900s after it had been abandoned for decades. In 1986, Children's Village, a boarding facility for children in difficult circumstances, which is located in the neighboring town of Dobbs Ferry, sold about 52 acres of its property in Hastings to a developer, Coachlight Properties of Hastings, Inc. The developer was planning to build nearly 100 homes that would have resulted in high traffic volume on the narrow, hilly, local roads adjoining Hillside Elementary School. A sizable community group formed creating a committee to "Save Hillside Woods." They fanned public support and mobilized residents, raising close to $800,000 from local residents and through various organizations. The 1987 stock market crash and the subsequent receivership of the bank that held the mortgage on the property eventually resulted in the purchase of the property from the FDIC, with the funds accumulated and a bond floated by the Village of Hastings. Two thirds of the $3,350,000 purchase price was funded by the Village, and the County paid the balance. It was a remarkable community effort to expand Hillside Woods and maintain the green space and the native flora and fauna that abounded there. Although the acquisition of Hillside Woods amply demonstrated the value to this community of protecting the natural forest, the village was not aware that purchasing it was in itself insufficient to preserve it as a natural environment. There was never a forest management plan to

monitor and ensure the continued health of the woods. Dearly beloved village resident, Fred Hubbard, who during his life championed the protection of the woods and was responsible for many of the trails within it, actually wrote about the degeneration of the woods that he observed in the 1970s, well before it was acquired by the Village. The need for restoration and regeneration of the woods has now become abundantly clear and is becoming a priority.

Restoration the Hillside Park and Woods to a healthy eastern woodlands must begin with a full understanding of its severely deteriorated condition, which was in large part triggered by the overpopulation of deer. As recently as twenty-five years ago the parks had dense bramble and vegetation at ground level. A diversity of species lived in the understory, and the next generation of trees was nurtured there. In the last two decades, however, the deer have decimated almost everything native from six feet high down to ground level. This threatens the woods as the next generation of trees is consumed before they can mature, and a whole ecology of species that existed in the understory is gone. The non-native earthworm population has exploded partly due to deer overabundance and caused a near collapse of the ground litter food web. Lack of understory has allowed invasive non-native vines to proliferate, jeopardizing the health of the ecosystem. Without their natural consumers, these invasive plants have been able to establish and proliferate rapidly, extirpating native flora and threatening fauna that relied on the native plants. The large trees in the forest are also thinning, as erosion and the rocky ground produce shallow root structures unable to anchor them during severe storms. As trees fall, the remaining trees are even more susceptible to being toppled by strong winds.

COMMUNITY INVOLVEMENT AND PUBLIC INPUT SESSIONS -

There has been an outpouring of public interest and support for the conservation and management of Hillside Woods & Park, a beloved park for the town and its residents. Engagement with school groups, Scouts, civic groups, and the Conservation Commission's "State of the Woods" 2017 forums have all helped build relationships which support the long-term restoration of the Woods.

The "State of the Woods" forum hosted expert naturalists and guided walks in Hillside Woods, and revealed that there is a dire need to restore the native ecology of the Woods & Park. Experts identified various challenges in Hillside Woods, the severest of which is white-tailed deer overpopulation, which greatly impacts forest regeneration, resulting in a lack of native understory shrubs and herbs, deer in poor condition because of overcrowding, and people injured in deer-car collisions and sick from tick-borne disease. Understory bird species populations are also in decline due to a lack of native habitat. On a broader scale, climate change induced higher temperatures result in more extreme water stress, forest migration, invasive species moving in, and extensive tree mortality. Encouraging ecological literacy and further positive interaction from the public with the woods was also identified as a concern.

Opportunities were also identified as part of the State of the Woods forum, such as the increasing populations of bobcat, fisher, and beaver, which lends to the question of whether the wolf, black bear, or mountain lion populations are rebounding locally. There is a deer sterilization pilot program, deer exclosures (two erected in 2014), and a vegetation monitoring program underway. Other community involvement includes regular cleanup and informational programs.

The Hastings Vine Squad is an exemplar group that was established by Susan Harris in 2012. Trained by Groundwork Hudson Valley, this group began removing invasive vines that are strangling, shading, and obscuring the trees in Hillside Woods & Park. This volunteer effort has grown and Vine Squad members are now removing vines from trees in public spaces all over the village, including sections of Hillside Park, every other weekend from November to March.

Since LBS began working on Forest Inventory and Management Planning, there have been two public presentations about the woods rehabilitation project to the citizens of Hastings-on-Hudson; one on June 7th, 2018 and a second on October 4th, 2018. A public input survey accompanied the presentations and key findings are highlighted below. The aim of these presentations was to solicit public opinion and galvanize support for volunteer efforts contributing to the restoration of the Woods. Based on the strong relations within the community and overall positive feedback from the public, involvement is expected to be great in the implementation of the management plan.

[Image] (left)
Invasive Tree-of-Heaven growing in a forest opening in Hillside Woods & Park.

[Image] (right)
A large snag in a forest opening. This dead tree is good habitat for cavity nesting birds and other wildlife.

SURVEY FINDINGS

Public input and participation have been important components in the restoration and management of Hillside Woods & Park from the onset. The Forest Inventory & Management Plan is grant-funded through the New York State Urban and Community Forestry Program, which is a partnership between DEC forestry professionals, public and private individuals, and volunteer organizations. Hence, collaboration and community involvement is an integral part of this DEC funding and a way to engage citizens in the care of the shared park space.

Two public meetings about the Hillside Woods & Park Forest Inventory & Management Plan project were held in 2018, inviting citizens of Hastings-on-Hudson to learn more about the projects and offer their feedback, specifically in the form of an online survey. The aim of these presentations was to solicit public opinion and galvanize support for ongoing and future volunteer efforts in the park.

> *As a result of the survey, 96% of those who responded agreed that trees and forests are a defining characteristic of Hastings-on-Hudson and improve the overall quality of life there. Also, when polled with the question "I am personally willing to invest a small amount of time and money to maintain and improve Hillside Woods & Park" over 80% of citizens agreed.*

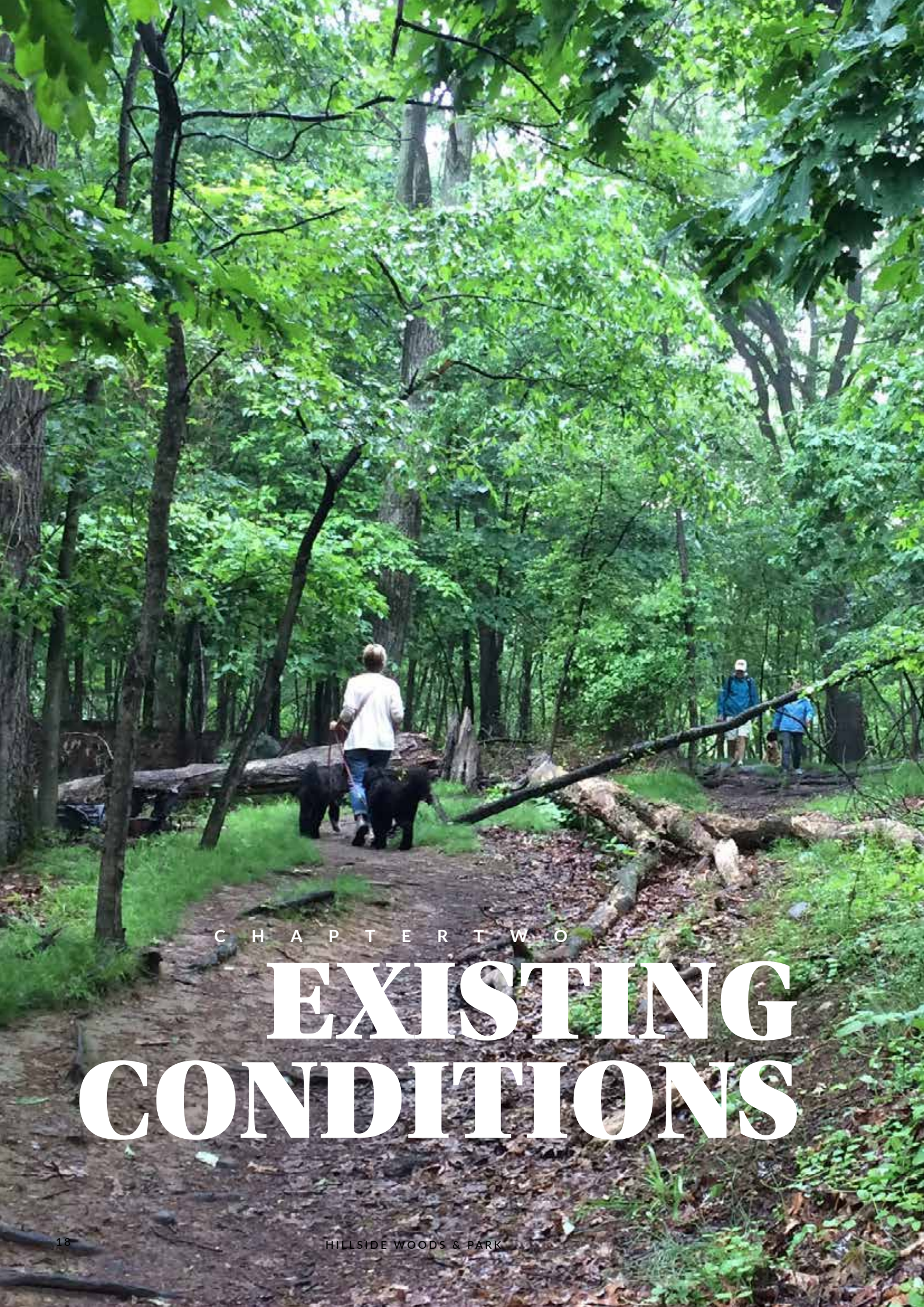
An online survey about urban forests, and Hillside Woods & Park specifically, was designed by LBS and was completed by 113 citizens between June and October of 2018. The results of the survey confirmed that the citizens of Hastings-on-Hudson deeply value Hillside Woods & Park are committed to the conservation and restoration of it.

Comprehensive survey findings and data can be found in the Appendix.

STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL
1.77%	2.65%	14.16%	36.28%	45.13%	
2	3	16	41	51	113

[Image] (right)
Survey results from the question: ***"I am personally willing to invest a small amount of time and money to maintain and improve Hillside Woods & Park.***

The optimal learning and growing environment for young children is composed of a full integration of indoor and outdoor spaces. The outdoor "classroom" of Hillside Woods & Park enhances and adds to the limited scope of activities available inside confined indoor classrooms by providing hands-on experiences, physical activity, play, social and emotional growth through peer interaction, and multifaceted approaches to cognitive development that connect children to nature and maximize their learning outcomes.



CHAPTER TWO

EXISTING CONDITIONS

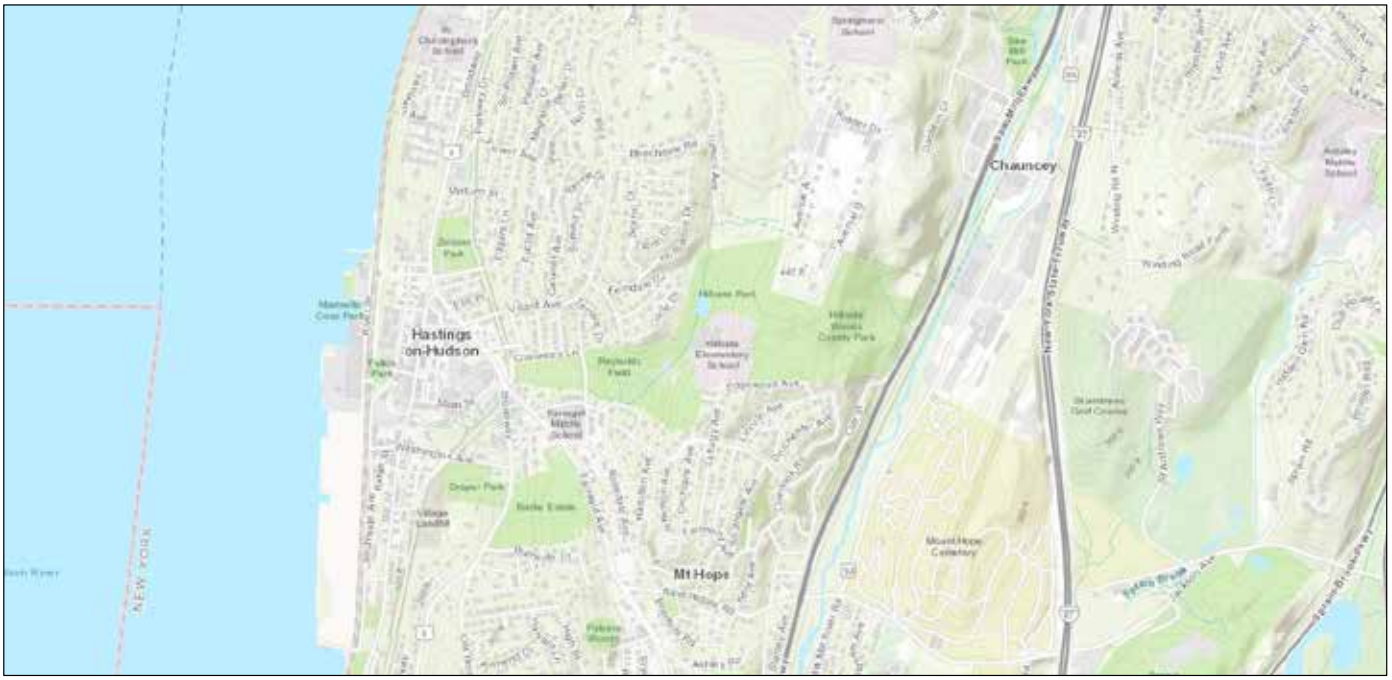
Small deer exclosure fences were erected by students from the neighboring school, to see how forest regeneration would be affected if deer were kept out of the forest. plots

Existing Conditions of Hillside Woods & Park - Natural Resource Inventory

HASTINGS-ON-HUDSON AND HILLSIDE WOODS & PARK LOCATION

Hastings-on-Hudson is a village and inner suburb of New York City located in the southwest part of the town of Greenburgh in the state of New York, United States. It is located on the eastern bank of the Hudson River, about 20 miles north of midtown Manhattan in New York City, and is served by a stop on the Metro-North Hudson Line. To the north of Hastings-on-Hudson is the village of Dobbs Ferry, to the south the city of Yonkers, and to the east unincorporated parts of Greenburgh. As of the 2010 census, Hastings-on-Hudson had a population of 7,849.

Hillside Woods & Park is an approximately 100-acre forest and park nestled into the northeastern corner of Hastings-on-Hudson. The Children's Village is to the north of the Woods & Park, to the east is the Saw Mill Parkway, and to the west and south are residential areas of Hastings-on-Hudson, as well as the Elementary School.



[Image] (above)
Location of Hillside Woods & Park in Hastings-on-Hudson.

[Image] (above)
Topography of Hillside Woods & Park.

TOPOGRAPHY

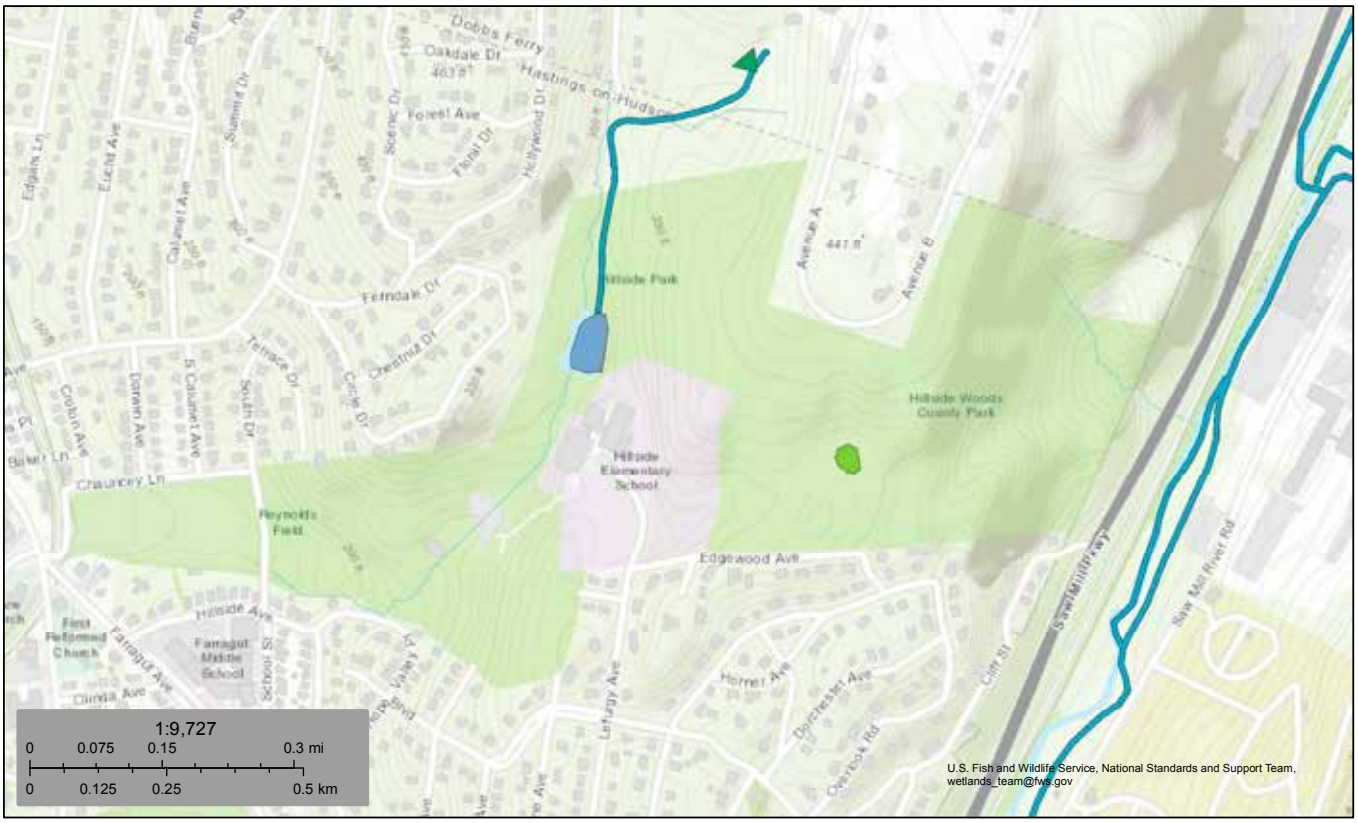
Topography of Hillside Woods & Park consists of western exposures in the west area of the Woods & Park, leading up to a low hill in the central section, and steep eastern exposures to the east. Numerous areas of exposed bedrock are present throughout.

HYDROLOGICAL OBSERVATIONS

Small streams, a pond, and wetlands exist in the central portion of Hillside Woods and Park. These water bodies are described in detail below:

Streams – There are several small streams in Hillside Woods & Park. Two small drainages in eastern Hillside Woods have intermittent streams that meet before flowing off-site toward the Saw Mill River. The flow of these streams is ephemeral, and slows greatly, sometimes drying out, in summer and fall. To the east within Hillside Park, there is a stream drainage that enters the park, flows into Sugar Pond, and then continues south before exiting the park and ultimately flowing into the Hudson River. This stream is more perennial in nature, and typically flows throughout the year.

Sugar Pond – Sugar Pond is an approximately .71 acre Class C pond, meaning the best intended uses are non-contact recreation (boating and fishing), aquatic life, and aesthetics. The Pond is located in the Riverview Manor portion of the Hillside Park, northwest of the Elementary School. Sugar Pond has been sampled under direction from the Citizens Statewide Lake Assessment Program (CSLAP). It is one of 16 CSLAP lakes among the more than 120 lakes found in Westchester County, and one of 47 CSLAP lakes among the more than 350 lakes and ponds in the Lower Hudson River drainage basin. The state of New York does not stock fish in Sugar Pond; it is not known if private stocking occurs. Secchi disk transparency, chlorophyll a levels, and total phosphorus readings in 2011 were typical of eutrophic, or highly productive lakes. The trophic state index (TSI) evaluation suggests that chlorophyll a readings (algae levels) are lower than expected given the other indicators (phosphorus and water clarity). This may be due to turbidity from other factors or elevated color reducing clarity and light transmission. However, chlorophyll a readings are still high. The complete CSLAP 2011 Lake Water Quality Summary for Sugar Pond can be found in the Appendix.



July 23, 2018

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Wetlands (NWI), Intermittent woodland pool – There are no NYS regulated wetlands located in or in the vicinity of Hillside Woods & Park. There is 3 federally regulated wetlands in the Woods & Park. Sugar Pond, mentioned above, is listed by the National Wetland Inventory as a freshwater pond (PUBHh). The stream inlet to Sugar Pond, also mentioned above, is listed as a riparian corridor wetland (R5UBH). The third wetland, located centrally in the Park & Woods, is commonly referred to as the Ephemeral Pool. The National Wetland Inventory categorizes the Ephemeral Pool as a freshwater emergent wetland (PEM1F). All of these wetlands are further described below.

Sugar Pond Wetland Classification code: PUBHh System Palustrine (P) : The Palustrine System includes all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt. Class Unconsolidated Bottom (UB) : Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%. Water Regime Permanently Flooded (H) : Water covers the substrate throughout the year in all years. Special Modifier Diked/Impounded (h) : These wetlands have been created or modified by a man-made barrier or dam that obstructs the inflow or outflow of water.

Sugar Pond Inlet Riparian Wetland Classification code: R5UBH System Riverine (R) : The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts of 0.5 ppt or greater. A channel is an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water. Subsystem Unknown Perennial (5) : This Subsystem designation was created specifically for use when the distinction between lower perennial, upper perennial, and tidal cannot be made from aerial photography and no data is available. Class Unconsolidated

Bottom (UB) : Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%. Water Regime Permanently Flooded (H) : Water covers the substrate throughout the year in all years.

Ephemeral Pool Wetland Classification code: PEM1F System Palustrine (P) : The Palustrine System includes all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt. Class Emergent (EM) : Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. Subclass Persistent (1) : Dominated by species that normally remain standing at least until the beginning of the next growing season. This subclass is found only in the Estuarine and Palustrine systems. Water Regime Semipermanently Flooded (F): Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.

GEOLOGY (SURFICIAL AND BEDROCK)

Pleistocene sandy till; ice-contact gravel, sand, and silt; sandy loamy till. Proterozoic gneiss (Lithology is orthogneiss, age is Middle Proterozoic (Mesoproterozoic)); Cambrian biotite-quartz-plagioclase gneiss and dolomitic marble; Ordovician schist and amphibolite. These bedrock types are metamorphic and undivided crystalline.

SOIL TYPES

Soil Map Unit Description with Soil Type Descriptions can be found in the Appendix.

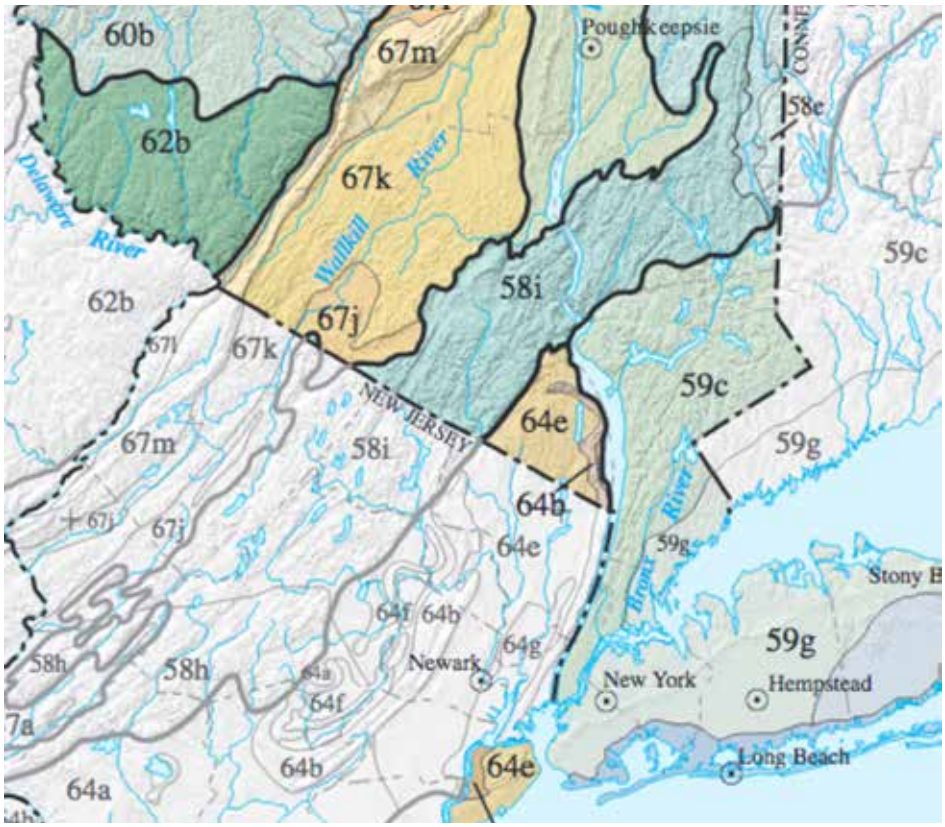
[Image] (above)
Soil Map of Hillside Woods & Park.

ASSOCIATION WITH BROADER LANDSCAPE & ECOREGION

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for research, assessment, management, and monitoring of ecosystems and ecosystem components. By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance (Bryce et. al., 1999). These general purpose ecological regions are critical for structuring and implementing ecosystem management strategies across federal agencies, state agencies, and nongovernmental organizations that are responsible for different types of resources within the same geographical areas (Omernik et. al., 2000).

Hillside Park & Woods, along with all of Hastings-on-Hudson, is located in the Northeast Coastal Zone Ecoregion of New York (Ecoregion 59). The Northeastern Coastal Zone ecoregion covers most of southern New England and the coastal areas of New Hampshire and southern Maine. Its landforms include rolling or irregular plains. Soils are Inceptisols formed from glacial till that support Appalachian oak forest and northeastern oak-pine forests. Similar to the Northeastern Highlands (58), the Northeastern Coastal Zone contains relatively nutrient-poor soils and concentrations of Pleistocene glacial lakes, some of which are sensitive to acidification. This ecoregion, however, contains considerably less surface irregularity and a higher human population density than Ecoregion 58. Although European settlers attempted to farm much of the Northeastern Coastal Zone until the mid-19th century, woodland and urban and suburban development now dominate much of the landscape, with minor areas of pasture and cropland.

More specifically, the Woods & Park are located within the Southern New England Coastal Plains and Hills (Ecoregion 59c). This small portion of the Southern New England Coastal Plains and Hills ecoregion enters the southeastern corner of New York north of Long Island Sound, continuing southward to include the Manhattan Prong between the Bronx River and the Hudson River. The Manhattan Prong is a narrow projection of the same Precambrian gneiss and schist that underlies the Hudson Highlands (58i). The landforms of the ecoregion include irregular plains with relief of 100 to 300 feet. Numerous, till-covered bedrock hills rise above the valleys and outwash plains. Historically, forests were



[Image] (above)
Ecoregion of Hillside Woods & Park.

dominated by a mix of oaks, American chestnut, hickories, and some hemlock and white pine. As with many other areas of New England, these forests were cleared, either for agriculture and grazing or for the production of charcoal. The Southern New England Coastal Plains and Hills ecoregion is distinguished from the more completely forested Glaciated Reading Prong/Hudson Highlands (58i) in the north by its low rolling topography and mix of woodland, rural residential, urban, and suburban centers.

CULTURAL RESOURCES

There are no mapped cultural resources by SHPO/CRIS (New York's State Historic Preservation Office), but several historically significant resources found in and around Hillside Woods & Park are worth mentioning:

- Old Farm Wall
- Old Foundations- Hillside Hospital, Birnie/Smith House
- Smith Greenhouse Ruins
- Smith Gardener's Cottage- Ice House, Stable Ruins
- Hillside Hospital – water tower site
- Chauncey Lane – old road from Five Corners to the Chauncey Farm (now Children's Village)
- Old Chimney – Probably Scout Hut, nearby ruins also probably part of Scout Buildings.
- Algonquin Trail – once went from Broadway to Irvington, through the Hillside Woods and along the Saw Mill River.

[Image] (below)
Summer 1990 Hastings Historian, describing some of the archeology of Hillside Park (Smith Greenhouse Ruins)

HASTINGS HISTORIAN

THE COTTAGE

Vol. 19, No. 3 — *A Quarterly Publication of the Hastings Historical Society* — Summer 1990

The Archeology of 19th Century Hillside Park

Hans E Schafer

When walking in Hillside Park in the summer of 1981, I stumbled accidentally on the impressive greenhouse ruins hidden from sight by trees, overgrown with shrubs and very healthy poison ivy vines, and realized that an entire chapter of Hastings history had disappeared.

Subsequent documentary research in the archives of the Hastings Historical Society revealed the location of a mansion and several of its auxiliary structures as well as fragmentary information about the first owners—Alexander Birnie and Augustine Smith—who built and resided at the estate for over half a century. This 50 acre Hillside estate was among the largest in Hastings and its contours have changed little during the past 150 years. An archeological investigation for the Hastings Historical Society proceeded under the auspices of the Materials and Laboratory for Archaeology at Missouri (MALFA) and with permission of the village administration for research work in the village park.

The objective of the investigation was to expand our knowledge of 19th century life of Hastings residents. Selective excavations between 1981 and 1983 turned up numerous architectural features and many artifacts. The work of excavation and documentation was done entirely by volunteers–largely by Hastings High School students under the supervision of Mr. Robert Tucker, who included the archeological work as part of his curriculum for approximately 20 students each year for the past seven years. This archeological site represents the exceptional case of an estate whose principal buildings–the mansion–has been destroyed, while some auxiliary structures such as the greenhouse have survived.

Environmental Background

The land east of the Hudson at Hastings rises fairly steeply from the water's edge and is located within the temperate zone of oak trees and chestnuts. The Hillside area lies about 150 meters (500 feet) above sea level and rises at the eastern portion to about 400 meters (1300 feet). Insola meander down towards the Hudson across outcroppings of gneiss and schist rock. There had been little change in the Hillside area since prehistoric days until a century and a half ago when the mansion, auxiliary buildings, and dirt roads were constructed.

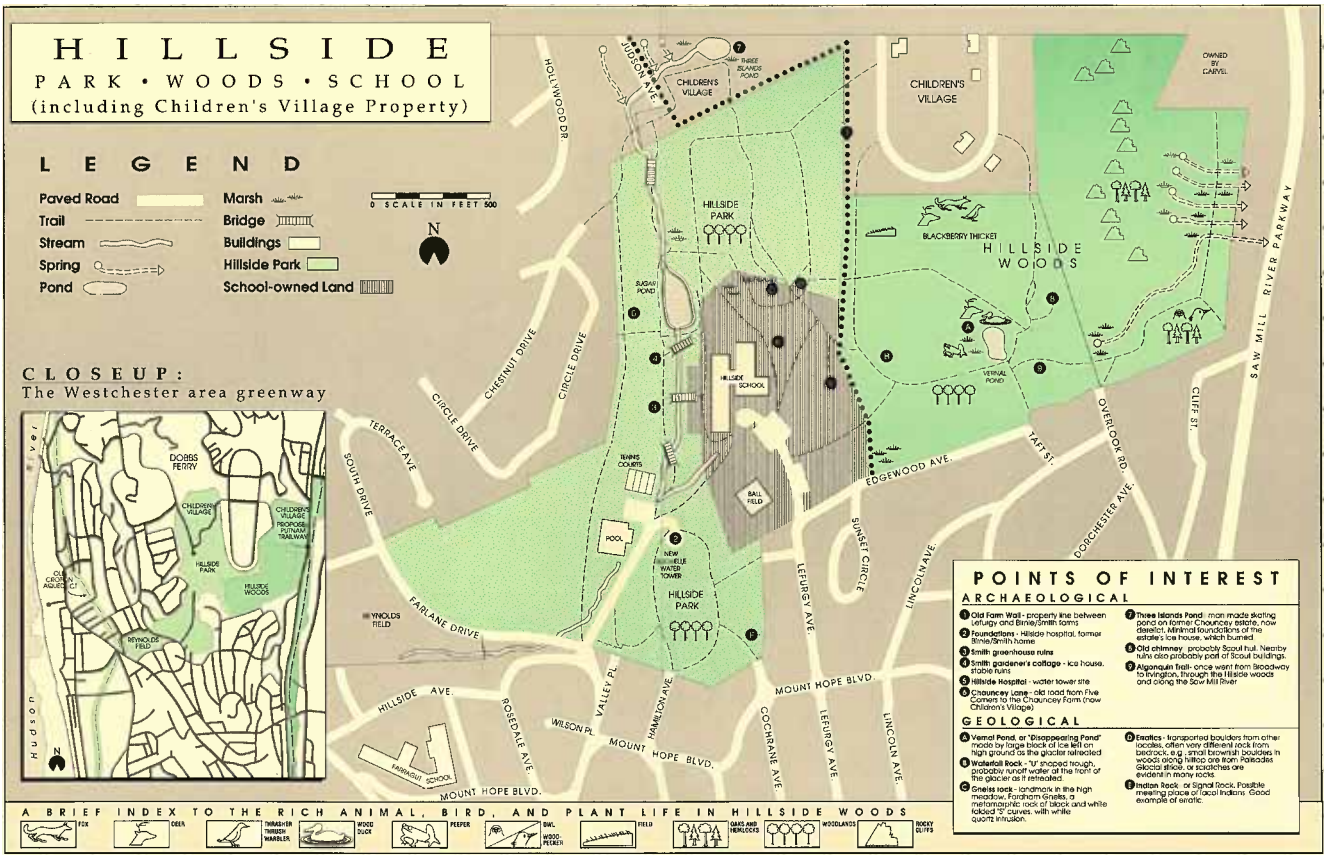
The natural beauty of the place was conveyed almost graphically by the surveyor's report in 1804: "Beginning at a stake at the ended stonewall adjoining the land of Henry Chauncey...along the land...as the fences

Hans E. Schafer is a member of the New York State Archaeological Association and a retired civil engineer. Born and raised in Berlin, Germany, he has lived with his family in Hastings for the past 22 years. This article is excerpted from a study Mr. Schafer prepared for the Historical Society this spring.

Photo by Robert Tucker

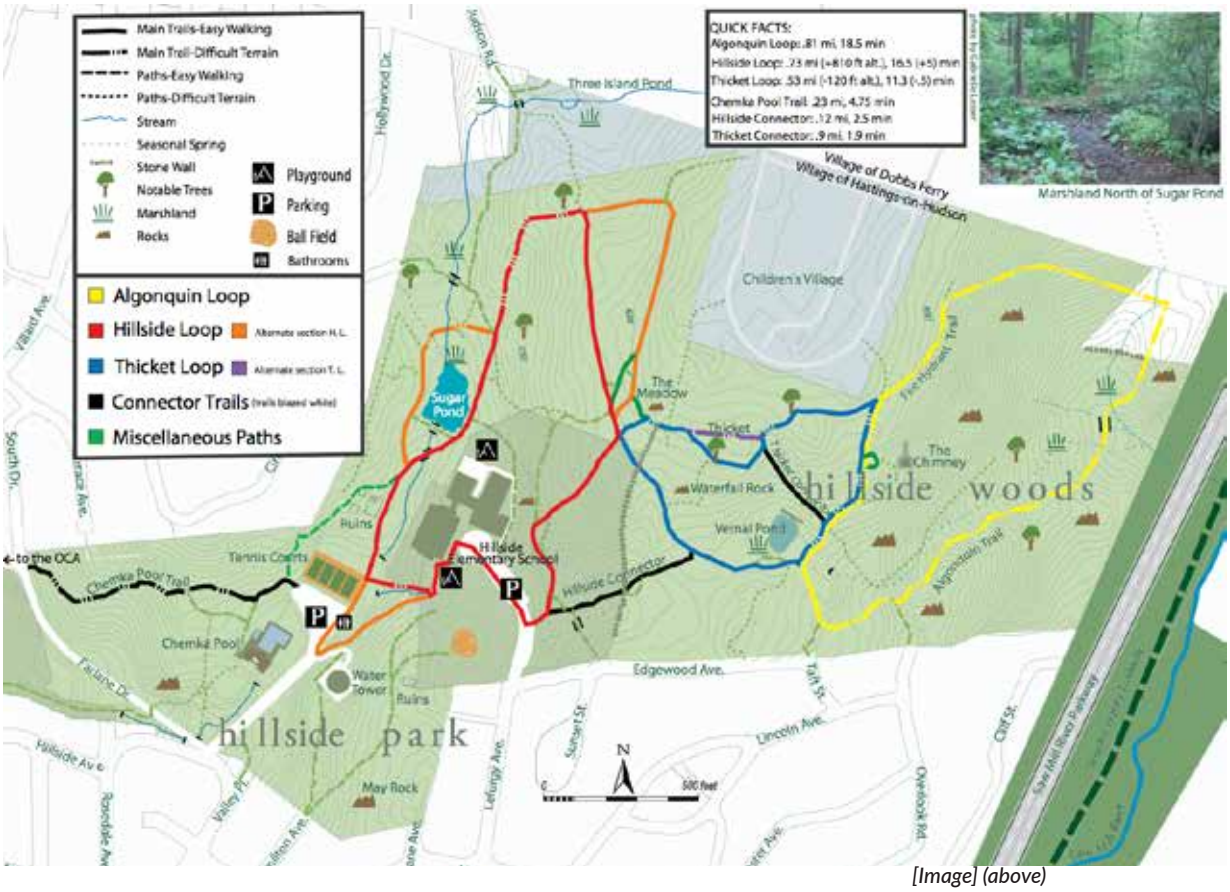
Hastings high school seniors, Morsien Davis, Michal Arni, and Lotta Gittel, excavating the north wall of the greenhouse in 1985.

[Image] (below)
The old chimney can be seen from the trail in Hillside Woods.



RECREATIONAL ACTIVITIES

There are trails throughout Hillside Woods & Park that are enjoyed by hikers, dog-walkers, students, and birdwatchers. Below is a map of the trail system. The trails also act as connectors to a larger network of trail systems in the area. The Old Croton Aqueduct trail connects to the Hillside Woods & Park trail system to the west of Reynolds Field, and the South County Trailway connects to the Hillside Woods & Park trail system to the east.



