



# Hillside Woods & Park Forest Inventory & Management Plan



Public Meeting  
Thursday, October 4th @ 7pm  
Community Center, Hastings-On-Hudson

# Presentation Outline

Who We Are

Background

Forest Inventory & Data Collection

i-Tree Ecosystem Analysis

Forestry Analytics

Recommendations & Management

Conclusion

Public Input Q&A



# Who We Are



**LBS Ecological** specializes in Ecological Planning & Design.

Our team:

Miguel Berrios, MLA, LEED AP  
Principal, Ecological Landscape Designer  
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Sarah Kelsen, Principal, Ecological Engineer  
Lance Ebel, Forester & Wildlife Management  
Artem Treyger, Forester & Certified Arborist

LBS Ecological is working closely with the village staff and public officials of Hastings-on-Hudson, including the Parks and Recreation Commission, the Conservation Commission, the Tree Preservation Board, and more.

# NYS DEC Urban & Community Forestry Program



The New York State Urban and Community Forestry Program is a partnership between DEC forestry professionals, public and private individuals, and volunteer organizations. It supports communities in comprehensive planning, management, and education to create healthy urban and community forests which enhance the quality of life for residents. Funding for this program is provided in part by the State of New York and the U.S. Forest Service.

The Hillside Woods & Park Forest Inventory & Management Plan is grant-funded through this program.

# Hillside Woods & Park



*The Hastings Conservation Commission presents  
a two-part forum on the state of Hillside Woods*

# **State of the Woods**

***Our Local Ecology, and What We Can Do to Restore It***

*Forums with Expert Naturalists and Guided Walks in Hillside Woods*

*Learn about where you live and how to live in it!*

# Basis of Recommendations

Several studies in the area suggest that combinations of site interventions (**tree planting, invasives removal** etc.), paired with a full-canopy forest, are most effective for promoting regeneration of native species, thus resulting in more self-sustaining urban forests (Doroski et al. 2018).

These studies have also shown that 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).

We can confidently progress forward with the restoration of Hillside Woods & Park through similar site improvements.

# Mitigating the Regeneration Issue

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.**



# Competing Invasive Vegetation

Competing invasive 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 native tree** seeds and seedlings.

# Competing Invasive Vegetation



# Deer

Deer 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



# Light on the Forest Floor

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 not allow enough light into the forest to support shade-intolerant invasive trees and shrubs.**

# Light on the Forest Floor



# Inventory & Data Collection

Our team 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.

# Inventory & Data Collection

The forest was surveyed using fixed plot sampling. Each plot was 1/10th of an acre, or a 66'x66' square. Plots were visited and laid out with temporary flagging.





# Analysis



Data from 30 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 30 field plots was also analyzed using contemporary **forestry analytics**. Contemporary forest analysis includes: tree species composition, density, basal area, diameter, overall tree condition, tree size/age, shrub and herbaceous species present.

Combined, these analyses aid in making forestry recommendations that will improve human health and environmental quality for Hillside Woods & Park.

