TREE INVENTORY & COMMUNITY FOREST MANAGEMENT PLAN

CITY OF HUDSON, NY

2022

LAND
Beyond the Sea *Ecological Design*

HUDSON
NEW YORK

INVENTORY AND MANAGEMENT PLAN
PRODUCED BY:

LBS (LAND BEYOND THE SEA) ECOLOGICAL

198 BUFFALO RD., BROOKTONDALE, NY 14817
MIGUEL BERRIOS: ISA CERTIFIED ARBORIST NY-6296A
PHONE: 607.342.0247
EMAIL: MIGUEL@LANDBEYONDTHESEA.COM
WWW.LANDBEYONDTHESEA.COM

FUNDING IS PROVIDED AS PART OF DEC'S URBAN AND COMMUNITY FORESTRY PROGRAM, WHICH WORKS TO INCREASE PUBLIC AWARENESS OF THE IMPORTANCE OF TREES AND HELPS COMMUNITIES DEVELOP AND IMPLEMENT COMPREHENSIVE TREE MANAGEMENT PLANS TO CREATE HEALTHY FORESTS WHILE ENHANCING QUALITY OF LIFE FOR RESIDENTS.

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HUDSON CITY HALL
KAMAL JOHNSON, MAYOR
MICHAEL HOFMANN, MAYORAL AIDE
HEATHER CAMPBELL, CITY TREASURER
MICHAEL CHAMEDIES, FORMER MAYORAL AIDE
RICK RECTOR, FORMER MAYOR
DON MOORE, FORMER MAYORAL AIDE

HUDSON COMMON COUNCIL
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MARGARET MORRIS
ART FRICK
DEWAN SAROWAR
MOHAMMAD RONY
AMBER HARRIS
RYAN WALLACE
MALACHI WALKER
THEODORE ANTHONY
VICKY DASKALOUDI
DOMINIC MERANTE

DEPARTMENT OF PUBLIC WORKS
PETER BUJANOW, COMMISSIONER
ROBERT PERRY, SUPERINTENDENT

YOUTH DEPARTMENT/OAKDALE LAKE
MAIJA REED, COMMISSIONER
LIZ YORCK, DIRECTOR

CONSERVATION ADVISORY COUNCIL
VANESSA BAEHR
MARIE BALLE
HILARY HILLMAN
DAVID KONIGSBERG
TOM O'DOWD
MICHAEL O'HARA
RICH VOLO
NATHAN WOODHULL
BRITT ZUCKERMAN
ANGELYN CHANDLER, FORMER MEMBER
BETH FEINGOLD, FORMER MEMBER
DALE SCHAFFER, FORMER MEMBER

HUDSON PARKS CONSERVANCY
KRISTAL HEINZ
CAROLE OSTERINK
DALE SCHAFFER
SARAH STERLING
RICH VOLO
DAVID VOORHEES

SPECIAL PROGRAMING AND YOUTH OUTREACH CONTRIBUTIONS
CHRISTINE VANDERLAN, COLUMBIA LAND CONSERVANCY
EMILY CHAMEDIES, LIBRARY DIRECTOR
BRENDA SHUFELT, LIBRARY PROGRAM DIRECTOR
THE YOUNG WOMEN OF PERFECT 10
MARLENE PARMENTIER, ELEMENTARY SCHOOL TEACHER, HUDSON CITY SCHOOL DISTRICT

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SEAMSTRESS
by appointment
646.285.4368

CHAPTER ONE

INTRODUCTION

[Image]
This Serviceberry Tree is living in a bioretention planter, a unique stormwater mitigation practice that slows and filters stormwater before it reaches the storm sewer.

Introduction

HOW IT STARTED

In 2020, the City of Hudson received a New York State Department of Environmental Conservation Urban and Community Forestry Grant to complete an Inventory of publicly owned urban trees and a Community Forest Management Plan (CFMP) for Hudson's urban forest, for which they put out a Request For Proposals to solicit work. The City hired LBS Ecological to complete the inventory and develop the City's first Community Forest Management Plan. This document is the culmination of that work, along with the efforts of the City of Hudson Conservation Advisory Council (CAC) and Department of Public Works over the last several years to improve the City's urban forest management operations.

The goal of the project is to acquire an informed framework within which the City of Hudson and its residents can manage the forest and trees of Hudson's Community Forest, in order to beautify the City streets, weave nature into the urban fabric of the City, and promote public safety by striving to keep trees healthy and less risky.