[Image] (above)
Trail Map of Hillside Woods & Park

RARE, THREATENED AND ENDANGERED SPECIES OR NATURAL COMMUNITIES

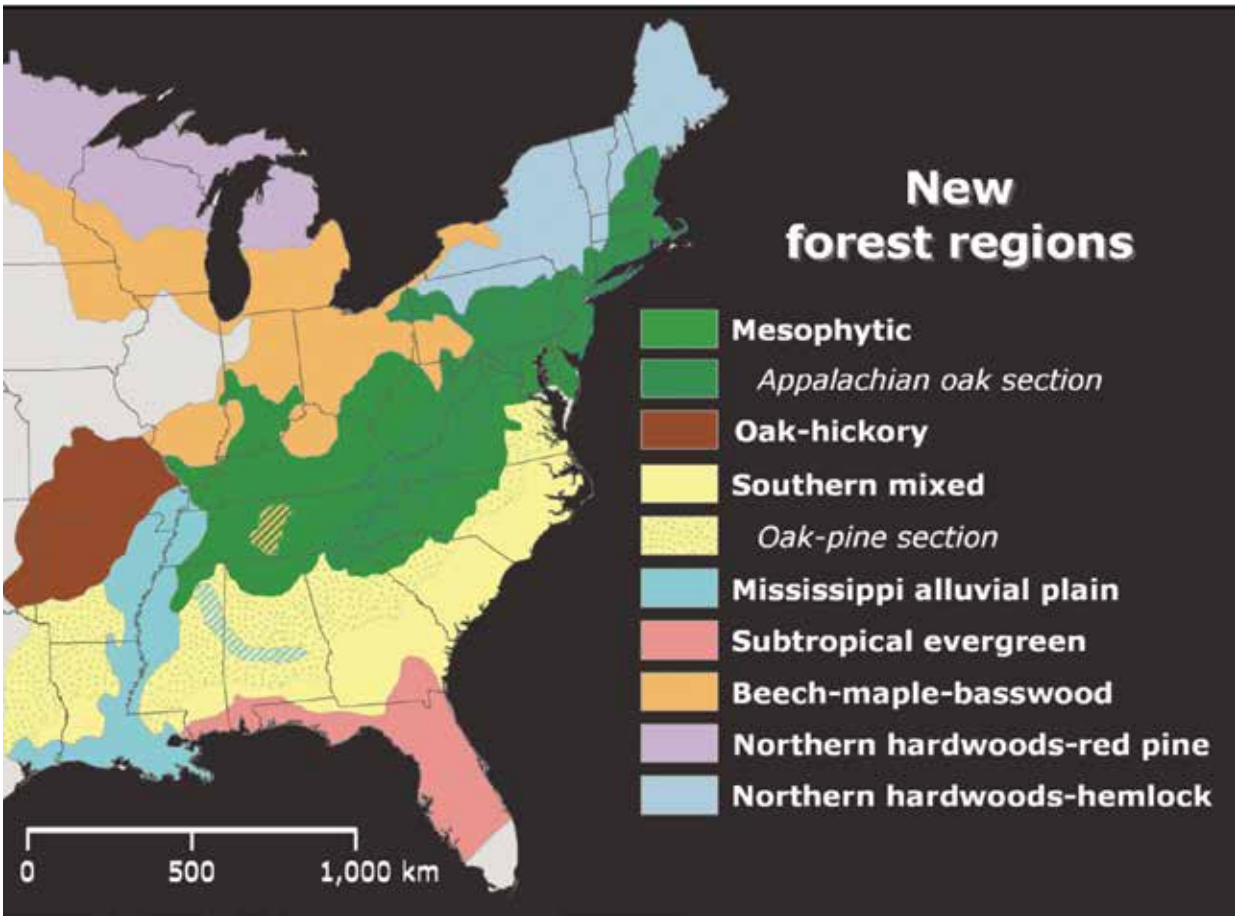
The DEC Environmental Resource Mapper and NY National Heritage Program Maps do not reveal any rare, threatened, or endangered species or natural communities found within Hillside Woods & Park. Also, none were surveyed or seen during the forest inventory work. There are however, several records from the surrounding area that are listed below:

Common Name: Torrey's Mountain-mint Scientific Name: Pycnanthemum torreyi
Date Last Documented: 1898-06-11
Location: East Hastings
NYS Protected: Endangered
Common Name: Reflexed Sedge Scientific Name: Carex retroflexa
Date Last Documented: 1898-06-11
Location: East Hastings
NYS Protected: Threatened
Common Name: Saltmarsh Bulrush Scientific Name: Bolboschoenus novae-angliae
Date Last Documented: 1898-09-05
Location: Glenwood-Hastings
NYS Protected: Endangered
Common Name: Field Beadgrass Scientific Name: Paspalum laeve
Date Last Documented: 1898-09-18
Location: Nepera Park Meadow
NYS Protected: Endangered

NATURAL VEGETATION AND PLANT LIST

Hillside Woods & Park (and all of Hastings-on-Hudson) exist in the Appalachian Oak region of the Mesophytic Forest of the Deciduous Forests of Eastern North America. Natural vegetation that has been historically found in these Appalachian oak dominated forests is various combinations of red, white, scarlet, black, or chestnut oaks, white pine, red maple, hickories, and other central or transitional northern hardwoods. On shallow dry rocky soils on upper slopes, chestnut oak, northern red oak, black oak, and some pitch pine usually are dominant species. On midslopes, oak-hemlock-white pine forests that also include some black birch, black cherry, and red maple are typically found. Areas of more moist forests include sugar maple, northern red oak, American beech, and white ash. Swamps may include red maple, green ash, hemlock or Atlantic white cedar. On small river floodplains, pin oak-green ash forest with some swamp white oak, American sycamore, red maple, and American elm are prevalent.

A comprehensive list of tree, shrub, and herbaceous plants compiled by NY-NJ-CT Botany Online can be found in the Appendix.



[Image] (above)
Forest Regions of the Eastern USA (Dyer, 2006)

(next spread)
A young section of forest that was once a forest opening. When regeneration was not an issue the forest could regrow, where now we only see regeneration of invasive plants.

CHAPTERTHREE

FOREST INVENTORY

Methodology

Understanding the structure, function, and value of an urban forest can promote management decisions that will improve human health and environmental quality. An assessment of the vegetation structure, function, and value of the Hillside Woods & Park urban forest was conducted in 2018. Data from field plots located throughout Hillside Woods & Park were analyzed using the i-Tree Eco model developed by the U.S. Forest Service, Northern Research Station. Additionally, data from the field plots was analyzed using contemporary forestry analytics. Combined, these analyses aid in making forestry recommendations for Hillside Woods & Park.

DATA COLLECTION

The forest was analyzed using fixed plot sampling. The plot locations were distributed evenly across all stands. Each plot was 1/10th of an acre, or a 66'x66' square. Plots were visited and laid out with temporary flagging. Slope and aspect were recorded. Observers recorded information on trees, shrubs and herbaceous plants. Trees were assessed in terms of species, strata (position in canopy), height, crown width, height to crown, diameter at breast height (DBH), condition, visible defects, root problems and wildlife value. Shrubs were identified to species and measured in terms of overall plot coverage and average height. Herbaceous plants were identified to genus or species, and measured in terms of overall plot coverage.

DATA ANALYSIS

Data was entered into i-Tree ECO, as well as Microsoft Excel for contemporary forestry data analysis. The i-Tree ECO analysis consisted of several factors; tree characteristics of the urban forest, urban forest cover and leaf area, air pollution removal by urban trees, carbon storage and sequestration, oxygen production, avoided runoff, structural and functional values, and potential pest impacts. Contemporary forest analysis consisted of several factors; tree species composition, density, basal area, diameter, overall tree condition, tree size/age, tree valuation, cost/benefit analysis, shrub species and herbaceous species present.

I-TREE ECOSYSTEM ANALYSIS, URBAN FOREST EFFECTS AND VALUES

Data from 30 field plots located throughout Hillside Woods & Park were analyzed using the i-Tree Eco model. i-Tree Eco is designed to use standardized field data from forest plots and local hourly air pollution and meteorological data to quantify urban forest structure and its numerous effects (Nowak and Crane 2000), including:

- Tree Characteristics and urban forest structure (e.g., species composition, tree health, leaf area, etc.).
- Amount of pollution removed hourly, and its associated percent air quality improvement throughout a year.
- Total carbon stored and net carbon annually sequestered by the urban forest.
- Effects of trees on building energy use and consequent effects on carbon dioxide emissions.
- Structural value of the forest, and value for air pollution removal and carbon storage and sequestration.
- Potential impact of infestations by pests, such as Asian longhorned beetle, emerald ash borer, and gypsy moth.

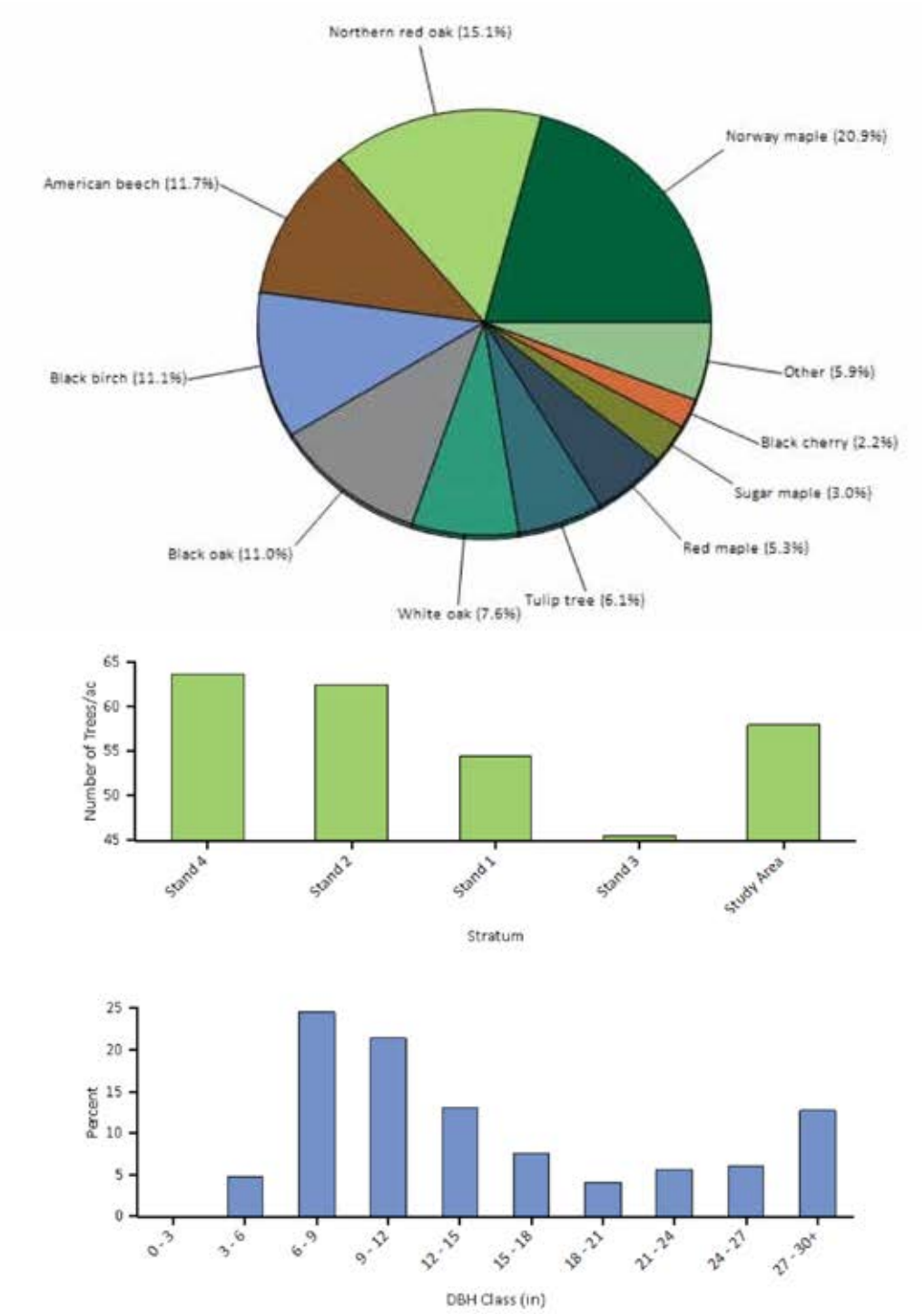
All field data were collected during the leaf-on season to properly assess tree canopies. Data collection included ground and tree cover, individual tree attributes of species, stem diameter, height, crown width, crown canopy missing and dieback (Nowak et al. 2005; Nowak et al. 2008).

i-Tree
Tools for Assessing and Managing
Forests & Community Trees

i-Tree Analysis Findings

TREE CHARACTERISTICS OF HILLSIDE WOODS & PARK

The urban forest of Hillside Woods & Park has an estimated 5,105 trees with a tree cover of 85.7 percent. The three most common species are Norway maple (20.9 percent), Northern red oak (15.1 percent), and American beech (11.7 percent). The overall tree density in Hillside Woods & Park is 58 trees/acre. Within the forest stands, the highest tree densities in Hillside Woods & Park occur in Stand 4 followed by Stand 2 and Stand 1.



[Images] (above)
Tree Species Composition of Hillside Woods & Park, Trees/Acre, and % Population by Diameter Class

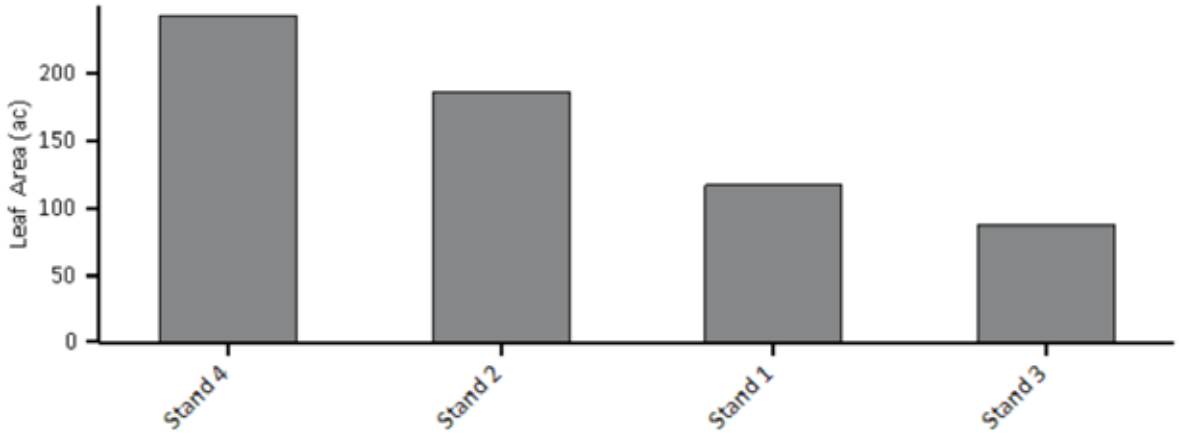
Urban forests are composed of a mix of native and exotic tree species. Thus, urban forests often have a tree diversity that is higher than surrounding native landscapes. Increased tree diversity can minimize the overall impact or destruction by a species-specific insect or disease, but it can also pose a risk to native plants if some of the exotic species are invasive plants that can potentially out-compete and displace native species. In Hillside Woods & Park, about 78 percent of the trees are species native to North America, while 77 percent are native to New York. Species exotic to North America make up 22 percent of the population. Most exotic tree species have an origin from Europe & Asia (21.7 percent of the species).

Invasive plant species are often characterized by their vigor, ability to adapt, reproductive capacity, and general lack of natural enemies. These abilities enable them to displace native plants and make them a threat to natural areas (National Invasive Species Information Center 2011). Two of the 19 tree species in Hillside Woods & Park are identified as invasive on the state invasive species list. These invasive species comprise 21.7 percent of the tree population. These two invasive species are Norway maple (20.9 percent of population) and Tree-of-Heaven (0.8 percent).

URBAN FOREST COVER AND LEAF AREA

Many tree benefits equate directly to the amount of healthy leaf surface area of the plant. Trees cover about 86 percent of Hillside Woods & Park and provide 635.7 acres of leaf area. Total leaf area is greatest in Stand 4 followed by Stand 2 and Stand 1.

In Hillside Woods & Park, the most dominant species in terms of leaf area are Norway maple, northern red oak, and American beech. The 10 species with the greatest importance values are listed in Table 1. Importance values (IV) are calculated as the sum of percent population and percent leaf area. High importance values do not mean that these trees should necessarily be encouraged in the future; rather these species currently dominate the urban forest structure.



[Image] (above) Leaf Area by Forest Stand

Species Name	*Percent Population*	*Percent Leaf Area*	*IV*
Norway maple	20.9	20.7	41.6
Northern red oak	15.1	16.7	31.8
American beech	11.7	13.5	25.2
Black oak	11.0	12.7	23.6
Black birch	11.1	7.7	18.8
Tulip tree	6.1	11.0	17.1
White oak	7.6	6.7	14.4
Red maple	5.3	4.0	9.3
Sugar maple	3.0	2.5	5.5
Black cherry	2.2	0.9	3.1

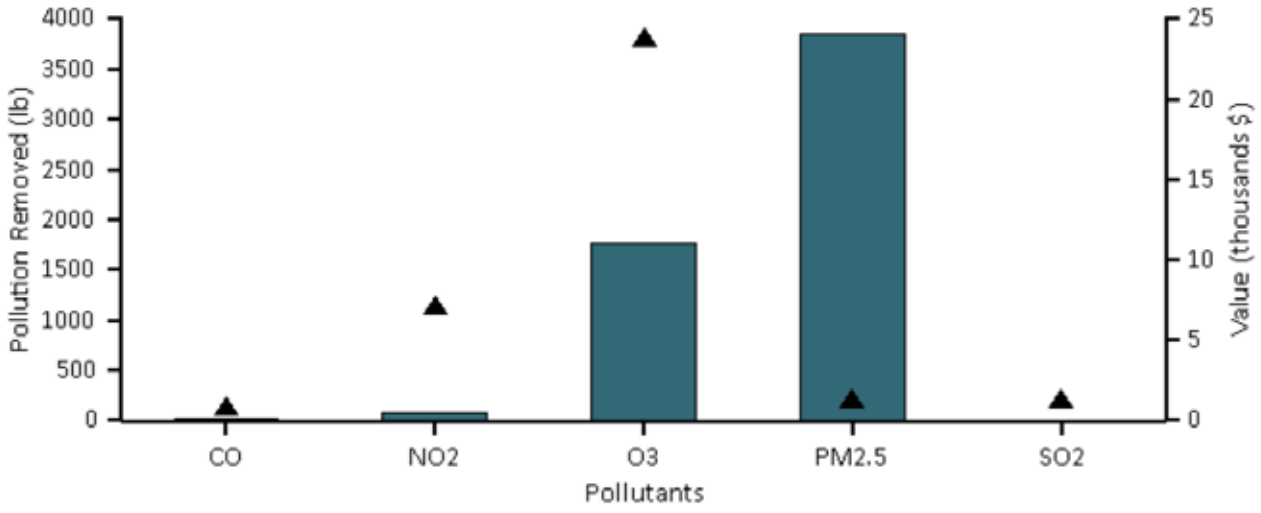
[Table] (left) Most important species in Hillside Woods & Park for Leaf Area

AIR POLLUTION REMOVAL

Poor air quality is a common problem in many urban areas. It can lead to decreased human health, damage to landscape materials and ecosystem processes, and reduced visibility. The urban forest can help improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings, which consequently reduces air pollutant emissions from power sources. Trees also emit volatile organic compounds that can contribute to ozone formation. However, integrative studies have revealed that an increase in tree cover leads to reduced ozone formation (Nowak and Dwyer 2000).

Pollution removal by trees and shrubs in Hillside Woods & Park was estimated using field data and the most recent pollution and weather data available. Pollution removal was greatest for ozone (Figure 7). It is estimated that trees and shrubs remove 2.705 tons of air pollution (ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 2.5 microns (PM2.5), and sulfur dioxide (SO2)) per year with an associated value of $35,700.

Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter less than 2.5 microns. Particulate matter less than 10 microns (PM10) is another significant air pollutant. Given that i-Tree Eco analyzes particulate matter less than 2.5 microns (PM2.5) which is a subset of PM10, PM10 has not been included in this analysis. PM2.5 is generally more relevant in discussions concerning air pollution effects on human health.



[Images] (above)
Annual Pollution Removal by Trees in Hillside Woods & Park

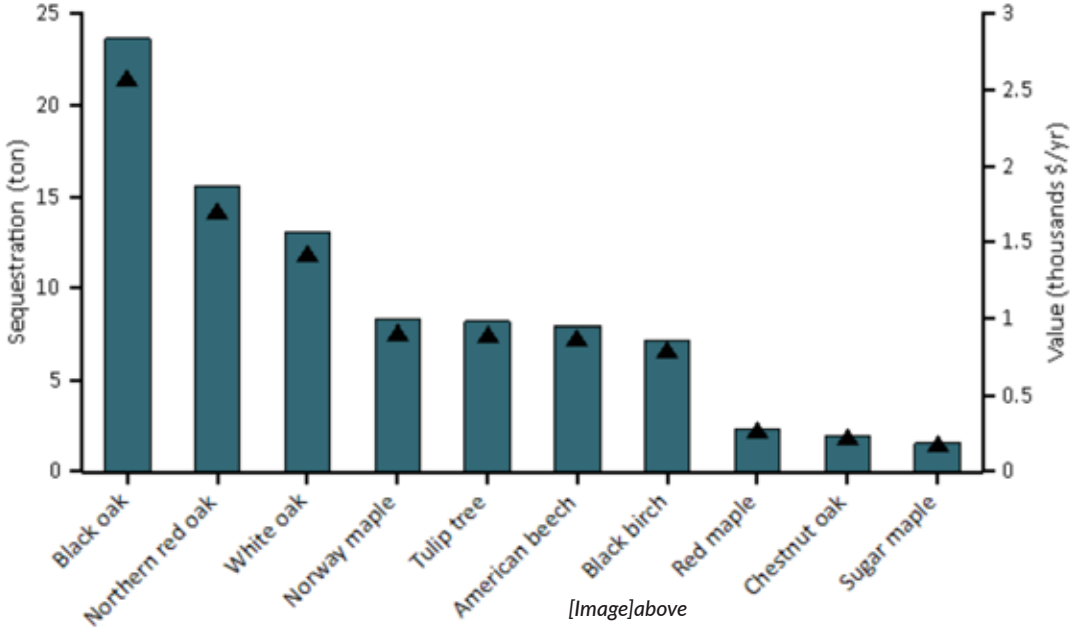
CARBON STORAGE AND SEQUESTRATION

Climate change is an issue of global concern. Urban trees help mitigate climate change by sequestering atmospheric carbon (from carbon dioxide) in their tissue and by altering energy use in buildings, and consequently altering carbon dioxide emissions from fossil-fuel based power sources (Abdollahi et al 2000).

Trees reduce the amount of carbon in the atmosphere by sequestering carbon in new growth every year. The amount of carbon annually sequestered increases with the size and health of the trees. The gross sequestration of Hillside Woods & Park trees is about 83.87 tons of carbon per year with an associated value of $11,200. Net carbon sequestration in the urban forest is about 30.2 tons.

Carbon storage is another way trees can influence global climate change. As a tree grows, it stores more carbon by holding it in its accumulated tissue. As a tree dies and decays, it releases much of the stored carbon back into the atmosphere. Thus, carbon storage is an indication of the amount of carbon that can be released if trees are allowed to die and decompose. Maintaining healthy trees will keep the carbon stored in trees, but tree maintenance can contribute to carbon emissions (Nowak et al. 2002c).

Trees in Hillside Woods & Park are estimated to store 4,020 tons of carbon ($535,000 worth). Of the species sampled, black oak stores and sequesters the most carbon (approximately 29.8% of the total carbon stored and 25.5% of all sequestered carbon).



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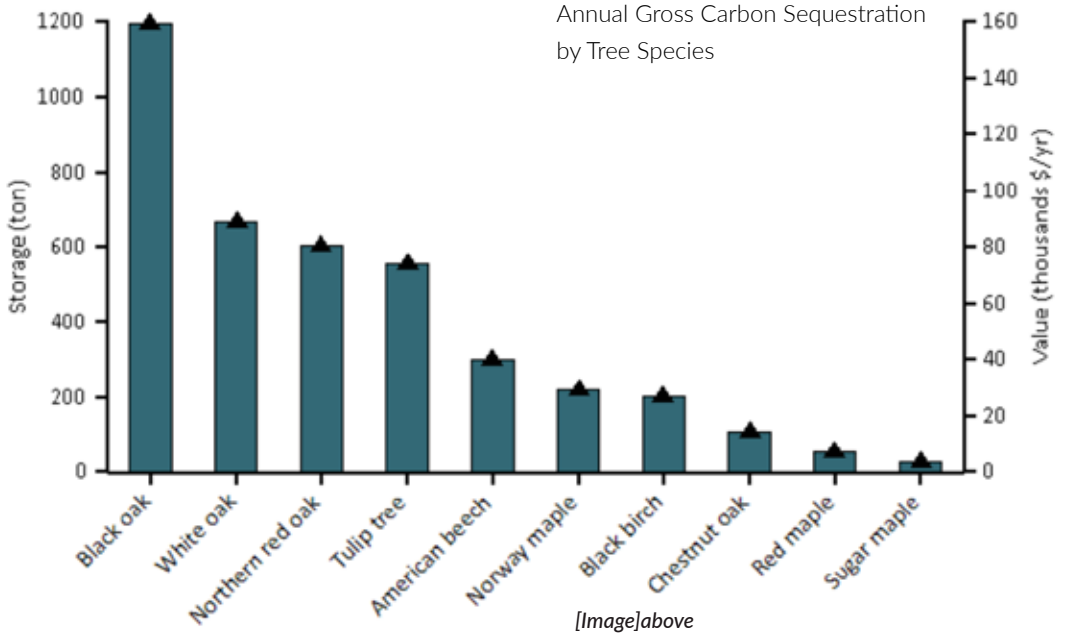
Annual Gross Carbon Sequestration by Tree Species



[Image]above

Carbon Storage by Tree Species

OXYGEN PRODUCTION

Oxygen production is one of the most commonly cited benefits of urban trees. The net annual oxygen production of a tree is directly related to the amount of carbon sequestered by the tree, which is tied to the accumulation of tree biomass.

Trees in Hillside Woods & Park are estimated to produce 80.52 tons of oxygen per year.

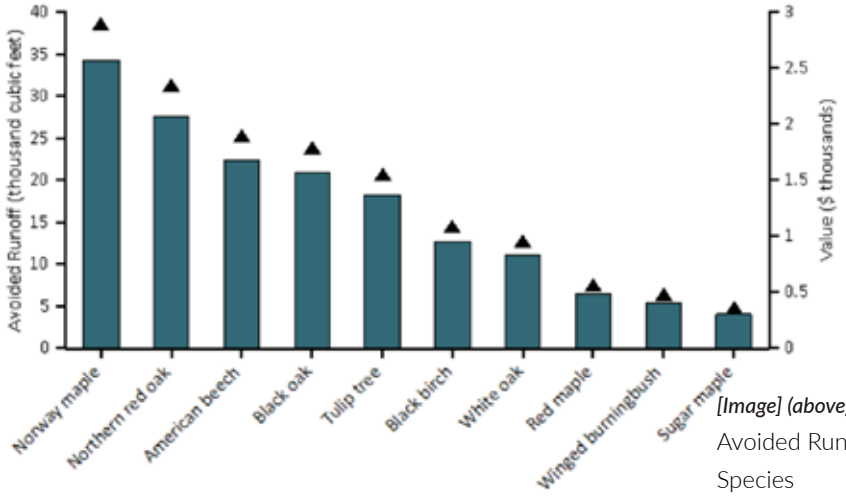
Species	*Oxygen (ton)*	*Net Carbon Sequestration (ton/yr)*	*Number of Trees*	*Leaf Area (acre)*
Northern red oak	18.75	7.03	771	106.17
Black oak	15.20	5.70	560	80.61
White oak	15.13	5.67	389	42.81
Black birch	9.38	3.52	568	48.96
Norway maple	8.47	3.18	1,069	131.46
American beech	6.39	2.40	597	85.60
Chestnut oak	3.58	1.34	21	5.38
Red maple	3.48	1.30	270	25.22
Sugar maple	3.37	1.26	154	15.67
American sycamore	0.85	0.32	19	5.51
Shagbark hickory	0.57	0.21	39	1.79
Black cherry	0.49	0.18	114	5.71
catalpa spp	0.48	0.18	37	2.17
Pignut hickory	0.43	0.16	56	2.39
Sassafras	0.33	0.12	55	0.79
Fairview norway maple	0.11	0.04	19	0.88
Gray birch	0.06	0.02	19	1.53
Tree of heaven	-0.13	-0.05	39	3.07
Tulip tree	-6.40	-2.40	309	70.02

[Image] (above)
Top 20 Oxygen Producting Tree Species

AVOIDED RUNOFF

Surface runoff is a serious cause for concern in many urban areas as it can lead to soil erosion and contribute pollution to streams, wetlands, rivers, lakes, and oceans. During precipitation events, some portion of the precipitation is intercepted by vegetation (trees and shrubs) while the other portion reaches the ground. The portion of the precipitation that reaches the ground and does not infiltrate into the soil becomes surface runoff (Hirabayashi 2012). In urban areas, the large extent of impervious surfaces increases the amount of surface runoff.

Urban trees and shrubs, however, are beneficial in reducing surface runoff. Trees and shrubs intercept precipitation, while their root systems promote infiltration and storage in the soil. The trees and shrubs of Hillside Woods & Park help to reduce runoff by an estimated 202,000 cubic feet per year with an associated value of $14,000. Avoided runoff is estimated based on local weather from the Westchester County Airport weather station (Meteorological Station ID: 725037-94745). In Hillside Woods & Park, the total annual precipitation in 2013 was 40.0 inches.



[Image] (above)
Avoided Runoff for Tree Species

STRUCTURAL AND FUNCTIONAL VALUES

Urban forests have a structural value based on the trees themselves (e.g., the cost of having to replace a tree with a similar tree); they also have functional values (either positive or negative) based on the functions the trees perform. The structural value of an urban forest tends to increase with a rise in the number and size of healthy trees (Nowak et al. 2002a). Annual functional values also tend to increase with increased number and size of healthy trees. Through proper management, urban forest values can be increased; however, the values and benefits also can decrease as the amount of healthy tree cover declines.

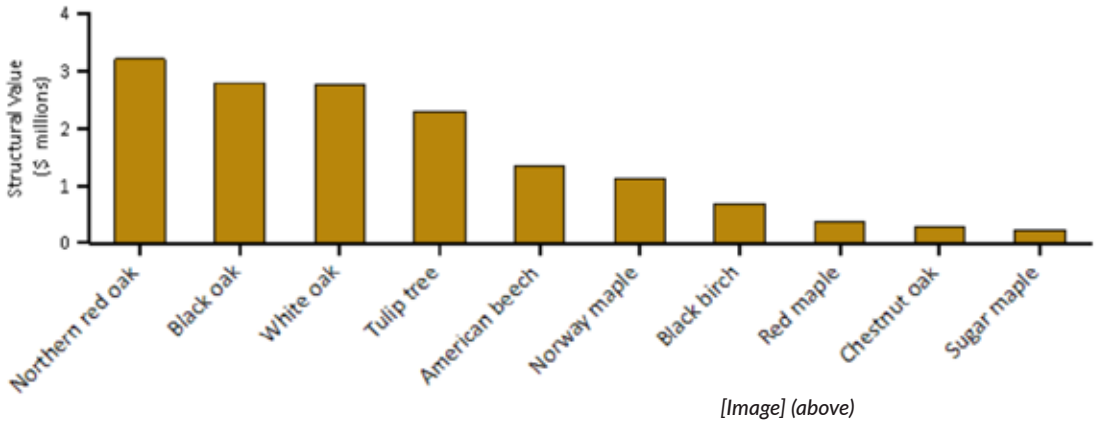
Urban trees in Hillside Woods & Park have the following structural values, where structural value is the value of a tree based on the physical resource itself (e.g., the cost of having to replace a tree with a similar tree):

- Structural value: $15.5 million
- Carbon storage: $535 thousand

Urban trees in Hillside Woods & Park have the following annual functional values:

- Carbon sequestration: $11.2 thousand
- Avoided runoff: $13.5 thousand
- Pollution removal: $35.7 thousand

Structural values were based on valuation procedures of the Council of Tree and Landscape Appraisers, which uses tree species, diameter, condition, and location information (Nowak et al. 2002a; 2002b).



[Image] (above)
Tree Species with Greatest Structural Value

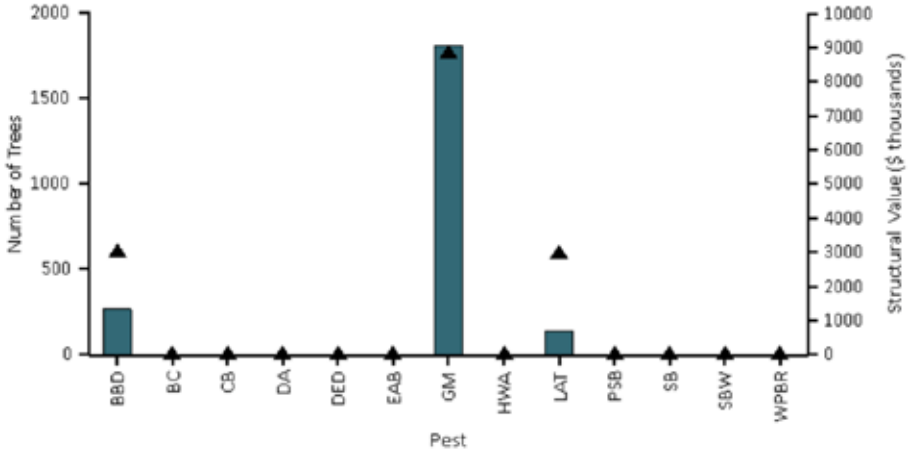
POTENTIAL PEST IMPACTS

Various insects and diseases can infest urban forests; potentially killing trees and reducing the health, structural value, and sustainability of the urban forest. As pests tend to have differing tree hosts, the potential damage or risk of each pest will differ among cities. Thirty-six pests were analyzed for their potential impact and compared with pest range maps (Forest Health Technology Enterprise Team 2014) in the conterminous United States to determine their proximity to Westchester County. Thirteen of the thirty-six pests analyzed are located within the county, three of which will affect the trees of Hillside Woods & Park.

Beech bark disease (BBD) (Houston and O'Brien 1983) is an insect-disease complex that primarily impacts American beech. This disease threatens 11.7 percent of the population, which represents a potential loss of $1.34 million in structural value.

The gypsy moth (GM) (Northeastern Area State and Private Forestry 2005) is a defoliator that feeds on many species causing widespread defoliation and tree death if outbreak conditions last several years. This pest threatens 34.5 percent of the population, which represents a potential loss of $9.05 million in structural value.

Quaking aspen is a principal host for large aspen tortrix (LAT), another defoliator (Ciesla and Kruse 2009). LAT poses a threat to 11.5 percent of the Hillside Woods & Park urban forest, which represents a potential loss of $705 thousand in structural value.



[Image] (above)
# of Trees at Risk for Most Threatening Pests located in the County

Contemporary Forestry Analytics

Data from the 30 field plots located throughout the forest stands of Hillside Woods & Park were analyzed using Excel to determine the following characteristics of the various forest stands:

- Tree Composition.
- Tree Density and Basal Area.
- Average Tree Diameter.
- Tree Condition.
- Tree Size and Age.
- Shrub Species Present.
- Herbaceous Species Present.

All field data were collected during the leaf-on season to properly assess tree canopies. Data collection included ground and tree cover, individual tree attributes of species, stem diameter, height, crown width, crown canopy missing and dieback.

FOREST STAND DELINEATION

Description and current condition – A forest stand is a contiguous community of trees sufficiently uniform in composition, structure, age and size class distribution, spatial arrangement, site quality, condition, or location to distinguish it from adjacent communities. The forest of Hillside Woods & Park is a collection of these stands. For management purposes, Hillside Woods & Park was broken into 4 separate stands, numbered 1-4. Each stand is biologically and geographically distinct. Stands are described in detail in the following Forest Stand Analysis Section.

Stand 1 – Oak/Maple forest type (mixed oak)
Stand 2 – Oak/Beech forest type (beech, maple, red oak, white oak)
Stand 3 – Successional Northern Hardwoods forest type
Stand 4 – Central Hardwoods forest type

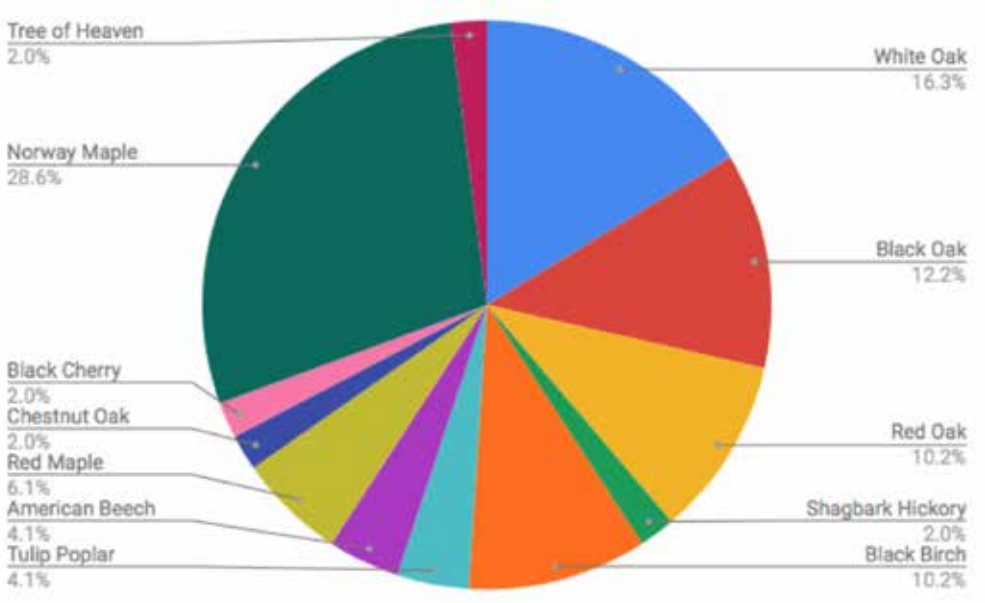
[Image] (above)
Forest Stands of Hillside Woods & Park

FOREST STAND ANALYSIS - STAND 1 - OAK/MAPLE- 18.5 ACRES

An Oak/Maple forest is a forest dominated by oaks and is typically found on south- and west-facing slopes. Soils may have calcareous materials at depth. Dominants are red, black, and white oak, and occasionally white pine. Black oak is an indicator of this ecological community type. Pignut or Shagbark hickory, and red maple are usually present. Flowering dogwood and chokecherry are often abundant in the understory.

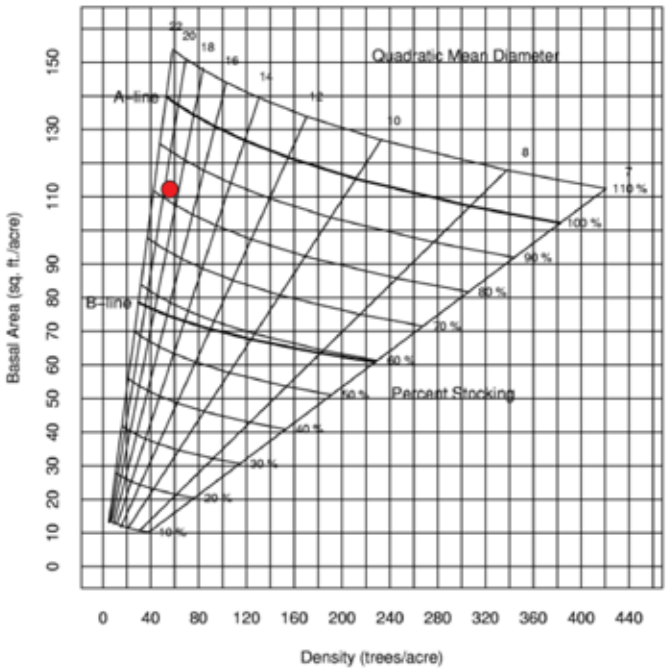
SPECIES COMPOSITION

The stand diversity is below average for the oak-maple forest type. Amongst the 12 species of hardwoods documented within the sample plots, Norway maple was dominant overall. The species composition tells us about the health of the forest, as well as the stage of growth. The most common species are intermediate in shade tolerance. This reflects the historical land use, which shows that the present forest regenerated in a relatively open condition.



DENSITY, BASAL AREA

Stand 1 is an Oak-Maple forest that has seen the invasion of Norway maple, a non-native species that outcompetes native hardwood species. The density is 55 trees per acre, and the basal area is 111.4 square feet/acre. As represented below in the stocking chart for upland oak forest stands, the stand is between the A and B line, and is therefore well-stocked. Tree canopy closure is close to 85%, trees are taking up much of the available space, but are not competing to a point that influences tree health negatively.



DIAMETER

The quadratic mean stand diameter is 19 inches. This is on the high-end for oak stands. This means that trees are, in the eyes of the forestry industry, mature. When one looks at the species present and the actual lifespan of the trees, there are some species that are reaching biological maturity, while others are still maturing.

TREE CONDITION

Overall, the canopy trees are healthy in this forest stand. There is however very little or no regeneration of canopy tree seedlings occurring due to deer browse and invasive plant pressure. There was an average occurrence of physical defects, fungal infection, and pest damage. The occurrence of these health concerns will be on the rise in this stand as trees begin to compete for resources. The understory trees in this stand are in a similar state to the overstory trees, they still exist yet are not regenerating. In a number of years this lack of regeneration will cause a failure in the forest as a tipping point is reached. The shrub and herbaceous layers of the stand are also degraded and in much of the stand non-existent due to regeneration issues.