# i-Tree Ecosystem Analysis, Urban Forest Effects and Values

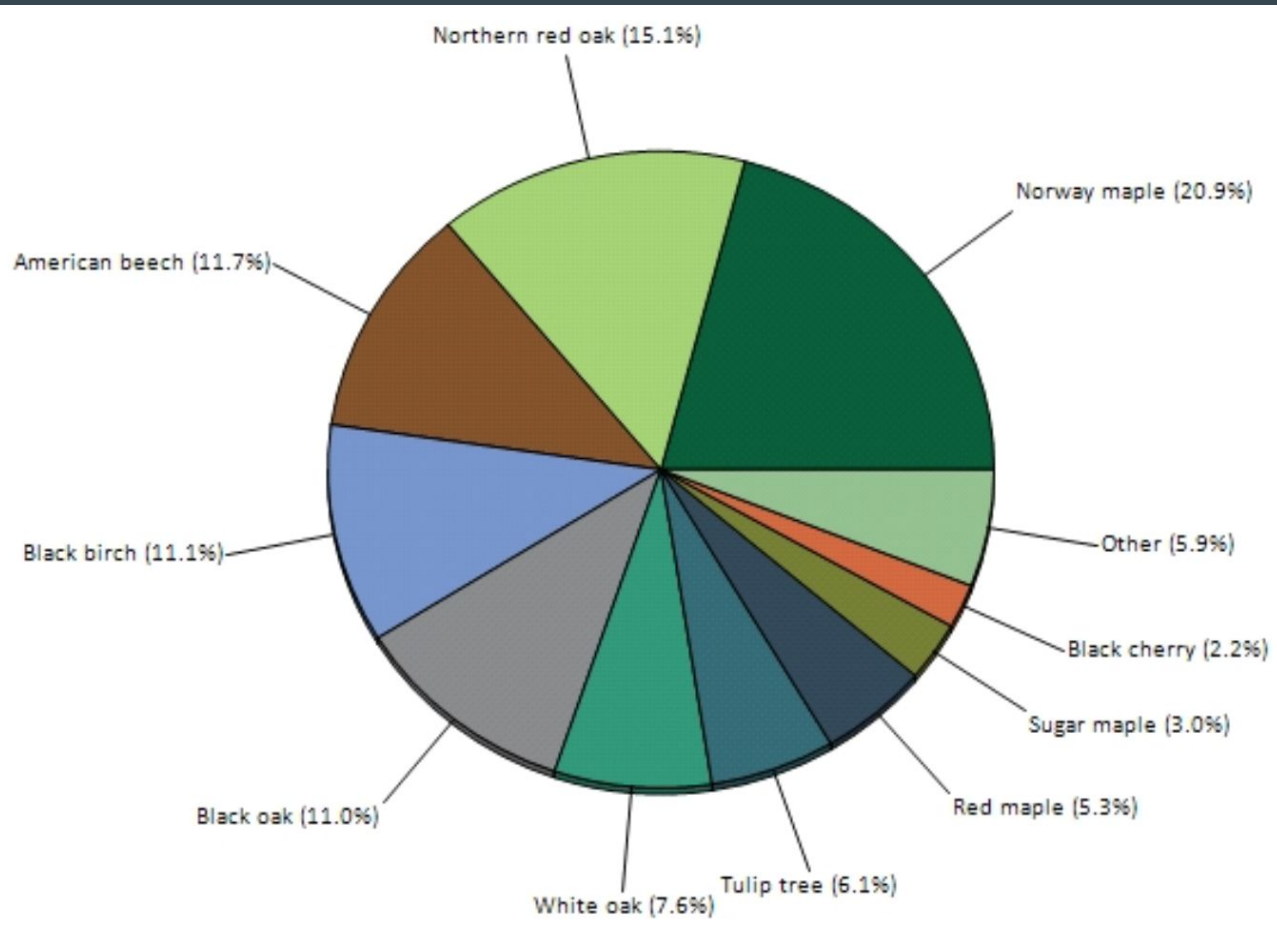
- **Tree Characteristics** and urban forest structure (e.g., species composition, tree health, leaf area, etc.).
- Amount of **pollution removed** hourly by the urban forest, and its associated percent **air quality improvement** throughout a year.
- **Total carbon stored** and **net carbon annually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

# 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.



# Structural and Functional Values

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

- Structural value: \$15.5 million
- Carbon storage: \$535,000

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

- Carbon sequestration: \$11,200
- Avoided runoff: \$13,500
- Pollution removal: \$35,700