VISION FOR HUDSON'S URBAN FOREST

The vision for the project is such that the Tree Inventory and Urban Forest Management Plan will serve as clear directions to improve the City's urban forest management efforts. In recommending the most effective combination of best management practices for Hudson's Urban Forest, the project will enable improvements in tree cover, stocking, species diversity retention, invasive plant removal, diverse and appropriate plantings for both street trees and park trees, coupled with protection of the public with reduced risk from hazardous trees. In addition to the beauty and majesty of community trees, a healthy urban forest will improve quality of life, and deliver economic, social and health benefits.

The project design reflects Hudson's belief that educating and including the community in the planning process will deliver a more comprehensive solution, and create additional capacity for management of the urban forest that will enhance the health of all community trees including: street trees, park trees, and trees on private properties.

DEC PROGRAM

This project was funded by the NYS Department of Environment 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. Over the last nine years, New York State has funded more than $11.4 million in grants to support projects with a total value of more than $18.3 million.

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 the website, and helpful links to other U&CF related websites. Financial assistance is available from the State through competitive grants. Eligible project categories included tree inventories and management plans; tree planting, maintenance and education programming. Funds are made available from the Environmental Protection Fund and managed and allocated by DEC. Grant proposals are evaluated for cost effectiveness, projected benefits, use of recommended standards in implementation, community outreach and education, support, and regional impact.

[Image] DEC logo

[Image] Miguel prepares to inventory trees

[Image] A newly planted Hawthorne is finishing blooming

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

LBS Ecological, on behalf of the City of Hudson, NY has prepared this Community Forest Management Plan as a technical and planning document for the trees of Hudson's Urban Forest. As a technical guidance document, the Community Forest Management Plan identifies current conditions of trees within the City. As a planning document, the Community Forest Management Plan provides a baseline of information regarding the issues/opportunities/constraints for Urban Forestry in Hudson's urban forest and identifies and provides management recommendations. Ultimately, the purpose of this document is to provide a framework within which the City of Hudson can wholly manage the forest and trees of Hudson's urban forest.

The project will address the condition of the urban forest in Hudson, and includes both a tree inventory (that includes a risk assessment of declining and trees in poor health, and an inventory of vacant tree pits/strips), and the development of an community forest management plan which includes a full 5-year Maintenance Plan for tree removal, pruning, and young tree training.

Inventory

The data from the inventory informs the management plan. This tree data was used to determine the urban forest's composition, ecosystem services that the trees provide, and potential pests and pathogens of the urban forest. Information including Location (Lat/Long), address location, species, DBH, Crown Dieback were collected as part of the inventory.

All trees from the Inventory were assessed also for risk. Factors noted were Canopy/Crown Condition, Trunk Condition, Root and Root Collar Condition, Priority Task, Maintenance Recommendation, and Additional Notes/ Comments.

Location of Plantable Street Tree Pits

In addition to collecting inventory data on the trees of Hudson's urban forest, the locations of plantable street tree pits and strips were also surveyed in order to determine where trees can be easily planted within Hudson's urban fabric. Plantable street tree pits/strips were determined to be suitable for small, medium, or large size trees, and the street address for the pits was noted.

[Image] The area between the sidewalk and roadway is where street trees can be planted in the Right of Way (ROW). This road is a good candidate for tree planting.

Community Forest Management Plan

LBS Ecological has produced a CFMP based on an environmental benefits analysis that includes:

- A vision for the long-term community forest and a strategy for how to care for the community trees, customized to reflect the findings and needs of the City of Hudson.
- The development of budgets and work plans, including timelines and tasks, to meet that vision.
- Instructions for the use of the tree inventory which identifies management needs, i.e. pruning rotations, removal implementation, and prioritization of work load.
- An urban forest environmental benefit analysis of environmental issues such as: water quality, air quality, the reduction of urban heat island effect, energy efficiencies, stormwater management, and health.
- Storm Preparedness Planning (as an additional section in CFMP) relating to observation of the urban forest and conditions
- Basic in-house training for all those involved with ongoing maintenance of the iTree Inventory and implementation of the Management Plan.
- A follow-up consultation in the second or third year, accompanied by one or more local volunteers to ensure positive long-term support.