TREE SIZE/AGE

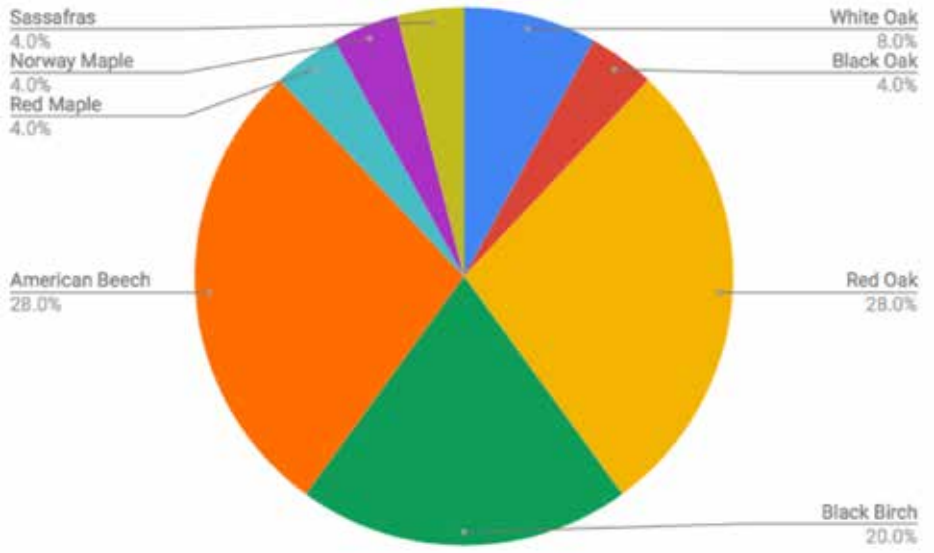
Trees are growing in two major canopy classes: overstory trees, averaging 60-80 feet in height, and understory trees, averaging 30-50 feet. There is limited growth in vegetation levels below 30 feet, for reasons noted above in the Tree Condition section. Trees range in age from 30-100 years.

[Images] (below)
A very sparse understory is found throughout the forest in Stand 1.

FOREST STAND ANALYSIS - STAND 2, OAK/BEECH - 21.9 ACRES The Oak/Beech forest type typically occurs on sites of deep, rich, well-drained soil with minimal disturbance. Stable talus slopes below terrace bluffs and above moist floodplains are the most common sites. Since these areas provide rich soil for agriculture, most of them have been cleared and cultivated in the past, leaving few mature stands of this type. Beech is the distinctive species of this type, but it usually is not as abundant as white oak, red oak, and sugar maple. Willow oak, yellow poplar and shagbark hickory may also be present. Sugar maple usually dominates the understory along with dogwood, deciduous holly, hornbeam, and hop hornbeam. Shrubs are infrequent, but woody vines such as grape and poison ivy often are abundant.

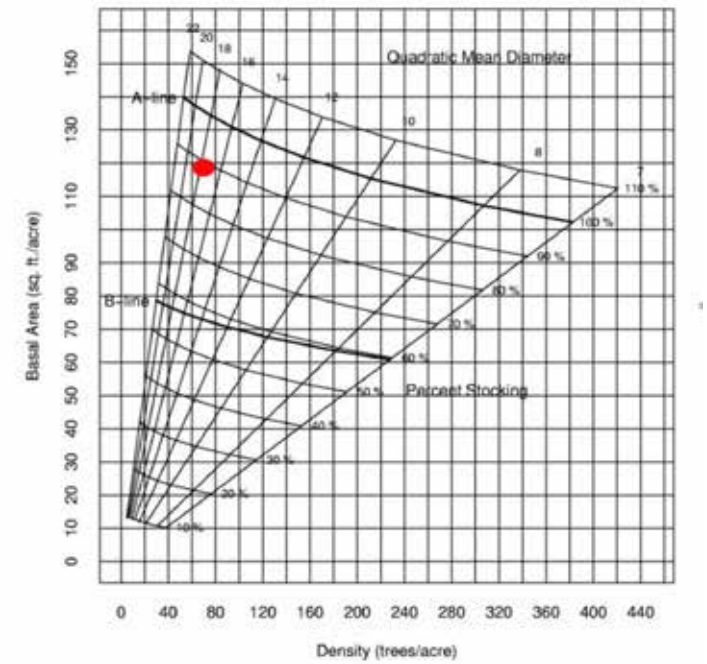
SPECIES COMPOSITION

The forest is predominantly an oak-beech type. American beech and northern red oak are the most prevalent species in the area, with white oak having a typical distribution for this forest type. Black birch forms a secondary canopy component. Red maple, sassafras, and Norway maple also share space in the understory, but are much less common.



DENSITY, BASAL AREA

The stand has a basal area of 117.4 square feet per acre, and has a density of 62.5 trees per acre. The forest here has grown quickly and the canopy has close to 100% closure, with a few openings from downed trees. Trees are competing for resources and are beginning to slow their growth as a result. Overall tree condition does show some evidence of this competition, especially in the secondary growth.



DIAMETER

The quadratic mean stand diameter is 17.8. The trees in the overstory are mature and form a dense canopy, while the understory trees are stunted due to lack of light.

TREE CONDITION

Canopy and understory trees showed some signs of decline, especially the black birch and other understory trees, which are competing for what little resources remain in the understory. Some larger trees had fungal growth and missing branches, but overall were in good condition. There is little to no regeneration in this stand, and even beech (a tree species that deer do not prefer or usually consume) is being browsed to extirpation. Shrub and herbaceous layers of the forest were also very heavily browsed by deer and have numerous invasive plants invading.

TREE SIZE/AGE

The overstory trees here are tall and impressive, but not as old as they may seem. Growth was fast in this stand. Based on historical photos and a stump that was examined, trees are around 80 years of age.

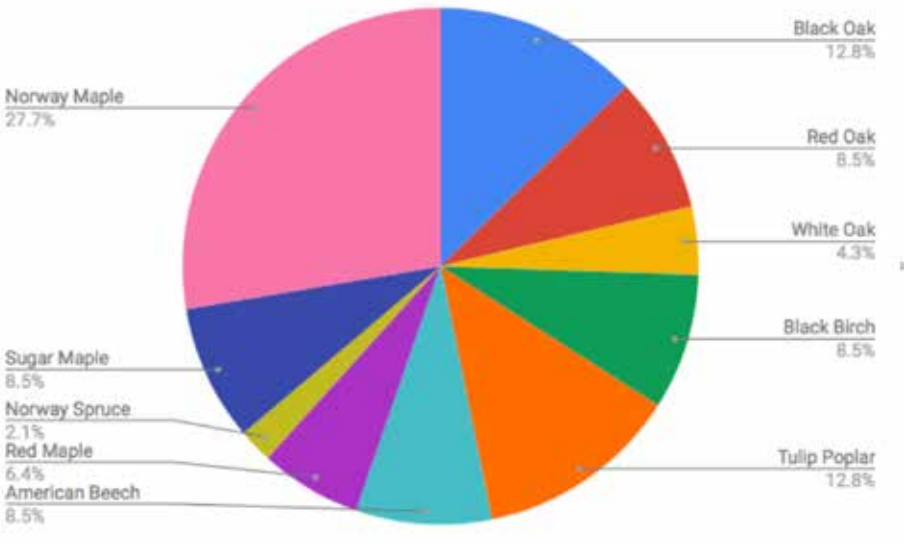
[Image] (above)
Not all deer problems arise from browse alone. These saplings have been rubbed by deer and have broken due to the rubs.

FOREST STAND ANALYSIS - STAND 3 – SUCCESSIONAL NORTHERN HARDWOODS - 16.8 ACRES

A Successional Northern Hardwoods Forest type is a forest with more than 60% canopy cover of trees that occurs on sites that have been cleared or otherwise disturbed. Dominant trees are usually two or more of the following: red maple, white pine, white ash, gray birch, quaking aspen, big-tooth aspen, and, less frequently, sugar maple and white ash. Tree seedlings and saplings may be of more shade tolerant species. Shrubs and ground cover species may be those of old-fields or forest openings.

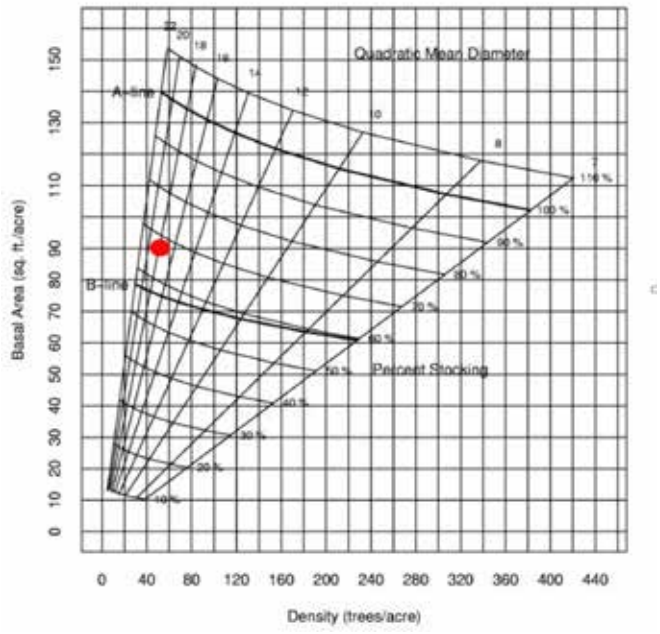
SPECIES COMPOSITION

This stand has good diversity for a northern hardwoods stand, and also includes some species that are non-native and potentially invasive. The chart below shows the species distribution and relative abundance.



DENSITY, BASAL AREA

This stand is a diverse northern hardwoods forest type. The density is 45 trees per acre, and the basal area is 90 square feet/acre. The chart below shows that the stand is well stocked, between the A and B line. Tree canopy closure is nearing 80%. Trees are still competing for resources, but there are openings in the forest. Typically these areas are where trees would have room to grow, regenerate, and have a chance to receive more sunlight. Unfortunately, in this case native tree vigor and overall health is poor due to invasive plant pressure and deer browse, and a complete lack of regeneration of natives is being observed.



DIAMETER

The quadratic mean stand diameter is 18 inches. This is high for this forest type. When one looks at the species present and the actual lifespan of the trees, there are some species that are reaching biological maturity, while others are still maturing.

TREE CONDITION

Canopy trees are healthy in this forest stand, but again similarly to the forest as a whole, there is little to no regeneration. There was an average occurrence of physical defects, fungal infection and pest damage. The occurrence of these health concerns will be on the rise in this stand as trees begin to compete for resources. The understory trees are being outcompeted by invasive trees and shrubs, and there is also no regeneration due to deer and invasive plant pressure.

TREE SIZE/AGE

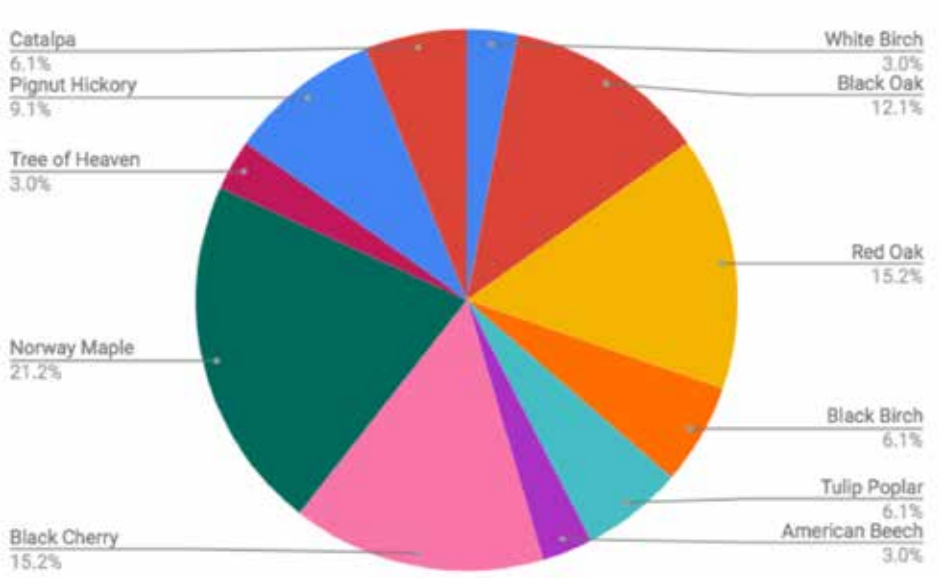
Trees are growing in two major canopy classes: overstory trees averaging 60-70 feet in height, and understory trees averaging 30-50 feet. There is limited growth in vegetation levels below 30 feet, as regeneration is failing and the forest is unable to replace itself as the canopy opens, deer browse, and invasives outcompete natives. Trees range in age from 15-80 years.

[Images] (below)
Recording inventory data ,
and a thick herbaceous layer
of invasive plants in stand 3

FOREST STAND ANALYSIS - STAND 4 – CENTRAL HARDWOODS - 30.8 ACRES The Central Hardwoods ecoregion is among the richest in North America for herbaceous plants and shrubs. The tree flora is less diverse, dominated by only a few species. Widespread dominants are white oak (Quercus alba), red oak (Q. rubra), black oak (Q. velutina), bitternut hickory (Carya cordiformis), and shagbark hickory (C. ovata). Flowering dogwood (Cornus florida) often occurs in the understory, along with sassafras (Sassafras spp.) and hop hornbeam (Carpinus spp.). The shrub layer is distinct, often with evergreens, and wildflowers are common. Intact wetter sites feature American elm (Ulmus americana), tulip tree (Liriodendron tulipifera), and sweetgum (Liquidambar styraciflua).

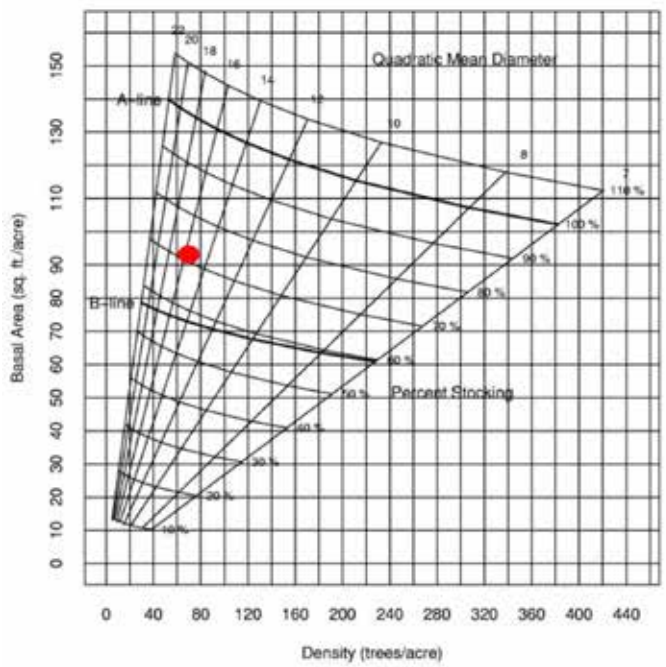
SPECIES COMPOSITION

This forest is a good example of the diversity found in a central hardwoods forest type, but the trees are currently unable to regenerate and this diversity will be lost in the coming years as deer browse and invasives are causing the forest to fail. The chart below shows relative abundance, but also clearly shows that Norway maple is out-competing the native species. This trend will continue if nothing is done to aid the native forest in regenerating, creating more of a monoculture of Norway maple in the stand.



DENSITY, BASAL AREA

The stand is in a rich section of land that produces high rates of tree growth. The density is 63.75 trees per acre, and the basal area is 92.9 square feet per acre. The chart below shows that the stand is above the B line and is well-stocked. Tree canopy closure is nearing 100% in most places, although there are some areas where trees have fallen or died, creating more light in lower levels of the forest and on the forest floor.



DIAMETER

The quadratic mean diameter of the stand is around 15.5 inches. Trees are nearing financial maturity, but have a long way to go in terms of overall life span.

TREE CONDITION

Tree health in this stand is declining overall, with diversity in the forest diminishing as invasive plants are gaining dominance. The major health issue is invasion by non-native species such as Norway maple, and lack of regeneration being caused by deer browse and invasive brush/shrubs.

Tree Size/Age

Trees grow large in this section, with many well over 100 feet tall. The age of the trees in this section range from 30-120 years, and the area contains some of the oldest and most undisturbed forested areas in Hillside Woods & Park.

[Images] (below)
Throughout stand 4 there is an intact canopy yet almost no regeneration on the forest floor..

Hazard Tree Inventory

METHODOLOGY, ITREE

Hazard trees were inventoried along hiking trails, trafficked and open areas within the Park and Woods, and along the Park and Woods property line. Hazard trees were first GPS located, numbered, and then inventoried/assessed for several factors. Factors noted were Location (Lat/Long), species, DBH, Canopy Condition, Trunk Condition, Root and Root Collar Condition, Priority, and Additional Notes.

Tree Locations were taken in Lat/Long, and trail or position in Hillside Park & Woods was also inventoried (Algonquin Trail, Eastern Property Line, etc.). Species was recorded for each Hazard tree along with DBH in inches. Canopy Condition was recorded on a scale of 1 to 4. If trees had a canopy defect such as an unbalanced crown, dead twigs/branches, broken stem/hangers, cracks, lightning damage, included bark, weak attachments, cavities/holes/dens, dead bark/cambium, cankers/burls/conks, decay, or overall decline, this was noted. Trunk Condition was recorded on a scale of 1 to 4. If trees had a trunk defect such as dead/missing bark, abnormal bark texture/color, codominant stems, included bark, cracks, sapwood damage/decay, cankers/galls/burls, sap ooze, lightning damage, heartwood decay, conks/mushrooms, cavity/nest/dens, poor taper, or lean, this was noted. Root and Root Collar Condition was recorded on a scale of 1 to 4. If trees had root or root collar defects such as buried collar, stem girdling, dead/decaying roots, conks/mushrooms, ooze, cavities, cracks, cut/damaged roots, root plate lifting, soil weakness, or response growth, this was noted. Priority was also rated on a scale of 1 to 4. Priority 4 trees were tagged/marked with red paint, because they are recommended for immediate pruning/removal. Additional Notes elaborate on canopy condition, trunk condition, root and root collar condition, and priority level.

HAZARD TREE INVENTORY DATA

All Hazard Tree data is found in the Appendix

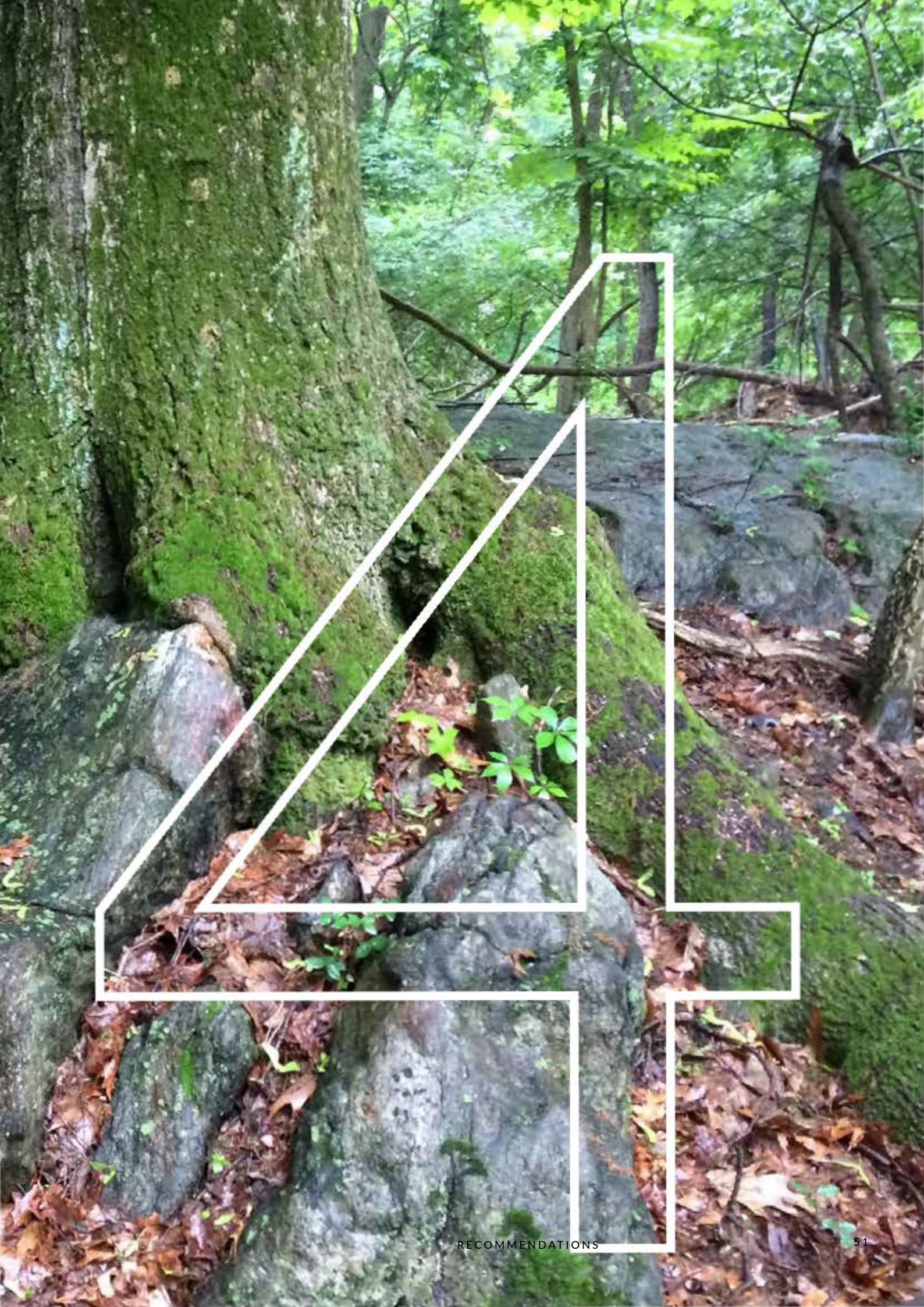
HAZARD TREE RECOMMENDATIONS & PRIORITY LEVELS

Using the Hazard Tree Inventory, several factors can be noted. Priority is the most important factor to note for municipal use:

Trees that are a Priority 1 are healthy trees with no need for any maintenance. Trees that are a Priority 2 are trees that show minor signs of decline/wounds/disease, and should be monitored in future inventory work. Trees that are a Priority 3 are trees that show moderate signs of decline, that are in need future maintenance pruning in order to reduce current risk. Trees that are a Priority 4 on are recommended for immediate maintenance, whether removal or pruning. For more information on removal or pruning see the Hazard Tree Pruning and Removal Pruning section in the appendix.

CHAPTER FOUR

RECOMMENDATIONS



Basis of Recommendations

Municipalities throughout NY and around the world are investing in urban forest restoration to protect native forest ecosystems as a form of green infrastructure. The aim is that these forests will develop into naturally-regenerating native forest stands. However, woody plant regeneration and recruitment is often cited as the most limiting factor to creating self-sustaining urban forests. As such, there is interest in site treatments that promote recruitment of native woody species and simultaneously suppress woody non-native recruitment. Findings from several studies (These sites are located in Kissena Corridor Park in Queens, and within the Rodman's Neck area of Pelham Bay Park, in the northeast corner of the Bronx in New York City (NYC), U.S.A.) in the greater NY City area suggest that combinations of site intervention (tree planting, invasive removal, etc.), paired with an full-canopy forest, may be most effective for promoting regeneration of native species resulting in more self-sustaining urban forests (Doroski et al. 2018).

These studies have also shown that, compared with unrestored sites, improvements in species diversity, greater forest structure complexity, and evidence of the regeneration and retention of native tree species is found in restored sites. In addition, differences were revealed in restoration outcomes depending on the level of intervention: clearing exotic shrubs and vines and planting native trees and shrubs improved tree diversity and canopy closure to a greater extent than clearing exotics alone, and the mechanical removal of invasive plants after the native plantings further improved some measures of restoration, such as tree species diversity and native tree regeneration. The results of these study suggest that the goal of a sustainable forest ecosystem dominated by native trees and other plant species may not be achievable without continued human intervention on site (Simmons et al. 2016, Johnson and Handel 2015).

[Image] (above)
Rodman's Neck, Pelham Bay Park. Before Restoration. New York City Parks Photo Archive.

MITIGATING THE REGENERATION ISSUE IN HILLSIDE WOODS & PARK

Most regeneration of hardwood forests occurs naturally, without planting trees, but many factors can affect forest regeneration. To regenerate naturally, the current forest must produce seedlings, stump sprouts, and root suckers that will become the next forest. The right conditions are necessary for forests to regenerate naturally. Unfortunately, the "right conditions" have not been met in Hillside Woods & Park.

In Hillside Woods & Park there are three defining factors affecting forest regeneration, which we will address with practices to help grow the forest sustainably. These three factors are ***competing invasive vegetation, deer impact, and light on the forest floor*** (Jackson et. al. 2017).

COMPETING INVASIVE VEGETATION

Competing vegetation consists of plants that interfere with the germination and growth of desirable seedlings by casting dense shade across the forest floor. Some competing plants also provide cover for small mammals that feed on tree seeds and seedlings. Several factors favor the development of competing vegetation. Many interfering plants tolerate shady understory conditions and are not typically browsed by deer. Some, such as Japanese barberry, are also invasive, meaning they spread rapidly and suppress native plant communities. Competing plants are similar to weeds in your garden—they interfere with the establishment and growth of your future crop. Undesirable trees and plants can take over a forest just as weeds can take over a garden.

Competing vegetation can inhibit diverse and valuable forest regeneration as well as the establishment of desirable non-woody plants, such as native wildflowers, forbs, and herbs. When competing plants are present and left untreated they may become the only plants that regenerate. Forestry operations will increase light on the forest floor and magnify problems caused by competing plants. It is not uncommon in NY to see forests like Hillside Woods & Park with understories covered with competing plants. In Hillside Woods & Park, successful forest regeneration depends on controlling these competing plants.

Extensive research and testing have provided low-risk and effective herbicide recommendations for controlling most competing vegetation. If it is preferred to not use herbicides, mechanical control of competing vegetation works in some cases. Typically, mechanical methods such as cutting or pulling are not as effective as herbicides and are ineffective at controlling non-woody plants like fern and grass. Mechanical removal generally involves having the forestry operator break off or cut competing seedlings and saplings. With this method, the competing plants will likely re-sprout; however, they may no longer have a height advantage over desirable seedlings.

To sustain Hillside Woods & Park, competing vegetation problems need to be recognized and treated before other forestry operations can be accomplished. Dealing with competing vegetation first is important because:

- Forestry operation slash (slash, or slashings are coarse and fine woody debris generated during logging operations or through wind, snow or other natural forest disturbances) can impede access
- Increased light will cause competing plants to flourish
- Desirable species may be more easily harmed by herbicide treatments
- Costs for controlling competing plants are typically higher after forestry operations

[Image] (right)
Invasive Vines and Brush taking over an opening in the forest of Hillside Woods & Park.

[Image] (left)
A deer browsing in an opening in the forest.

DEER

Like many communities in NY, the Village of Hastings-on-Hudson has a significant white-tailed deer population that has resulted in numerous negative impacts, including car-deer collisions, property damage, and, in Hillside Woods & Park, an overbrowsing of the woods. Through selective feeding, deer have broadly affected forest plant communities. Specifically, they have reduced tree seedling numbers, seed availability, species composition, and seedling height. They have also affected herbaceous plant composition as they browse on some species and ignore others (which tend to be invasive plants). In Hillside Woods & Park, years of overbrowsing has severely depleted the habitat, and the deer are creating significant effects.

Deer have taste preferences. Some plants are highly preferred while others are hardly touched. By selectively browsing preferred species, deer have the ability to completely change the species found in forest understories. Selective browsing can greatly reduce or eliminate preferred species—or those not resilient to browsing—and favors less preferred, more resilient species (typically, invasive species). There is strong evidence that the expansion of understory invasive plants in forests across NY results from deer overbrowsing, which removes plants that would normally compete with invasive non-palatable plants. The dense invasive understory in Hillside Woods & Park are the result of high deer impact over many years. Research has shown that invasive plant density increases as deer impact increases. Unfortunately, after invasive plant cover dominates the understory, the forest's ability to support deer declines. A severely damaged forest may appear to have no deer at all. Likely, a few deer will continue to suppress desirable tree species. The cycle of browsing and poor habitat is difficult to break.

Although hunting/culling is by far the most practical means of reducing deer impact, other tools include affecting deer fertility (surgically or via contraceptives), fencing, seedling protectors, and deer repellents. Areas with low deer impact will support healthy, diverse understories, preparing the forest for future replacement following planned forestry operations or natural disturbances.

The Village of Hastings examined a range of alternatives and first settled on a study of immunocontraception to examine its impact on the local deer population. Currently Hastings-on-Hudson is in the middle of its fifth year of the deer immunocontraception study. From 2014 to March 2018, 69 does had been captured and immunized since 2014. Nine captured and immunized does died due to hunting, collisions with cars and other accidents, leaving up to 60 immunized does in or near the Village, which is estimated to be around 75% of all adult does. In the early fall of 2018 camera trapping will be used again to gather a deer census, and with so many tagged deer, it's accuracy will be higher than in previous years. The full report of the fourth year of the study is now available on the Village website. It remains to be seen what impact this program will have on the number of deer browsing down Hillside Woods. The Village is now considering complimenting the immunocontraceptive program with deer exclosure fencing, turning to a more multi-faceted approach to the deer problem. Recommendations for deer exclosure fencing in Hillside Woods & Park will be discussed later in this Plan.

LIGHT ON THE FOREST FLOOR

The amount of sunlight reaching the forest floor plays a key role in determining which tree seedling species will germinate and grow. Tree species have different requirements for sunlight, a factor referred to as shade tolerance. Shade tolerance describes the light level at which a species is best able to germinate and grow. Foresters generally separate trees into three shade-tolerance classes: intolerant, intermediate, and tolerant.

Examining the shade-tolerance classes of the majority of desirable trees in Hillside Woods & Park, we find they fall into two different shade-tolerance classes: intermediate and tolerant. Most undesirable and invasive trees and shrubs fall into the intolerant class. Understanding the shade-tolerance characteristics of desirable and undesirable species forms the basis for developing forestry operation prescriptions. In this instance we want to restrict enough light into the forest to discourage shade-intolerant trees and shrubs.

HILLSIDE WOODS & PARK IS A UNIQUE URBAN FOREST SETTING, WITH A UNIQUE SET OF ISSUES, OPPORTUNITIES, AND CONSTRAINTS AS COMPARED TO OTHER URBAN FORESTS. IN ADDITION TO THOSE LISTED ABOVE, HERE ARE SEVERAL OTHER OVERARCHING TOPICS WORTH MENTIONING:

OVERSTORY - There is an overall lack of overstory regeneration, and severe degradation of forest

understory, yet the overstory is still intact in much of the Hillside Woods & Park. This is important because the overstory begins the process of forest regeneration. Without implementation of best management practices to rectify this situation the native forest will continue to diminish. If we can promote regeneration, we can avoid a disaster in the coming years.

UNDERSTORY - The majority of the forest has an understory that is severely disturbed, yet there are still areas where a healthy understory does exist. These pockets include the components that need to be rebuilt throughout the other areas of the forest. Understanding these healthy areas allows managers a glimpse of what is possible, seed stock for replanting, and a focus for areas for management.

DOGS – It is a common sight to see Village residents out for a walk with their dog in Hillside Woods & Park. Many folks even consider the forest an off-leash dog walking zone, a place that dogs can run and play similar to a Dog Park. Unfortunately, this has led to some disturbance in the forest: wildlife is affected, and dog feces has become an issue. We recommend that the Village enact a stronger "leashed-dogs-only" policy to reduce these negative effects. Additionally, we recommend that more dog waste bag/trash kiosks are installed and available for public use.

EDGE FACTOR – One of the biggest stressors to large forest blocks is fragmentation. Hillside Woods & Park is a fragment of what historically was a large forested area. At each forest "edge" there is potential for the forest to be degraded. Edges between forest and non-forest habitats often have significant effects on forest microclimate and resource availability, with corresponding effects on species composition and abundance. Exotic species are often increased in abundance near forest edges. This increase in abundance could be either because of the increase in resource availability near edges, or because of increased dispersal into forest edges.

SCHOOLS & OUTDOOR CLASSROOM SPACE – Because of the proximity of Hillside Woods & Park to the Elementary, Middle & High Schools, there is a unique opportunity for the area to be programmed for outdoor classroom space.

Across the USA today, children's health, development, learning, and well-being have been seriously compromised by decades of changes that have dramatically altered childhood. Key among these changes has been a significantly reduced amount of time spent outdoors, which is linked to a number of other detrimental trends. Experience in the field and child development research alike are showing that all children need and benefit from more time outdoors; it is critical for their health, self-concept, and future school success. The optimal learning and growing environment for young children is composed of a full integration of indoor and outdoor spaces. The outdoor "classroom" of Hillside Woods & Park enhances and adds to the limited scope of activities available inside confined indoor classrooms by providing for hands-on experiences, physical activity, social and emotional growth through peer interaction, and multifaceted approaches to cognitive development that connect children to nature and maximize their learning outcomes.

[Image] (left)
Children and teachers explore Hillside Woods & Park, learning about the ecology of the area and the different habitats found in the forest.

Forest Management Schedule

Hillside Woods & Park Management Plan Schedule of Operations for Forest Stands					
Date to be Applied:	**Conservation Practice Name**	**Forest Stand**	**Acres/Units**	**Cost per Acre/ Unit**	**Total Cost**
2019 2020	Timber Stand Improvement - (Norway Maple Cull)	1 - comprehensive 2 - light thinning with consultant 3 - comprehensive 4 - comprehensive	18.5 21.9 16.8 30.8	$350/acre $150/acre $350/acre $350/acre	$6,475.00 $3,285.00 $5,880.00 $10,780.00
2019 2020 2021	Invasive Brush Management - Hand Tools, Woody Vegetation	1 - heavy 2 - light 3 - heavy 4 - mid	13 18.4 5.8 27.8	$395/acre $265/acre $395/acre $335/acre	$5,135.00 $4,876.00 $2,291.00 $9,313.00
2020	Invasive Brush Management - Mechanical, Trees and Woody Vegetation	1 2 3 4	5.5 3.5 11 3	$660/acre $660/acre $660/acre $660/acre	$3,630.00 $2,310.00 $7,260.00 $1,980.00
2019 2020 2021	Tree & Shrub Establishment - Individual Tree - Hand Plant with Tree Protection Fences or Tubes	1 2	270 225	$12 each	$3,240.00 $2,700.00
2022 2023	Tree & Shrub Establishment - Hand Planting	2 3 4	180 810 535	$8 each	$1440.00 $6,480.00 $4,280.00
2022 2023	Forb (Wildflower) and Fern Establishment - Hand Planting	2 3 4	770 860 895	$4 each	$3,080.00 $3,440.00 $3,580.00
2022 2023	Tree & Shrub Site Preparation - Hand Site Preparation	1 2 3 4	270 405 810 535	$3 each	$810.00 $1,215.00 $2,430.00 $1,605.00
2022 2023	Mulching, Tree & Shrub	1 2 3 4	270 405 810 535	$4 each	$1080.00 $1,620.00 $3,240.00 $2,140.00
2019 2020 2021	Structures for Wildlife - Brush Pile (Small)	1 2 3 4	55.5 65.7 50.4 92.4	$55 each	$3,052.00 $3,613.50 $2,772.00 $5,082.00
2021	Deer Exclosure Fencing	2 partial 3 4	9,500 LF	$25/LF	$237,500
				Total Net Cost:	**$357,614.50**

Forest Management Recommendations

Taking into account the overall issues, opportunities, and constraints mentioned above for the entire forest, we can consider management by forest stand in order to prescribe BMPs for the differing conditions found in each of stand.

STAND 1 RECOMMENDATIONS

This Oak/Maple stand has seen the invasion of Norway maple, a non-native species that outcompetes native hardwood species. Because the stand density is 55 trees per acre, and the basal area is 111.4 square feet/acre, it is considered well-stocked. Tree canopy closure is moderate/high as well, and trees are taking up much of the available space. All invasive shrubs should be managed before other forestry operations take place. In this forest stand, Norway maple trees should be girdled or felled/ removed. This will reduce the abundance of Norway maple, while opening the canopy to allow light into the lower forest layers and understory. Regeneration and planting of native oaks, hickory, red/ sugar maple, and understory trees/shrubs should be accomplished after the Norway maple has been managed.

BEST MANAGEMENT PRACTICES (see BMP Installation Requirements section for more information)

Invasive Brush Management (Hand Tools, Woody Vegetation),
Invasive Brush Management (Mechanical, Trees and Woody Vegetation),
Tree & Shrub Establishment (Hand Plant),
Tree & Shrub Site Preparation (Hand Site Preparation),
Mulching (Tree & Shrub),
Structures for Wildlife (Brush Pile - Small),
Timber Stand Improvement (Norway Maple Cull),

[Image] (above)
Photo of Stand 1

STAND 2 RECOMMENDATIONS

This Oak/Beech stand has a basal area of 117.4 square feet per acre, and has a density of 62.5 trees per acre. The forest here has grown quickly and the canopy is close to 100% closure. Trees are competing for resources and are beginning to slow their growth as a result. Beech bark disease is a worry in this stand, although the disease has largely not affected the beech in the stand so far. Removal of invasive trees and shrubs in this stand is most important because there is less invasive plant pressure, and less Norway maple in the overstory. Accomplishing this removal will open the canopy just enough to allow for regeneration of species that need intermediate levels of light, while allowing trees that can regenerate at lower light levels (beech and hard maple) to thrive as well. Forestry operations in this stand need to be careful to not negatively affect the riparian and pond areas to the maximum extent possible. This includes minimizing nearby soil disturbance, keeping machines out of waterways, and potentially erecting a silt fence to keep runoff out of the riparian and pond areas.

We recommend the addition of a deer exclusion fence to protect the integrity of portions of Stand 2 as well. This fence is recommended to enclose Forest Stand 2 above sugar pond (and stand 3 and part of Stand 2 as well, see page 65 for Fence Map image). The areas within this stand to the south of sugar pond are not to be fenced, due to extremely high invasive pressure, and because the forest here is narrow, acting like an isthamus that connects to Stand 1. To facilitate easy access in and out of the fenced area, both pedestrian S-gates and vehicle/maintenance gates are recommended.

To increase diversity of all forest layers, plantings are recommended within the fence. These plantings will have no deer pressure so they should consist of a diversity of species, many of which would otherwise be browsed to death by the healthy population of deer in Hastings-on-Hudson.

BEST MANAGEMENT PRACTICES (see BMP Installation Requirements section for more information)

Invasive Brush Management (Hand Tools, Woody Vegetation),
Invasive Brush Management (Mechanical, Trees and Woody Vegetation),
Tree & Shrub Establishment (Hand Plant),
Forb (Wildflower) and Fern Establishment (Hand Plant),
Tree & Shrub Site Preparation (Hand Site Preparation),
Mulching (Tree & Shrub),
Structures for Wildlife (Brush Pile - Small),
Timber Stand Improvement (Norway Maple Cull),
Deer Exclosure Fencing (partial, area north of sugar pond, see map).

[Image] (above)
Photo of Stand 2

STAND 3 RECOMMENDATIONS

This Successional Northern Hardwood stand has good diversity, but also includes some species that are non-native and invasive. The density is 45 trees per acre, and the basal area is 90 square feet/acre; therefore some species are reaching biological maturity, while others are still maturing. There are some forest openings and areas of thinner canopy where invasive plants are dominant (mainly in the northern section of the stand). Removal of invasive Norway maple and other invasive trees/shrubs will create a situation where the forest stand will grow rapidly, and the stand will need to be managed to keep invasives under control as additional light is allowed to recharge the understory and shrub layers. Certain invasives exist in this stand that are not yet prevalent in the surrounding forest. These must be managed to prevent their establishment elsewhere.