# Structural Values:

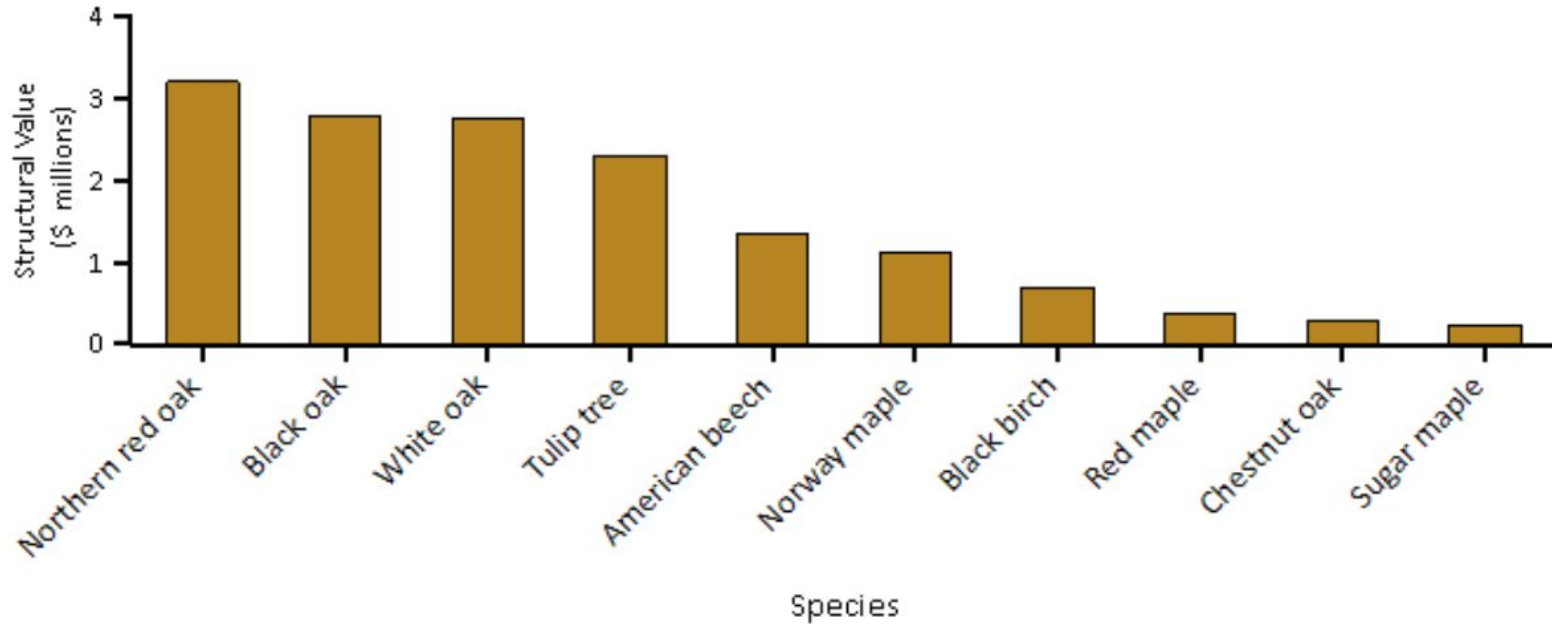


Figure 11. Tree species with the greatest structural value, Hastings on Hudson

# Contemporary Forestry Analytics

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

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

# Forest Stand Delineation

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.



# Historical Aerials - 1947



# Historical Aerials - 1960



# Historical Aerials - 1976



# Historical Aerials - 2016



# Forest Stand Delineation

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



# Forest Management Recommendations - Stand 1



# Forest Management Recommendations - Stand 1

## *Best Management Practices -*

Invasive Brush Management (Hand Tools, Woody Vegetation),

Invasive Brush Management (Mechanical, Trees and Woody Vegetation),

Tree & Shrub Establishment (Individual Tree - Hand Plant with Tree Protection Tubes),

Tree & Shrub Site Preparation (Hand Site Preparation),

Mulching (Tree & Shrub),

Structures for Wildlife (Brush Pile - Small),

Timber Stand Improvement (Norway Maple Cull).

# Forest Management Recommendations - Stand 2





# Forest Management Recommendations - Stand 2



# Forest Management Recommendations - Stand 2

## *Best Management Practices -*

Invasive Brush Management (Hand Tools, Woody Vegetation),

Invasive Brush Management (Mechanical, Trees and Woody Vegetation),

Tree & Shrub Establishment (Individual Tree - Hand Plant with Tree Protection Tubes),

Tree & Shrub Site Preparation (Hand Site Preparation),

Mulching (Tree & Shrub),

Structures for Wildlife (Brush Pile - Small),

Timber Stand Improvement (Norway Maple Cull).

# Forest Management Recommendations - Stand 3



# Forest Management Recommendations - Stand 3

## *Best Management Practices -*

Invasive Brush Management (Hand Tools, Woody Vegetation),

Invasive Brush Management (Mechanical, Trees and Woody Vegetation),

Tree & Shrub Establishment (Individual Tree - Hand Plant with Tree Protection Tubes),

Tree & Shrub Site Preparation (Hand Site Preparation),

Mulching (Tree & Shrub),

Structures for Wildlife (Brush Pile - Small),

Timber Stand Improvement (Norway Maple Cull).

# Forest Management Recommendations - Stand 4



# Forest Management Recommendations - Stand 4

## *Best Management Practices -*

Invasive Brush Management (Hand Tools, Woody Vegetation),

Invasive Brush Management (Mechanical, Trees and Woody Vegetation),

Tree & Shrub Establishment (Individual Tree - 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

# Forest Management Recommendations - Deer Fence

## Deer Exclosure Fence

- 8' tall woven or welded wire fence
- Will require several gates (single pedestrian, double pedestrian, vehicular)
- Will be through uneven terrain in wooded area
- Cost Per Linear Foot is approximately 20-35 LF (\$25 per LF for calculations below)