The CFMP will be included in aspects of future planning related to Hudson's urban forest. LBS Ecological will deliver the CFMP to City staff and committee members to provide guidance to all those involved with the ongoing maintenance of the tree inventory and implementation of the Community Forest Management Plan. The grant project will build the capacity of Hudson to promote the community's enjoyment and exploration of Hudson's Urban Forest, educate and involve the community in developing an appreciation and understanding of the unique urban forest and local ecosystem, and demonstrate and encourage sustainability concepts and practices that will inspire all of us to live in balance with the natural systems upon which all life depends.

[Image] A newly planted tree has been adequately planted, is mulched, and is supported with stakes and ties.

Hudson's Urban Forest Background

HISTORY

Take a moment to consider that people have been walking here, along paths lined by trees, for the past 13,000 years. The First Peoples here maintained a reciprocal relationship with nature in accordance with their spiritual traditions and substantial cultures. Mahican and Munsee Lenape people lived here and used trees for shade, shelter, food, fire, tools, and transportation. European colonization, expansion, and violence forced many of their descendants to relocate as far as Wisconsin and Canada. Mahicans (or "Mohicans") named themselves after the river, Mahicanituk: "the river that flows both ways"; the Mahicanituk is currently called the "Hudson River". Many Mahicans lived in villages along the river, including specifically here, in what is now known as Hudson. Trees helped make homes (wetus, wigwams, or longhouses), wooden "palisade" walls, bows and arrows, and fishing gear (like weirs, poles, and smoking racks). People used fire to manage forests for ease of travel, hunting, and agriculture. Villages were surrounded by gardens among charred stumps and beyond those would be forests full of fruits and game. Dugout canoes were made by burning and scraping Tuliptrees (Liriodendron tulipifera) and other species. While travel by boat was important, the First Peoples also created extensive paths and roads for easy travel near and far, some of which became the roads and highways still traveled today, including Route 9 traversing the land now called the City of Hudson, NY. (Stanne et al. 1996, https://native-land.ca, https://www.mohican.com, Pritchard et al. 2007, Mann CC 2011, Dunbar-Ortiz, R 2014)

[Image] Photo Credit: Hudson Riverkeeper

In the 1600's the Dutch began settling the Mahican territory in what is now known as the City of Hudson. The City was chartered in 1785. Hudson grew on a hill sloping up from the Hudson River. Before streets were covered with non-porous paving, before automobiles, before air conditioning, street trees that shaded people and buildings, soaked up storm water and retained soil were seen as essential to the well-being and environmental stability of the community. We do not have many photos of street trees from the past, but the photographic record we do have shows that trees were purposely planted "in the gutter" for storm water management.

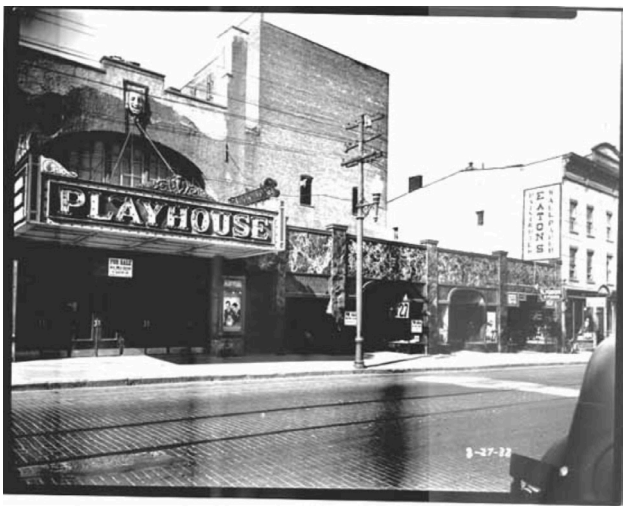
[Image] (above)
Warren Street – The young street trees were planted in the gutter are supported and protected.

[Images] (above)
1st and Warren Street – cobblestone paving allowed for water penetration.