We recommend the addition of a deer exclusion fence to protect the integrity of the forest of stand 3. This fence is recommended to completely enclose Forest Stand 3 (and stand 4 and part of Stand 2 as well, see page 65 for Fence Map image). To facilitate easy access in and out of the fenced area, both pedestrian S-gates and vehicle/maintenance gates are recommended.

To increase diversity of all forest layers, plantings are recommended within the fence. These plantings will have no deer pressure so they should consist of a diversity of species, many of which would otherwise be browsed to death by the healthy population of deer in Hastings-on-Hudson.

BEST MANAGEMENT PRACTICES (see BMP Installation Requirements section for more information)

Invasive Brush Management (Hand Tools, Woody Vegetation),
Invasive Brush Management (Mechanical, Trees and Woody Vegetation),
Tree & Shrub Establishment (Hand Plant),
Forb (Wildflower) and Fern Establishment (Hand Plant),
Tree & Shrub Site Preparation (Hand Site Preparation),
Mulching (Tree & Shrub),
Structures for Wildlife (Brush Pile - Small),
Timber Stand Improvement (Norway Maple Cull),
Deer Exclosure Fencing.

[Image] (above)
Photo of Stand 3

STAND 4 RECOMMENDATIONS

This Central Hardwoods stand has a density is 63.75 trees per acre, and the basal area is 92.9 square feet per acre. The stand is well-stocked, and tree canopy closure is nearing 100% in most places. This stand shows little in terms of regeneration, similarly to all the stands. Also Norway maple is outcompeting native trees, and must be managed. This will open the canopy to recharge the understory and allow plantings to flourish.

Because deer immunocontraception has seen some promise, but unfortunately has not nearly achieved the goal of reducing deer numbers to a satisfactory level, we recommend the addition of a deer exclusion fence to protect the integrity of the Hillside Woods. This fence is recommended to completely enclose Forest Stand 4 (and stand 3 and part of Stand 2 as well, , see page 65 for Fence Map image). To facilitate easy access in and out of the fenced area, both pedestrian S-gates and vehicle/maintenance gates are recommended.

To increase diversity of all forest layers, plantings are recommended within the fence. These plantings will have no deer pressure so they should consist of a diversity of species, many of which would otherwise be browsed to death by the healthy population of deer in Hastings-on-Hudson.

BEST MANAGEMENT PRACTICES (see BMP Installation Requirements section for more information)

Invasive Brush Management (Hand Tools, Woody Vegetation),
Invasive Brush Management (Mechanical, Trees and Woody Vegetation),
Tree & Shrub Establishment (Hand Plant),
Forb (Wildflower) and Fern Establishment (Hand Plant),
Tree & Shrub Site Preparation (Hand Site Preparation),
Mulching (Tree & Shrub),
Structures for Wildlife (Brush Pile - Small),
Timber Stand Improvement (Norway Maple Cull),
Deer Exclosure Fencing.

[Image] (above)
Photo of Stand 4

Best Management Practices -Implementation Requirements

TIMBER STAND IMPROVEMENT (TSI) - IMPLEMENTATION REQUIREMENTS AND SPECIFICATIONS

Timber stand improvement (TSI) is a cutting or culling of undesirable trees and species. By removing undesirable species and poorly formed, diseased or insect-infested trees, TSI improves the species composition and stand quality. In the 4 forest stands we recommend TSI as a BMP because it can be accomplished by removing Norway maple (Acer platanoides) and other invasive trees within the forest.

Trees may be girdled or killed-in-place by herbicide, or added to wildlife brush piles. Because Norway maple has reached a level of 20.9% overall in the forest, it's removal will effectively open the canopy in most stands to help regenerate the lower canopy levels and shrub/herbaceous level.

Identification: The Norway maple is a large deciduous canopy tree that can grow up to 90 feet. It has a broad, rounded crown that is densely limbed. The bark begins smooth and grayish, but later becomes darker and narrowly and vertically fissured. The leaves are opposite and can be very large, up to 7" both long and wide and are palmately veined and notched with 5 distinct lobes. The top surface is a dull green, and the underside is hairless, glossy and pale. They turn bright yellow in autumn. The leaf stalk is long and narrow and produces a milky sap when broken at the end. Flowers are bright green, 5/16" wide, with 5 upright petals clusters which occur just before leaf out. Fruit is 2 samaras, each about 1-2" long that contain a seed in the middle. The samaras mature by the end of summer and are dispersed by the wind. It is possible that some seeds are eaten and dispersed by birds and small mammals as well. Buds are very large, much larger than the buds of sugar and red maples (Acer saccharum & Acer rubrum). They are glabrous, stocky and usually turn green to red with large scales surrounding. The terminal bud is especially large and is an easy identifier from native maples in the winter.

Current Distribution: Within Hillside Woods & Park, Norway maple has invaded stands 1, 3, and 4 most successfully. It has pushed into the edges of most stands, and now has begun to regenerate within the stands.

Why it has Become Established: The Norway maple reproduces quite freely and its large samaras travel easily over the wind both locally and to new areas. The seeds germinate quickly. It is a very hardy, fast- growing tree and is very tolerant of the harsh conditions of city dust, car exhaust and industrial smoke. Thus its place as a city shade tree has become well-known and it has been planted vigorously for over two hundred years. Today it is one of the most common street trees in Hastings-on-Hudson. It can occur on eroded hillsides and along broken sidewalks as its tolerance for nutrient-poor soil is great. It is also shade tolerant and thrives well in dark mature forest understories. Also it leafs out before most other species do and goes to leaf off later, prolonging its growing season considerably.

All of these factors have led up to the Norway maple easily escaping cultivation and spreading out into Hillside Woods & Park's edge habitats, disrupted habitats, and even mature forested areas. It quickly shades out other tree, shrub and herbaceous species and establishes itself as the primary canopy cover. Since its seedlings and saplings grow well in the shade of the bigger seed-source tree, it can form monotypic stands that perpetually expand.

[Image] Bark of a mature Norway maple.

[Image] Leaves of Norway maple. Norway maple trees create a very dense shade under their canopy.

[Image] Bark of a young Norway maple tree.

Threat: The greatest threat the Norway maple presents to Hillside Woods & Park is ultimately the domination of forest canopy and the subsequent loss of richness of native species, both in the canopy and understories. Because of its hardiness, ability to grow in a variety of soils, rapid growth, and copious seed production the Norway maple has spread into the forest of Hillside Woods & Park. In doing so, in many areas of the park (especially stand 1, 3 and 4) it has outcompeted native canopy species such as red oak (Quercus rubus), black oak (Quercus velutina), tulip tree (Liriodendron tulipifera), red maple (Acer rubrum) and the hickorys (Carya sp.). Because it creates large amounts of shade it has inhibited the growth of mid-layer species such as black birch (Betula lenta), flowering dogwood (Cornus florida), spicebush (Lindera benzoin) and black cherry (Prunus serotina).

Control Method: The control of the Norway is important to stop this invasive species from becoming any more dominant in the forest canopy and understory. Complete eradication seems unlikely in the very short term, but immediate control will at least slow its rapid spread and give Hillside Woods & Park a chance to recover while there are still other species present in the forest to help in such an effort. Methods of removing or halting the growth of the Norway maple vary and can be determined by the severity of the infestation, the type of environment they are found in (slope, aspect, open/closed canopy), and resources available.

Because Norway maples are already established in the area and have begun to compose some of the canopy, it is important that the large seed-source trees are killed first. Tree removal might be the best solution. When large trees are removed, however, it is very important that native plants are available to plant so sun-loving invasive vines do not take over the space beneath the newly opened canopy. Girdling large trees by cutting into the cambium layer around the trunk in a continuous ring is effective in killing them, typically within a couple of growing seasons. This also allows for more the forest structure to remain and prevents an immediate hole in the canopy. We recommend girdling for any trees greater than 12" that are not hazardous to hiking trails, houses, etc.

Herbicides are effective in speeding up the killing process by applying to both cut stumps and girdled trees. Tryclopyrs and glyphosate agents are readily available and effective. Basel bark treatments can also be used and have proven to be effective in killing large Norway maples by the Natural Resources Group of the New York City Parks Department. This method also keeps the dead tree in place.

Where only seedlings and saplings require removing, hand weeding may be the only process needed. A weed wrench, which is a long-handled device that grips a sapling at its base, uses leverage to pull Norway maples out of the ground with most of their roots intact. Small saplings can also be snipped using pruning loppers or machetes and followed by applying herbicide to the exposed stump.

Finally, a great thing the Village of Hastings-on-Hudson can do in this effort is to not plant Norway maples anywhere in the Village! Native alternatives are available that provide as much shade and aesthetic presence as the Norway maple. Some of these are: red maple (Acer rubrum), sweet gum (Liquidamber styraciflua), black gum (Nyssa sylvatica), and native oaks (Quercus sp).

[Image] (right)
A girdled tree will die and become habitat in the forest as it decomposes standing up. Do not girdle Norway maple trees within 100' of trails

DEER EXCLUSION FENCE - IMPLEMENTATION REQUIREMENTS AND SPECIFICATIONS

(adapted from Fencing Handbook For 10' Woven Wire Deer Exclusion Fence. Minnesota Department of Natural Resources Wildlife Damage Management Program)

Purpose: The recommended deer exclosure fence shall be a minimum of 8' in height to keep deer from jumping over, and shall be held tightly to the ground so that deer cannot push under. Our specification recommendeds a fence type that is approximately ten ft. in height comprised of pressure treated wooden post frame and structure supporting eight ft. (tensile) woven wire fence fabric, topped with two strands of smooth, high-tensile, wire.

Materials: A brief description of the key components follows. Posts used for such a fence should be pressure treated pine/cedar or other wood of equal life and strength. The posts are treated with CCA or ACZA chemical compounds. The wood posts should be new, sound, free of bark, and free from decay with all limbs trimmed substantially flush with the body. They should be substantially straight throughout their length. All post dimensions are based on the minimum diameter +/- .5 inch. Post sizes of 6" x 16‟, 5" x 16‟, and 4" x 14‟ are typically used for this type of fence. Brace Pins are used to assemble the structural elements used to build the corners and support the gates.These pins of various lengths are comprised of galvanized steel. Woven wire fabric used as the actual barrier is 12.5 ga., high tensile wire, class 3 galvanized. The woven wire is comprised of +/- 20 horizontal wires, assembled with vertical stay wires 12" apart to a height of 96 inches. This wire is referred to as 20/96/12 woven wire. Mechanical strainers are utilized to tighten the smooth wire when building the corner and gate brace assemblies. Donalds or Robertson style strainers are galvanized or zinc coated and feature a 1/2" square hub.The square hub allows for rapid winding with the tightening tool or a wrench. Smooth wire should be new, and meet the minimum criteria of 12.5 ga., class 3 galvanized, with a tensile strength of 170,000 psi. Avoid wire of higher tensile strength (it is difficult to use). Barbed staples that are a minimum 9ga., class 3 galvanized, 1- 3/4" long, are used to secure the wire to the wooden posts. Longer staples are acceptable but must be barbed. Tension springs are used to control the tension of the smooth wire used to finish off the top of the fence. These are galvanized, or zinc coated, 9", heavy duty springs. They should have compression marks to facilitate correct tension. Gates should be purchased prior to fence construction, if possible, so that you can determine the proper spacing for gate posts. Gates such as pasture gates, or equivalent, work nicely. These are tubular steel gates with two, 3⁄4" x 12" hinge bolts on each gate. Hinges are bolted to the gate, not welded. Two gates are stacked, bottom to bottom, to create a single gate panel. Gates made of stainless steel or galvanized frames, covered with woven wire, are also available from sources for woven wire. The woven wire fabric is spliced together using splicing sleeves for 12.5 ga. wire. Two sleeves are used for each splice of high tensile smooth wire and each strand of woven wire. A single long sleeve may be used if they allow sufficient space for two full crimps.

Construction Methods:

Setting Posts - The preferred method for setting posts is by using a mechanical post driver, or comparable equipment capable of vertically setting 6" (or 4") x 14' round posts to a depth of 4 feet. Posts may be set by auguring a 12" diameter hole to the appropriate depth, setting the post, and firmly hand tamping. Backfill with a suitable material such as crushed rock or gravel, with a maximum 2" crown around each post. All posts should be set vertically, with the larger diameter end set into the ground. Posts should be set plumb to the outside (wire side of the fence) and in straight lines.

Post Spacing - Corner, gate, and brace posts for "H" brace assemblies are set 15'9" on center, to accommodate the 16' length of the horizontal brace. Set the corner posts first. Once the corner posts are installed, attach a high-tensile wire, 3' above the ground, to one corner post and string it to the next corner post. This guide wire, tightened with a wire strainer, will form a straight line from which to align the vertical brace and line posts. Measure and mark the location of each post hole so that each lies on the inside edge of the guide wire. Vertical brace posts are positioned 15'9" from the edge of each corner or gate post, to accommodate the 16' horizontal brace post. All line posts are spaced 20' apart. Once the fence line is marked, the guide wire can be dropped to allow for drilling of the holes. After the postholes

are drilled, retighten the guide wire and begin installing posts. Install each post so that the outer face is next to the guide wire when plumb. Do not allow the posts to touch the guide wire, as this will cause all other posts to be out of alignment. Once the line posts are installed, the guide wire can be removed and laid to the side (do not discard as this wire will be used as a top wire later in the project). The brace assemblies can now be constructed.

Bracing Materials and Construction - Bracing is required at all corners, ends, gates, and pull assemblies in the fence. Brace assemblies use wood posts with a minimum top diameter of 6" and a minimum length of 16', that are set 72" into the ground as upright members.

• Corners are required at all points where the fence alignment changes 15 degrees or more. Three 6"x16' vertical posts and two 5" x16' horizontal braces are required for each corner.

• End bracing is required where the fence ends on each side of a gate opening. Two 6"x16' vertical posts and one 5"x16' horizontal brace are required for each end brace.

• Pull assemblies are required in straight sections of fence so that the maximum distance between corners and pull assemblies does not exceed 1,320 feet. Two 6"x16' vertical posts and one 5"x16' brace are required.

• Double braces should be used on each end for straight fence lines exceeding 1,000 feet. Double end braces require three 6"x16' posts and two 5"x 16' horizontal braces.

All brace assembly posts should be set into the ground to avoid displacement when tension is applied to the wires. Posts should be set in with the small, tapered end up. The bracing (horizontal) member will be a wooden post with a minimum diameter of 5" and a 16' length. The horizontal brace post is held in place with a 5" pin on one end and a 10" pin on the other end. The brace assembly is held together with a double loop of 12½ gauge high tensile wire and strainer.

Over uneven terrain, additional bracing may be required between corner, end, and brace assemblies. Wood posts with a minimum top diameter of 5" should be set at least 48" into the ground at all points where excessive upward or downward pull is encountered.

Woven Wire Installation - Woven wire should be installed and stretched according to the manufacturers recommendations. The woven wire should be held as tightly as possible to the ground.

With the use of a tractor or front end loader, the wire is unrolled along the length of the fence-line. It is temporarily tacked into place as it is unrolled. Each horizontal wire is then wrapped around the end post and back around itself with a minimum of three twists to securely fasten it. Once the wire is permanently tied off at the end of a "pull" (corner or gate assembly), it can be stretched, spliced, and permanently stapled to the line posts. Remember to set the staples loose enough to allow the woven wire to slide, as it will expand and contract throughout the seasons.

The woven wire is then mechanically stretched using bars and pullers designed for this purpose. Each side of the wire is fastened to a set of bars with pin wedges. The bars are connected with the pullers and then drawn to the desired tension. Once tensioned, the two ends of each horizontal wire are spliced together to form a continuous fabric and the stretched fabric is permanently stapled to the line posts.

Staples should be set to allow movement of the horizontal wires. The two top and two bottom horizontal wires should be stapled on each line post with an additional 6 staples used on the remaining wires in random alternating pattern, with a minimum of 10 staples on each line post. Splices may be accomplished by either lap splice or compression splice. If lap splices are used, the line wire ends are each twisted a minimum of four wraps around the corresponding wire and trimmed. If compression sleeves are used, a minimum of two sleeves per wire must be used. A single, long crimping sleeve that allows two mechanical crimps may be used. The end of each wire should be bent perpendicular to the horizontal wire and trimmed. Once the splice is complete and all posts stapled, the pullers can be removed followed by removal of the stretching bars.

Installing Top Wires - Once the woven wire has been stretched and fastened, the top wires are ready to be attached to the fence. These are spaced 6" apart, and 6" from the top of the woven wire. When stapling these wires to the line posts, be sure to staple them loose enough so that the wire can slide freely. These top wires are anchored at each gate post using a crimping sleeve. Tighteners (strainers) are installed on each section (pull) of these wires, to keep them from sagging. Indicator springs are installed in conjunction with the strainers, to measure the tension on the wire. Wires strung too tightly can cause maintenance issues by pulling corner posts inward. Therefore, these wires should be

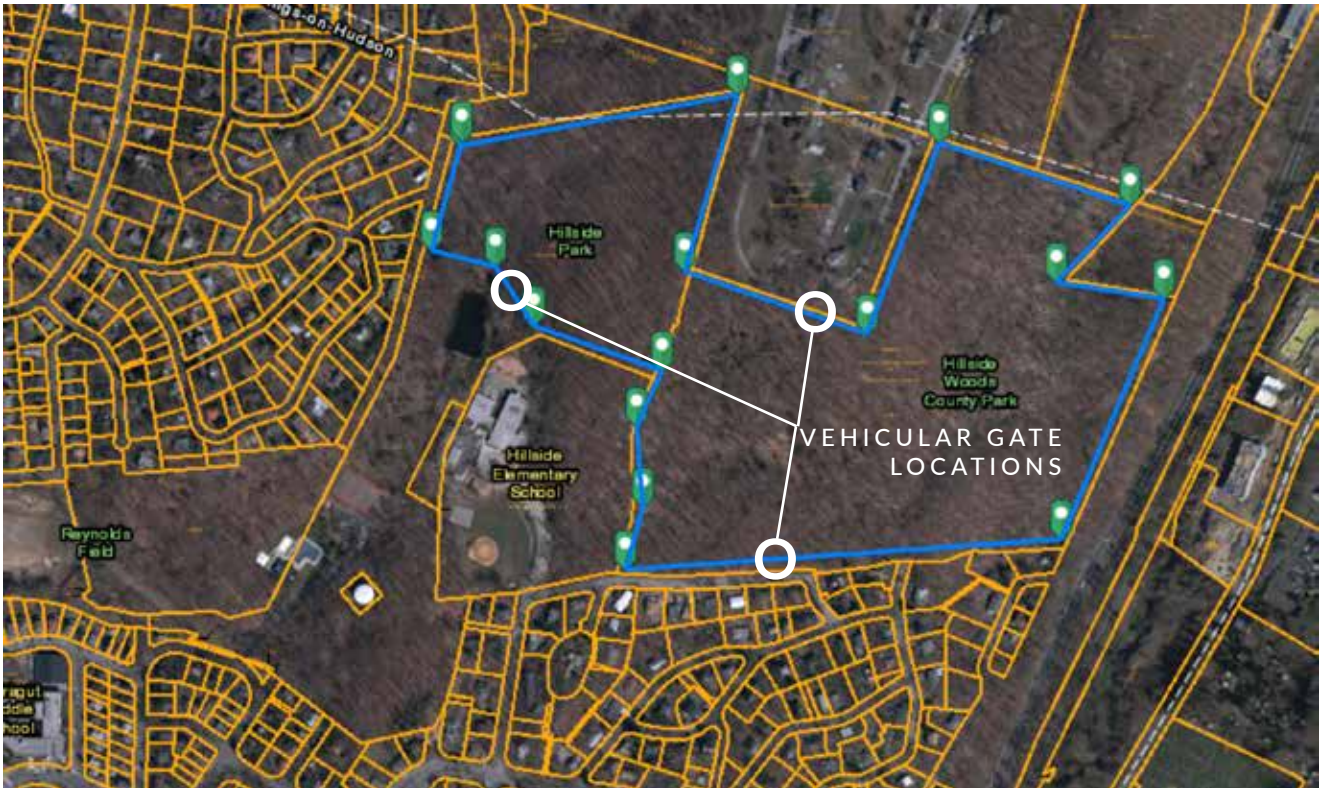
loosened in the fall when cold temperatures cause the wires to contract, and re-tightened again in the spring.

Gates - Gates are the final detail of an exclusion fence for deer. Cost effective gates can be made easily by using standard livestock gates available at most farm supply stores. Two of these gates can be set bottom to bottom and bolted together using a piece of conduit as a sleeve. For most applications, gates made of 1-3/4" tubing are sufficient. For applications requiring a heavier, stronger gate, 2" tube gates are available. Make sure the gates you buy have bolt through hinges. Some manufacturers use lag screws for lighter gates. These are less desirable since the lag screws are not as strong and adjustment becomes very difficult once the gates are installed. There are many other gate options that can be considered for higher costs. Gates shall be located at all trail intersections with the fenced area. Additionally there shall be a vehicular gate entrance at a minimum of 3 locations, one on Edgewood Drive, one from the Childrens Village (Dassern Drive), and one located east of sugar pond. These locations are shown in the map below.

Fence Maintenance - Fences should be thoroughly inspected at a minimum of twice annually, spring and fall. Examine the fence line for the purpose of identifying loose staples, heaving posts, and broken or damaged posts or wire, and make repairs as necessary. Tension on the top smooth wires should be adjusted each spring and fall. Tension should be lessened in the fall to prevent over-tightening, as cold winter temperatures cause the wire to contract. These smooth wires should be re-tightened in the spring to correct sagging caused by heat expansion. Gate openings should be inspected frequently to ensure that gates are not sagging, and that the gate posts are not leaning. This can create gaps under the gate opening large enough for a deer to squeeze through. It is recommended that vegetation along the fence line be mowed to eliminate cover that would allow deer to approach the fence without being seen.

Deer will also travel along fence line clearings and will take advantage of unsecured voids or access points.

Once the woven wire fence installation has been completed, only a few tools are required for routine maintenance. Either an 8” wire cutter, with recessed cutter, or a heavy duty 8” wire cutter with side cutter is necessary. Both are extremely durable and useful tools. An E- Z Pull crimping tool is a high quality, multi-purpose tool required for crimping splicing sleeves; its hooked end facilitates removal of staples. A strainer tightener handle, matching the style of strainer used on the fence, is necessary for adjusting the strainers.



[Image] (above)
Location of deer exclosure fence of Stand 4, Stand 3, and part of Stand 2.

PLANTING & ESTABLISHMENT - IMPLEMENTATION REQUIREMENTS AND SPEC'S

Site Preparation: Competing herbaceous vegetation and invasive shrubs/trees will be mechanically controlled using tiller, brush hog, mulching head, brush saws and/or chain saws. Native shrubs should be protected and retained whenever possible.

Fertilizers and Amendments: Natural fertility on the site is generally adequate. No fertilizer or lime is needed. If plants show lack of vigor in years after installation, soil tests should be conducted and nutrients added if needed (compost or other natural fertilizers are recommended).

Planting Method: Trees/Shrubs are to be planted into holes that are twice the width of the root ball. Plants are to be planted at same soil depth as in pot, no deeper. Planting Details are shown below:

Planting Description: A mix of native trees/shrubs tolerant of intermediate successional conditions. Planting rates and species to be planted in each stand are listed in the following section.

Tree Shelter Installation and Maintenance: Tree shelters, also known as tree protectors or tree tubes, protect young trees from wind, deer, rodents, and direct herbicide spray. They also provide a mini-greenhouse effect that stimulates rapid early tree growth which, after emergence above the shelter, slows to the same growth as without shelters. If trees are installed that are above 6' tall, tree shelters may be replaced with “spiral guards”, that will protect from damage and girdling from rodents. Spiral guards are not suitable for feathered trees, multi-stemmed shrubs or conifers, as they are only suitable for protecting a single, clear, 6'+ tall stem.

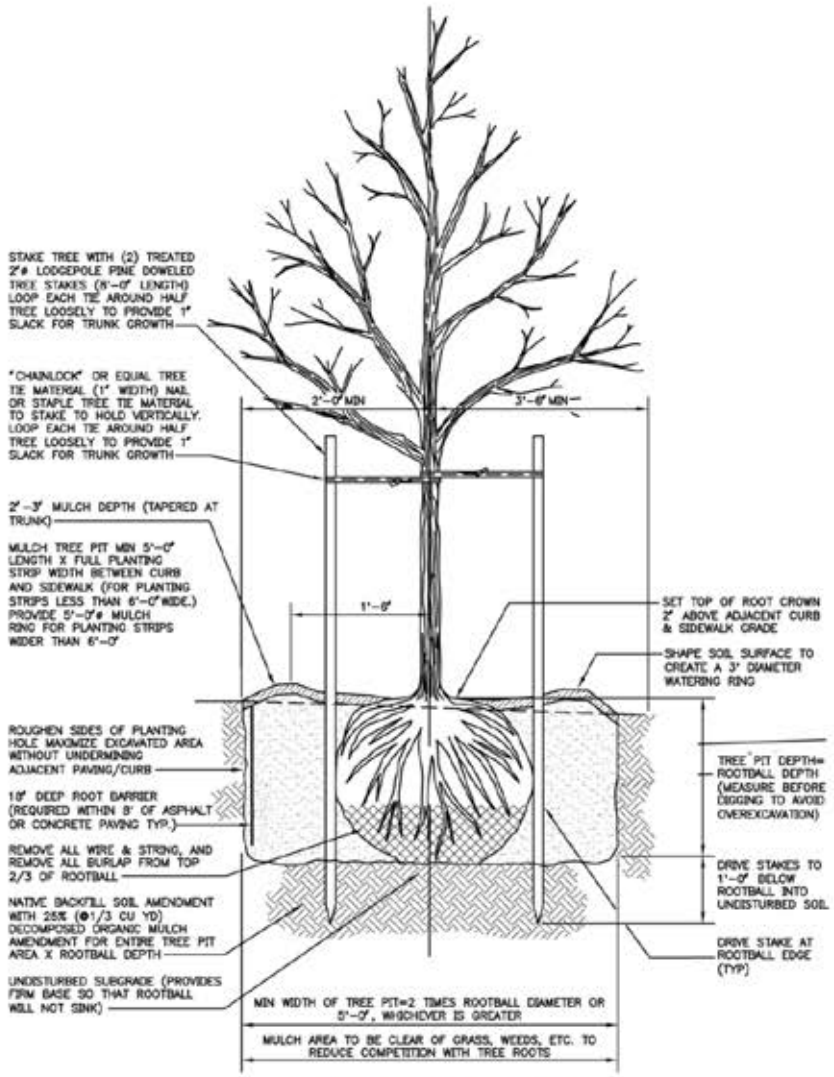
Most tree shelters are made of polyethylene or polypropylene with varying amounts of ultraviolet light (UV) protection and come in lengths from one to six feet. They are available as pre-formed cylinders, cylinders that ship flat, flat sheets that are folded into cylinders, or square tubes that ship flat. Tree tubes that are 6'+ should be used in order to protect trees from deer browse, as per instructions by manufacturer.

Tree shelters should be installed after seedlings have been planted. They are installed with a support stake. Drive the stake into the ground 2” to 3” from seedling, to a depth of 1’, ensuring that top of stake will be below top of tube, but 3” to 6” above the topmost tie position. Insert ties in appropriate holes on tube and tie loosely, or leave open, as instructed by manufacturer. Regular inspection and maintenance is needed for effective protection. Straighten tipped shelters. Replace broken stakes. Use fabric, mulches, mowing, or herbicides to control weeds around trees. Remove shelters and stakes when the tube begins restricting tree stem diameter growth.

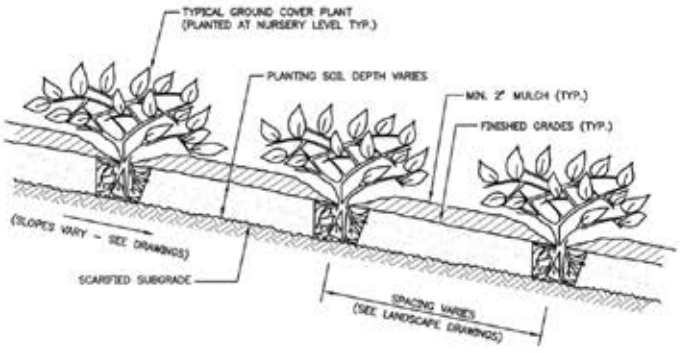
As an alternative to tree shelters (tubes) trees/shrubs can also be protected from browse by surrounding them with a small section of 6' welded wire fencing (approximately 8-10' in length, made into a cylinder). These sections of fence shall be anchored and supported using 6' t-posts. This method of protection works well with multistemmed trees/shrubs, and may be more appropriate for larger trees/shrubs.

Operations and Maintenance: Access by vehicles or equipment during or after tree/shrub establishment should be controlled to protect new plants and minimize erosion, compaction and other site impacts. The trees and shrubs will be inspected periodically and protected from adverse impacts including insects, diseases or competing vegetation, fire and damage from livestock or wildlife. If needed, competing vegetation should be controlled until the woody plants are established. Noxious weeds should be controlled. Replanting will be required when survival is inadequate (after three growing seasons there should be 70% survival overall without any gaps/voids that would impact the function of the planting. Supplemental water will be provided as needed).

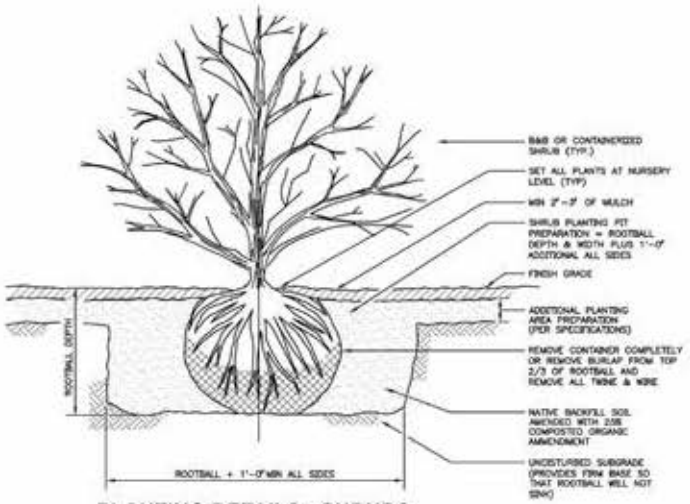
[Image] (right)
Tree shelter example.



PLANTING DETAILS - TREES



PLANTING DETAILS - PERENNIALS



PLANTING DETAILS - SHRUBS

STAND 1 PLANTING LISTS

This forest stand is the only stand that will not be enclosed in a deer fence at all. For this reason, only trees and shrubs are to be planted because any herbaceous plants would be eaten by deer. All plantings in this stand shall be protected by tree tubes or fences pursuant to the above section ***Tree Shelter Installation and Maintenance***.

Below are lists of trees/shrubs to be planted in different conditions that exist in the stand. There are several lists:

Tree Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, especially where invasive plants have been removed. The goal of these plantings is to re-create the canopy that has been lost in the forest, and create shade conditions that invasive plants do not prefer.

Tree Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These trees are intermediate to shade tolerant plants, and will grow into the understory, ultimately replacing canopy trees in the forest as the older trees die, fail, or succomb to pests/diesease/storms.

Shrub Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, especially where invasive plants have been removed. The goal of these plantings is to add a native shrub layer that can grow beyond deer browse height, and form a diverse layer of shrubs that can replace the invasive plants in the understory.

Shrub Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These shrubs are intermediate to shade tolerant plants, and will grow into the understory, replacing the invasive shrub layer in the forest after they've been removed.

Tree Planting Rates and Species - Stand 1, Moderate to Full Sun Conditions		
Species	Size	Number
Acer rubrum (red maple)	8"-24" Bare Root Stock	5
Betula lenta (black birch)	8"-24" Bare Root Stock	15
Carya cordiformis (bitternut hickory)	8"-24" Bare Root Stock	5
Carya glabra (pignut hickory)	8"-24" Bare Root Stock	5
Carya ovata (shagbark hickory)	8"-24" Bare Root Stock	10
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	10
Liriodendron tulipifera (tulip tree)	8"-24" Bare Root Stock	5
Populus tremuloides (quaking aspen)	8"-24" Bare Root Stock	10
Prunus serotina (black cherry)	8"-24" Bare Root Stock	15
Quercus alba (white oak)	8"-24" Bare Root Stock	10
Quercus prinus (chestnut oak)	8"-24" Bare Root Stock	5
Quercus rubra (red oak)	8"-24" Bare Root Stock	10
Quercus velutina (black oak)	8"-24" Bare Root Stock	10
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	10

Tree Planting Rates and Species - Stand 1, Shade and Part Shade Conditions		
Species	Size	Number
Acer saccharum (sugar maple)	8"-24" Bare Root Stock	10
Carpinus caroliniana (musclewood)	8"-24" Bare Root Stock	10
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	10
Ostrya virginiana (hophornbeam)	8"-24" Bare Root Stock	15
Quercus alba (white oak)	8"-24" Bare Root Stock	5
Quercus prinus (chestnut oak)	8"-24" Bare Root Stock	5
Quercus rubra (red oak)	8"-24" Bare Root Stock	5
Quercus velutina (black oak)	8"-24" Bare Root Stock	5
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	10

Shrub Planting Rates and Species - Stand 1, Moderate to Full Sun Conditions		
Species	Size	Number
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	15
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	15
Viburnum dentatum (arrowwood viburnum)	8"-24" Bare Root Stock	10
Viburnum prunifolium (blackhaw viburnum)	8"-24" Bare Root Stock	10

Shrub Planting Rates and Species - Stand 1, Shade to Part Shade Conditions		
Species	Size	Number
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	10
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	10

STAND 2 PLANTING LISTS

This forest stand includes a section of forest that will not be enclosed in a deer fence, and a larger section that will be fenced. In the unfenced area, similarly to in stand 1, only trees and shrubs are to be planted because any herbaceous plants would be eaten by deer. These plantings shall be protected by tree tubes or fences pursuant to the above section ***Tree Shelter Installation and Maintenance***. In the remainder of the stand, where fencing will be accomplished, a more diverse plant pallete that includes wildflowers and ferns will be planted. Below are lists of trees/shrubs/herbaceous plants to be planted in different conditions that exist in the stand. There are several lists:

Tree Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, mainly where invasive plants have been removed to the south of sugar pond. The goal of these plantings is to re-create the canopy that has been lost in the forest, and create shade conditions that invasive plants do not prefer.

Tree Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the remainder of the stand. These trees are intermediate to shade tolerant plants, and will grow into the understory, ultimately replacing canopy trees in the forest as the older trees die, fail, or succomb to pests/diesease/storms.

Shrub Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, especially where invasive plants have been removed. The goal of these plantings is to add a native shrub layer that can grow beyond deer browse height, and form a diverse layer of shrubs that can replace the invasive plants in the understory.

Shrub Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These shrubs are intermediate to shade tolerant plants, and will grow into the understory, replacing the invasive shrub layer in the forest after they've been removed.

Forb (Wildflower) Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These wildflowers are shade tolerant forest plants, many of which are spring ephemerals. These forbs will replace lost diversity in the forest, and re-create a healthy herbaceous layer in the forest stand.

Fern Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These ferns are shade tolerant forest plants, which grow in the same conditions as the wildflowers mentioned above. These ferns will replace lost diversity in the forest, and re-create a healthy herbaceous layer in the forest stand.

Tree Planting Rates and Species - Stand 2, Moderate to Full Sun Condition		
Species	Size	Number
Acer rubrum (red maple)	8"-24" Bare Root Stock	10
Betula lenta (black birch)	8"-24" Bare Root Stock	10
Carya ovata (shagbark hickory)	8"-24" Bare Root Stock	10
Carya tomentosa (mockernut hickory)	8"-24" Bare Root Stock	5
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	10
Prunus serotina (black cherry)	8"-24" Bare Root Stock	10
Quercus alba (white oak)	8"-24" Bare Root Stock	10
Quercus rubra (red oak)	8"-24" Bare Root Stock	10
Quercus velutina (black oak)	8"-24" Bare Root Stock	10
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	15

Fern Planting Rates and Species - Stand 2, Shade to Part Shade Conditions		
Species	Size	Number
Athyrium filix-femina (lady fern)	50 Cell Tray, Deep (LP50, DP50)	20
Polystichum acrostichoides (Christmas fern)	50 Cell Tray, Deep (LP50, DP50)	30
Thelypteris noveboracensis (New York beech fern)	50 Cell Tray, Deep (LP50, DP50)	30

Shrub Planting Rates and Species - Stand 2, Moderate to Full Sun Conditions		
Species	Size	Number
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	35
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	50
Viburnum dentatum (arrowwood viburnum)	8"-24" Bare Root Stock	20
Viburnum prunifolium (blackhaw viburnum)	8"-24" Bare Root Stock	20

Shrub Planting Rates and Species - Stand 2, Shade to Part Shade Conditions		
Species	Size	Number
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	20
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	20
Mitchella repens (partridgeberry)	8"-24" Bare Root Stock	15
Viburnum acerifolium (maple-leaf viburnum)	8"-24" Bare Root Stock	20

Forb (Wildflower) Planting Rates and Species - Stand 2, Shade to Part Shade Conditions		
Species	Size	Number
Aralia nudicaulis (wild sarsaparilla)	50 Cell Tray, Deep (LP50, DP50)	25
Arisaema triphyllum (Jack-in-the-pulpit)	50 Cell Tray, Deep (LP50, DP50)	30
Asarum canadense (wild ginger)	50 Cell Tray, Deep (LP50, DP50)	50
Aster cordifolius (heart-leaved aster)	50 Cell Tray, Deep (LP50, DP50)	100
Aster divaricatus (white wood aster)	50 Cell Tray, Deep (LP50, DP50)	100
Dicentra cucullaria (Dutchman's breeches)	50 Cell Tray, Deep (LP50, DP50)	25
Erythronium americanum (trout lily)	50 Cell Tray, Deep (LP50, DP50)	50
Eupatorium rugosum (white snake root)	50 Cell Tray, Deep (LP50, DP50)	30
Geum canadense (white avens)	50 Cell Tray, Deep (LP50, DP50)	30
Helianthus divaricatus (woodland sunflower)	50 Cell Tray, Deep (LP50, DP50)	50
Oenothera biennis (common evening primrose)	50 Cell Tray, Deep (LP50, DP50)	30
Panax trifolius (dwarf ginseng)	50 Cell Tray, Deep (LP50, DP50)	20
Polygonatum biflorum (true Solomon's seal)	50 Cell Tray, Deep (LP50, DP50)	50
Sanguinaria canadensis (bloodroot)	50 Cell Tray, Deep (LP50, DP50)	50
Smilacina racemosa (false Solomon's seal)	50 Cell Tray, Deep (LP50, DP50)	50

Tree Planting Rates and Species - Stand 2, Shade and Part Shade Conditions		
Species	Size	Number
Acer saccharum (sugar maple)	8"-24" Bare Root Stock	20
Carpinus caroliniana (musclewood)	8"-24" Bare Root Stock	20
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	10
Ostrya virginiana (hophornbeam)	8"-24" Bare Root Stock	20
Quercus alba (white oak)	8"-24" Bare Root Stock	10
Quercus velutina (black oak)	8"-24" Bare Root Stock	10
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	15

STAND 3 PLANTING LISTS

This forest stand will be completely enclosed in a deer fence and plantings include a diverse plant pallete that consists of trees, shrubs, wildflowers, and ferns because there will be no deer browse issues. This stand has a severe invasive plant issue, and the intention of these plantings is to replace invasives that have been removed in several openings with native plants (these openings are referred to as the "thicket" to locals of Hastings-on-Hudson). Below are lists of trees/shrubs/herbaceous plants to be planted in different conditions that exist in the stand. There are several lists:

Tree Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, mainly where invasive plants have been removed in the "thicket" area. The goal of these plantings is to re-create the canopy that has been lost in these areas, and create shade conditions that invasive plants do not prefer. These are more early-successional plants that will grow quickly to fill in the canopy.

Tree Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand, in openings and in shadier conditions. These trees are intermediate to shade tolerant plants, and will grow into the understory, and then ultimately replace canopy trees in the forest as the older trees die, fail, or succomb to pests/diesease/storms.