For Stand 4 alone ~5000 LF @ \$125,000

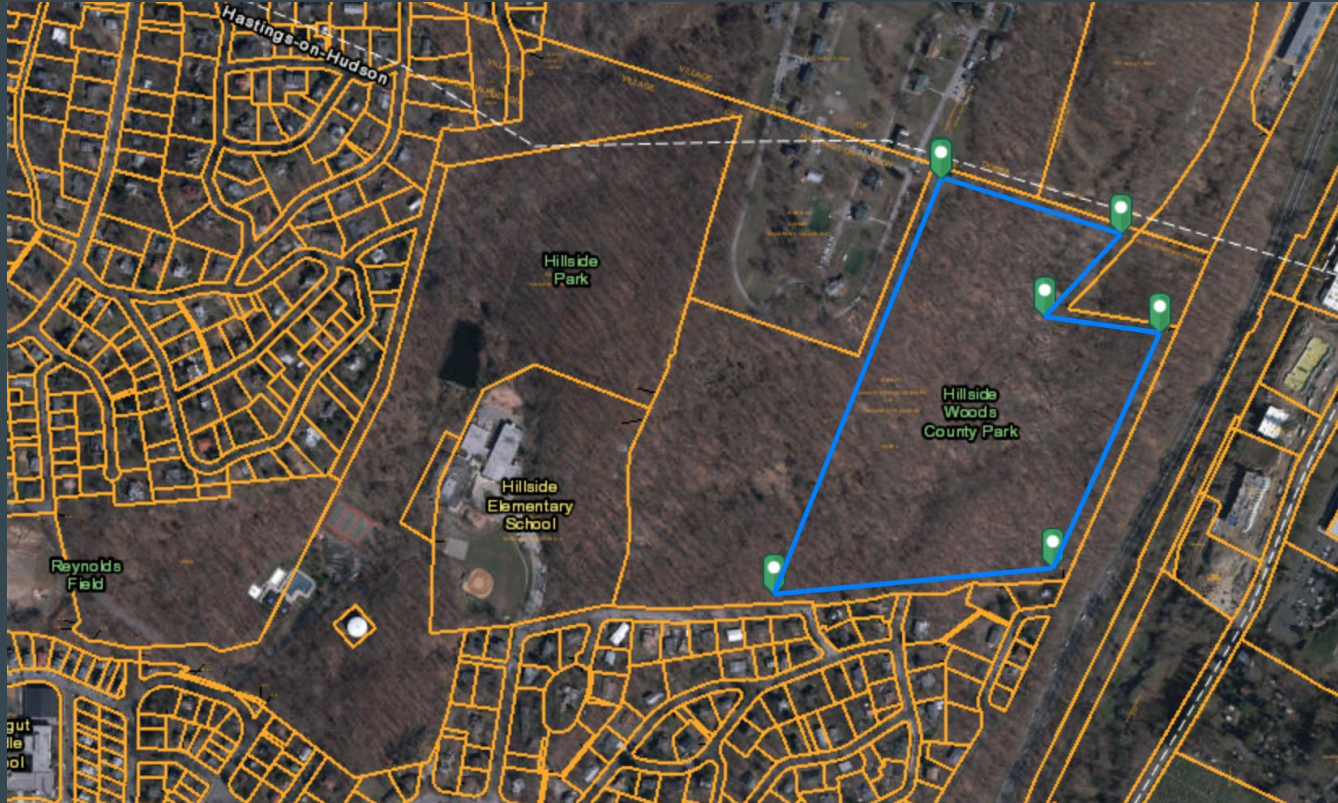
For Stand 3+4 ~6600 LF or @ \$165,000

For partial Stand 2+3+4 ~9,500 LF @ \$237,500

For all Stand 2+3+4 ~10,750 LF @ \$268,750