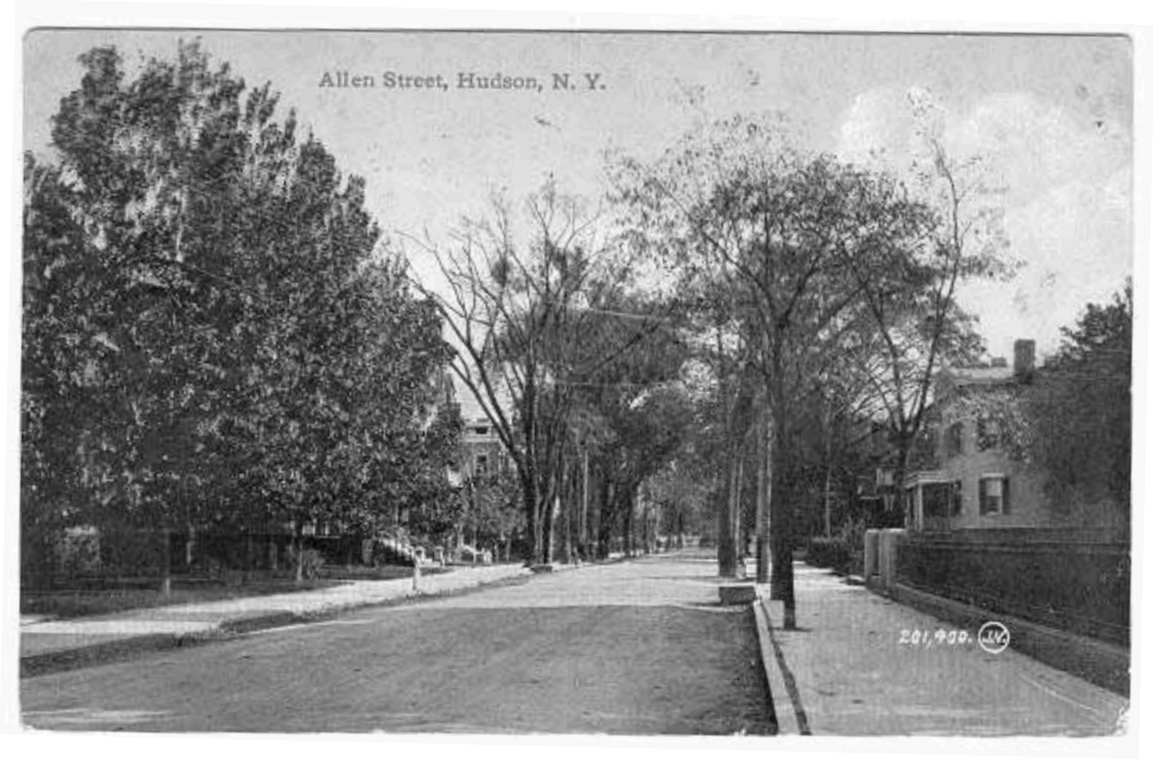
[Image] (above)
Hudson's "Main Street", Warren Street, in 1868.

[Image] (above)
Warren Street – photo date uncertain.

By the early 1900's, accommodating cars became a high priority as did the placement of poles to carry telephone and electric lines. Trees in the modern urban environment were likely deemed quaint and old fashioned—and removed. With the advent of paving, slate sidewalks, storm drains, and the prioritization of automobile over pedestrian traffic, the urban street tree came to be seen as either a luxury for stately homes or a menace that dropped pesky leaves and sprinkled pollen on the beloved automobile. Ironically, car culture created a good reason to save and replant street trees: their ability, as pollution increased, to sequester carbon.



[Images] (above)
Warren Street in the 1920's – the city was abuzz with "modern" urban amenities, streetcars, automobiles, telephone and electric wires signal prosperity



[Image] (above)
Allen Street, residential neighborhoods retained their connection to nature in the early 1900's

Momentum Toward Success: In the early 1990s, the City experienced an influx of antique dealers and entrepreneurs, taking advantage of Hudson's relatively inexpensive real estate and the architecturally attractive Warren Street buildings. With a lot of private investment and sweat equity Hudson became established as one of the premier antique centers of the Northeast. Warren Street became a retail and dining corridor; much of this success can be linked to improvements in streetscape including street tree planting, and Warren Street to this day still has the most dense street tree canopy in Hudson.