Shrub Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, especially where invasive plants have been removed. The goal of these plantings is to add a native shrub layer that can form a diverse layer of shrubs that can replace the invasive plants in the understory.

Shrub Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These shrubs are intermediate to shade tolerant plants, and will grow into the understory, replacing the invasive shrub layer in the forest after they've been removed.

Forb (Wildflower) Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in the open areas, where invasive plants have been removed in the "thicket" area. The goal of these plantings is to create a forested-meadow condition that will in a number of years grow shadier and shadier as trees/shrub plantings mature.

Forb (Wildflower) Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand, mainly in forested areas. These wildflowers are shade tolerant forest plants, many of which are spring ephemerals. These forbs will replace lost diversity in the forest, and re-create a healthy herbaceous layer in the forest stand.

Fern Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These ferns are shade tolerant forest plants, which grow in the same conditions as the wildflowers mentioned above. These ferns will replace lost diversity in the forest, and re-create a healthy herbaceous layer in the forest stand.

Tree Planting Rates and Species - Stand 3, Moderate to Full Sun Condition		
Species	Size	Number
Acer rubrum (red maple)	8"-24" Bare Root Stock	35
Acer saccharum (sugar maple)	8"-24" Bare Root Stock	20
Betula lenta (black birch)	8"-24" Bare Root Stock	50
Carpinus caroliniana (musclewood)	8"-24" Bare Root Stock	25
Carya cordiformis (bitternut hickory)	8"-24" Bare Root Stock	20
Carya glabra (pignut hickory)	8"-24" Bare Root Stock	20
Carya tomentosa (mockernut hickory)	8"-24" Bare Root Stock	20
Carya ovata (shagbark hickory)	8"-24" Bare Root Stock	20
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	20
Liriodendron tulipifera (tulip tree)	8"-24" Bare Root Stock	10
Populus tremuloides (quaking aspen)	8"-24" Bare Root Stock	15

Tree Planting Rates and Species - Stand 3, Moderate to Full Sun Condition		
Prunus serotina (black cherry)	8"-24" Bare Root Stock	35
Quercus alba (white oak)	8"-24" Bare Root Stock	20
Quercus prinus (chestnut oak)	8"-24" Bare Root Stock	20
Quercus rubra (red oak)	8"-24" Bare Root Stock	20
Quercus velutina (black oak)	8"-24" Bare Root Stock	20
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	35

Tree Planting Rates and Species - Stand 3, Shade and Part Shade Conditions		
Species	Size	Number
Carpinus caroliniana (musclewood)	8"-24" Bare Root Stock	25
Carya ovata (shagbark hickory)	8"-24" Bare Root Stock	20
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	15
Ostrya virginiana (hophornbeam)	8"-24" Bare Root Stock	25
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	25

Shrub Planting Rates and Species - Stand 3, Moderate to Full Sun Conditions		
Species	Size	Number
Aronia arbutifolia (red chokeberry)	8"-24" Bare Root Stock	20
Clethra alnifolia (sweet pepperbush)	8"-24" Bare Root Stock	10
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	30
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	40
Rubus occidentalis (black raspberry)	8"-24" Bare Root Stock	20
Vaccinium corymbosum (highbush blueberry)	8"-24" Bare Root Stock	25
Vaccinium pallidum (hillside blueberry)	8"-24" Bare Root Stock	25
Viburnum acerifolium (maple-leaf viburnum)	8"-24" Bare Root Stock	15
Viburnum dentatum (arrowwood viburnum)	8"-24" Bare Root Stock	25
Viburnum prunifolium (blackhaw viburnum)	8"-24" Bare Root Stock	25

Shrub Planting Rates and Species - Stand 3, Shade to Part Shade Conditions		
Species	Size	Number
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	10
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	20
Mitchella repens (partridgeberry)	8"-24" Bare Root Stock	20
Viburnum acerifolium (maple-leaf viburnum)	8"-24" Bare Root Stock	20

Fern Planting Rates and Species - Stand 3, Shade to Part Shade Conditions		
Species	Size	Number
Athyrium filix-femina (lady fern)	50 Cell Tray, Deep (LP50, DP50)	30
Polystichum acrostichoides (Christmas fern)	50 Cell Tray, Deep (LP50, DP50)	30
Thelypteris noveboracensis (New York beech fern)	50 Cell Tray, Deep (LP50, DP50)	30

Forb (Wildflower) Planting Rates and Species - Stand 3, Moderate to Full Sun Conditions		
Species	Size	Number
Antennaria sp. (pussytoes)	50 Cell Tray, Deep (LP50, DP50)	10
Apocynum cannabinum (Indian hemp dogbane)	50 Cell Tray, Deep (LP50, DP50)	25
Aster cordifolius (heart-leaved aster)	50 Cell Tray, Deep (LP50, DP50)	25
Aster divaricatus (white wood aster)	50 Cell Tray, Deep (LP50, DP50)	25
Dianthus armeria (Deptford pink)	50 Cell Tray, Deep (LP50, DP50)	10
Eupatorium rugosum (white snake root)	50 Cell Tray, Deep (LP50, DP50)	20
Euthamia graminifolia (grass-leaved goldenrod)	50 Cell Tray, Deep (LP50, DP50)	20
Geum canadense (white avens)	50 Cell Tray, Deep (LP50, DP50)	25
Helianthus decapetalus (thin-leaved sunflower)	50 Cell Tray, Deep (LP50, DP50)	15
Helianthus divaricatus (woodland sunflower)	50 Cell Tray, Deep (LP50, DP50)	30
Scutellaria lateriflora (maddog skullcap)	50 Cell Tray, Deep (LP50, DP50)	20
Silene caroliniana (wild pink)	50 Cell Tray, Deep (LP50, DP50)	15
Solidago bicolor (silverrod goldenrod)	50 Cell Tray, Deep (LP50, DP50)	20
Solidago caesia (blue-stemmed goldenrod)	50 Cell Tray, Deep (LP50, DP50)	20
Solidago juncea (early goldenrod)	50 Cell Tray, Deep (LP50, DP50)	20
Solidago odora (sweet goldenrod)	50 Cell Tray, Deep (LP50, DP50)	20
Solidago rugosa (rough-stemmed goldenrod)	50 Cell Tray, Deep (LP50, DP50)	20
Thalictrum dioicum (early meadow rue)	50 Cell Tray, Deep (LP50, DP50)	30
Verbena urticifolia (white vervain)	50 Cell Tray, Deep (LP50, DP50)	15

Forb (Wildflower) Planting Rates and Species - Stand 3, Shade to Part Shade Conditions		
Species	Size	Number
Aralia nudicaulis (wild sarsaparilla)	50 Cell Tray, Deep (LP50, DP50)	20
Arisaema triphyllum (Jack-in-the-pulpit)	50 Cell Tray, Deep (LP50, DP50)	20
Asarum canadense (wild ginger)	50 Cell Tray, Deep (LP50, DP50)	30
Aster cordifolius (heart-leaved aster)	50 Cell Tray, Deep (LP50, DP50)	30
Aster divaricatus (white wood aster)	50 Cell Tray, Deep (LP50, DP50)	30
Dicentra cucullaria (Dutchman's breeches)	50 Cell Tray, Deep (LP50, DP50)	25
Erythronium americanum (trout lily)	50 Cell Tray, Deep (LP50, DP50)	30
Eupatorium rugosum (white snake root)	50 Cell Tray, Deep (LP50, DP50)	20
Geum canadense (white avens)	50 Cell Tray, Deep (LP50, DP50)	20
Helianthus divaricatus (woodland sunflower)	50 Cell Tray, Deep (LP50, DP50)	35
Oenothera biennis (common evening primrose)	50 Cell Tray, Deep (LP50, DP50)	25
Panax trifolius (dwarf ginseng)	50 Cell Tray, Deep (LP50, DP50)	10
Polygonatum biflorum (true Solomon's seal)	50 Cell Tray, Deep (LP50, DP50)	30
Sanguinaria canadensis (bloodroot)	50 Cell Tray, Deep (LP50, DP50)	30
Smilacina racemosa (false Solomon's seal)	50 Cell Tray, Deep (LP50, DP50)	30

STAND 4 PLANTING LISTS

This forest stand will be completely enclosed in a deer fence and plantings include a diverse plant pallete that consists of trees, shrubs, wildflowers, and ferns because there will be no deer browse issues. This stand has less invasive shrubs than other stands, but does have issues with invasive trees, mainly Norway maple. Along the forest border with the Children's Village this problem is most severe, and it is our expectation that removal of invasive trees here will create an open-forest condidtion that should be densely planted with Moderate to Full Sun adapted trees and shrubs. Below are lists of trees/shrubs/herbaceous plants to be planted in this area, as well as the various other conditions that exist in the stand. There are several lists:

Tree Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, mainly where invasive plants have been removed to the east of the Children's Village. The goal of these plantings is to re-create the canopy that has been lost to invasive trees in these areas, and create shade conditions that invasive plants do not prefer. These are more early-successional plants that will grow quickly to fill in the canopy.

Tree Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand, in openings and in shadier conditions. These trees are intermediate to shade tolerant plants, and will grow into the understory, and then ultimately replace fast growing canopy trees in the forest as these trees die, fail, or succomb to pests/diesease/storms.

Shrub Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in open areas, especially where invasive plants have been removed. The goal of these plantings is to add a native shrub layer that can form a diverse layer of shrubs that can replace the invasive plants in the understory.

Shrub Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These shrubs are intermediate to shade tolerant plants, and will grow into the understory, replacing the invasive shrub layer in the forest after they've been removed.

Forb (Wildflower) Plantings in Moderate to Full Sun Conditions - these plantings are to be accomplished in the open areas, where invasive plants have been removed. The goal of these plantings is to create a forested-meadow condition that will in a number of years grow shadier and shadier as sun tolerant trees/shrub plantings mature.

Forb (Wildflower) Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand, mainly in closed-canopy forested areas. These wildflowers are shade tolerant forest plants, many of which are spring ephemerals. These forbs will replace lost diversity in the forest, and re-create a healthy herbaceous layer in the forest stand.

Fern Plantings in Shade to Part Shade Conditions - these plantings are to be evenly distributed throughout the stand. These ferns are shade tolerant forest plants, which grow in the same conditions as the wildflowers mentioned above. These ferns will replace lost diversity in the forest, and re-create a healthy herbaceous layer in the forest stand.

Tree Planting Rates and Species - Stand 4, Moderate to Full Sun Condition		
Species	Size	Number
Acer rubrum (red maple)	8"-24" Bare Root Stock	10
Acer saccharum (sugar maple)	8"-24" Bare Root Stock	10
Betula lenta (black birch)	8"-24" Bare Root Stock	25
Carya cordiformis (bitternut hickory)	8"-24" Bare Root Stock	10
Carya glabra (pignut hickory)	8"-24" Bare Root Stock	10
Carya tomentosa (mockernut hickory)	8"-24" Bare Root Stock	10
Carya ovata (shagbark hickory)	8"-24" Bare Root Stock	15
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	15
Liriodendron tulipifera (tulip tree)	8"-24" Bare Root Stock	15
Prunus serotina (black cherry)	8"-24" Bare Root Stock	15
Quercus alba (white oak)	8"-24" Bare Root Stock	10
Quercus prinus (chestnut oak)	8"-24" Bare Root Stock	5
Quercus rubra (red oak)	8"-24" Bare Root Stock	10
Quercus velutina (black oak)	8"-24" Bare Root Stock	10
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	15

Tree Planting Rates and Species - Stand 4, Shade and Part Shade Conditions		
Species	Size	Number
Acer rubrum (red maple)	8"-24" Bare Root Stock	10
Acer saccharum (sugar maple)	8"-24" Bare Root Stock	10
Carpinus caroliniana (musclewood)	8"-24" Bare Root Stock	15
Carya cordiformis (bitternut hickory)	8"-24" Bare Root Stock	10
Carya glabra (pignut hickory)	8"-24" Bare Root Stock	10
Carya tomentosa (mockernut hickory)	8"-24" Bare Root Stock	10
Carya ovata (shagbark hickory)	8"-24" Bare Root Stock	10
Cornus florida (flowering dogwood)	8"-24" Bare Root Stock	20
Ostrya virginiana (hophornbeam)	8"-24" Bare Root Stock	15
Quercus alba (white oak)	8"-24" Bare Root Stock	10
Quercus rubra (red oak)	8"-24" Bare Root Stock	10
Quercus velutina (black oak)	8"-24" Bare Root Stock	10
Sassafras albidum (sassafras)	8"-24" Bare Root Stock	10

Forb (Wildflower) Planting Rates and Species - Stand 4, Moderate to Full Sun Conditions		
Species	Size	Number
Antennaria sp. (pussytoes)	50 Cell Tray, Deep (LP50, DP50)	20
Aster cordifolius (heart-leaved aster)	50 Cell Tray, Deep (LP50, DP50)	50
Aster divaricatus (white wood aster)	50 Cell Tray, Deep (LP50, DP50)	50
Dianthus armeria (Deptford pink)	50 Cell Tray, Deep (LP50, DP50)	10
Eupatorium rugosum (white snake root)	50 Cell Tray, Deep (LP50, DP50)	20
Euthamia graminifolia (grass-leaved goldenrod)	50 Cell Tray, Deep (LP50, DP50)	15
Geum canadense (white avens)	50 Cell Tray, Deep (LP50, DP50)	15
Helianthus decapetalus (thin-leaved sunflower)	50 Cell Tray, Deep (LP50, DP50)	15
Helianthus divaricatus (woodland sunflower)	50 Cell Tray, Deep (LP50, DP50)	25
Scutellaria lateriflora (maddog skullcap)	50 Cell Tray, Deep (LP50, DP50)	25
Silene caroliniana (wild pink)	50 Cell Tray, Deep (LP50, DP50)	10
Solidago bicolor (silverrod goldenrod)	50 Cell Tray, Deep (LP50, DP50)	15
Solidago caesia (blue-stemmed goldenrod)	50 Cell Tray, Deep (LP50, DP50)	15
Solidago juncea (early goldenrod)	50 Cell Tray, Deep (LP50, DP50)	15
Solidago odora (sweet goldenrod)	50 Cell Tray, Deep (LP50, DP50)	15
Solidago rugosa (rough-stemmed goldenrod)	50 Cell Tray, Deep (LP50, DP50)	15
Thalictrum dioicum (early meadow rue)	50 Cell Tray, Deep (LP50, DP50)	15
Verbena urticifolia (white vervain)	50 Cell Tray, Deep (LP50, DP50)	15

Shrub Planting Rates and Species - Stand 4, Moderate to Full Sun Conditions		
Species	Size	Number
Aronia arbutifolia (red chokeberry)	8"-24" Bare Root Stock	10
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	15
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	20
Vaccinium corymbosum (highbush blueberry)	8"-24" Bare Root Stock	10
Vaccinium pallidum (hillside blueberry)	8"-24" Bare Root Stock	10
Viburnum acerifolium (maple-leaf viburnum)	8"-24" Bare Root Stock	15
Viburnum dentatum (arrowwood viburnum)	8"-24" Bare Root Stock	10
Viburnum prunifolium (blackhaw viburnum)	8"-24" Bare Root Stock	10

Shrub Planting Rates and Species - Stand 4, Shade to Part Shade Conditions		
Species	Size	Number
Hamamelis virginiana (witch-hazel)	8"-24" Bare Root Stock	25
Lindera benzoin (spicebush)	8"-24" Bare Root Stock	25
Mitchella repens (partridgeberry)	8"-24" Bare Root Stock	25
Viburnum acerifolium (maple-leaf viburnum)	8"-24" Bare Root Stock	25

Forb (Wildflower) Planting Rates and Species - Stand 4, Shade to Part Shade Conditions		
Species	Size	Number
Aralia nudicaulis (wild sarsaparilla)	50 Cell Tray, Deep (LP50, DP50)	20
Arisaema triphyllum (Jack-in-the-pulpit)	50 Cell Tray, Deep (LP50, DP50)	50
Asarum canadense (wild ginger)	50 Cell Tray, Deep (LP50, DP50)	50
Aster cordifolius (heart-leaved aster)	50 Cell Tray, Deep (LP50, DP50)	25
Aster divaricatus (white wood aster)	50 Cell Tray, Deep (LP50, DP50)	25
Dicentra cucullaria (Dutchman's breeches)	50 Cell Tray, Deep (LP50, DP50)	35
Erythronium americanum (trout lily)	50 Cell Tray, Deep (LP50, DP50)	35
Eupatorium rugosum (white snake root)	50 Cell Tray, Deep (LP50, DP50)	20
Geum canadense (white avens)	50 Cell Tray, Deep (LP50, DP50)	15
Helianthus divaricatus (woodland sunflower)	50 Cell Tray, Deep (LP50, DP50)	40
Oenothera biennis (common evening primrose)	50 Cell Tray, Deep (LP50, DP50)	25
Panax trifolius (dwarf ginseng)	50 Cell Tray, Deep (LP50, DP50)	15
Polygonatum biflorum (true Solomon's seal)	50 Cell Tray, Deep (LP50, DP50)	30
Sanguinaria canadensis (bloodroot)	50 Cell Tray, Deep (LP50, DP50)	30
Smilacina racemosa (false Solomon's seal)	50 Cell Tray, Deep (LP50, DP50)	30

Fern Planting Rates and Species - Stand 4, Shade to Part Shade Conditions		
Species	Size	Number
Athyrium filix-femina (lady fern)		30
Polystichum acrostichoides (Christmas fern)		30
Thelypteris noveboracensis (New York beech fern)		30

MULCHING (TREE AND SHRUB) - IMPLEMENTATION REQUIREMENTS AND SPECIFICATIONS

This practice supports the purposes of conserving soil moisture, reducing energy use associated with irrigation, providing erosion control, facilitating the establishment of vegetative cover for plantings from tree/shrub establishment, and improving soil health

Operation: Prior to mulching, the soil surface will be prepared in order to achieve the desired purpose (see Tree/Shrub Site Preparation). Mulching should be done with wood products such as wood chips, bark, or shavings or other wood materials. Apply a minimum 2-inch thickness comprised of particles that remain in place during heavy rainfall and/or strong wind events.

Maintenance: Mulched areas will be periodically inspected, and mulch will be reinstalled or repaired as needed to accomplish the intended purpose. Reapply when mulch has decomposed and is no longer serving desired purpose. Invasive Brush Management - Implementation Requirements and Specifications This will be expanded upon greatly with a invasive plant protocol, lists, tree/brush/vine management, Nature Cons. WISP docs

Renovation Method: Competing invasive shrubs/trees will be mechanically controlled using brush hog, mulching head, brush saws and/or chain saws. Cut brush and branches should be left in small piles to create nesting habitat for bees and other wildlife.

Operation: Success of the practice should be determined by evaluating post-treatment regrowth of target species after sufficient time has passed to monitor the situation and gather reliable data. Length of evaluation periods will depend on the woody species being monitored, proximity of propagules (seeds, branches, and roots) to the site, transport mode of seeds (wind or animals) and methods and materials used.

Maintenance: Following initial application, some regrowth, resprouting, or reoccurrence of brush may be expected. Spot treatment of individual plants or areas needing re-treatment should be completed as needed while woody vegetation is small and most vulnerable to desired treatment procedures.

[Image] (right)
Natural shredded hardwood mulch should be used on plantings.

WILDLIFE BRUSH PILE (SMALL) - IMPLEMENTATION REQUIREMENTS AND SPECIFICATIONS

Site Preparation: Slash and brush created from Norway maple and other invasive plant management should be piled to improve wildlife habitat within the forest, as well as improve the forest aesthetics. All invasive plants from Brush Management should be cleared from the site of the brush pile base, and roots of invasives grubbed out.

Installation Method: Materials used in brush piles will depend largely on what is available. For the most part dead brush from Invasive Brush Management can produce the majority of brush for the brush piles. Oak and other hardwoods which are rot resistant make durable bases, if these resources are available. Other suitable materials include uprooted stumps and cull logs. The largest material should form the base and layers of smaller limbs and branches should be added as filler.

Installation Description: When properly constructed and located, brush piles can benefit many species of wildlife, including bobwhite quail, cottontail rabbits, ruffed grouse, wild turkeys, skunks, raccoons, opossums, woodchucks, chipmunks, and many birds including white-throated sparrows and juncos. Predators such as foxes, bobcats, hawks, owls and coyotes benefit from the small mammal and bird populations found in or around brush piles. Grasses, forbs and vines, which are highly valuable to wildlife, will grow up through brush piles and add density and permanence to the piles.

Operations and Maintenance: Inspect brush piles semi-annually & after major storms to see if the piles have decayed or been damaged. If needed, construct a new pile, or add additional logs, branches & limbs to original pile to maintain original diameter & height.

[Image] (right)
Brush pile for wildlife

Recommendations - General Urban Forestry Administrative

ARBORIST STAFFING AND VILLAGE BOARD, INVENTORY AND PLAN REVIEW

Create a position for someone with proper education in arboriculture/silviculture to bring modern forestry techniques to the management of the urban forests in Hastings-on-Hudson. Routine maintenance of urban forest databases of information will allow the Village to monitor the changing condition of the urban forest, and to make adjustments to ensure that steady progress with our goals for the urban forest.

Charge the Hastings-on-Hudson Conservation Commission and Tree Board to have more involvement with urban forestry projects on all public land, including parks and street trees. An updated mandate will lend support and input to decisions taking place throughout the Village.

Appoint a part or full-time, certified Village Arborist

Successful stewardship of a thriving urban forest requires the in-house expertise of a certified arborist who has clearly defined responsibility at the Department of Parks and Recreation for overseeing the urban forest (planning, training and supervision, scheduling, developing further Department of Parks and Recreation protocols, etc.). This person could be a new hire, or someone currently working for the Department who can be trained and certified as an ISA Certified Arborist and take on new responsibilities in their role.

- The Arborist will work with a Department of Parks and Recreation crew specifically trained to provide the necessary workforce to improve the trees of Hastings-on-Hudson.
- Provide training opportunities to ensure that the arborist stays current regarding the BMPs of the urban forest and other green infrastructure.
- Coordinate tree planting and tree care performed by the staff of the Department of Parks and Recreation, or by consultants.

Update the tree inventory and maintain an up-to-date database:

- Develop a process for regularly sharing information, between Department of Parks and Recreation, Tree Board, and other NGO groups regarding plantings, removals, and trends in tree conditions.
- Charge the Tree Board with developing a process (to be approved by the Village Arborist) that will use the public or coordinated citizen volunteers to help gather information on tree status.
- Undertake periodic sampled inventories, beginning no later than five years from the adoption of this plan, focused on a particular planning issue or concern.

[Image] (left)
Crew working with Arborist.

SET ADDITIONAL PLANTING TARGETS FOR PROGRESS ON THE URBAN FOREST:

• The Department of Parks and Recreation will work with the Tree Board to set planting targets (annual, mid-term, and long term) and priority planting areas for all urban forest areas within Hastings-on-Hudson including street trees and other public parks and green spaces.

• Determine the metrics that will be used to measure progress towards goals for an expanded urban forest (for example; canopy, number of trees, overall biomass, native species vs. invasive species; environmental, social, & economic benefits) and adopt targets for those metrics.

PROMOTE PLANTING NATIVE SPECIES TREES AND SHRUBS ON ALL LAND, PUBLIC AND PRIVATE

• This strategy adds resiliency to the Village's urban forest in anticipation of Global Climate Change.

• Encourages wildlife and pollinator habitat.

• "Near Native" and species adapted to the region can be planted as well.

BASE FORESTRY PRACTICE ON CURRENT SCIENTIFIC INFORMATION

• Draw on local or regional resources for expert recommendations (Cornell Cooperative Extension,, NYS DEC, NRCS, Soil and Water Conservation District, and others)

FIND AND LEVERAGE RESOURCES AND FUNDS FOR URBAN FOREST IMPROVEMENT

With the knowledge that the benefits from trees far outweigh the costs, mobilize financial and human resources, public and private, to preserve and expand our urban forest.

Leverage Village Funds Whenever Possible by Applying for Matching Grants.

The DEC and the Arbor Day Foundation are two likely possibilities for matching grant opportunities.

• Apply for the next round of DEC funding, for a grant to fund tree planting

• Research and apply for other federal, state, foundational or private environmental stewardship grants

Impose a fee permit to remove a tree from within the Village's current or future Right of Way.

• Such fees should go directly into a funding the Urban Forestry program.

Engage Civic Partners to Participate in Planting Programs or Campaigns

Find creative ways to incentivize citizens, developers, business owners, and homeowners to expand and preserve the urban forest.

Continue to Build a Partnership With and Negotiate With the Utility Company

• Plant and maintain large species trees wherever possible – only planting small species when necessary (line conflicts, etc.).

PROMOTE COMMUNITY AND GRASSROOTS EFFORTS

Village Board leaders, the Village Arborist, or community leaders shall engage the public in the care and stewardship of the urban forest. Fostering public-private partnerships to achieve the Village's goals will add capacity to what can be accomplished.

Raise Awareness—through education, collaboration, and the exchange of information—among stakeholders about the value and needs of the urban forest.

- Engage with Village property owners, local businesses, developers, the design community and Village boards to promote the goals for the urban forest
- Educate the public about the rationale behind project goals/objectives, best management practices, and the tree/shrub/herbaceous planting lists.
- Bring focus to Village tree plantings by bundling them into campaigns that will attract the public's interest. Generate energy and interest by announcing planting or greening campaigns and invite public participation.

Educate the public about the value and needs of the urban forest

- Produce and distribute information through educational brochures and web-based media.
- Develop user-friendly sources of tree information for the Department of Parks and Recreation, or other Village entities to distribute.
- Encourage the public to value diversity and to eliminate invasive species trees and shrubs from the Village.
- Plan future tree plantings to anticipate the demands of global climate change.

Encourage direct citizen stewardship

- Encourage and incentivize private planting & maintenance and planting or maintenance partnerships with the Village.
- Organize community planting days and trained citizen pruning teams.
- Train volunteers to assist the Department of Parks and Recreation with care of young trees and monitoring the health of the urban forest. Consult with other cities who have used citizen volunteers successfully to glean knowledge.
- Utilize citizen scientists and researchers to inform and support Village efforts.
- Solicit citizen input for planning, prioritizing, and updating the tree inventory

[Image] (right)
Volunteers lopping invasives and using a weed-wrench to pull invasive plants up by the roots.

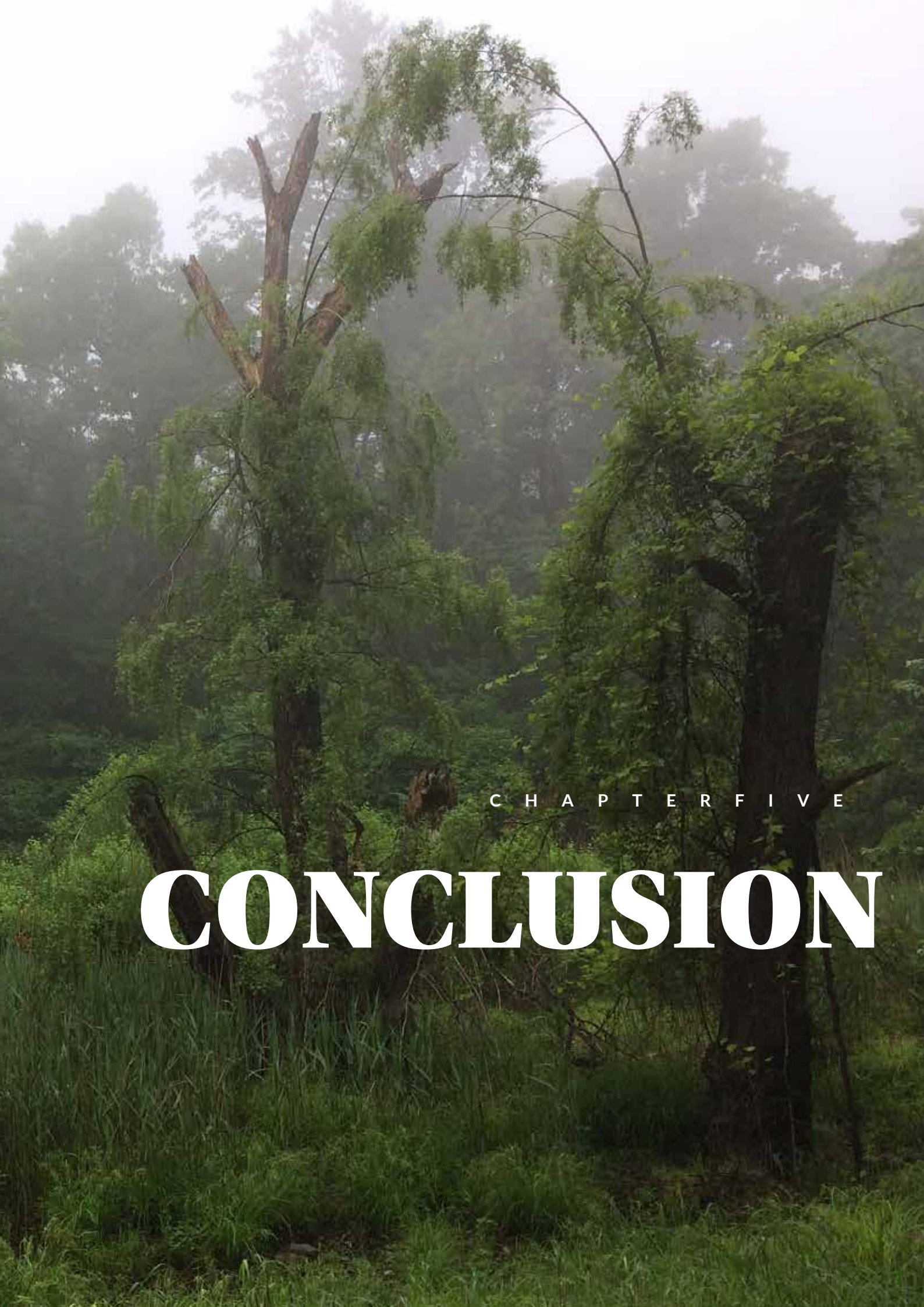
RECOMMENDATIONS- PARK PLANNING AND DESIGN

Access and Entrance – There is no Main Entrance, or official access points to Hillside Woods & Park. We recommend creation of a Main Entrance (with parking, trail map, other signage, in a central location). Access Points around the perimeter should be enhanced with small kiosks/signs.

Trails and Wayfinding – Trails are designated and labeled, but there is no obvious trail map in the park. This should be located at the Main Entrance. Trails are in good shape, with minor trail work needed to keep pedestrian traffic as safe as possible.

Signage – Trails are marked with colored markers, but there are limited informational/directional signs (e.g. “School this way”; “Algonquin Trail”).

[Image] (right)
Example of an entry sign/kiosk



CHAPTER FIVE

CONCLUSION

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Conclusion

Restoration of Hillside Woods & Park to a healthy eastern woodland must address the combination of overpopulation of deer, invasive plants, and light on the forest floor. Deer browse is a severe threat to the woods, as the next generation of trees is consumed before they can mature. The resulting lack of understory has allowed invasive vines, shrubs, and trees to proliferate, further jeopardizing the health of the ecosystem. The large trees in the forest are also thinning, as erosion and rocky ground result in shallow root structures, unable to anchor large trees during severe storms, which are ever-increasing as climate change becomes more severe. As trees fall, the remaining trees are even more susceptible to being toppled by strong winds, and the increased sunlight reaching the forest floor has exacerbated the invasive plant problem, giving a competitive advantage to these sun-loving, deer-browse resistant plants.

Considering the severe deer over-browse in Hillside Woods & Park, a deer exclusion fence is strongly recommended. Findings from several studies in the greater New York City area suggest that combinations of various site interventions (specifically tree planting and invasives removal), paired with a full-canopy forest, may be most effective for promoting regeneration of native species, thus resulting in healthier, more self-sustaining urban forests (Doroski et al. 2018). Due to the successful studies on the subject, it is optimistic that the restoration of Hillside Woods & Park can be completed through similar site improvements.

This Urban Forest Management Plan outlines a process to restore Hillside Woods & Park, beginning with the removal of invasive plants threatening the forest. After these plants have been thoroughly controlled, a deer exclosure fence will be erected to keep the deer population from over-browsing the native understory plants. Lastly, select native trees, shrubs, and herbaceous plant species will be planted to restore diversity and aid in the regeneration of the forest.

In order to oversee the implementation of this plan, a General Urban Forestry Administrative staff member is recommended. Additional park planning and design improvements, including to the park entrances and trails, is also recommended. With the demonstrated civic and community support for the project, a healthy future for Hillside Woods & Park is foreseeable.

CHAPTER SIX

THANKS

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Thanks

This project is an ongoing collaboration between DEC forestry professionals, public and private individuals, and various civic and volunteer organizations.

Special thanks goes to the people, Village Departments and Boards, and organizations making this project possible, including:

Mayor Swiderski, Hastings-on-Hudson
Francis Frobel, Village Manager
Dan Lemons, Village Trustee, Conservation Commission Trustee Liaison
Sharon Kivowitz, Conservation Commission Chair
Andrew Ratzkin, Conservation Commission Co-Chair
Haven Colgate, Conservation Commission & Vine Squad Leader
Aaron Podhurst, Parks and Recreation Superintendent
David Downs, Parks and Recreation Commission
Joanne Baecher-DiSalvo, Parks and Recreation Chair
Charles Sadler, Tree Preservation Board
Jennifer Petillo, Administrative Assistant

The Hastings-on-Hudson Parks and Recreation Commission,
The Hastings-on-Hudson Conservation Commission,
The Hastings-on-Hudson Tree Preservation Board,
The Hastings Historical Society,
Hastings High School Environmental Club,
Hillside Nature Guides Program,
The Hastings Vine Squad,
Hudson River Audubon Society,
and the Dobbs Ferry Conservation Advisory Board.

CHAPTER SEVEN

APPENDIX

References

Abdollahi, K.K.; Ning, Z.H.; Appeaning, A., eds. 2000. Global climate change and the urban forest. Baton Rouge, LA: GCRCC and Franklin Press. 77 p.

Bryce, S.A., Omernik, J.M., and Larsen, D.P., 1999, Ecoregions – a geographic framework to guide risk characterization and ecosystem management: Environmental Practice, v. 1, no. 3, p. 141-155

Ciesla, W. M.; Kruse, J. J. 2009. Large Aspen Tortrix. Forest Insect & Disease Leaflet 139. Washington, DC: U. S. Department of Agriculture, Forest Service. 8 p.

Doroski, D. A.; Alexander J. Felson; Mark A. Bradford; Mark P. Ashton; Emily E. Oldfield; Richard A. Hallett; Sara E. Kuebbing. 2018. Factors driving natural regeneration beneath a planted urban forest. Urban Forestry & Urban Greening 29, 238–247.

Dyer, J.M. 2006. Revisiting the Deciduous Forests of Eastern North America. BioScience Vol. 56, No. 4.

Forest Health Technology Enterprise Team. 2014. 2012 National Insect & Disease Risk Maps/Data. Fort Collins, CO: U.S. Department of Agriculture, Forest Service. http://www.fs.fed.us/foresthealth/technology/nidrm2012.shtml

Hirabayashi, S. 2012. i-Tree Eco Precipitation Interception Model Descriptions, http://www.itreetools.org/eco/ resources/ iTree_Eco_Precipitation_Interception_Model_Descriptions_V1_2.pdf

Houston, D. R.; O'Brien, J. T. 1983. Beech Bark Disease. Forest Insect & Disease Leaflet 75. Washington, DC: U. S. Department of Agriculture, Forest Service. 8 p.

Jackson, D.R.; Michael T. Wolf; and James Finley. 2017. Regenerating Hardwood Forests: Managing Competing Plants, Deer, and Light. Forest Science Fact Sheet. Ag Communications and Marketing © The Pennsylvania State University.

Johnson, L.R., and S.N. Handel. 2016. Restoration treatments in urban park forests drive long-term changes in vegetation trajectories. Ecological Applications 26:940–956.

MNDNR. Fencing Handbook For 10' Woven Wire Deer Exclusion Fence. Minnesota Department of Natural Resources Wildlife Damage Management Program. https://files.dnr.state.mn.us/recreation/hunting/deer/bovine-tb/fencing_guide.pdf

National Invasive Species Information Center. 2011. Beltsville, MD: U.S. Department of Agriculture, National Invasive Species Information Center. http://www.invasivespeciesinfo.gov/plants/main.shtml

Northeastern Area State and Private Forestry. 2005. Gypsy moth digest. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry.

Nowak, D.J.; Crane, D.E. 2000. The Urban Forest Effects (UFORE) Model: quantifying urban forest structure and functions. In: Hansen, M.; Burk, T., eds. Integrated tools for natural resources inventories in the 21st century. Proceedings of IUFRO conference. Gen. Tech. Rep. NC-212. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 714-720.

Nowak, D.J.; Crane, D.E.; Stevens, J.C.; Hoehn, R.E. 2005. The urban forest effects (UFORE) model: field data collection manual. V1b. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station, 34 p. http://www.fs.fed.us/ne/syracuse/Tools/downloads/UFORE_Manual.pdf

Nowak, D.J.; Hoehn, R.E.; Crane, D.E.; Stevens, J.C.; Walton, J.T; Bond, J. 2008. A ground-based method of assessing urban forest structure and ecosystem services. Arboriculture and Urban Forestry. 34(6): 347-358.

Nowak, D.J.; Dwyer, J.F. 2000. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, John, ed. Handbook of urban and community forestry in the northeast. New York, NY: Kluwer Academics/Plenum: 11-22.

Nowak, D.J.; Crane, D.E.; Dwyer, J.F. 2002a. Compensatory value of urban trees in the United States. Journal of Arboriculture. 28(4): 194 - 199.

Nowak, D.J.; Crane, D.E.; Stevens, J.C.; Ibarra, M. 2002b. Brooklyn's urban forest. Gen. Tech. Rep. NE-290. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 107 p.

Nowak, D.J.; Stevens, J.C.; Sisinni, S.M.; Luley, C.J. 2002c. Effects of urban tree management and species selection on atmospheric carbon dioxide. Journal of Arboriculture. 28(3): 113-122.

Omernik, J.M., Chapman, S.S., Lillie, R.A., and Dumke, R.T., 2000, Ecoregions of Wisconsin: Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, v. 88, p. 77-103.

Simmons, B.L.; Richard A. Hallett; Nancy Falxa Sonti; D. S. N. Auyeung; Jacqueline W. T. Lu. 2016. Long-term outcomes of forest restoration in an urban park. Restoration Ecology Vol. 24, No. 1, pp. 109–118.

CSLAP - Sugar Pond

See attached document

CSLAP 2011 Lake Water Quality Summary:
Sugar Pond

General Lake Information

Location	Hastings-on-Hudson
County	Westchester
Basin	Lower Hudson River
Size	0.29 hectares (0.71 acres)
Lake Origins	Augmented by dam
Watershed Area	34.6 hectares (85.4 acres)
Retention Time	0.0 years
Mean Depth	2.4 meters
Sounding Depth	4.5 meters
Public Access?	Yes; Open to ice skating in the winter.
Major Tributaries	None
Lake Tributary To…	Minor Tribs to East of Hudson
WQ Classification	C
Lake Outlet Latitude	40.997485
Lake Outlet Longitude	-73.869326
Sampling Years	2011
2011 Samplers	Kendra Garrison
Main Contact	Kendra Garrison

Lake Map

Background
Sugar Pond is a 1 acre Class C pond in the town of Hastings-on-Hudson, Westchester County. 2011 is the first year Sugar Pond has been sampled under direction from the Citizens Statewide Lake Assessment Program (CSLAP).

It is one of 16 CSLAP lakes among the more than 120 lakes found in Westchester County, and one of 47 CSLAP lakes among the more than 350 lakes and ponds in the Lower Hudson River drainage basin

Lake Uses
Sugar Pond is a Class C pond, meaning the best intended uses are non contact recreation – boating and fishing, aquatic life, and aesthetics. The lake actively supports each of these uses.

All New York State fishing regulations are applicable. The state of New York does not stock fish in Sugar Pond; it is not known if private stocking occurs.

There are no lake-specific fish consumption advisories on Sugar Pond.