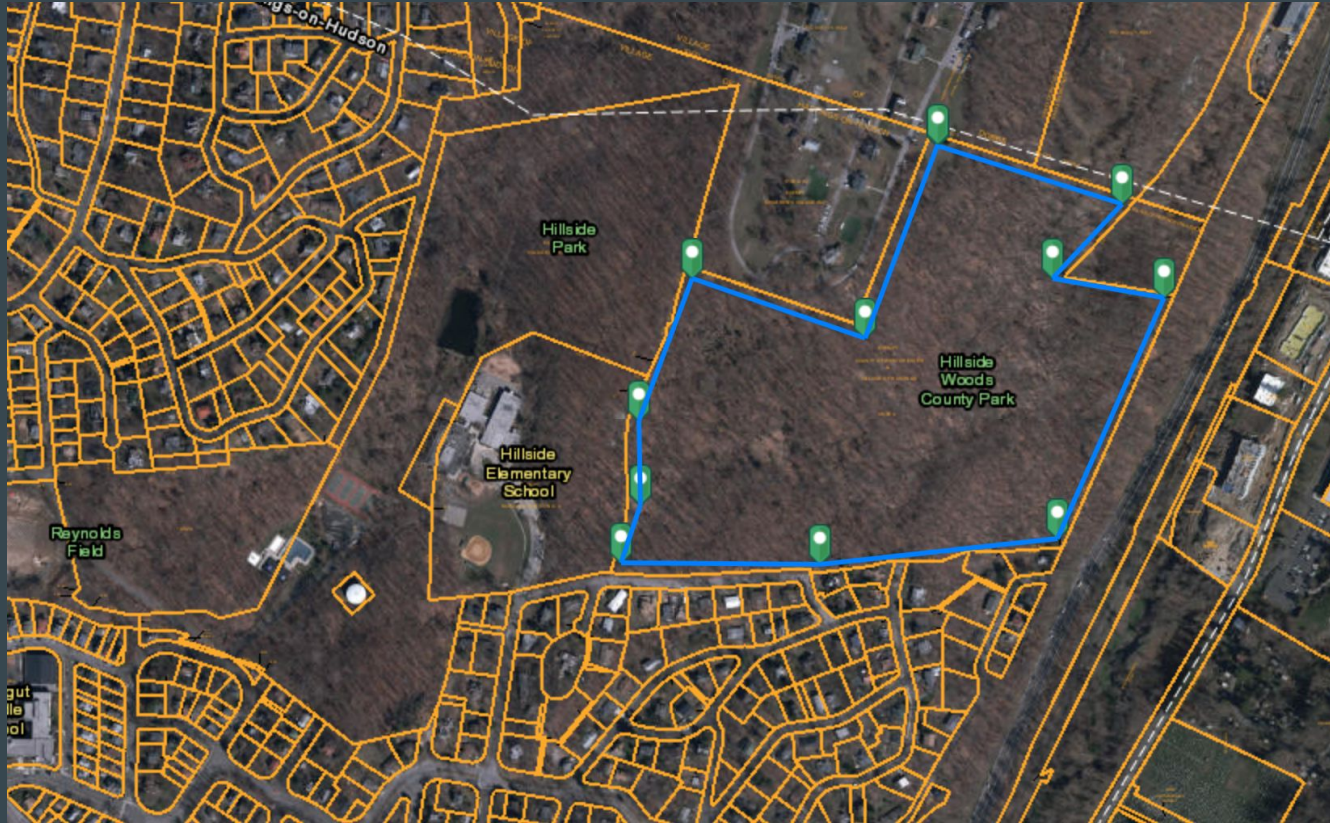
For all stands ~14,350 LF @ \$358,750

# Deer Fence - Stand 4, approx. 5000 Linear Feet

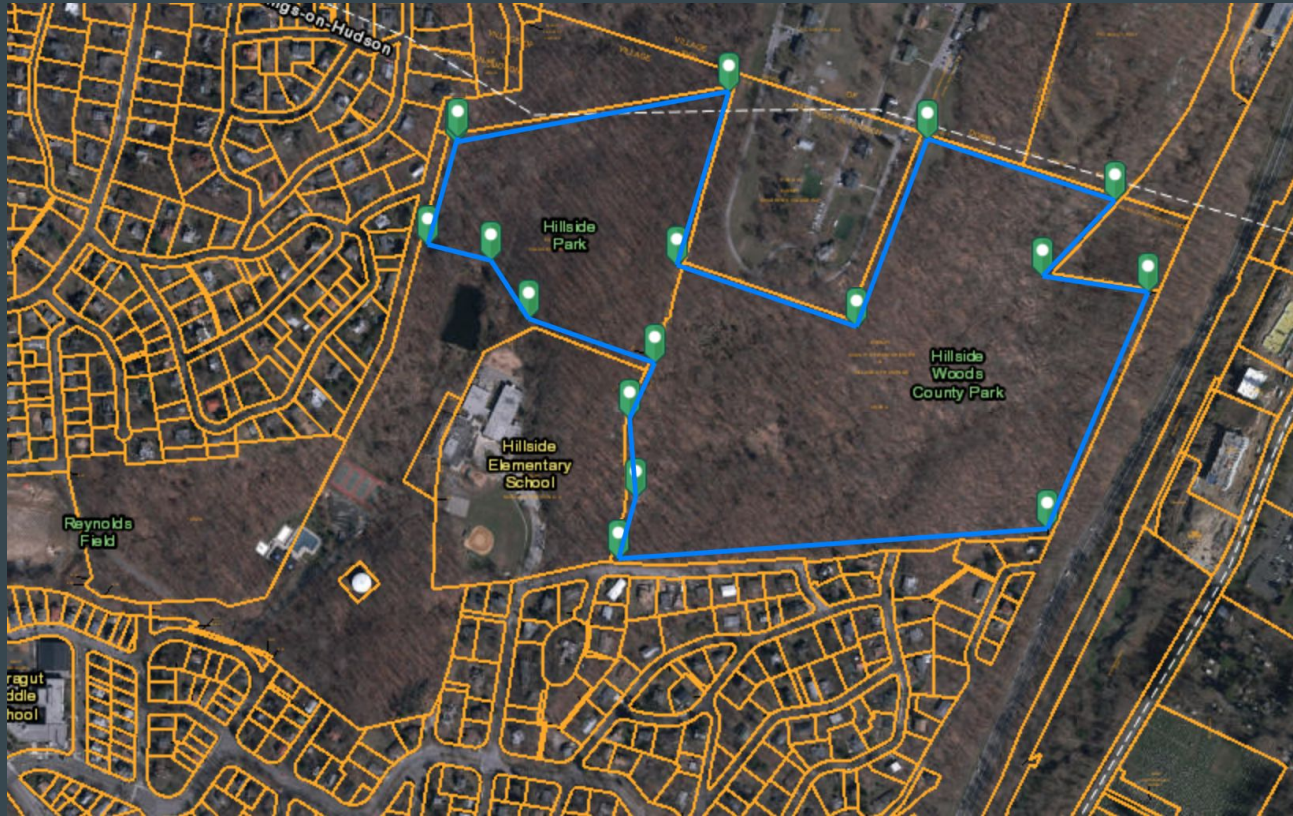