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[Image] (above)
Lower Warren Street

[Image] (above)
Mid Warren Street

HISTORY OF HUDSON'S PARKS

Located within the City of Hudson there are several parks, cemeteries, public spaces, and playgrounds. The plazas, 'pocket parks', and historical parks are excellent places to enjoy a natural setting, observe wildlife, do some people watching or just to escape the hustle and bustle of the City. Some of the more historically important and larger parks are described below:

Promenade Hill

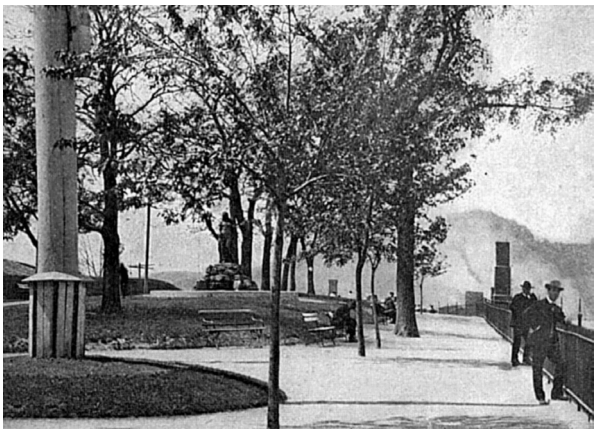
Promenade Hill, overlooking the Hudson River, is the Hudson's oldest park. Established in 1795, it is the first public space in the country set aside with the expressed purpose of viewing the landscape. This painting by Henry Ary, dated 1854, is one of the earliest images of Promenade Hill, at that time also called Parade Hill.

[Image] (above)
Parade Hill (Promenade Hill) in 1854

In 1878, various improvements were made to Promenade Hill. Writing in 1908, Anna Bradbury briefly describes those improvements in her book History of the City of Hudson, NY:

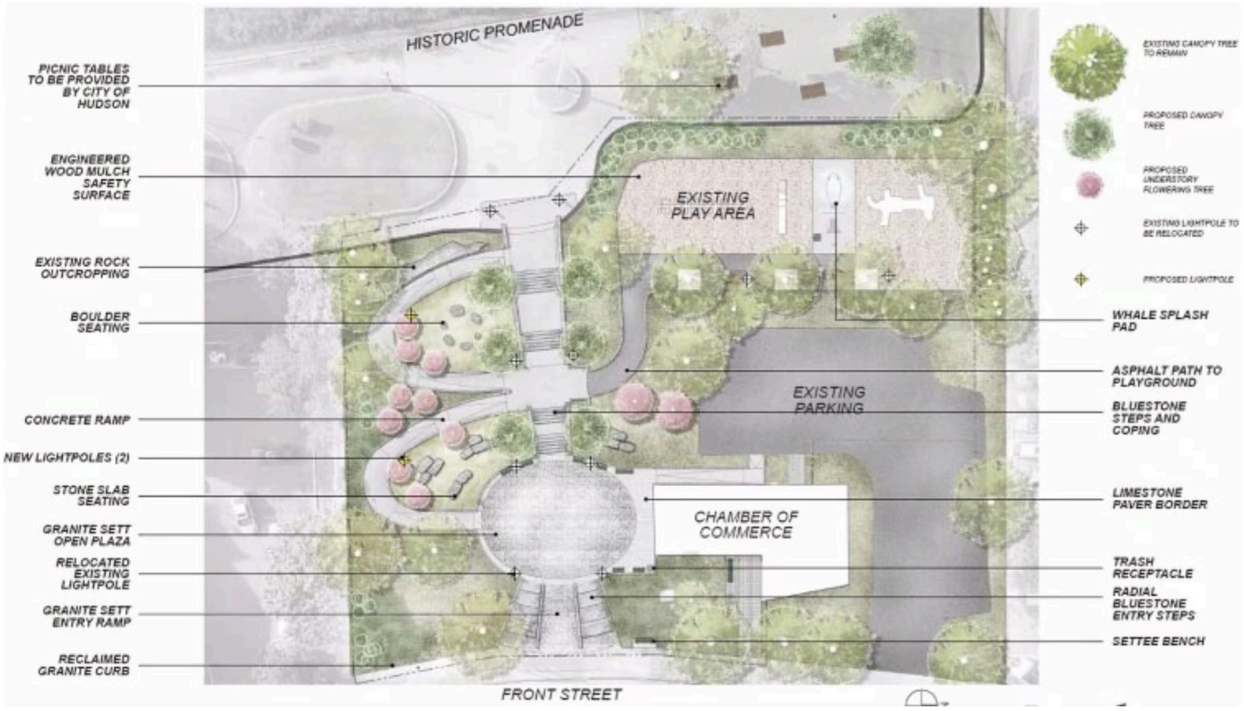
> . . . the authorities took measures to improve the Promenade Hill, by the erection of an ornamental iron fence along the full length of its dangerous frontage, and by increased attention to its walks and lawn.