Historical Water Quality Data
CSLAP sampling was conducted on Sugar Pond for the first time in 2011. The CSLAP reports for the lake will eventually be found on the NYSFOLA website at http://nysfola.mylaketown.com and on the NYSDEC web page at http://www.dec.ny.gov/lands/77821.html.

Lake Association and Management History
Sugar Pond is located in the Riverview Manor portion of the Hillside Woods. Information about the lake association is not yet available.

Summary of 2011 CSLAP Sampling Results

Evaluation of 2011 Annual and Monthly Results Relative to 2006-2010
Since Sugar Pond was sampled for the first time through CSLAP in 2011, sampling results cannot be compared to historical data. Future generations of CSLAP reports will include a comparison to data collected starting in 2011.

Evaluation of Eutrophication Indicators
Secchi disk transparency, chlorophyll *a* levels, and total phosphorus readings in 2011 were typical of *eutrophic*, or highly productive lakes. The trophic state index (TSI) evaluation suggests that chlorophyll *a* readings (algae levels) are lower than expected given the other indicators (phosphorus and water clarity). This may be due to turbidity from other factors or elevated color reducing clarity and light transmission. However, chlorophyll *a* readings are still high. These assessments may become clearer with additional (future) data. Overall trophic conditions are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators
Algae levels are high enough to render the lake susceptible to taste and odor compounds or elevated DBP (disinfection by product) compounds that could affect the potability of the water.

However, the lake is not classified for potable water use. Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Limnological Indicators

Color readings are higher than those found in the typical NYS lake, and may reduce water transparency. Nitrogen readings (NOx, ammonia, and total nitrogen) are slightly higher than in other lakes, although it is likely that algae levels are still controlled by phosphorus. pH readings are typical of alkaline lakes, and conductivity readings are typical of hardwater lakes. Calcium readings are high enough to support zebra mussel colonization, although it is not known if these exotic animals have been found in the lake. Additional data will help to determine if these assessments are representative of normal conditions in the lake. Overall limnological conditions are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Biological Condition

Phytoplankton, zooplankton, macrophyte, and macroinvertebrate data have not been collected through CSLAP at Sugar Pond. As a result, biological assessments of the lake reported in the Lake Scorecard will be incomplete.

Evaluation of Lake Perception

Water quality assessments indicated that the lake most frequently exhibited “definite algal greenness”, an assessment that is probably consistent with the measured water quality conditions in the lake. Aquatic plants typically grow to the lake surface, at times densely, and at times both “poor water clarity” and “excessive weed growth” significantly affect the recreational suitability of the lake. It is not known if exotic or invasive plants are found in the lake. Recreational assessments were “slightly” to “substantially” impaired throughout the summer, consistent with the surface weed growth, and consistent with the measured water quality conditions. Additional data will help to determine if these assessments represent normal conditions in the lake. Overall lake perception is summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

With only one year of water temperature readings, local climate change cannot be easily evaluated.

Evaluation of Algal Toxins

Algal toxin levels can vary significantly within blooms and from shoreline to lake, and the absence of toxins in a sample does not indicate safe swimming conditions. However, phycocyanin readings were below the levels indicating susceptibility for harmful algal blooms (HABs). The limited analysis of algae samples from the open water and shoreline blooms indicated microcystin readings below the levels indicating unsafe swimming conditions. These suggest that the algal communities are not dominated by blue green algae, although this will become clearer with additional data.

Lake Condition Summary

Category	Indicator	Min	2011 Avg	Max		Classification	2011 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.55	0.55	0.55		Eutrophic	Not known	Not yet known
	Chlorophyll *a*	0.05	10.91	36.70		Eutrophic	Not known	Not yet known
	Total Phosphorus	0.026	0.049	0.073		Eutrophic	Not known	Not yet known
Potable Water Indicators	Hypolimnetic NH4					Not sampled through CSLAP	Not known	Not known
	Hypolimnetic As					Not sampled through CSLAP	Not known	Not known
	Hypolimnetic Iron					Not sampled through CSLAP	Not known	Not known
	Hypolimnetic Mn					Not sampled through CSLAP	Not known	Not known
Limnological Indicators	Hypolimnetic TP					Not sampled through CSLAP	Not known	Not known
	Nitrate + Nitrite	0.01	0.10	0.27		Intermediate NOx	Not known	Not yet known
	Ammonia	0.02	0.06	0.13		Low Ammonia	Not known	Not yet known
	Total Nitrogen	0.90	1.25	1.50		High Total Nitrogen	Not known	Not yet known
	pH	7.05	8.04	8.73		Alkaline	Not known	Not yet known
	Specific Conductance	614	703	793		Hardwater	Not known	Not yet known
	True Color	27	38	59		Intermediate Color	Not known	Not yet known
	Calcium	24.0	24.0	24.0		Highly Susceptible to Zebra Mussels	Not known	Not yet known
Lake Perception	WQ Assessment	3	3.0	3		Definite Algal Greenness	Not known	Not yet known
	Plant Coverage	3	3.3	4		Surface Plant Growth	Not known	Not yet known
	Rec. Assessment	4	4.3	5		Substantially Impaired	Not known	Not yet known
Biological Condition	Phytoplankton					Not measured through CSLAP	Not known	Not known
	Macrophytes					Not measured through CSLAP	Not known	Not known
	Zooplankton					Not measured through CSLAP	Not known	Not known
	Macroinvertebrates					Not measured through CSLAP	Not known	Not known
	Fish					Warmwater fishery?	Not known	Not known
	Invasive Species					None observed	Not known	Not known
Local Climate Change	Air Temperature	29	30.2	32			Not known	Not yet known
	Water Temperature	26	27.3	28			Not known	Not yet known
Harmful Algal Blooms	Open Water Phycocyanin	5	25	66		All readings indicate low risk of BGA in open water	Not known	Not known
	Open Water Microcystis					No lakewide toxins data	Not known	Not known
	Shoreline Phycocyanin	0	0	0		Some shoreline BGA blooms likely	Not known	Not known
	Shoreline Microcystis	1.3	1.3	1.3		Shoreline bloom toxins above drinking water criteria but below swimming criteria	Not known	Not known
	Other Toxins					Low anatoxin-a and cylindrospermposin	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

Sugar Pond is not cited on the 2008 Lower Hudson River basin Priority Waterbody List (PWL).

Potable Water (Drinking Water)

The CSLAP dataset at Sugar Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, is inadequate to evaluate the use of the lake for potable

water, and the lake is not used for this purpose. The limited CSLAP indicators suggest that any "unofficial" potable water use of the lake might be impaired by excessive algae.

Contact Recreation (Swimming)
The CSLAP dataset at Sugar Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that swimming and contact recreation may be *impaired* by excessive algae and low water clarity.

Non-Contact Recreation (Boating and Fishing)
The CSLAP dataset on Sugar Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that non-contact recreation may be *stressed* by excessive weeds.

Aquatic Life
The CSLAP dataset on Sugar Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life may be *threatened* elevated pH. Additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

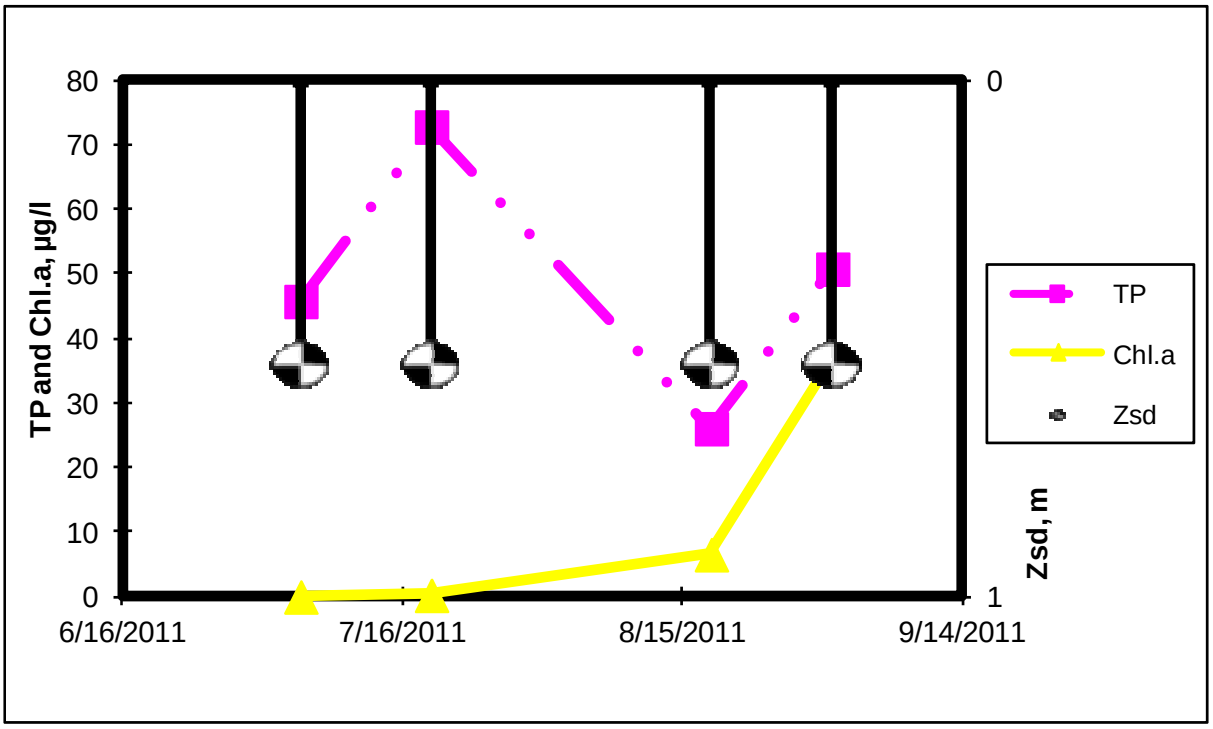
Aesthetics
The CSLAP dataset on Sugar Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *threatened* by excessive weeds and algae, consistent with persistent reports that the lake "looks bad".

Fish Consumption
There are no fish consumption advisories posted for Sugar Pond.

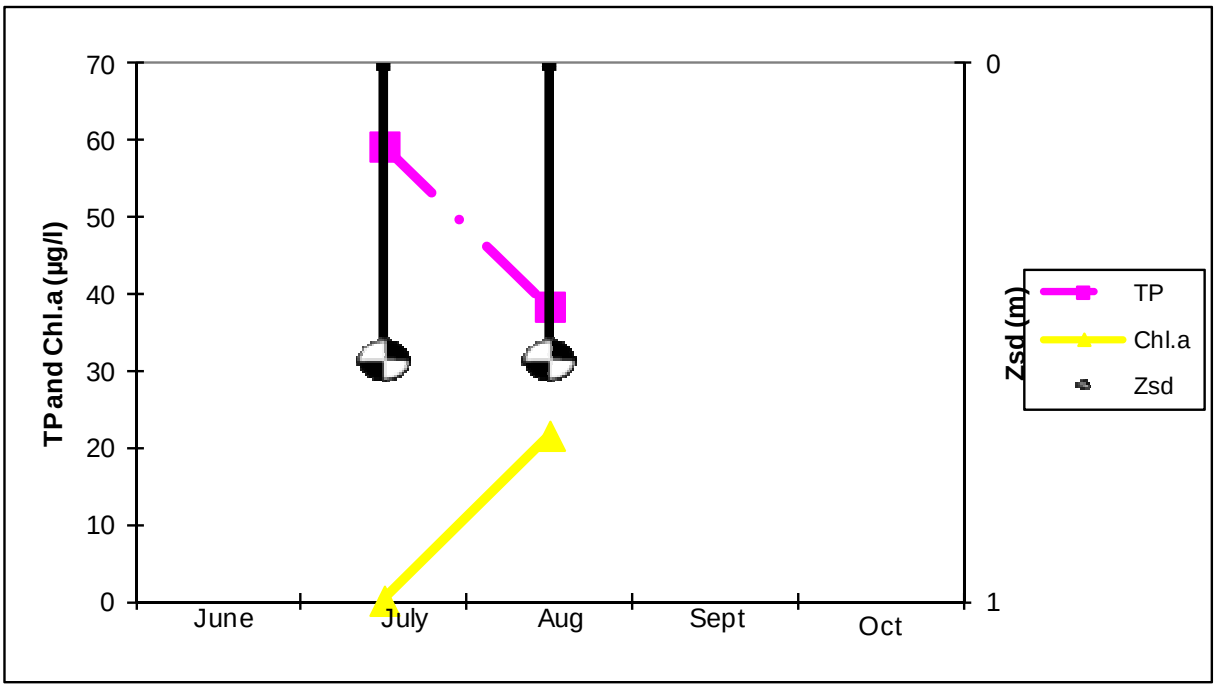
Additional Comments and Recommendations
Additional CSLAP data and information from other sources may help to determine if the 2011 evaluation outlined above is representative of normal conditions in the lake.

Aquatic Plant IDs-2011
No aquatic plants submitted for identification

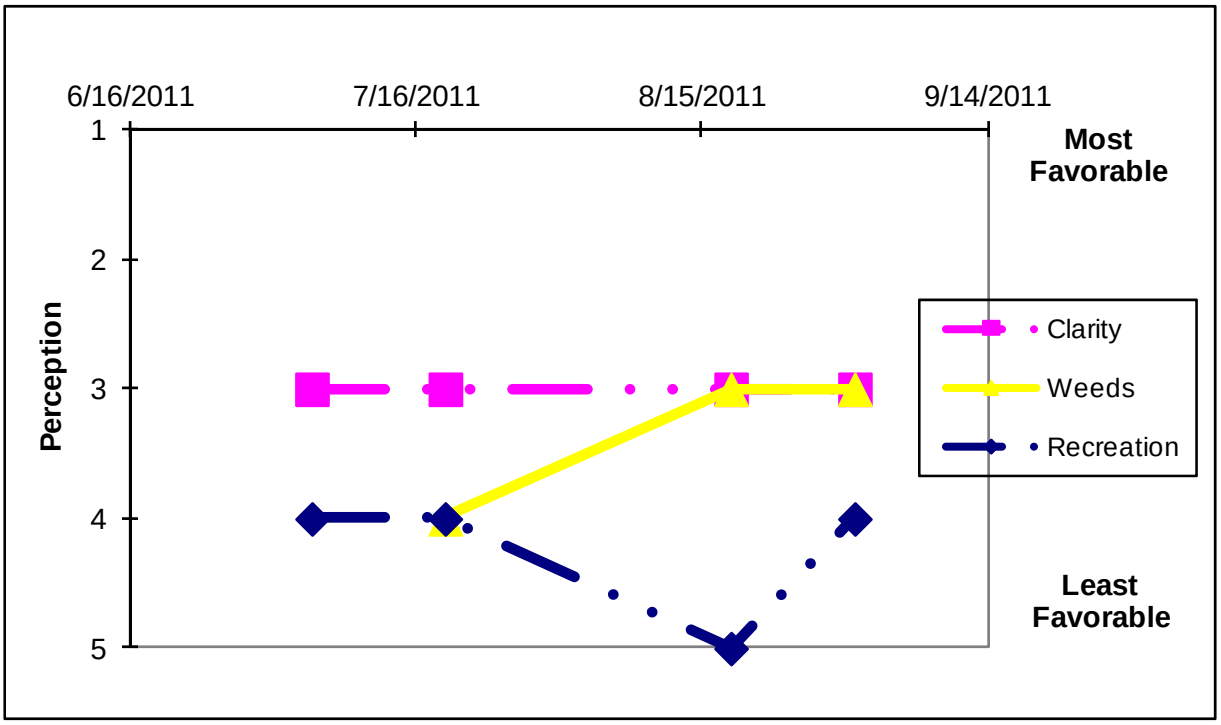
Time Series: Trophic Indicators, 2011



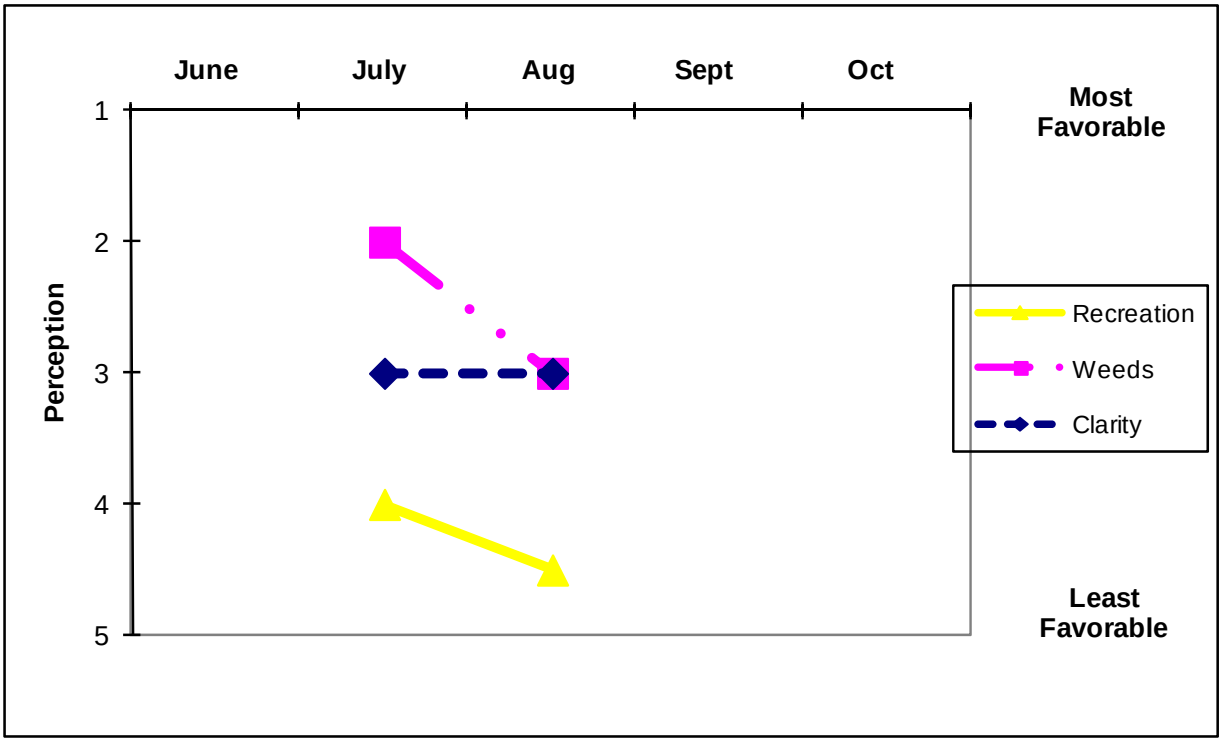
Time Series: Trophic Indicators, Typical Year (2011)



Time Series: Lake Perception Indicators, 2011



Time Series: Lake Perception Indicators, Typical Year (2011)



Appendix A- CSLAP Water Quality Sampling Results for Sugar Pond

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
227	Sugar Pond	7/5/2011	4.5	0.55	2.6	0.046	0.13	0.13	0.90	43.23	59	7.94	635	24.0	0.05
227	Sugar Pond	7/19/2011	4.5	0.55	2.6	0.073	0.27	0.02	1.50	45.24	34	8.42	614		0.30
227	Sugar Pond	8/18/2011	3.5	0.55	1.8	0.026	0.01	0.04	1.22	102.75	30	8.73	793		6.60
227	Sugar Pond	8/31/2011	3.5	0.55		0.051	0.01	0.04	1.40	60.72	27	7.05	771		36.70
227	Sugar Pond		grab	HAB											
227	Sugar Pond		grab	HAB											

LNum	PName	Date	Zbot	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Anatoxin-a	Cyc
227	Sugar Pond	7/5/2011	4.5	surf	32	26	3		4	2	0	0	8.10	4.80			
227	Sugar Pond	7/19/2011	4.5	surf	29	28	3	4	4	2	0	0	5.40	3.80			
227	Sugar Pond	8/18/2011	3.5	surf	29	28	3	3	5	12	0	0	66.30	8.60			
227	Sugar Pond	8/31/2011	3.5	surf	30	27	3	3	4	268	0	0	19.60	26.00			
227	Sugar Pond		grab	surf											1.31	<0.8	<0.1
227	Sugar Pond		grab	surf													

Legend Information

Indicator	*Description*	*Detection Limit*	*Standard (S) / Criteria (C)*
General Information			
Lnum	lake number (unique to CSLAP)		
Lname	name of lake (as it appears in the Gazetteer of NYS Lakes)		
Date	sampling date		
Field Parameters			
Zbot	lake depth at sampling point, meters (m)		
Zsd	Secchi disk transparency or clarity	0.1m	1.2m (C)
Zsamp	water sample depth (m)	0.1m	none
Tair	air temperature (C)	-10C	none
TH20	water temperature (C)	-10C	none
Laboratory Parameters			
Tot.P	total phosphorus (mg/l)	0.003 mg/l	0.020 mg/l (C)
NOx	nitrate + nitrite (mg/l)	0.01 mg/l	10 mg/l NO3 (S), 2 mg/l NO2 (S)
NH4	total ammonia (mg/l)	0.01 mg/l	2 mg/l NH4 (S)
TN	total nitrogen (mg/l)	0.01 mg/l	none
TN/TP	nitrogen to phosphorus (molar) ratio, = (TKN + NOx)*2.2/TP		none
TCOLOR	true (filtered) color (ptu, platinum color units)	1 ptu	none
pH	powers of hydrogen (S.U., standard pH units)	0.1 S.U.	6.5, 8.5 S.U. (S)
Cond25	specific conductance, corrected to 25C (umho/cm)	1 umho/cm	none
Ca	calcium (mg/l)	1 mg/l	none
Chl.a	chlorophyll a (ug/l)	0.01 ug/l	none
Fe	iron (mg/l)	0.1 mg/1	1.0 mg/l (S)
Mn	manganese (mg/l)	0.01 mg/l	0.3 mg/l (S)
As	arsenic (ug/l)	1 ug/l	10 ug/l (S)
AQ-PC	Phycocyanin (aquaflor) (unitless)	1 unit	none
AQ-Chl	Chlorophyll *a* (aquaflor) (ug/l)	1 ug/l	none
MC-LR	Microcystis-LR (ug/l)	0.01 ug/l	1 ug/l potable (C) 20 ug/l swimming (C)
Ana	Anatoxin-a (ug/l)	0.3 ug/l	none
Cyl	Cylindrospermposin (ug/l)	0.1 ug/l	none
Lake Assessment			
QA	water quality assessment; 1 = crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels		
QB	aquatic plant assessment; 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = surface plant coverage		
QC	recreational assessment; 1 = could not be nicer, 2 = excellent, 3 = slightly impaired, 4 = substantially impaired, 5 = lake not usable		
QD	reasons for recreational assessment; 1 = poor water clarity, 2 = excessive weeds, 3 = too much algae, 4 = lake looks bad, 5 = poor weather, 6 = litter/surface debris, 7 = too many lake users, 8 = other		
QF, QG	Health and safety issues today (QF) and past week (QG); 0 = none, 1 = taste/odor, 2 = GI illness humans/animals, 3 = swimmers itch, 4 = algae blooms, 5 = dead fish, 6 = unusual animals, 7 = other		

Soil Map Unit Description

See attached document

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Westchester County, New York

ChD—Charlton fine sandy loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2wh0t
Elevation: 0 to 1,290 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw - 7 to 22 inches: gravelly fine sandy loam
C - 22 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Sutton, fine sandy loam

Percent of map unit: 5 percent
Landform: Ground moraines, ridges, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave

Across-slope shape: Linear
Hydric soil rating: No

Paxton

Percent of map unit: 5 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Chatfield

Percent of map unit: 3 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Nose slope, crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Canton

Percent of map unit: 2 percent
Landform: Ridges, hills, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

CIC—Charlton fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2wh0p
Elevation: 0 to 1,570 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Very Stony

Setting

Landform: Ridges, hills, ground moraines
Landform position (two-dimensional): Backslope, shoulder, summit

Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Sutton, very stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Paxton, very stony

Percent of map unit: 5 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, very stony

Percent of map unit: 3 percent

Landform: Hills, ridges
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leicester, very stony

Percent of map unit: 2 percent
Landform: Ground moraines, drainageways, hills, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

CrC—Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2w698
Elevation: 0 to 1,550 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, very stony, and similar soils: 50 percent
Chatfield, very stony, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Chatfield, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Sutton, very stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester, very stony

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

Hollis, very stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

CsD—Chatfield-Charlton complex, 15 to 35 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2w69k
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Chatfield, very stony, and similar soils: 45 percent
Charlton, very stony, and similar soils: 35 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chatfield, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Charlton, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Leicester, very stony

Percent of map unit: 6 percent
Landform: Depressions, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Rock outcrop

Percent of map unit: 5 percent
Landform: Ridges, hills
Hydric soil rating: No

Hollis, very stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, nose slope, crest
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Sutton, very stony

Percent of map unit: 4 percent

Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

CtC—Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w69g
Elevation: 0 to 1,540 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Chatfield, extremely stony, and similar soils: 39 percent
Hollis, extremely stony, and similar soils: 26 percent
Rock outcrop: 17 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chatfield, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Nose slope, crest, side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Igneous and metamorphic rock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 12 percent
Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Sutton, extremely stony

Percent of map unit: 3 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Paxton, extremely stony

Percent of map unit: 2 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Leicester, extremely stony

Percent of map unit: 1 percent
Landform: Depressions, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

HrF—Hollis-Rock outcrop complex, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2w69q

Elevation: 0 to 1,540 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis, very stony, and similar soils: 60 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Chatfield, very stony

Percent of map unit: 10 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Charlton, very stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Leicester, very stony

Percent of map unit: 4 percent
Landform: Drainageways, hills, depressions, ground moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton, very stony

Percent of map unit: 1 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

PnC—Paxton fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w66y
Elevation: 0 to 1,320 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Paxton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton

Setting

Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None

Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Charlton

Percent of map unit: 7 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 6 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Footslope, summit, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 2 percent
Landform: Depressions, drumlins, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

RgB—Ridgebury loam, 2 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: bd9d
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, somewhat poorly drained, and similar soils: 50 percent
Ridgebury, poorly drained, and similar soils: 35 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Somewhat Poorly Drained

Setting

Landform: Hills, till plains, drumlinoid ridges
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till derived mainly from granite, gneiss, and schist

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 26 inches: gravelly fine sandy loam
H3 - 26 to 60 inches: gravelly loam

Properties and qualities

Slope: 2 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 14 to 30 inches to densic material
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B/D
Hydric soil rating: No

Description of Ridgebury, Poorly Drained

Setting

Landform: Hills, till plains, drumlinoid ridges
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till derived mainly from granite, gneiss, and schist

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 26 inches: gravelly fine sandy loam
H3 - 26 to 60 inches: gravelly loam

Properties and qualities

Slope: 2 to 8 percent

Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 14 to 30 inches to densic material
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Woodbridge

Percent of map unit: 7 percent
Hydric soil rating: No

Sun

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Ridgebury, bouldery

Percent of map unit: 3 percent
Hydric soil rating: No

Ub—Udorthents, smoothed

Map Unit Setting

National map unit symbol: bd7f
Elevation: 50 to 2,400 feet
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, smoothed, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Smoothed

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 70 inches: very gravelly loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 18 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 4.6 inches)

Minor Components

Urban land

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: No

Charlton

Percent of map unit: 2 percent
Hydric soil rating: No

Riverhead

Percent of map unit: 2 percent
Hydric soil rating: No

Sun

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Leicester

Percent of map unit: 2 percent
Hydric soil rating: No

Hollis

Percent of map unit: 2 percent
Hydric soil rating: No

Uc—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: bd7g
Elevation: 50 to 2,400 feet
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, wet substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Wet Substratum

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 72 inches: very gravelly loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 4.6 inches)

Minor Components

Udorthents

Percent of map unit: 5 percent
Hydric soil rating: No

Urban land

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Fredon

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Paxton

Percent of map unit: 2 percent
Hydric soil rating: No

Ipswich

Percent of map unit: 2 percent
Landform: Tidal marshes
Hydric soil rating: Yes

Raynham

Percent of map unit: 2 percent
Hydric soil rating: Yes

Hinckley

Percent of map unit: 2 percent
Hydric soil rating: No

UIC—Urban land-Charlton-Chatfield complex, rolling, very rocky

Map Unit Setting

National map unit symbol: bd7n
Elevation: 100 to 1,000 feet
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 40 percent
Charlton and similar soils: 20 percent
Chatfield and similar soils: 15 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ridges, hills, till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid loamy till derived mainly from schist, gneiss, or granite

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 24 inches: sandy loam
H3 - 24 to 60 inches: sandy loam

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.5 inches)

Description of Chatfield

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest

Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from granite, gneiss, or schist

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 24 inches: flaggy silt loam
H3 - 24 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 3.2 inches)

Minor Components

Leicester

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: No

Sutton

Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Hollis

Percent of map unit: 2 percent
Hydric soil rating: No

Sun

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Palms

Percent of map unit: 1 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

UID—Urban land-Charlton-Chatfield complex, hilly, very rocky

Map Unit Setting

National map unit symbol: bd7p
Elevation: 100 to 1,000 feet
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 50 percent
Charlton and similar soils: 20 percent
Chatfield and similar soils: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ridges, hills, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid loamy till derived mainly from schist, gneiss, or granite

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 24 inches: sandy loam
H3 - 24 to 60 inches: sandy loam

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.5 inches)

Description of Chatfield

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from granite, gneiss, or schist

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 24 inches: flaggy silt loam
H3 - 24 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 3.2 inches)

Minor Components

Sutton

Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Leicester

Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: No

Hollis

Percent of map unit: 1 percent
Hydric soil rating: No

Sun

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

UmC—Urban land-Chatfield-Rock outcrop complex, rolling

Map Unit Setting

National map unit symbol: bd7q
Elevation: 100 to 1,000 feet

Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 50 percent
Chatfield and similar soils: 20 percent
Rock outcrop: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Typical profile

H1 - 0 to 6 inches: variable

Description of Chatfield

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from granite, gneiss, or schist

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 24 inches: flaggy silt loam
H3 - 24 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 3.2 inches)

Description of Rock Outcrop

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Capacity of the most limiting layer to transmit water (Ksat): Low to very high (0.01 to 19.98 in/hr)

Minor Components

Charlton
Percent of map unit: 5 percent
Hydric soil rating: No

Hollis
Percent of map unit: 3 percent
Hydric soil rating: No

Udorthents
Percent of map unit: 3 percent
Hydric soil rating: No

Sutton
Percent of map unit: 2 percent
Hydric soil rating: No

Leicester
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: No

Sun
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

UpB—Urban land-Paxton complex, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2w67p
Elevation: 0 to 930 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 50 percent
Paxton and similar soils: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Typical profile
M - 0 to 10 inches: cemented material

Properties and qualities
Slope: 3 to 8 percent

Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Description of Paxton

Setting

Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Woodbridge

Percent of map unit: 9 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope, summit, footslope

Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Charlton

Percent of map unit: 6 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 5 percent
Landform: Drumlins, ground moraines, drainageways, hills, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Udorthents

Percent of map unit: 5 percent
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

UvB—Urban land-Riverhead complex, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: bd7w
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 50 percent
Riverhead and similar soils: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverhead

Setting

Landform: Deltas, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits overlying stratified sand and gravel

Typical profile
H1 - 0 to 6 inches: loam
H2 - 6 to 25 inches: sandy loam
H3 - 25 to 30 inches: loamy sand
H4 - 30 to 60 inches: loamy sand

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Minor Components

Knickerbocker
Percent of map unit: 5 percent
Hydric soil rating: No

Pompton
Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents
Percent of map unit: 5 percent
Hydric soil rating: No

Hinckley
Percent of map unit: 5 percent
Hydric soil rating: No

Charlton
Percent of map unit: 3 percent
Hydric soil rating: No

Udifluvents
Percent of map unit: 1 percent
Hydric soil rating: No

Fluvaquents
Percent of map unit: 1 percent
Landform: Flood plains

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Westchester County, New York
Survey Area Data: Version 13, Oct 8, 2017

eBird Field Checklist

Hillside Woods & Children's Village Westchester, New York, US ebird.org/hotspot/L324290
83 species - Year-round, All Years

Notes: This checklist is generated with data from eBird (ebird.org), a global database of bird sightings from birders like you. If you enjoy this checklist, please consider contributing your sightings to eBird. It is 100% free to take part, and your observations will help support birders, researchers, and conservationists worldwide.

Waterfowl
___Mallard

Herons, Ibis, and Allies
___Great Blue Heron
___Green Heron
___Black-crowned Night-Heron

Vultures, Hawks, and Allies
___Turkey Vulture
___Red-tailed Hawk

Pigeons and Doves
___Mourning Dove

Cuckoos
___Black-billed Cuckoo

Owls
___Great Horned Owl

Hummingbirds
___Ruby-throated Hummingbird

Woodpeckers
___Red-bellied Woodpecker
___Downy Woodpecker
___Hairy Woodpecker
___Northern Flicker
___Pileated Woodpecker

Tyrant Flycatchers: Pewees, Kingbirds, and Allies
___Eastern Wood-Pewee
___Eastern Phoebe
___Great Crested Flycatcher
___Eastern Kingbird

Vireos
___Warbling Vireo
___Red-eyed Vireo

Jays, Magpies, Crows, and Ravens
___Blue Jay
___American Crow
___Fish Crow

Martins and Swallows
___Barn Swallow

Tits, Chickadees, and Titmice
___Black-capped Chickadee
___Tufted Titmouse

Nuthatches
___White-breasted Nuthatch

Wrens
___House Wren
___Carolina Wren

Gnatcatchers
___Blue-gray Gnatcatcher

Kinglets
___Golden-crowned Kinglet
___Ruby-crowned Kinglet

Thrushes
___Veery
___Gray-cheeked Thrush
___Bicknell's Thrush
___Swainson's Thrush
___Hermit Thrush
___Wood Thrush
___American Robin

Catbirds, Mockingbirds, and Thrashers
___Gray Catbird
___Brown Thrasher
___Northern Mockingbird

Starlings and Mynas
___European Starling

Waxwings
___Cedar Waxwing

Wood-Warblers
___Ovenbird
___Northern Waterthrush
___Blue-winged Warbler
___Black-and-white Warbler
___Nashville Warbler
___Common Yellowthroat
___American Redstart
___Cape May Warbler
___Northern Parula
___Magnolia Warbler
___Bay-breasted Warbler
___Blackburnian Warbler
___Yellow Warbler
___Chestnut-sided Warbler
___Blackpoll Warbler
___Black-throated Blue Warbler
___Yellow-rumped Warbler
___Prairie Warbler
___Black-throated Green Warbler
___Canada Warbler

New World Sparrows
___Chipping Sparrow
___Dark-eyed Junco
___White-throated Sparrow
___Song Sparrow
___Swamp Sparrow
___Eastern Towhee

Yellow-breasted Chat
___Yellow-breasted Chat

Cardinals, Grosbeaks, and Allies
___Scarlet Tanager
___Northern Cardinal
___Rose-breasted Grosbeak
___Indigo Bunting

Blackbirds
___Baltimore Oriole
___Red-winged Blackbird
___Brown-headed Cowbird
___Common Grackle

Finches, Euphonias, and Allies
___House Finch
___American Goldfinch

Old World Sparrows
___House Sparrow

Plant Inventory List

http://nynjctbotany.org/lgtofc/hillside.html
Dr. Patrick L. Cooney

Trees:
Acer japonica (Japanese maple)
Acer negundo (box elder maple)
Acer platanoides (Norway maple)
Acer rubrum (red maple)
Acer saccharinum (silver maple)
Acer saccharum (sugar maple)
Ailanthus altissima (tree-of-heaven)
Albizia julibrissin (silk tree)
Betula lenta (black birch)
Betula populifolia (gray birch)
Carpinus caroliniana (musclewood)
Carya cordiformis (bitternut hickory)
Carya glabra (pignut hickory)
Carya tomentosa (mockernut hickory)
Castanea dentata (American chestnut)
Catalpa sp. (catalpa)
Cornus florida (flowering dogwood)
Fagus grandifolia (American beech)
Fraxinus americana (white ash)
Gleditsia triacanthos (honey locust)
Larix sp. (larch) planted
Liriodendron tulipifera (tulip tree)
Morus alba (white mulberry)
Nyssa sylvatica (tupelo)
Paulownia tomentosa (empress tree)
Picea glauca (blue spruce)
Pinus strobus (white pine)
Platanus occidentalis (sycamore)
Populus deltoides (cottonwood)
Populus tremuloides (quaking aspen)
Prunus avium (sweet cherry)
Prunus pensylvanica (bird cherry)
Prunus serotina (black cherry)
Pyrus malus (apple)
Quercus alba (white oak)
Quercus prinus (chestnut oak)
Quercus rubra (red oak)
Quercus velutina (black oak)
Robinia pseudoacacia (black locust)
Salix alba var. (weeping willow)
Salix nigra (black willow)
Salix sp. (willow)
Sassafras albidum (sassafras)
Taxus canadensis (American yew)
Tsuga canadensis (eastern hemlock)
Ulmus americana (American elm)

Shrubs:
Alnus sp. (alder)
Aronia arbutifolia (red chokeberry)
Berberis thunbergii (Japanese barberry)
Cephalanthus occidentalis (buttonbush)
Chimaphila maculata (striped wintergreen)
Clethra alnifolia (sweet pepperbush)
Cornus amomum (swamp or silky dogwood)
Cornus racemosa (gray-stem dogwood)
Euonymus alatus (winged euonymus)
Forsythia sp. (forsythia)
Hamamelis virginiana (witch-hazel)
Hibiscus syriacus (rose of Sharon)
Ligustrum vulgare (common privet)
Lindera benzoin (spicebush)
Lonicera morrowii (morrow's honeysuckle)
Mitchella repens (partridgeberry)
Pachysandra terminalis (pachysandra)
Philadelphus sp. (mock orange)
Rhododendron periclymenoides (pinkster flower)
Rhodotypos scandens (jet bead)
Rhus typhina (staghorn sumac)
Rosa multiflora (multiflora rose)
Rubus alleghaniensis (common blackberry)
Rubus occidentalis (black raspberry)
Rubus phoenicolasius (wineberry raspberry)
Salix discolor (pussy willow)
Spiraea japonica (Japanese spiraea)
Vaccinium corymbosum (highbush blueberry)
Vaccinium pallidum (hillside blueberry)
Viburnum acerifolium (maple-leaf viburnum)
Viburnum dentatum (arrowwood viburnum)
Viburnum prunifolium (blackhaw viburnum)
Vinca minor (periwinkle)

Vines:
Ampelopsis brevipedunculata (porcelain berry)
Apios americana (groundnut)
Calystegia sepium (hedge bindweed)
Celastrus orbiculatus (Asian bittersweet)
Cuscuta gronovii (common dodder)
Hedera helix (English ivy)
Humulus lupulus (common hops)
Lonicera japonica (Japanese honeysuckle)
Parthenocissus quinquefolia (Virginia creeper)
Sicyos angulatus (bur cucumber)
Smilax rotundifolia (round-leaved greenbrier)
Toxicodendron radicans (poison ivy)

Vitis aestivalis (summer grape)
Vitis riparia (riverbank grape)
Wisteria frutescens (wisteria)

Herbs:
Acalypha sp. (three-seeded mercury)
Aegopodium podagraria (goutweed)
Alliaria petiolata (garlic mustard)
Allium vineale (field garlic)
Ambrosia artemisiifolia (common ragweed)
Ambrosia trifida (giant ragweed)
Antennaria sp. (pussytoes)
Anthriscus sylvestris (wild chervil)
Apocynum cannabinum (Indian hemp dogbane)
Aralia nudicaulis (wild sarsaparilla)
Arctium sp. (burdock)
Arisaema triphyllum (Jack-in-pulpit)
Artemisia absinthium (common wormwort)
Artemisia vulgaris (common mugwort)
Asarum canadense (wild ginger)
Aster cordifolius (heart-leaved aster)
Aster divaricatus (white wood aster)
Aureolaria flava (smooth false foxglove)
Bidens cernua (nodding bur marigold)
Bidens comosa (swamp beggar ticks)
Bidens frondosa (devil's beggar ticks)
Boehmeria cylindrica (false nettle)
Brassica juncea (Indian or Chinese mustard)
Carum carvi
Centaurea nigra (black knapweed)
Centaurea jacea (brown knapweed)
Chenopodium album (pigweed)
Cichorium intybus (chicory)
Circaea lutetiana (enchanter's nightshade)
Collinsonia canadensis (horsebalm)
Commelina communis (Asiatic dayflower)
Conyza canadensis (horseweed)
Coronilla varia (crown vetch)
Cypripedium acaule (pink lady's slipper)
Daucus carota (Queen Anne's lace)
Desmodium canadense (showy tick trefoil)
Desmodium paniculatum (panicled trefoil)
Dianthus armeria (Deptford pink)
Dicentra cucullaria (Dutchman's breeches)
Epifagus virginiana (beech drops)
Epilobium coloratum (purple-leaved willow herb)
Erigeron annuus (daisy fleabane)
Erythronium americanum (trout lily)
Eupatorium maculatum (spotted Joe-Pye-weed)
Eupatorium perfoliatum (boneset)
Eupatorium purpureum (sweet-scented Joe-Pye-weed)
Eupatorium rugosum (white snake root)
Euthamia graminifolia (grass-leaved goldenrod)
Geum canadense (white avens)
Glechoma hederacea (gill-over-the-ground)
Helianthus decapetalus (thin-leaved sunflower)
Helianthus divaricatus (woodland sunflower)
Hemerocallis fulva (tawny day lily)
Hesperis matronalis (dame's rocket)
Hieracium kalmii (Canada hawkweed)
Hieracium sp. (hawkweed)
Impatiens capensis (orange jewelweed)
Lactuca canadensis (wild lettuce)
Lactuca serriola (prickly lettuce)
Lamium purpureum (purple dead nettle)
Larix sp. (larch)
Lathyrus latifolius (everlasting pea)
Lemna sp. (duckweed)
Lepidium virginicum (poor man's pepper)
Lobelia inflata (Indian tobacco lobelia)
Lysimachia ciliata (fringed loosestrife)
Lysimachia quadriflora (smooth loosestrife)
Lythrum salicaria (purple loosestrife)
Maianthemum canadense (Canada mayflower)
Melilotus alba (white sweet clover)
Mentha x piperita (peppermint)
Mollugo verticillata (carpetweed)
Monotropa uniflora (Indian pipe)
Narcissus sp. (daffodil)
Oenothera biennis (common evening primrose)
Oxalis sp. (yellow wood sorrel)
Panax trifolius (dwarf ginseng)
Peltandra virginica (arrow arum)
Phytolacca americana (pokeweed)
Pilea pumila (clearweed)
Plantago lanceolata (English plantain)
Plantago major (common plantain)
Polygonatum biflorum (true Solomon's seal)
Polygonum arenastrum (dooryard knotweed)
Polygonum cespitosum (cespitose smartweed)
Polygonum cuspidatum (Japanese knotweed)
Polygonum pensylvanicum (Pennsylvania smartweed)
Polygonum persicaria (lady's thumb)
Polygonum sagittatum (arrow-leaved tearthumb)
Polygonum virginianum (Virginia knotweed)
Portulaca oleracea (common purslane)
Potentilla canadensis (dwarf cinquefoil)
Potentilla simplex (common cinquefoil)
Prunella vulgaris (self-heal)
Ranunculus ficaria (lesser celandine)
Rumex obtusifolius (broad-leaved dock)
Sanguinaria canadensis (bloodroot)

Scutellaria lateriflora (maddog skullcap)
Silene caroliniana (wild pink)
Smilacina racemosa (false Solomon's seal)
Solidago bicolor (silverrod goldenrod)
Solidago caesia (blue-stemmed goldenrod)
Solidago canadensis (Canada goldenrod)
Solidago juncea (early goldenrod)
Solidago odora (sweet goldenrod)
Solidago rugosa (rough-stemmed goldenrod)
Symplocarpus foetidus (skunk cabbage)
Taraxacum officinale (dandelion)
Thalictrum dioicum (early meadow rue)
Trifolium pratense (red clover)
Trifolium repens (white clover)
Typha latifolia (broad-leaved cattail)
Verbascum thapsus (common mullein)
Verbena urticifolia (white vervain)
Viola sororia (common blue violet)
Wolffia sp. (water meal)

Rushes:
Juncus effusus (soft rush) Juncus tenuis (path rush)

Sedges:
Carex crinita (fringed sedge)
Carex pensylvanica (Pennsylvania sedge)
Cyperus strigosus (nut sedge)
Scirpus atrovirens (dark-green bulrush)
Scirpus cyperinus (woolly grass bulrush)

Grasses:
Dactylis glomerata (orchard grass)
Digitaria sanguinalis (hairy crabgrass)
Echinochloa crus-gallii (barnyard grass)
Eleusine indica (zipper grass)
Leersia virginica (white grass)
Microstegium vimineum (Japanese stilt grass)
Panicum clandestinum (deer-tongue panic grass)
Phleum pratense (timothy grass)
Phragmites australis (giant reed grass)
Poa annua (annual bluegrass)
Setaria faberi (nodding foxtail grass)

Ferns and Fern Allies:
Athyrium filix-femina (lady fern)
Dennstaedtia punctilobula (hay-scented fern)
Polystichum acrostichoides (Christmas fern)
Thelypteris noveboracensis (New York beech fern)

HAZARD TREE PRUNING AND REMOVAL

Pruning is the deliberate removal of tree branches and limbs to achieve a specific objective in the alteration of a tree's health and form. Pruning is the most significant practice due to costs and impact on the tree, but can extend the useful life of a tree in your yard for decades. The practices set forth in this appendix are consistent with the pruning guidelines and Best Management Practices adopted by the International Society of Arboriculture, the American National Standard for Tree Care Operations–Tree, Shrub, and Other Woody Plant Maintenance-Standard Practices (ANSI.A300-1995), the U.S. Forest Service, and the National Arbor Day Foundation.