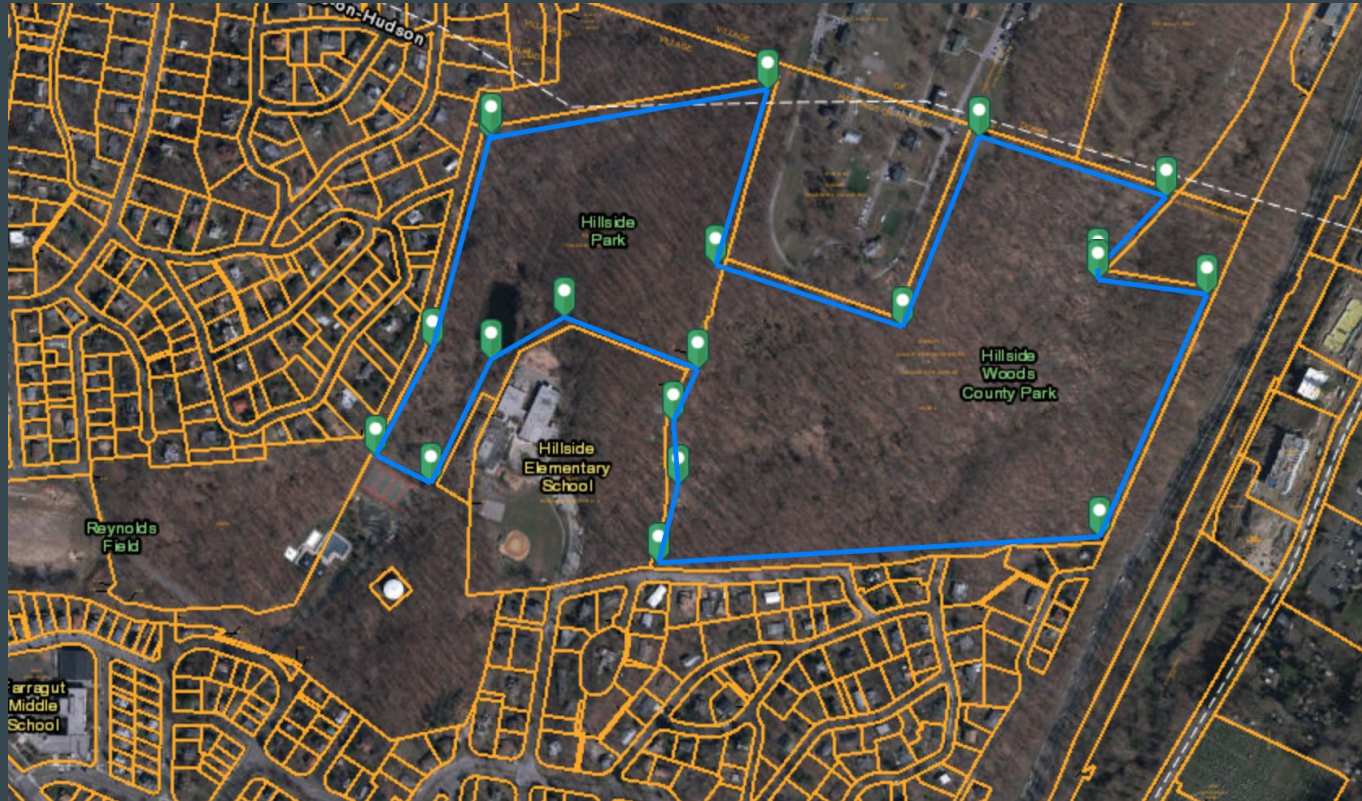
# Deer Fence - Stand 3+4, approx. 6600 Linear Feet



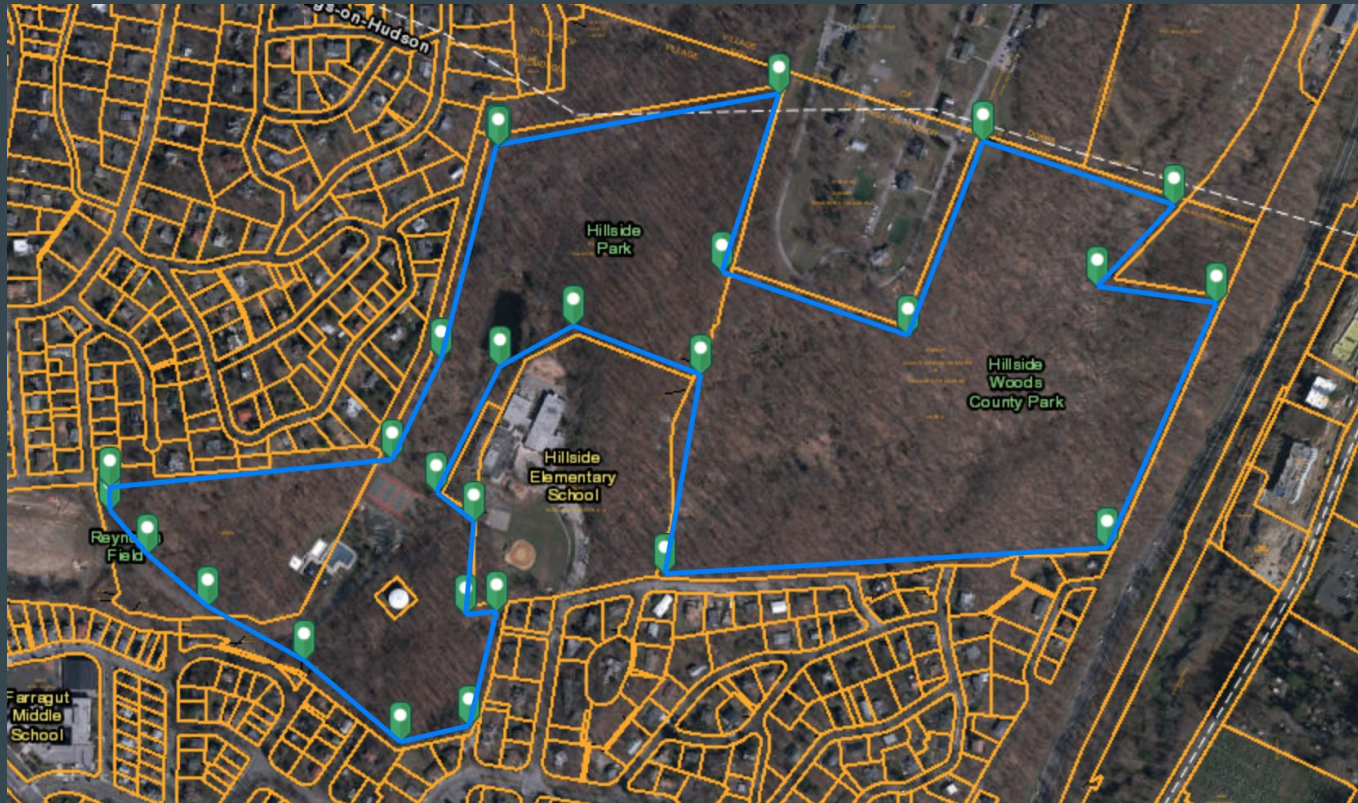
# Deer Fence - Stand 2(partial)+3+4, approx. 9500 Linear Feet