The images that follow show the park in the 1890s, not long after the Victorian improvements to the park had been made.



[Images] (above)
Historic pictures suggest that there was some pattern to the placement of trees in this park—one that no longer exists, because trees have been removed but none have been planted to replace them.

The approach to Promenade Hill, which until Urban Renewal in the 1970s was the westward continuation of Warren Street, Hudson's main street, is currently being reconfigured and renovated with funds from a Downtown Revitalization Initiative grant awarded to Hudson in 2017. The historic promenade is not part of the renovation.



[Image] (above)
Conceptual Design of the approach to Promenade Hill.

Seventh Street Park (a.k.a. the Public Square)

The parcel of land on which the park is situated was given to the City of Hudson in 1800 by Ezekiel Gilbert, with the intention that it be a park, but it wasn't actually developed as a park until 1878. The story of its creation is told by Anna Bradbury in her History of the City of Hudson, NY (1907):

> [The Public Square] as we have seen was intended for a public park by the donor, but for some inscrutable reason it was denuded of it fine old forest trees, and paved with cobblestones. To complete the devastation, the Hudson and Berkshire Railroad was allowed to cross it, and thus it remained until 1878, when the matter was taken up by a resident on the upper side of the Square. Subscriptions were solicited and a sufficient sum was raised, together with the gifts of the coping and trees from individuals, to transform the treeless desert into a refreshing little oasis. The Boston and Albany Railroad Company atoned in a measure for its presence, by generously furnishing sufficient gravel to fill in the whole surface of the Park.

These images show the park in its early days. The fountain at its center was installed in 1883 and drastically "re-imagined" in 1975.

[Images] (above)
As was the case with Promenade Hill, there was pattern to the placement of the trees in Public Square Park (7th Street Park). Over the years, with removal and replacement and the addition of different species, any notion of design or pattern has been lost.

The citizens' group calling itself Friends of the Public Square (FOPS) was organized in the past year and has a memorandum of understanding (MOU) with the City of Hudson for the purpose of rejuvenating the park. So far, the group has organized volunteers to repaint the park benches and has removed unneeded fences around the now inoperative 1975 fountain. Further initiatives will be pursued informed by public input.

[Image] (above)
Benches were pained in order to help to rejuvinate Public Square.

Cedar Park Cemetery

The burying ground in Hudson is made up of two parts: Hudson City Cemetery, which was established in 1784 and has been determined to be National Register-eligible for its noteworthy collection of funerary art; and Cedar Park Cemetery, which was developed in 1896 and is significant not so much for its funerary art as for its landscape design.

There is no indication that landscape design was a conscious element in the development of the Hudson City Cemetery, but it was for Cedar Park. Although developed late in the 19th century, its design, with its curving paths and decorative pond, is characteristic of the rural cemetery movement. The entrance to Cedar Park was landscaped by local notable Dr. John Conover Smock, who, it is believed, engaged the help of Frederick Law Olmstead in designing the cemetery. Smock was an important geologist, who during his career chaired the Department of Mining and Metallurgy at Rutgers University, served as New Jersey State Geologist, and was an assistant in charge of the New York State Museum. When he retired to the mansion in Hudson now known as Cavell House, located not fair from the cemetery, he pursued his interest in horticulture. It is said that on the grounds of his home he planted a specimen of every tree and shrub that was indigenous to New York State.

A thoughtful walk in this part of the cemetery makes it clear that trees and shrubs were an essential element of the cemetery's original design. Unfortunately, no records of that original design have been discovered, and trees that have died or been seriously damaged by storms have been removed and not replaced. It may still be possible, based on a careful study of what has survived, to re-create the original landscape plan and create a plan for replanting trees in the cemetery.

[Images] (above)
Elements of Cedar Park Cemetery, including the pollarded catalpa trees (bottom photo).

Henry Hudson Riverfront Park

The Hudson River can be accessed at water level at Henry Hudson Riverfront Park, to allow visitors to envision how the town of Hudson became the home of whalers in the 1800s. The park is located close by the train station and is a nice spot for a picnic, a short walk, or enjoying the scenery over the Hudson River. It is common to see people fishing and boating on a sunny afternoon.