Trees may need to be pruned to:

- Remove dead or hazardous branches
- Maintain vehicular, pedestrian, and sight clearance
- Improve the tree structure, e.g. balancing crown weight to avoid future leaning Increase light or air penetration
- Improve tree aesthetics

Avoid Harm to You and Your Tree

Although we are providing these basic instructions on tree pruning, we recommend contacting an ISA Certified Arborist for anything more than basic tree care. Pruning trees incorrectly can not only damage your trees but also result in injuries or death for untrained individuals. An arborist is a specialist in the care of individual trees. ISA Certified Arborists are knowledgeable about the needs of trees and are trained and equipped to provide proper care.

When to Contact an Arborist:

- The tree cannot be pruned from the ground.
- The tree has been identified as hazardous.
- The tree is near electrical or other utility lines.
- The branch(es) that need to be pruned are large.

Safety Tips:

- Keep pruning equipment sharp, clean, and in good operating condition. Be careful with all tools.
- Make clean cuts.
- When pruning trees that show evidence of disease, disinfect pruning equipment between trees.
- During extreme infestations, disinfect equipment between cuts.
- Always wear personal protective safety equipment, including safety glasses, while pruning.

When to Prune

The best time to prune living branches is late in the dormant season or very early in spring before leaves form. Growth is maximized and wounds close faster. Flowering trees should be pruned after blooming. Routine maintenance pruning of dead or dying branches can be done at any time. However, your tree species may be an exception to these general rules. For new trees, inspect for pruning needs annually. Prune trees regularly throughout their life to keep them healthy, safe, and aesthetically pleasing. Do not defer pruning until limbs get large. Large limbs equal large wounds, which are more difficult for a tree to seal and leave the tree open to disease, insects, and rot. Do not prune trees on a crisis-only basis. Do not attempt to reduce tree size as a substitute for proper tree selection and placement. Known as topping, this is incredibly damaging to trees.

What to Prune

Young and mature trees have different pruning needs. On new trees, prune only dead, broken, crossed, or rubbing branches. A young tree can survive the removal of up to one-third of its foliage in a growing season, but do not remove more than one-quarter of the foliage of a mature tree in any one growing season. Do not make indiscriminate cuts on large branches in an attempt to lower the height of the tree. This is called topping and is one of the worst things you can do to your trees.

You may wish to prevent future hazards in mature trees by removing branches that may become problematic in the future. Branches with splits and cracks at a joint can be weak. Multiple branches attached to one spot on the trunk can also be trouble spots. U-shaped joints are stronger than narrow V- shaped unions, which can harbor disease-causing debris. Broken branches, whether partially attached or completely separated from the tree, are called hangers or widow makers. They are extremely hazardous and likely to fall; they should be removed promptly. The same is true for deadwood.

Training Pruning

To reach their full potential in maturity, young trees should be trained. Training is careful, thoughtful pruning that creates strong trunk and branch structure and a visually pleasing form. This influences future performance, landscape potential, and safety. Correct pruning of young trees will improve structural stability, increase tree longevity, and decrease maintenance costs. Trained trees will have fewer branches but better spacing. With fewer structural defects when mature, trained tress reduce the need for costly corrective measures later. The process of training young trees directs growth to fulfill the landscape function, reduces structural defects that may lead to tree failure, and ultimately decreases hazard potential and liability risks. Well- maintained trees are an asset to any landscape.

How to Prune

Proper pruning takes skill and practice. To minimize the amount of exposed wood, make small cuts and conserve as many living branches as possible. Excess end weight should be removed with preliminary cuts to avoid tearing bark. Always prune trees back to the parent branch or a lateral branch that is at least one-third the diameter of the branch being pruned. Avoid cutting the trunk or branches that you are not actively pruning. Do not remove more than one-quarter of the foliage from a branch unless you are removing the entire branch.

Every branch has a swell at the base, where it meets the trunk of the tree. This is known as the branch collar. All pruning cuts should be made further away from the trunk than the collar.

1. Make a shallow cut on the underside of the branch, away from the collar. This will prevent bark tears if the branch drops suddenly.
2. Just beyond the partial cut, cut through the branch to remove the bulk of the weight.
3. Finish the prune by cutting through the branch just outside the branch collar.

The two most common pruning errors are known as "flush cuts" and "stub cuts." Both of these errors happen during Cut 3. A flush cut is a cut that injures or removes the branch collar. A stub cut leaves too much branch past the collar. Stub and flush cuts can open your tree to pests, disease, and decay. Remember, tree wounds should be left uncovered so the tree's immune system can take care of them.

Hazard Tree Removal

Tree removal is a natural and expected part of the tree lifecycle, but it can be dangerous and expensive when done on an emergency basis. Our ISA Certified Arborist(s) have helped to create this plan for the removal and replacement of your trees over time based on known vulnerabilities and expected lifespan. To avoid unnecessary replacements, prune your trees carefully and provide them with water and nutrients. Inspect your trees for damage annually and after storms. Trees that are a poor selection for the location, that lack adequate growing space, or that conflict with infrastructure such as buildings, roadways, or utility services could require removal. To avoid these costly problems, follow our selection and planting guides.

Trees that are badly damaged or in irreversible decline should be removed and replaced in order to avoid hazards. In the case of diseased trees, they should be removed promptly to avoid infecting adjacent trees. An otherwise healthy tree may be removed in order to prepare a site for development, but this should be in a strict minimum of cases. Removing trees to make construction more convenient wastes thousands of dollars in ecosystem benefits and services.

If a tree has heritage or historic value but has a high risk of becoming a hazard, consider restricting public access or moving valuable structures instead of removing it. Have an ISA Certified Arborist evaluate tree health and risk of failure before removing heritage trees.

Positively identify ownership of the tree before authorizing a removal. If the tree is in a public right-of- way, contact the local jurisdiction for guidance before work begins. Some jurisdictions require a permit, some allow only certified arborists to work on such trees, and others allow only crews to work on trees on publicly owned properties, including rights-of-way.

Never attempt to remove a tree alone. Hire experienced professionals to remove trees. Request the local utility company to remove trees located near or beneath utility lines; do not attempt to remove these trees yourself. Accidental contact with utility lines can cause severe injury or death.

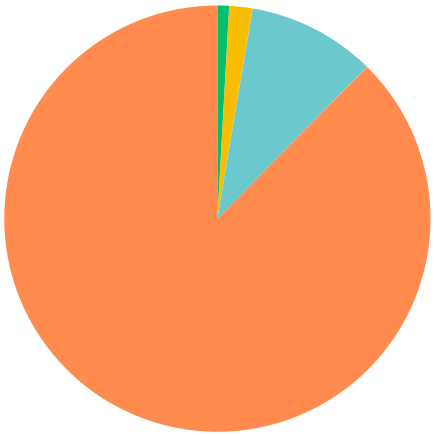
Whatever the reason for removal, the site should be evaluated to determine whether another tree can be planted in the same location or nearby to maintain tree canopy cover in the area. Replace trees wherever and whenever possible. Select large canopy trees if space permits, and follow proper planting procedure.

Survey of Villagers during Public Presentations

See attached document

Q1 Do Urban Trees make the Village a better place to live and work?

Answered: 113 Skipped: 1

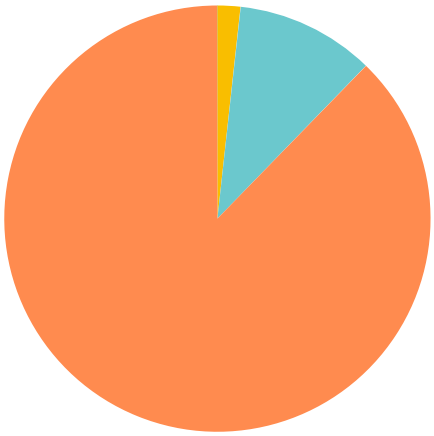


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.88% 1	0.00% 0	1.77% 2	9.73% 11	87.61% 99	113	4.83

Q2 Trees and Parks increase property values and residential ownership

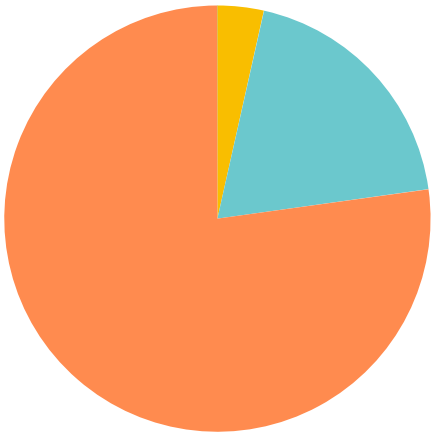
Answered: 114 Skipped: 0



	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	1.75% 2	10.53% 12	87.72% 100	114	4.86

Q3 Trees decrease energy use and consumption by shading and cooling

Answered: 114 Skipped: 0

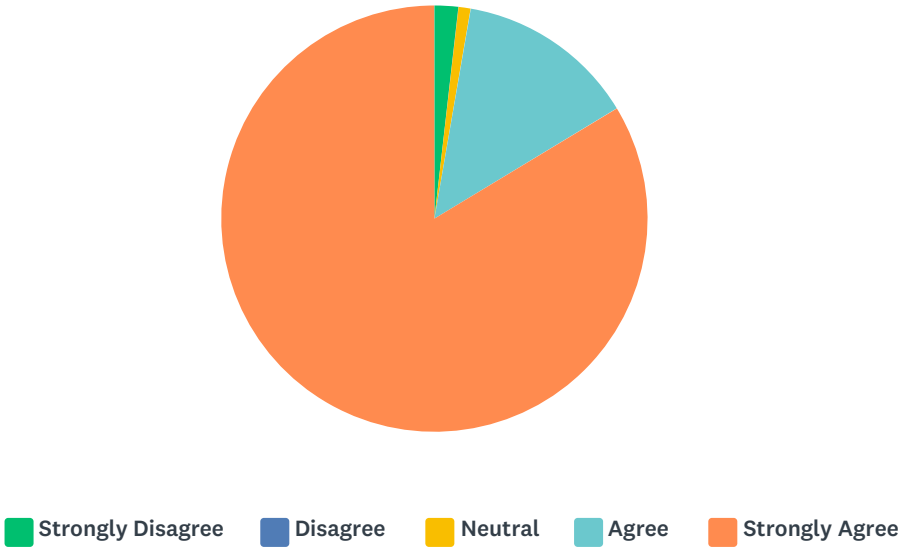


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	3.51% 4	19.30% 22	77.19% 88	114	4.74

Q4 Trees decrease stormwater runoff and erosion

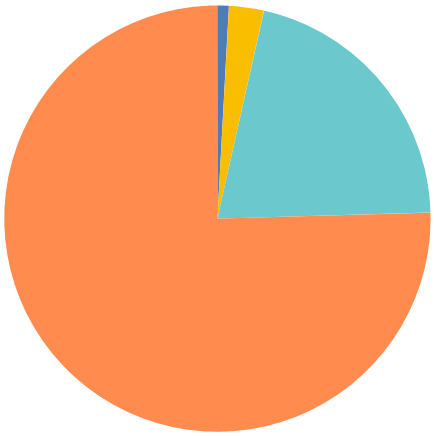
Answered: 110 Skipped: 4



	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	1.82% 2	0.00% 0	0.91% 1	13.64% 15	83.64% 92	110	4.77

Q5 Trees reduce smog and dust and filter air pollutants

Answered: 114 Skipped: 0

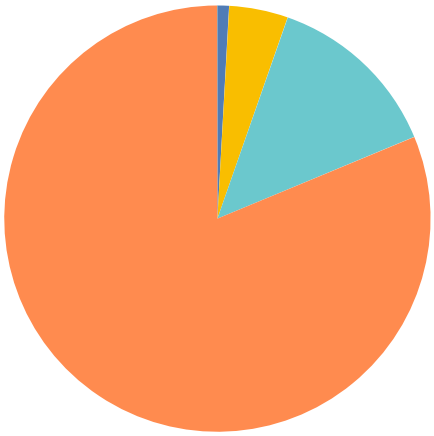


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.88% 1	2.63% 3	21.05% 24	75.44% 86	114	4.71

Q6 Trees decrease noise from roads, industries and other sources.

Answered: 112 Skipped: 2

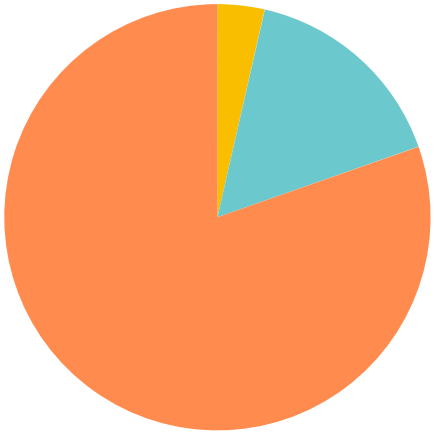


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.89% 1	4.46% 5	13.39% 15	81.25% 91	112	4.75

Q7 Trees and Forests are a defining character of Hastings-on-Hudson and improve the overall quality of life.

Answered: 112 Skipped: 2

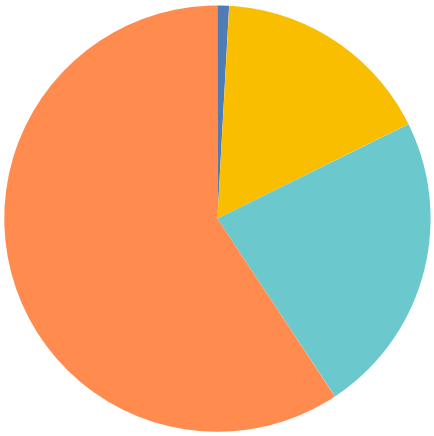


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	3.57% 4	16.07% 18	80.36% 90	112	4.77

Q8 Trees protect water quality.

Answered: 113 Skipped: 1

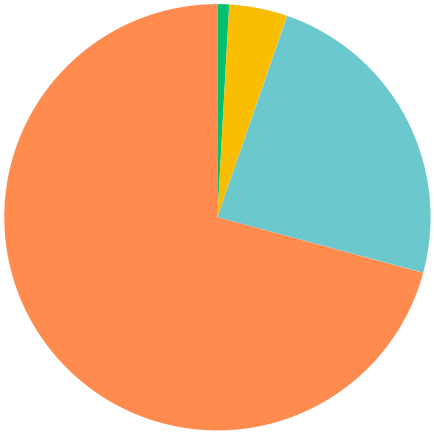


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.88% 1	16.81% 19	23.01% 26	59.29% 67	113	4.41

Q9 The forest of Hillside Woods and Park provides measurable economic and environmental benefits that justify planting and maintenance costs.

Answered: 113 Skipped: 1

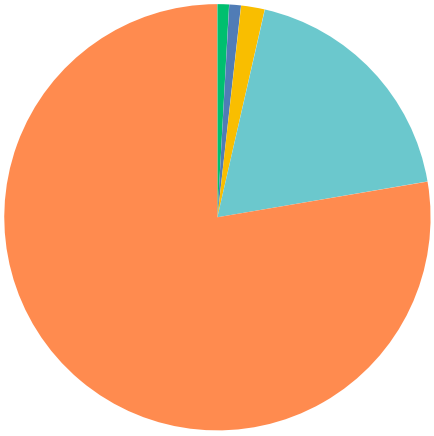


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.88% 1	0.00% 0	4.42% 5	23.89% 27	70.80% 80	113	4.64

Q10 Hillside Woods and Park gives the surrounding neighborhoods “Character”.

Answered: 112 Skipped: 2

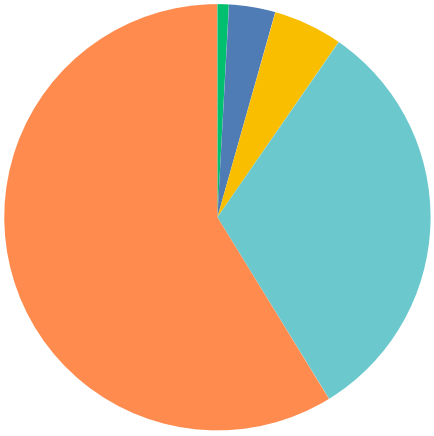


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.89% 1	0.89% 1	1.79% 2	18.75% 21	77.68% 87	112	4.71

Q11 Park trees are equal in value to other city infrastructure investments such as street lights, benches and sidewalks.

Answered: 114 Skipped: 0

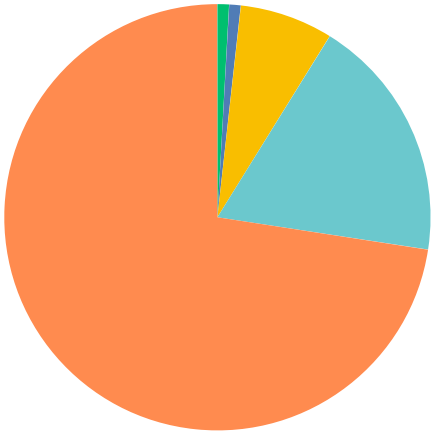


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.88% 1	3.51% 4	5.26% 6	31.58% 36	58.77% 67	114	4.44

Q12 Non-native & invasive trees should be avoided when selecting trees for planting in Hillside Woods & Park.

Answered: 113 Skipped: 1

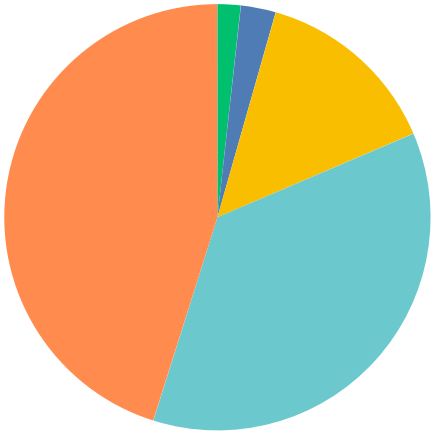


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.88% 1	0.88% 1	7.08% 8	18.58% 21	72.57% 82	113	4.61

Q13 I am personally willing to invest a small amount of time and money to maintain and improve Hillside Woods & Park.

Answered: 113 Skipped: 1

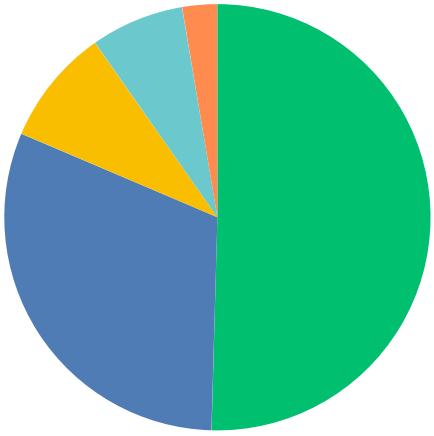


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	1.77% 2	2.65% 3	14.16% 16	36.28% 41	45.13% 51	113	4.20

Q14 Park trees should not be planted because they cost too much to maintain and preserve.

Answered: 113 Skipped: 1

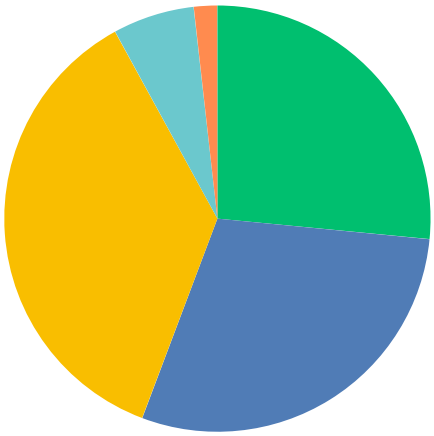


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	50.44% 57	30.97% 35	8.85% 10	7.08% 8	2.65% 3	113	1.81

Q15 Under current practices Park trees are well maintained.

Answered: 113 Skipped: 1

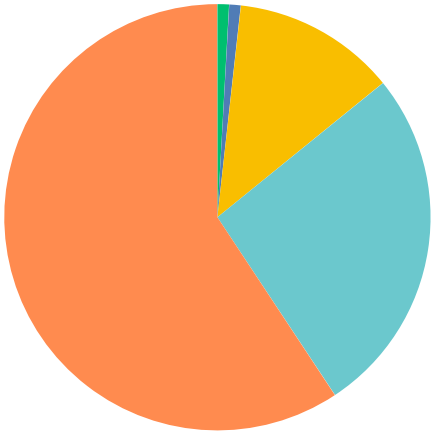


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	26.55% 30	29.20% 33	36.28% 41	6.19% 7	1.77% 2	113	2.27

Q16 A diversity of native trees and other plants provide resiliency to pests and weather fluctuations.

Answered: 113 Skipped: 1

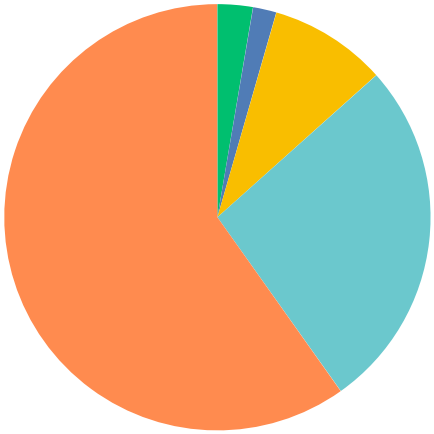


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.88% 1	0.88% 1	12.39% 14	26.55% 30	59.29% 67	113	4.42

Q17 There is a need to create a Hillside Woods & Park Forest Management Plan

Answered: 112 Skipped: 2

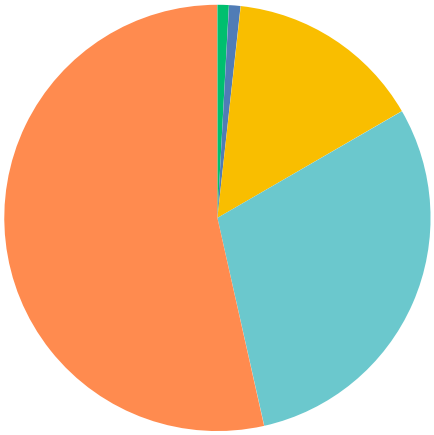


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	2.68% 3	1.79% 2	8.93% 10	26.79% 30	59.82% 67	112	4.39

Q18 The Village, and the Hillside Woods & Park Forestry Project should provide educational opportunities and resources to the public about proper tree planting, maintenance, and selection.

Answered: 114 Skipped: 0

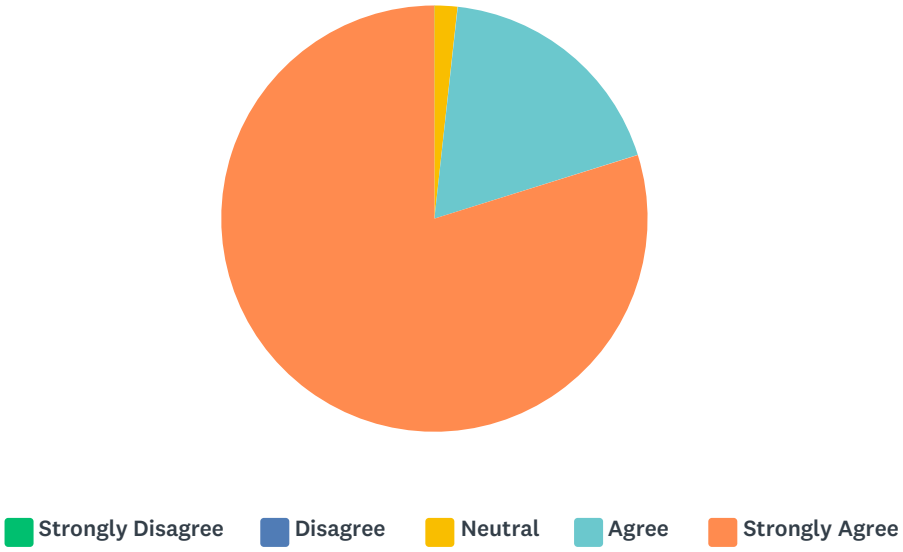


Strongly Disagree Disagree Neutral Agree Strongly Agree

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.88% 1	0.88% 1	14.91% 17	29.82% 34	53.51% 61	114	4.34

Q19 Hillside Woods & Park are important to me.

Answered: 114 Skipped: 0



	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	1.75% 2	18.42% 21	79.82% 91	114	4.78

Forest Inventory Data (i-Tree Eco, contemporary forestry)

See attached file

ID	Stratum	Latitude (Y)	Longitude (X)	Size (ac)	Stake	% Tree	% Shrub	% Measure	Notes	Complete?
18	Stand 2	40.9990834	-73.868879	0.1	FALSE	95% - 99%	0%	100	5; NW; beech suckering all w/ deer rubs	TRUE
19	Stand 2	40.999071	-73.867668	0.1	FALSE	90% - 95%	0%	100	3; NW; no understory; trail bisects	TRUE
23	Stand 4	40.999044	-73.862835	0.1	FALSE	80% - 85%	20% - 25%	100	10; SE; Butted up to children's property; moved plot about 50ft from edge	TRUE
31	Stand 2	40.9981606	-73.8688755	0.1	FALSE	90% - 95%	1% - 5%	100	10; W; bisected by 2 paths	TRUE
32	Stand 2	40.9981539	-73.867668	0.1	FALSE	90% - 95%	0%	100	2; W; Basically no understory, trail bisects	TRUE
36	Stand 4	40.998121	-73.862852	0.1	FALSE	90% - 95%	0%	100		TRUE
37	Stand 4	40.998133	-73.8616332	0.1	FALSE	70% - 75%	5% - 10%	100	5; SE; Right on perennial stream	TRUE
43	Stand 1	40.9972628	-73.87009825	0.1	FALSE	80% - 85%	50% - 55%	100	5; E; West of pond and wetland, lots of downed wood	TRUE
46	Stand 3	40.9972429	-73.8664753	0.1	FALSE	95% - 99%	10% - 15%	100	1; S; Transition to thicket/woods	TRUE
47	Stand 3	40.99723	-73.865281	0.1	FALSE	95% - 99%	1% - 5%	100	3; S; Intersects trail, deer bedded down, large snag, woody debris, exposed bedrock	TRUE
48	Stand 3	40.9972234	-73.864071	0.1	FALSE	80% - 85%	1% - 5%	100	2;S; Intersects trail; several smaller than 6 DBH	TRUE
49	Stand 4	40.9997217	-73.862861	0.1	FALSE	90% - 95%	1% - 5%	100	10; SE; rocky outcropping, lots of woody debris and down trees	TRUE
50	Stand 4	40.99721	-73.861659	0.1	FALSE	95% - 99%	5% - 10%	100	5; SE; seep to NE with Skunk Cabbage	TRUE
51	Stand 4	40.997216	-73.860448	0.1	FALSE	90% - 95%	5% - 10%	100	35; SE; several less than 6in beech in plot	TRUE
56	Stand 1	40.9963425	-73.8701112	0.1	FALSE	95% - 99%	5% - 10%	100	0; Stream down	TRUE
59	Stand 3	40.9963195	-73.8664925	0.1	FALSE	60% - 65%	80% - 85%	100	2; S; Very shrubby	TRUE
60	Stand 3	40.996313	-73.865274	0.1	FALSE	50% - 55%	1% - 5%	100	1; SSE; Intermitten woodland pool	TRUE
61	Stand 3	40.996306	-73.86408	0.1	FALSE	15% - 20%	30% - 35%	100	3; S; Opening in forest with cistern, lots of cines and invasives	TRUE
62	Stand 4	40.9963059	-73.86287	0.1	FALSE	40% - 45%	40% - 45%	100	5; SE; in drainage	TRUE
63	Stand 4	40.996299	-73.8616592	0.1	FALSE	90% - 95%	0%	100	5; SE	TRUE
66	Stand 1	40.995603	-73.87344	0.1	FALSE	80% - 85%	50% - 55%	100	10; S; Protected, mesic	TRUE
67	Stand 1	40.995443	-73.872471	0.1	FALSE	90% - 95%	1% - 5%	100	5; S; Understaory of shagbark and cherry	TRUE
69	Stand 1	40.9995429	-73.87011989	0.1	FALSE	80% - 85%	20% - 25%	100	10; NW; Lots of downed wood, opening in canopy from large oak, bisected byu paved trail from school	TRUE
72	Stand 3	40.995415	-73.866493	0.1	FALSE	70% - 75%	10% - 15%	100	1; N; Flat, minor ridge, smaller sassafras and hickory	TRUE
73	Stand 3	40.995388	-73.86521	0.1	FALSE	90% - 95%	1% - 5%	100	5; E; Several dead snag trees, many less than 6 DBH	TRUE
74	Stand 3	40.995389	-73.86408	0.1	FALSE	80% - 85%	5% - 10%	100	5; W; Edge plot. yard waste drop off site	TRUE
80	Stand 1	40.99457	-73.87254	0.1	FALSE	90% - 95%	0%	100	5; S; sidehill drainage channel	TRUE
81	Stand 1	40.99455	-73.87129	0.1	FALSE	90% - 95%	80% - 85%	100	15; WSW;	TRUE
82	Stand 1	40.9945148	-73.8701285	0.1	FALSE	90% - 95%	1% - 5%	100	0;	TRUE
95	Stand 1	40.993542	-73.87077	0.1	FALSE	90% - 95%	0%	100	5; S; Sugarmaple in understory	TRUE

Hazard Tree Data (i-Tree Streets)

See attached file

Treeid	SpCode	DBH	CondTrunk	CondCanopy	CondRoot	Priority	GPS_Lat	GPS_Lon	StreetId	Comments
1	White oak	24 to 30 in	Good	Poor	Good	Low	40.994987N	73.864869W	Algonquin trail	at trailhead
2	Black cherry	6 to 12 in	Fair	Good	Good	Med	40.997016N	73.864864W	Algonquin trail	dead stum
3	Northern red oak	6 to 12 in	Poor	Dead or Dying	Fair	Med	40.994977N	73.864978W	Algonquin trail	dead
4	Black oak	18 to 24 in	Good	Good	Good	Routin Maintenance	40.995058N	73.864873W	Algonquin trail	dead branch
5	Black oak	12 to 18 in	Good	Good	Good	Routin Maintenance	40.995105N	73.864773W	Algonquin trail	dead branch
6	Black oak	12 to 18 in	Poor	Dead or Dying	Dead or Dying	Med	40.995311N	73.864217W	Algonquin trail	dead
7	Northern red oak	36 to 42 in	Fair	Fair	Good	Low	40.995301N	73.864167W	Algonquin trail	dead branch
8	Red maple	18 to 24 in	Fair	Good	Fair	Low	40.995355N	73.864157W	Algonquin trail	trunk rot
9	Boxelder	6 to 12 in	Good	Dead or Dying	Good	Low	40.995465N	73.864077W	Algonquin trail	mostly dead crown
10	Black oak	30 to 36 in	Good	Fair	Good	Low	40.995469N	73.869034W	Algonquin trail	dead branches
11	White ash	18 to 24 in	Fair	Dead or Dying	Fair	Med	40.995521N	73.863985W	Algonquin trail	dead
12	White oak	24 to 30 in	Good	Good	Good	Routin Maintenance	40.995389N	73.863729W	Algonquin trail	dead branch
13	White oak	30 to 36 in	Good	Poor	Good	Low	40.995543N	73.863605W	Algonquin trail	dead branch
14	White oak	30 to 36 in	Good	Good	Good	Low	40.995655N	73.863496W	Algonquin trail	dead branch
15	Black birch	6 to 12 in	Fair	Dead or Dying	Poor	Med	40.995647N	73.863460W	Algonquin trail	dead
16	White ash	18 to 24 in	Good	Poor	Good	Low	40.995680N	73.863402W	Algonquin trail	decline
17	White ash	12 to 18 in	Fair	Poor	Good	Low	40.995680N	73.863403W	Algonquin trail	large canker
18	Black birch	12 to 18 in	Poor	Dead or Dying	Dead or Dying	High	40.995763N	73.863284W	Algonquin trail	dead
19	Black birch	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.995763N	73.863284W	Algonquin trail	dead
20	Black birch	6 to 12 in	Poor	Good	Good	Low	40.995992N	73.863113W	Algonquin trail	canker
21	Black birch	12 to 18 in	Poor	Dead or Dying	Dead or Dying	High	40.996115N	73.862951W	Algonquin trail	dead
22	Black birch	12 to 18 in	Poor	Good	Fair	Med	40.996109N	73.862594W	Algonquin trail	root rot cankers
23	Bitternut hickory	12 to 18 in	Dead or Dying	Fair	Dead or Dying	High	40.996252N	73.867320W	Algonquin trail	hanging
24	Black oak	24 to 30 in	Fair	Fair	Good	High	40.996343N	73.862430W	Algonquin trail	dead branches, pruning hanger
25	Black birch	12 to 18 in	Poor	Good	Good	Med	40.99652N	73.862292W	Algonquin trail	trunk hollow rot
26	Black birch	18 to 24 in	Fair	Good	Fair	Low	40.996389N	73.862102W	Algonquin trail	canker
27	Black birch	24 to 30 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.996511N	73.861796W	Algonquin trail	root rot
28	Black birch	12 to 18 in	Dead or Dying	Good	Fair	High	40.996578N	73.861688W	Algonquin trail	will split at canker
29	Black birch	18 to 24 in	Poor	Poor	Poor	Med	40.996538N	73.861663W	Algonquin trail	dying
30	American elm	12 to 18 in	Fair	Dead or Dying	Good	Low	40.996961N	73.861099W	Algonquin trail	dead