# Deer Fence - Stand 2+3+4, approx. 10750 Linear Feet



# Deer Fence - All Stands, approx. 14350 Linear Feet



**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
2020	Timber Stand Improvement - (Norway Maple Cull)	1 - comprehensive	18.5	\$350/acre	\$6,475.00
		2 - light thinning with consultant	21.9	\$150/acre	\$3,285.00
		3 - comprehensive	16.8	\$350/acre	\$5,880.00
		4 - comprehensive	30.8	\$350/acre	\$10,780.00
2019 2020 2021	Invasive Brush Management - Hand Tools, Woody Vegetation	1 - heavy	18.5	\$395/acre	\$7,307.50
2 - light		21.9	\$265/acre	\$5,803.50	
3 - heavy		16.8	\$395/acre	\$6,636.00	
4 - mid		30.8	\$335/acre	\$10,318.00	
2020	Invasive Brush Management - Mechanical, Trees and Woody Vegetation	1	5.5	\$660/acre	\$3,630.00
2		3.5	\$660/acre	\$2,310.00	
3		11	\$660/acre	\$7,260.00	
4		3	\$660/acre	\$1,980.00	
2022	Tree & Shrub Establishment - Individual Tree - Hand Plant with Tree Protection Tubes	1	277	\$12 each	\$3,324.00
		2	328		\$3,936.00
		3	252		\$3,024.00
2022	Tree & Shrub Establishment - Individual Tree - Hand Plant	4	462	\$8 each	\$3,696.00
2022	Tree & Shrub Site Preparation - Hand Site Preparation	1	277	\$3 each	\$831.00
		2	328		\$984.00
		3	252		\$756.00
		4	462		\$1,386.00
2022	Mulching, Tree & Shrub	1	277	\$4 each	\$1,108.00
		2	328		\$1,312.00
		3	252		\$1,008.00
		4	462		\$1,848.00
2019 2020 2021	Structures for Wildlife - Brush Pile (Small)	1	55.5	\$55 each	\$3,052.00
2		65.7	\$3,613.50		
3		50.4	\$2,772.00		
4		92.4	\$5,082.00		
2021	Deer Exlosure Fencing	4 (and 3?)	5000-7500 LF	\$20-35/LF	~\$150,000.00
				<b>Total Net Cost:</b>	<b>~\$280,000.00</b>

# Recommendations – General Urban Forestry Administrative

## *Arborist Staffing and Village Board Updates*

Create a position for someone with proper education in 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.

Engage 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.

# Recommendations – General Urban Forestry Administrative

## *Inventory and Plan Review and Updates*

- Update the tree inventory and maintain an up-to-date database
- Set additional planting targets (annual, mid/long-term) for progress on the urban forest
- Promote planting native species and near-native species trees and shrubs on all land
- Base forestry practice on current scientific information

# Recommendations – General Urban Forestry Administrative

## *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
- Impose a fee permit to remove a tree from within the Village's Right of Way.
- Engage civic partners to participate in planting programs or campaigns
- Find creative ways to incentivize citizens to expand and preserve the urban forest.
- Continue to build a partnership with and negotiate with the utility company