An existing design feature of the Core Riverfront Area which discourages the public from accessing and using the Henry Hudson Riverfront Park is the location of the State Boat Launch north of and adjacent to the Hudson Power Boat Association. Parking for both boating facilities necessitates a large parking lot area, however, the current expanse of asphalt parking area, situated in a rectangle and devoid of any trees or landscaping, presents an eyesore to the public which could be addressed if the entrance to the City's riverfront and Henry Hudson Riverfront Park is to become a welcoming space which draws the public toward the park and river. (Waterfront Plan)

[Images] (above)
Henry Hudson Riverfront Park is one of the best spots in the City of Hudson to enjoy the Hudson River.

PLANNING OF THE URBAN FOREST BY THE CONSERVATION ADVISORY COUNCIL (CAC)

Management of the urban forest in the past had happened organically, and often more responsively than proactively. In recent years however, planning of the forest has catalyzed. Planning in earnest with respect to the urban forest of the City of Hudson began with the creation of a Conservation Advisory Council.

The City of Hudson Conservation Advisory Council (CAC) is made up of appointed volunteers; between them possessing diverse professional expertise and practical experience relating to ecology, environmental concerns, education, community and planning. The mission of the CAC is to advise the elected city officials on environmental issues and their impact on the health and safety of the residents, the health of the ecology, the stability of the built environment and the livability of the city, all which need to be considered when creating legislation or policy. The CAC members interact with county, regional and state governmental and non-governmental groups for information gathering, solution seeking and potential burden sharing.

Primary foci of the CAC are:

- Global warming and planning for potential changes in our geology and geography;
- City density as human migration escalates;
- Water management, (conservation, retention and protection);
- Urban forestry, creating and maintaining a healthy tree canopy to mitigate heat issues and aid in higher air quality.
- Greenspace
- Air quality

Four of the primary foci of the CAC can be directly related to urban forestry (in bold above), and one of the foci is the application of urban forestry to achieve ecosystem services provided by trees. This urban forestry foci has been the main driver to develop Hudson's urban forestry program, and has yielded both this CFMP, and a tree planting permit process for landowners to create more urban tree canopy on their properties' public ROW. To encourage planting of appropriate street trees, the CAC devised, and the City adopted, an application and permit process for planting street trees, with an accompanying guide to appropriate urban species choices and proper planting and maintenance practices. The application and guide are included in the appendix.

MANAGEMENT OF THE URBAN FOREST BY THE DEPARTMENT OF PUBLIC WORKS (DPW))

While the CAC plans for and makes recommendations for the urban forest, the Hudson Commissioner of Public Works and Department of Public Works are in charge of it's management. City of Hudson Code C22-22 is copied below:

C22-22 City of Hudson Code - Power to control trees in public places

The Commissioner of Public Works shall also have power, and it shall be his duty, to regulate and control the planting and setting out of trees and shrubs in and upon the highways, streets, sidewalks and all other public places of the City, except cemetery lands, and to inspect and ascertain the condition of such trees and shrubs so planted. If, in his sole judgment, any such tree or shrub shall have become unsightly, detrimental to or destructive of any highway, street, sidewalk or public place, or shall interfere with, impede or prevent the safe or full use thereof by the public, the Commissioner shall notify the owner of the property abutting the place upon which such tree or shrub stands or stood to remove the same or the stump thereof, or otherwise prune such tree or shrub, within such period of time, not to exceed 30 days, from the date of such notice as the Commissioner shall prescribe. In the event that such owner shall fail, refuse or neglect so to do, the Commissioner shall have the power forthwith to cause such tree, shrub or stump to be pruned or removed and all City expenses incurred in performing such pruning or removal shall be a lien upon the property upon which such pruning is made, and the Commissioner of Public Works may enforce its collection by appropriate remedies. The trunk, trunks, shoots or stump of any tree or shrub directed to be removed under the provisions of this section or any other provision of law shall be severed at or below ground level or grade only and no part thereof shall be permitted to protrude above such level or grade. For the purposes of this section, any tree or shrub which overhangs any highway, street, sidewalk or public place in such a way as to impede or interfere with traffic or travel thereon or which obstructs any street lamp or traffic light or sign or interferes therewith shall be deemed to have been planted or set out in and upon such public ways and places.