31	Tulip tree	18 to 24 in	Fair	Fair	Good	Low	40.997098N	73.861144W	Algonquin trail	dead branch
32	American beech	6 to 12 in	Fair	Dead or Dying	Poor	Med	50.997156N	73.861003W	Algonquin trail	falling
33	Tulip tree	36 to 42 in	Good	Fair	Good	Low	40.997195N	73.861163W	Algonquin trail	dying canopy
34	Tulip tree	30 to 36 in	Good	Good	Poor	Low	40.997267N	73.861131W	Algonquin trail	root rot
35	Black birch	12 to 18 in	Good	Fair	Good	Low	40.997662N	73.860805W	Algonquin trail	canker
36	White oak	18 to 24 in	Poor	Fair	Good	Low	40.997859N	73.860567W	Algonquin trail	decline
37	Black birch	12 to 18 in	Fair	Good	Good	Routin Maintenance	40.997931N	73.860610W	Algonquin trail	root/trunk
38	Black birch	12 to 18 in	Poor	Good	Poor	Low	40.997931N	73.860610W	Algonquin trail	root/trunk
39	Black birch	12 to 18 in	Good	Good	Poor	Low	40.998104N	73.860485W	Algonquin trail	root
40	Black birch	12 to 18 in	Fair	Fair	Poor	Med	40.998181N	73.860411W	Algonquin trail	Canker
41	Black birch	12 to 18 in	Poor	Good	Poor	Low	40.998247N	73.860508W	Algonquin trail	Canker
42	Black birch	12 to 18 in	Poor	Good	Fair	Med	40.998216N	73.860526W	Algonquin trail	Canker
43	Black birch	12 to 18 in	Fair	Good	Poor	Low	40.998250N	73.860608W	Algonquin trail	Root
44	Black birch	6 to 12 in	Poor	Good	Poor	Med	40.998309N	73.860603W	Algonquin trail	Canker near base
45	Birch	12 to 18 in	Fair	Good	Good	Routin Maintenance	40.998368N	73.860664W	Algonquin trail	Canker
46	Black birch	12 to 18 in	Poor	Good	Poor	Med	40.998404N	73.860718W	Algonquin trail	canker, root rot, trunk rot
47	Black birch	6 to 12 in	Dead or Dying	Good	Good	High	40.998479N	73.860808W	Algonquin trail	Broken at canker
48	Northern red oak	18 to 24 in	Fair	Poor	Poor	Med	40.998698N	73.860725W	Algonquin trail	Root ooze/rot
49	Boxelder	6 to 12 in	Poor	Fair	Poor	Med	40.998878N	73.860786W	Algonquin trail	Root rot
50	Pignut hickory	12 to 18 in	Fair	Poor	Good	Routin Maintenance	40.998790N	73.860981W	Algonquin trail	Decline
51	Black birch	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.998891N	73.860971W	Algonquin trail	Dead
52	Black birch	12 to 18 in	Fair	Poor	Good	Med	40.998820N	73.861259W	Algonquin trail	Top dead
53	Black birch	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.998805N	73.861398W	Algonquin trail	Dying/cankers
54	Tulip tree	12 to 18 in	Dead or Dying	Fair	Dead or Dying	High	40.998805N	73.861338W	Algonquin trail	Dying
55	Black birch	12 to 18 in	Dead or Dying	Dead or Dying	Poor	High	40.999008N	73.861860W	Algonquin trail	Cankers, dieback
56	Boxelder	6 to 12 in	Fair	Poor	Good	Med	40.999008N	73.861860W	Algonquin trail	
57	Black birch	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	Low	40.999017N	73.861852W	Algonquin trail	Dead
58	Tulip tree	18 to 24 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.999100N	73.862195W	Algonquin trail	Dead
59	Black birch	12 to 18 in	Fair	Fair	Good	Low	40.999100N	73.862179W	Algonquin trail	
60	Black oak	24 to 30 in	Good	Fair	Good	Routin Maintenance	40.998932N	73.862362W	Algonquin trail	Dead branches
61	American elm	6 to 12 in	Fair	Poor	Fair	Low	40.998874N	73.862501W	Algonquin trail	

62	Boxelder	12 to 18 in	Fair	Dead or Dying	Fair	High	40.998563N	73.863089W	Algonquin trail	Dead
63	Boxelder	6 to 12 in	Dead or Dying	Poor	Good	High	40.998369N	73.863158W	Algonquin trail	One of three trunks
64	Boxelder	6 to 12 in	Dead or Dying	Poor	Good	High	40.998369N	73.863158W	Algonquin trail	One of three trunks
65	Boxelder	6 to 12 in	Dead or Dying	Poor	Good	High	40.998369N	73.863158W	Algonquin trail	One of three trunks
66	Boxelder	12 to 18 in	Poor	Fair	Poor	Med	40.998255N	73.863284W	Algonquin trail	
67	Boxelder	12 to 18 in	Good	Fair	Good	Routin Maintenance	40.998063N	73.863158W	Algonquin trail	
68	Boxelder	6 to 12 in	Fair	Fair	Good	Low	40.997991N	73.863159W	Algonquin trail	
69	Boxelder	6 to 12 in	Fair	Poor	Good	Routin Maintenance	40.997991N	73.863159W	Algonquin trail	
70	Boxelder	6 to 12 in	Poor	Good	Good	Low	40.997972N	73.863148W	Algonquin trail	Branches
71	Boxelder	6 to 12 in	Dead or Dying	Dead or Dying	Poor	High	40.997942N	73.863230W	Algonquin trail	Dead snag
72	Northern red oak	18 to 24 in	Poor	Fair	Fair	Med	40.997906N	73.863240W	Algonquin trail	
73	Northern red oak	18 to 24 in	Fair	Good	Good	Routin Maintenance	40.997830N	73.863314W	Algonquin trail	
74	Boxelder	0 to 3 in	Fair	Fair	Good	Low	40.997697N	73.863396W	Algonquin trail	
75	Boxelder	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997691N	73.863507W	Algonquin trail	
76	Northern red oak	18 to 24 in	Good	Fair	Good	Low	40.997672N	73.863629W	Algonquin trail	
77	Boxelder	12 to 18 in	Fair	Poor	Good	Low	40.997619N	73.863577W	Algonquin trail	
78	Black oak	24 to 30 in	Poor	Poor	Fair	Low	40.997533N	73.863638W	Algonquin trail	
79	Boxelder	12 to 18 in	Good	Fair	Good	Routin Maintenance	40.997700N	73.863773W	Algonquin trail	
80	Boxelder	6 to 12 in	Poor	Good	Good	Low	40.997606N	73.863688W	Algonquin trail	
81	White oak	12 to 18 in	Good	Poor	Good	Low	40.997487N	73.863757W	Algonquin trail	
82	Black cherry	6 to 12 in	Good	Fair	Good	Low	40.997418N	73.863844W	Algonquin trail	Leaner
83	Black oak	18 to 24 in	Good	Fair	Good	Low	40.997326N	73.863920W	Algonquin trail	
84	Boxelder	6 to 12 in	Poor	Fair	Good	Med	40.997313N	73.864070W	Algonquin trail	
85	Black oak	12 to 18 in	Good	Poor	Fair	Low	40.997369N	73.864158W	Algonquin trail	One of two
86	Black oak	12 to 18 in	Fair	Poor	Fair	Low	40.997369N	73.864158W	Algonquin trail	One of two
87	Black cherry	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997250N	73.864041W	Algonquin trail	Dead
88	Black oak	18 to 24 in	Good	Fair	Good	Low	40.997248N	73.864191W	Algonquin trail	
89	White oak	12 to 18 in	Good	Fair	Good	Low	40.997025N	73.864067W	Algonquin trail	
90	White oak	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	Med	40.997025N	73.864067W	Algonquin trail	
91	Northern red oak	12 to 18 in	Fair	Poor	Good	Med	40.997040N	73.864119W	Algonquin trail	
92	Northern red oak	12 to 18 in	Good	Fair	Good	Low	40.996974N	73.864114W	Algonquin trail	

93	Northern red oak	18 to 24 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.996735N	73.864127W	Algonquin trail	Dead
94	White oak	30 to 36 in	Poor	Fair	Good	Low	40.996611N	73.864327W	Algonquin trail	
95	Black birch	3 to 6 in	Dead or Dying	Good	Poor	High	40.996411N	73.864222W	Algonquin trail	
96	Black birch	6 to 12 in	Dead or Dying	Good	Poor	High	40.996411N	73.864222W	Algonquin trail	Cankers
97	Black birch	6 to 12 in	Dead or Dying	Good	Poor	High	40.996299N	73.864506W	Algonquin trail	
98	Black birch	6 to 12 in	Dead or Dying	Good	Dead or Dying	High	40.996347N	73.864566W	Algonquin trail	Cankers, root
99	White oak	30 to 36 in	Fair	Poor	Good	Low	40.996127N	73.864802W	Algonquin trail	Dead branches
100	White oak	18 to 24 in	Good	Poor	Good	Med	40.996030N	73.864839W	Algonquin trail	
101	Northern red oak	24 to 30 in	Good	Good	Good	Low	40.995815N	73.864999W	Algonquin trail	Dead branch
102	Black birch	12 to 18 in	Dead or Dying	Fair	Dead or Dying	High	40.995838N	73.865015W	Algonquin trail	Cankers
103	Black birch	12 to 18 in	Poor	Poor	Poor	Med	40.995633N	73.864879W	Algonquin trail	
104	Black oak	18 to 24 in	Good	Poor	Good	Med	40.995565N	73.864837W	Algonquin trail	Dead branch
105	Northern red oak	12 to 18 in	Fair	Fair	Good	Routin Maintenance	40.995355N	73.864752W	Algonquin trail	Stem suckering
106	Black oak	12 to 18 in	Good	Fair	Good	Low	40.995281N	73.864813W	Algonquin trail	Dead branch
107	Red maple	18 to 24 in	Fair	Fair	Good	Low	40.995864N	73.864869W	Thicket loop	
108	Red maple	18 to 24 in	Fair	Good	Fair	Low	40.995755N	73.865285W	Thicket loop	
109	White oak	36 to 42 in	Poor	Good	Dead or Dying	High	40.995755N	73.865285W	Thicket loop	Prune branches
110	Black birch	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.5795N	73.865376W	Thicket loop	Dead on trail
111	Black locust	24 to 30 in	Good	Fair	Poor	Med	40.995891N	73.865505W	Thicket loop	
112	Black walnut	36 to 42 in	Fair	Fair	Fair	Routin Maintenance	40.995834N	73.865645W	Thicket loop	
113	White oak	30 to 36 in	Good	Fair	Good	Low	40.995735N	73.865897W	Thicket loop	branches
114	White oak	12 to 18 in	Good	Fair	Good	Low	40.995731N	73.865823W	Thicket loop	Branches
115	Red maple	18 to 24 in	Fair	Fair	Good	Low	40.995766N	73.865988W	Thicket loop	Dead branches
116	White ash	24 to 30 in	Fair	Poor	Poor	Med	40.995822N	73.866088W	Thicket loop	Dying
117	White oak	30 to 36 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.995919N	73.866248W	Thicket loop	Dead near trail
118	Black oak	18 to 24 in	Good	Fair	Good	Med	40.995951N	73.866484W	Thicket loop	Near trail
119	Black birch	12 to 18 in	Poor	Good	Good	Low	40.995860N	73.866576W	Thicket loop	Cankers
120	Northern red oak	18 to 24 in	Poor	Fair	Fair	Low	40.996229N	73.866862W	Thicket loop	Decline
121	Tulip tree	24 to 30 in	Fair	Fair	Good	Low	40.996360N	73.866850W	Thicket loop	Branches
122	Black oak	18 to 24 in	Good	Fair	Good	Low	40.995875N	73.866995W	Thicket loop	Branches
123	Black oak	18 to 24 in	Fair	Poor	Fair	Med	40.996711N	73.866940W	Thicket loop	Top broken/decline

124	Northern red oak	24 to 30 in	Poor	Poor	Fair	Med	40.996765N	73.867083W	Thicket loop	Branches/stem on trail
125	Black oak	24 to 30 in	Good	Fair	Good	Routin Maintenance	40.996720N	73.867039W	Thicket loop	Branch
126	Black oak	12 to 18 in	Good	Fair	Good	Low	40.996792N	73.867154W	Thicket loop	Branch
127	Black oak	30 to 36 in	Fair	Poor	Good	Med	40.996908N	73.867281W	Thicket loop	Over trail
128	Black oak	30 to 36 in	Good	Poor	Good	Low	40.997005N	73.867307W	Thicket loop	Branch over trail
129	Black oak	12 to 18 in	Good	Poor	Good	Low	40.997145N	73.866820W	Thicket loop	Branches
130	Black oak	12 to 18 in	Poor	Dead or Dying	Fair	Med	40.997154N	73.866727W	Thicket loop	Almost dead
131	White ash	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997146N	73.866487W	Thicket loop	Dead
132	Boxelder	12 to 18 in	Poor	Good	Good	Low	40.997177N	73.866447W	Thicket loop	Scarred
133	Northern red oak	18 to 24 in	Fair	Poor	Good	Low	40.997046N	73.866420W	Thicket loop	Prune widowmaker
134	White oak	12 to 18 in	Poor	Fair	Fair	Med	40.997021N	73.866417W	Thicket loop	Decline
135	Tree of heaven	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997036N	73.866334W	Thicket loop	Dying
136	Boxelder	24 to 30 in	Dead or Dying	Poor	Good	High	40.996909N	73.866211W	Thicket loop	Dead stem, target drink spot
137	Boxelder	18 to 24 in	Poor	Fair	Good	Med	40.996752N	73.866230W	Thicket loop	Canker
138	Black oak	18 to 24 in	Poor	Fair	Good	Med	40.996880N	73.866148W	Thicket loop	Bottle opener tree
139	Black cherry	6 to 12 in	Poor	Poor	Poor	High	40.996924N	73.866073W	Thicket loop	Drinking spot
140	Boxelder	6 to 12 in	Poor	Poor	Fair	Med	40.997010N	73.866029W	Thicket loop	Drinking spot
141	Boxelder	6 to 12 in	Fair	Good	Good	Low	40.996977N	73.866090W	Thicket loop	Drinking spot
142	Red mulberry	6 to 12 in	Fair	Poor	Fair	Low	40.996847N	73.865948W	Thicket loop	Mulberry in trail
143	Boxelder	6 to 12 in	Poor	Good	Good	Low	40.996790N	73.865868W	Thicket loop	
144	White ash	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.996909N	73.866211W	Thicket loop	Overhanging drinking spot
145	Red maple	18 to 24 in	Fair	Fair	Fair	Low	40.995828N	73.865623W	Thicket loop	Dead branches
146	Northern red oak	6 to 12 in	Good	Fair	Fair	Routin Maintenance	40.996740N	73.865728W	Thicket loop	Branches over trail
147	Black oak	24 to 30 in	Good	Poor	Good	Low	40.996777N	73.865593W	Thicket loop	Branches
148	Northern red oak	12 to 18 in	Good	Fair	Good	Low	40.996834N	73.865542W	Thicket loop	Branch
149	Black oak	30 to 36 in	Dead or Dying	Poor	Poor	High	40.996848N	73.865466W	Thicket loop	About to fall, saprot
150	White oak	12 to 18 in	Fair	Poor	Good	High	40.996725N	73.865174W	Thicket loop	Dead branches, remove branch over trail
151	Black oak	12 to 18 in	Good	Poor	Good	Low	40.996621N	73.865000W	Thicket loop	Branch
152	Black oak	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.996404N	73.864863W	Thicket loop	Hanging toward trail
153	Black birch	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	Med	40.996400N	73.864860W	Thicket loop	Snag
154	Black birch	12 to 18 in	Poor	Good	Good	Med	40.996460N	73.864998W	Thicket loop	On trail, stem injured

155	Black oak	36 to 42 in	Good	Poor	Good	High	40.996368N	73.864788W	Thicket loop	Prune branch
156	Northern red oak	12 to 18 in	Good	Fair	Good	Low	40.997493N	73.864289W	Thicket loop	Branch
157	White oak	24 to 30 in	Good	Fair	Good	Med	40.997318N	73.864406W	Thicket loop	Branches
158	Boxelder	6 to 12 in	Dead or Dying	Good	Fair	Med	40.997372N	73.864509W	Thicket loop	Stem injured/rot
159	Black cherry	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997315N	73.864698W	Thicket loop	Dead
160	Black cherry	12 to 18 in	Good	Poor	Good	Routin Maintenance	40.997295N	73.864765W	Thicket loop	Dead branch leaning
161	Boxelder	12 to 18 in	Good	Fair	Good	Low	40.997284N	73.864076W	Thicket loop	Branch
162	Boxelder	12 to 18 in	Fair	Poor	Good	Low	40.997317N	73.865023W	Thicket loop	Branches
163	White oak	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	Med	40.997280N	73.865004W	Thicket loop	Dead
164	Boxelder	6 to 12 in	Poor	Good	Fair	Med	40.997277N	73.865181W	Thicket loop	In trail split
165	Northern red oak	12 to 18 in	Good	Poor	Good	Low	40.997231N	73.865198W	Thicket loop	Dead tap
166	Boxelder	6 to 12 in	Fair	Good	Good	Low	40.997251N	73.865168W	Thicket loop	Stem injured, branch leaning
167	American basswood	12 to 18 in	Good	Fair	Dead or Dying	Low	40.997251N	73.865168W	Thicket loop	Injured and leaning
168	White ash	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997176N	73.865163W	Thicket loop	Dead
169	American basswood	18 to 24 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997176N	73.865163W	Thicket loop	Dead, snag
170	Pin cherry	6 to 12 in	Dead or Dying	Fair	Dead or Dying	High	40.997074N	73.865448W	Thicket loop	Root rot
171	Boxelder	12 to 18 in	Fair	Poor	Good	Low	40.997021N	73.865473W	Thicket loop	Decline
172	White ash	6 to 12 in	Poor	Fair	Good	Med	40.997059N	73.865500W	Thicket loop	Almost dead
173	Boxelder	12 to 18 in	Poor	Good	Good	Routin Maintenance	40.997029N	73.865612W	Thicket loop	Bad form, split stem
174	Black cherry	6 to 12 in	Dead or Dying	Dead or Dying	Good	High	40.996910N	73.865597W	Thicket loop	Dead stem, branches
175	Black cherry	12 to 18 in	Good	Poor	Good	Low	40.996910N	73.865597W	Thicket loop	Branch
176	Black cherry	12 to 18 in	Good	Poor	Good	Low	40.996910N	73.865597W	Thicket loop	Branch
177	Tulip tree	12 to 18 in	Dead or Dying	Good	Poor	Med	40.995841N	73.866505W	Connector trails	Trunk rot in buttress
178	Tulip tree	36 to 42 in	Fair	Fair	Good	Low	40.995764N	73.866703W	Connector trails	Codominant issue
179	White ash	24 to 30 in	Fair	Fair	Fair	Med	40.995686N	73.867086W	Connector trails	Dying branches
180	White ash	24 to 30 in	Fair	Fair	Fair	Low	40.995686N	73.867086W	Connector trails	*On trail
181	Boxelder	6 to 12 in	Dead or Dying	Poor	Good	Med	40.996140N	73.870387W	Hillside loop	Stem bad shape
182	Boxelder	12 to 18 in	Poor	Good	Good	Low	40.996140N	73.870387W	Hillside loop	
183	Black walnut	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.996151N	73.870470W	Hillside loop	Remove
184	Black oak	30 to 36 in	Fair	Fair	Dead or Dying	Med	40.996245N	73.870398W	Hillside loop	Bad base/rot
185	Boxelder	6 to 12 in	Good	Dead or Dying	Good	Med	40.996329N	73.870265W	Hillside loop	Near trail

186	Boxelder	12 to 18 in	Fair	Good	Fair	Routin Maintenance	40.996620N	73.870141W	Hillside loop	Near trail in clump
187	Willow	12 to 18 in	Good	Poor	Fair	Med	40.996956N	73.869630W	Hillside loop	
188	Tulip tree	12 to 18 in	Fair	Fair	Poor	Low	40.996975N	73.869529W	Hillside loop	Decline
189	Black birch	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997557N	73.869040W	Hillside loop	Dead
190	Boxelder	6 to 12 in	Fair	Good	Good	Routin Maintenance	40.996628N	73.870099W	Hillside loop	In clump
191	Black birch	6 to 12 in	Good	Dead or Dying	Good	High	40.996910N	73.869926W	Hillside loop	Dead
192	Black birch	6 to 12 in	Good	Dead or Dying	Good	High	40.996927N	73.869666W	Hillside loop	Dead
193	Northern red oak	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997665N	73.868941W	Hillside loop	Dead
194	Northern red oak	30 to 36 in	Fair	Poor	Good	High	40.997728N	73.868938W	Hillside loop	Dead branches
195	Northern red oak	24 to 30 in	Good	Poor	Poor	High	40.997813N	73.868900W	Hillside loop	Dead branches, prune
196	Sassafras	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997898N	73.868950W	Hillside loop	Dead
197	Black oak	24 to 30 in	Good	Poor	Poor	High	40.998072N	73.868811W	Hillside loop	Prune branches
198	Black birch	12 to 18 in	Poor	Good	Fair	Med	40.998075N	73.868828W	Hillside loop	Will fail at base
199	Black birch	12 to 18 in	Poor	Good	Good	Low	40.998085N	73.868645W	Hillside loop	Split and injured crotch
200	Black birch	12 to 18 in	Dead or Dying	Good	Fair	Med	40.998222N	73.868834W	Hillside loop	Cankers bad
201	White oak	18 to 24 in	Dead or Dying	Dead or Dying	Poor	High	40.998303N	73.868809W	Hillside loop	Dead
202	Black birch	18 to 24 in	Poor	Good	Good	Low	40.998322N	73.868773W	Hillside loop	Trunk rot
203	White oak	30 to 36 in	Good	Poor	Fair	High	40.998469N	73.868715W	Hillside loop	Prune branches
204	Black birch	18 to 24 in	Good	Dead or Dying	Good	High	40.998488N	73.868804W	Hillside loop	Prune branches
205	Northern red oak	24 to 30 in	Good	Poor	Good	Med	40.998528N	73.868815W	Hillside loop	Prune branches
206	Black birch	12 to 18 in	Poor	Good	Fair	High	40.998762N	73.868630W	Hillside loop	Stem failure
207	American beech	12 to 18 in	Dead or Dying	Good	Fair	Med	40.998967N	73.868542W	Hillside loop	Stem split
208	American beech	30 to 36 in	Dead or Dying	Fair	Fair	High	40.998973N	73.868200W	Hillside loop	Will fail
209	White oak	18 to 24 in	Fair	Fair	Good	Med	40.999165N	73.868119W	Hillside loop	Branch
210	Black birch	12 to 18 in	Good	Fair	Good	Med	40.999193N	73.867976W	Hillside loop	Branch
211	White oak	24 to 30 in	Good	Poor	Good	High	40.999266N	73.867880W	Hillside loop	Branches, prune
212	Black birch	12 to 18 in	Dead or Dying	Dead or Dying	Poor	Med	40.999274N	73.867917W	Hillside loop	Dead but nice snage
213	Black oak	36 to 42 in	Poor	Poor	Poor	Med	40.999350N	73.867909W	Hillside loop	Dying
214	Black birch	18 to 24 in	Poor	Fair	Fair	Med	40.999215N	73.867700W	Hillside loop	Cankers
215	Black birch	12 to 18 in	Dead or Dying	Poor	Poor	High	40.998900N	73.867568W	Hillside loop	Remove
216	Black birch	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.998822N	73.867701W	Hillside loop	Dead dangerous snag

217	Black birch	12 to 18 in	Poor	Good	Good	Med	40.998809N	73.867815W	Hillside loop	Cankers
218	Black oak	24 to 30 in	Fair	Poor	Fair	Low	40.998611N	73.867755W	Hillside loop	Branches, overall decline
219	White oak	30 to 36 in	Good	Fair	Good	Low	40.998550N	73.867669W	Hillside loop	Branches
220	Black birch	18 to 24 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.998518N	73.867639W	Hillside loop	Dangerous snag
221	Northern red oak	12 to 18 in	Fair	Good	Fair	Low	40.998436N	73.867550W	Hillside loop	Decline/canker
222	Northern red oak	12 to 18 in	Good	Fair	Good	Med	40.998436N	73.867550W	Hillside loop	Prune branches
223	Black birch	6 to 12 in	Dead or Dying	Good	Good	Med	40.998334N	73.867591W	Hillside loop	Canker
224	Black oak	18 to 24 in	Dead or Dying	Dead or Dying	Dead or Dying	Med	40.998329N	73.867584W	Hillside loop	Snag will fall off trail
225	Northern red oak	12 to 18 in	Good	Fair	Good	Routin Maintenance	40.998265N	73.867544W	Hillside loop	Branch
226	Northern red oak	18 to 24 in	Good	Poor	Good	Med	40.998279N	73.867651W	Hillside loop	Branch
227	Northern red oak	6 to 12 in	Good	Fair	Good	Low	40.998288N	73.867700W	Hillside loop	Branch
228	Northern red oak	12 to 18 in	Fair	Poor	Good	Med	40.998117N	73.867633W	Hillside loop	Dead branches
229	Black oak	18 to 24 in	Good	Fair	Good	Routin Maintenance	40.997966N	73.867523W	Hillside loop	Dead branches
230	Northern red oak	18 to 24 in	Good	Fair	Good	Low	40.997884N	73.867523W	Hillside loop	Larger stem dead branch
231	Black cherry	6 to 12 in	Fair	Dead or Dying	Fair	High	40.997730N	73.867530W	Hillside loop	Dead, remove all
232	Bigtooth aspen	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.997795N	73.867443W	Hillside loop	Dead
233	Black cherry	12 to 18 in	Dead or Dying	Poor	Poor	High	40.997590N	73.867536W	Hillside loop	Hanging over trail, remove branches
234	Black locust	6 to 12 in	Good	Fair	Poor	Med	40.997513N	73.867488W	Hillside loop	Leaner
235	Black cherry	6 to 12 in	Dead or Dying	Dead or Dying	Poor	High	40.997427N	73.867274W	Hillside loop	Dead stem
236	Black cherry	6 to 12 in	Fair	Dead or Dying	Fair	High	40.997427N	73.867274W	Hillside loop	Dead stem
237	Black oak	18 to 24 in	Fair	Dead or Dying	Fair	High	40.997380N	73.867063W	Orange (Alternate section HL)	Branches, prune
238	White oak	12 to 18 in	Good	Poor	Good	Low	40.997518N	73.867084W	Orange (Alternate section HL)	Branches
239	Black oak	6 to 12 in	Good	Fair	Good	Routin Maintenance	40.997728N	73.867040W	Orange (Alternate section HL)	Branches
240	Black oak	24 to 30 in	Good	Dead or Dying	Good	High	40.997758N	73.867076W	Orange (Alternate section HL)	Many dead branches
241	Black oak	18 to 24 in	Fair	Poor	Good	Med	40.997906N	73.866968W	Orange (Alternate section HL)	Branch
242	Black oak	12 to 18 in	Poor	Good	Fair	Med	40.998086N	73.866992W	Orange (Alternate section HL)	Stem injury at base
243	Black oak	18 to 24 in	Fair	Good	Good	Routin Maintenance	40.998097N	73.866996W	Orange (Alternate section HL)	Dead branch, rotted base
244	Black oak	18 to 24 in	Good	Poor	Good	Med	40.998135N	73.866970W	Orange (Alternate section HL)	Branch

245	Northern red oak	12 to 18 in	Good	Poor	Dead or Dying	Med	40.998280N	73.866884W	Orange (Alternate section HL)	Branch. leaning hard
246	Black birch	6 to 12 in	Poor	Good	Poor	Med	40.998408N	73.866831W	Orange (Alternate section HL)	Root rot, base rot
247	Black oak	30 to 36 in	Poor	Dead or Dying	Fair	High	40.998530N	73.866816W	Orange (Alternate section HL)	Trim branch, possibly remove
248	Northern red oak	24 to 30 in	Good	Fair	Good	Routin Maintenance	40.998632N	73.866749W	Orange (Alternate section HL)	Branch
249	Black birch	6 to 12 in	Fair	Good	Good	Low	40.998744N	73.866768W	Orange (Alternate section HL)	Canker
250	Black oak	24 to 30 in	Good	Fair	Good	Low	40.998649N	73.866697W	Orange (Alternate section HL)	Branch
251	Black birch	12 to 18 in	Dead or Dying	Poor	Poor	High	40.998957N	73.866705W	Orange (Alternate section HL)	Remove
252	Northern red oak	12 to 18 in	Good	Fair	Good	Routin Maintenance	40.999196N	73.866674W	Orange (Alternate section HL)	Branch
253	Northern red oak	12 to 18 in	Good	Dead or Dying	Poor	Med	40.999265N	73.866608W	Orange (Alternate section HL)	On trail, in decline
254	Black birch	6 to 12 in	Poor	Good	Poor	High	40.999316N	73.866618W	Orange (Alternate section HL)	Remove
255	Black birch	12 to 18 in	Dead or Dying	Good	Good	High	40.999424N	73.866743W	Orange (Alternate section HL)	Injured stem at base
256	Black birch	12 to 18 in	Fair	Fair	Poor	Low	40.999336N	73.866750W	Orange (Alternate section HL)	Cankers
257	Northern red oak	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.999348N	73.866750W	Orange (Alternate section HL)	Dead
258	Black oak	18 to 24 in	Fair	Fair	Fair	Low	40.99364N	73.866803W	Orange (Alternate section HL)	Prune branch
259	Red maple	18 to 24 in	Good	Poor	Good	Low	40.999335N	73.869126W	Orange (Alternate section HL)	Branch
260	Black birch	12 to 18 in	Fair	Good	Fair	Routin Maintenance	40.999228N	73.866923W	Orange (Alternate section HL)	Canker
261	Red maple	12 to 18 in	Poor	Fair	Fair	Med	40.999331N	73.867550W	Orange (Alternate section HL)	Decline
262	Black birch	6 to 12 in	Fair	Good	Good	Routin Maintenance	40.999371N	73.867353W	Orange (Alternate section HL)	Canker
263	American beech	24 to 30 in	Fair	Fair	Fair	Low	40.999315N	73.867476W	Orange (Alternate section HL)	Decline
264	Northern red oak	24 to 30 in	Good	Poor	Good	High	40.999289N	73.867558W	Orange (Alternate section HL)	Prune
265	White oak	30 to 36 in	Good	Dead or Dying	Fair	High	40.998090N	73.868923W	Orange (Alternate section HL)	Decline, prune branches
266	Northern red oak	18 to 24 in	Good	Poor	Good	Med	40.998098N	73.869583W	Orange (Alternate section HL)	Branches

267	Tulip tree	18 to 24 in	Good	Poor	Good	Low	40.997721N	73.869643W	Orange (Alternate section HL)	Branch
268	Tulip tree	6 to 12 in	Fair	Good	Fair	Routin Maintenance	40.997360N	73.869781W	Orange (Alternate section HL)	Root/base rot
269	American elm	12 to 18 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.996920N	73.869956W	Orange (Alternate section HL)	Dead
270	Atlantic white cedar	18 to 24 in	Good	Fair	Good	Routin Maintenance	40.996636N	73.870427W	Green connector (Pond to Chemka)	Almost dead
271	Sugar maple	18 to 24 in	Good	Fair	Good	Low	40.996590N	73.870499W	Green connector (Pond to Chemka)	
272	Boxelder	12 to 18 in	Poor	Fair	Fair	Med	40.996427N	73.870636W	Green connector (Pond to Chemka)	Broken up
273	American elm	6 to 12 in	Good	Fair	Good	Low	40.996328N	73.870843W	Green connector (Pond to Chemka)	Prune branch
274	White oak	30 to 36 in	Good	Poor	Fair	Med	40.996270N	73.870924W	Green connector (Pond to Chemka)	Declining, on trail
275	Boxelder	12 to 18 in	Fair	Poor	Good	Low	40.996099N	73.871311W	Green connector (Pond to Chemka)	Branches
276	Northern red oak	12 to 18 in	Dead or Dying	Fair	Poor	High	40.996072N	73.871430W	Green connector (Pond to Chemka)	Leaning hard, bad rot
277	Black cherry	6 to 12 in	Fair	Poor	Poor	Med	40.995992N	73.871417W	Green connector (Pond to Chemka)	Dead stem
278	Black cherry	12 to 18 in	Good	Fair	Fair	Low	40.995992N	73.871417W	Green connector (Pond to Chemka)	Prune branch
279	White oak	18 to 24 in	Fair	Good	Fair	Routin Maintenance	40.995933N	73.871402W	Green connector (Pond to Chemka)	Branches
280	Boxelder	6 to 12 in	Poor	Good	Fair	Med	40.995957N	73.871494W	Green connector (Pond to Chemka)	Trunk injured
281	Black cherry	6 to 12 in	Fair	Poor	Good	Med	40.995982N	73.871479W	Green connector (Pond to Chemka)	Dead canopy
282	Black oak	30 to 36 in	Fair	Good	Fair	Routin Maintenance	40.995854N	73.871467W	Green connector (Pond to Chemka)	Old tree
283	White oak	30 to 36 in	Good	Dead or Dying	Good	High	40.995733N	73.871500W	Green connector (Pond to Chemka)	Branch prune
284	Northern red oak	6 to 12 in	Good	Dead or Dying	Good	High	40.995671N	73.871500W	Connector trails	Widowmaker branch
285	Black oak	18 to 24 in	Good	Poor	Good	Med	40.995623N	73.871693W	Connector trails	Branch
286	Red maple	18 to 24 in	Fair	Good	Good	Routin Maintenance	40.995513N	73.871971W	Connector trails	Trunk rot
287	Northern red oak	36 to 42 in	Fair	Dead or Dying	Fair	Med	40.995497N	73.872163W	Connector trails	Branch prune
288	Tulip tree	24 to 30 in	Poor	Dead or Dying	Poor	Med	40.995357N	73.872180W	Connector trails	Leave for snag
289	Black oak	30 to 36 in	Good	Dead or Dying	Good	High	40.995396N	73.872363W	Connector trails	Branches
290	Black cherry	6 to 12 in	Fair	Poor	Good	Med	40.996520N	73.872266W	Connector trails	Decline/rot
291	Black cherry	6 to 12 in	Fair	Poor	Good	Low	40.995666N	73.872496W	Connector trails	Branches

292	White oak	24 to 30 in	Fair	Fair	Fair	Low	40.995672N	73.872607W	Connector trails	Branches
293	Black oak	12 to 18 in	Poor	Dead or Dying	Poor	High	40.995625N	73.872705W	Connector trails	Remove
294	Black oak	30 to 36 in	Good	Dead or Dying	Good	High	40.995669N	73.873077W	Connector trails	Branches prune
295	Sassafras	6 to 12 in	Good	Poor	Fair	Low	40.995695N	73.873419W	Connector trails	Branch
296	White oak	42 to 1000 in	Good	Fair	Fair	Low	40.995728N	73.873526W	Connector trails	Branches
297	Boxelder	6 to 12 in	Poor	Good	Good	Low	40.995653N	73.873589W	Connector trails	Stem injury
298	Black oak	42 to 1000 in	Fair	Fair	Fair	Low	40.995583N	73.873768W	Connector trails	Lightning? Injury branch
299	Black oak	30 to 36 in	Dead or Dying	Dead or Dying	Dead or Dying	Med	40.995587N	73.873870W	Connector trails	Snag breaking up, dead
300	White oak	42 to 1000 in	Good	Dead or Dying	Fair	High	40.995626N	73.874024W	Connector trails	Branches prune
301	White oak	24 to 30 in	Good	Poor	Good	Med	40.995450N	73.874166W	Connector trails	Prune branch over trail
302	Black oak	12 to 18 in	Good	Poor	Fair	Low	40.995576N	73.874421W	Connector trails	Branches
303	Black oak	24 to 30 in	Fair	Fair	Good	Low	40.995672N	73.874506W	Connector trails	Rot, branches
304	Black birch	18 to 24 in	Dead or Dying	Dead or Dying	Poor	High	40.995777N	73.874539W	Connector trails	Dead, remove
305	Tulip tree	18 to 24 in	Dead or Dying	Fair	Dead or Dying	High	40.995598N	73.874661W	Road from field to Chemka	Dead
306	Black birch	6 to 12 in	Good	Poor	Fair	Low	40.995566N	73.874620W	Road from field to Chemka	
307	Tulip tree	12 to 18 in	Poor	Fair	Poor	Med	40.995197N	73.874419W	Road from field to Chemka	Rotted stem base
308	Cottonwood	12 to 18 in	Good	Fair	Fair	Low	40.994729N	73.873693W	Road from field to Chemka	Bad base
309	Red maple	12 to 18 in	Fair	Fair	Good	Low	40.994645N	73.873234W	Road from field to Chemka	Dying
310	Red maple	6 to 12 in	Poor	Dead or Dying	Fair	High	40.994645N	73.873234W	Road from field to Chemka	Dead
311	Sugar maple	18 to 24 in	Good	Poor	Fair	Low	40.994212N	73.872911W	Road from field to Chemka	Near road
312	Black cherry	6 to 12 in	Fair	Dead or Dying	Poor	High	40.994456N	73.872066W	Road from field to Chemka	Hanging over road
313	Boxelder	6 to 12 in	Good	Dead or Dying	Fair	Med	40.994491N	73.872144W	Road from field to Chemka	Near road, decline
314	Yellow birch	6 to 12 in	Good	Poor	Fair	Low	40.994793N	73.872118W	Road from field to Chemka	
315	Tulip tree	18 to 24 in	Good	Fair	Fair	Low	40.994583N	73.871950W	Road from field to Chemka	Decline, branches
316	Tulip tree	12 to 18 in	Dead or Dying	Fair	Dead or Dying	High	40.994703N	73.871767W	Road from field to Chemka	Bad rot
317	White oak	24 to 30 in	Fair	Good	Fair	Low	40.994888N	73.871217W	Road from field to Chemka	Old, decline, near road

318	Boxelder	18 to 24 in	Fair	Fair	Fair	Low	40.995129N	73.870960W	Road from field to Chemka	Over parking lot
319	Japanese maple	12 to 18 in	Poor	Fair	Good	Med	40.995100N	73.870675W	Orange (Water tower)	Rotted
320	Black birch	12 to 18 in	Good	Poor	Good	Low	40.995182N	73.870524W	Orange (Water tower)	Branch/canker
321	Northern red oak	6 to 12 in	Dead or Dying	Dead or Dying	Dead or Dying	High	40.995207N	73.870200W	Orange (Water tower)	Branch hung up
322	Japanese maple	6 to 12 in	Poor	Poor	Good	Med	40.995261N	73.870372W	Orange (Water tower)	
323	Black birch	6 to 12 in	Poor	Dead or Dying	Good	High	40.995395N	73.870195W	Orange (Water tower)	Dead, remove
324	Tulip tree	24 to 30 in	Fair	Poor	Good	Med	40.995700N	73.870094W	Orange (Water tower)	Branch
325	White ash	12 to 18 in	Good	Good	Good	Low	40.995618N	73.879955W	Orange (Water tower)	Ok but EAB
326	Northern red oak	42 to 1000 in	Good	Dead or Dying	Good	Med	40.995618N	73.870040W	Orange (Water tower)	Branch
327	American elm	6 to 12 in	Poor	Dead or Dying	Fair	High	40.995924N	73.871276W	Red trail to parking	Dead
328	American elm	6 to 12 in	Good	Poor	Good	Med	40.995924N	73.871276W	Red trail to parking	Decline
329	Red maple	24 to 30 in	Good	Fair	Good	Routin Maintenance	40.995329N	73.871823W	Red trail to parking	Branches filing
330	Black oak	42 to 1000 in	Good	Poor	Fair	Med	40.995336N	73.871990W	Red trail to parking	Branches
331	Black oak	30 to 36 in	Poor	Poor	Good	Med	40.995185N	73.872109W	Red trail to parking	Branches, canopy
332	Northern red oak	12 to 18 in	Good	Good	Good	Routin Maintenance	40.995015N	73.872196W	Red trail to parking	Near pool fence, overhang
333	Tulip tree	12 to 18 in	Fair	Fair	Poor	Low	40.994870N	73.872462W	Red trail to parking	Buried stem
334	Sassafras	12 to 18 in	Good	Poor	Fair	Med	40.994971N	73.871888W	Red trail to parking	Decline

HILLSIDE WOODS & PARK

TREE INVENTORY & URBAN FOREST MANAGEMENT PLAN

Land Beyond the Sea, Ecological Design (LBS Ecological), on behalf of the Village of Hastings-on- Hudson, NY has prepared this Urban Forestry Management Plan as a technical and planning document for trees and forest stands located within the Hillside Woods & Park.

As a technical guidance document, the Urban Forestry Management Plan identifies current conditions of trees and forested areas within the Woods & Park. As a planning document, the Urban Forestry Management Plan provides a baseline of information regarding the issues, opportunities, and constraints for Urban Forestry in Hillside Woods & Park, and identifies and provides management recommendations. Ultimately, the purpose of this document is to provide a framework within which the Village of Hastings-on-Hudson can wholly manage the forest and trees of Hillside Woods & Park.

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