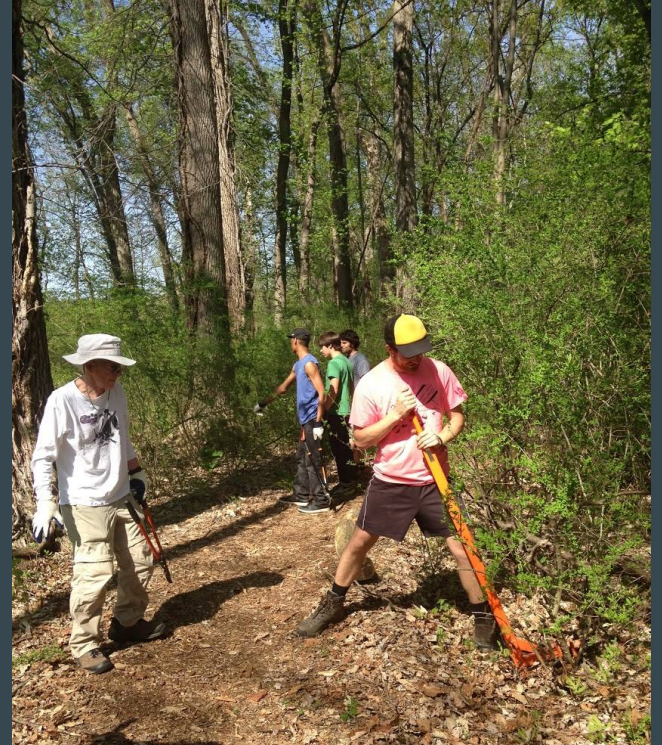


# Recommendations – General Urban Forestry Administrative

## *Promote Community and Grassroots Efforts*

Engage the public in the care and stewardship of our urban forest. Build public-private partnerships to achieve the Village's goals.

- Raise awareness
- Educate the public about the value and needs of the urban forest
- Encourage direct citizen stewardship



# Recommendations- Park Planning and Design

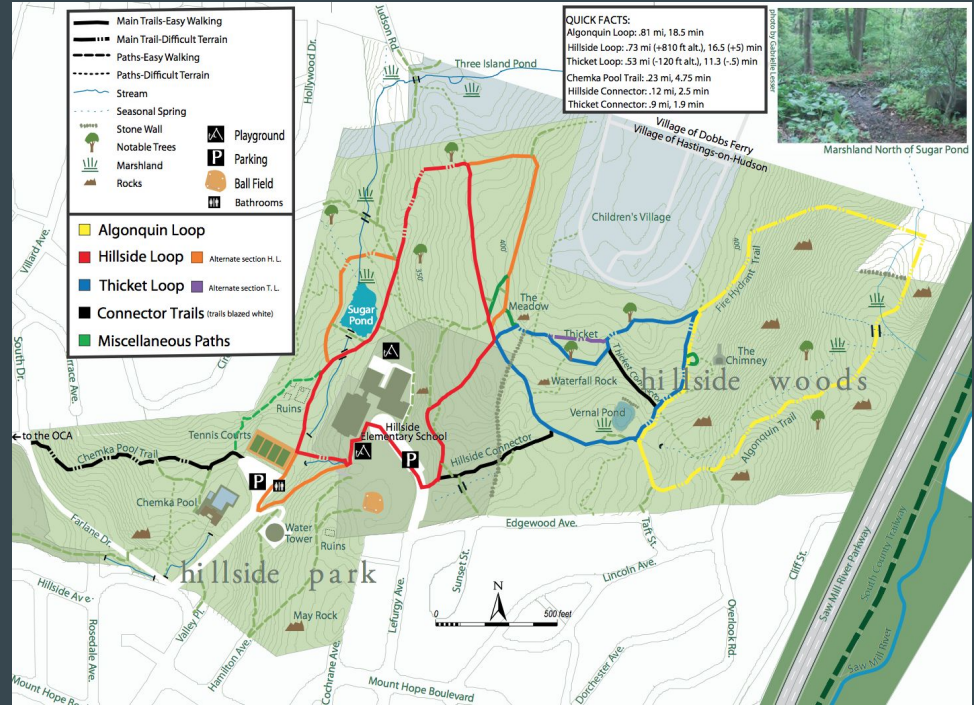
## Access & Entrance

There is no Main Entrance, or official access points really. We recommend creation of a Main Entrance (with parking, trail map, other signage, in a central location). Access Points around the perimeter can also be enhanced with small kiosks/signs.



# Recommendations- Park Planning and Design

*Trails and Wayfinding* – Trails are designated and labeled (although there are limited informational & directional signs ie. “School this way”, “Algonquin Trail”), but there is no obvious trail map posted 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.



# Conclusion

Dire need for restoration, plenty of studies proving restoration potential & value

Invasives removal, deer exclusion fence, native species plantings & regeneration

General Urban Forestry Administrative

Galvanize community support, park planning and design improvements

# Thank You!

Please reach out if you've got any future questions, comments, or thoughts you'd like to share with us. We appreciate your interest in Hillside Woods & Park.

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# Feedback & Survey

Please take a moment to sign up on our emailing list before you go, or take note of this web address to go to the survey directly:

<https://www.surveymonkey.com/r/SMZGMZ7>

Thanks!