The City manages public trees as mentioned in the code above. Trees are planted by landowners when a permit is solicited and reviewed, and if the City deems a tree unsafe it can notify the property owner and have them deal with the risky tree (prune or remove). This is inclusive of trees on private property that 'overhang' any roadway, sidewalk, or public place and obstruct traffic or travel (including obstructing signs, lights, etc.). If the property owner does not comply the City will accomplish the work and create a lien on the property tax to collect payment.

MAINTENANCE OF THE URBAN FOREST BY CITIZENS

Trees in the public right of way (ROW) in the City of Hudson are maintained by their property owners, either at their own discretion or at the direction of the Commissioner of Public Works. Generally all planting, pruning, and tree removal is the responsibility of the property owner. The CAC along with the DPW certainly does plant trees, but there is no scheduled annual tree planting process, and typically these public tree plantings happen during events such as Arbor Day plantings. The City maintains trees on City property, such as Cedar Park Cemetery, Henry Hudson Riverfront Park, other parks, municipal buildings and lots, etc.

PLANNING IN HUDSON THAT INFORMS THIS CFMP

Previous to the creation of the CAC, the City of Hudson did have some minor direction for urban forest management from it's Comprehensive Planning Process, as well as from additional other plans with environmental or natural resource based scopes.

The City of Hudson Comprehensive Plan (April 2002), City of Hudson Local Waterfront Revitalization Plan (November 2011), Nature in the City a Natural Resource and Open Space Inventory of Hudson NY (May 2019), 2018 Natural Resource Inventory Columbia County NY, and other documents relevant to this CFMP were reviewed in order to develop the plan in congruity with previous planning. Key aspects of direction from several plans are noted below:

City of Hudson Comprehensive Plan

The Comprehensive Plan recommends programs and projects that support the kind of dynamic and lively culture that makes Hudson a place enjoyable to live in and attractive to businesses and entrepreneurs. A major component of this culture is rooted in Hudson's pedestrian friendly streetscapes, and in the trees that are living there. In the Comprehensive plan, Goal 3: Promote Economic and Cultural Vitality, best speaks to goals and objectives that can be achieved via urban forestry. Below are elements of this section of the Comprehensive plan that have informed this CFMP.

Improve the Pedestrian Streetscape

If a downtown area is pedestrian friendly, numerous benefits can result. Where the distance is reasonable, people will choose to walk if the connections are safe, comfortable, enjoyable, and if destinations are clearly linked by a network of pedestrian walkways. Combined, with such improvements as benches placed in shaded areas and directional signage, these provisions can help create a vibrant downtown community. In addition, street plantings can improve the urban aesthetic immeasurably. These public improvements can play a strong role in defining downtowns and help create a pedestrian friendly atmosphere.

Provide Pedestrian Amenities

In addition to safe crosswalks and continuous sidewalks, it is important that the City continue to invest in amenities that make walking more interesting and enjoyable. Benches offer pedestrians a place to rest, talk, and people watch, and should be distributed widely. Attractive human- scale lighting enhances the aesthetic, and engenders a sense of personal security. Trees, planters, hanging flower baskets, banners, and attractive pavement also help enhance the pedestrian environment. Pedestrian-scaled wayfinding signage permits the casual visitor a sense of direction and improved comfort levels in unknown places. Wayfinding signage could be made available at each corner on Warren Street identifying the stores located on that block as well as side streets. Street amenities such as benches, pedestrian scaled lights, street trees, clocks, planters, and trash receptacles should be located in the areas generally with high pedestrian activity.

Landscape Edges

Where parking lots abut the sidewalk, a distinct border should exist between the two. Ideally, this border would be landscaped, creating a continuous edge to the sidewalk and enhancing the aesthetic value. Such a border could take the form of a low hedgerow, a wooden or wrought iron fence, or a planting strip of shrubbery. This border would serve not only to improve the aesthetics, but also to create a physical barrier to separate pedestrians from parked vehicles.

The City of Hudson Comprehensive Plan has shown that throughout the City there are streets, sidewalks and alleyways that need upgrading. Investments in public improvements like sidewalks, bicycle paths, better landscaping along major roads, planting street trees, improving public parks, and open spaces can raise property values and reconnect them to the rest of the City while potentially improving public safety.

City of Hudson Local Waterfront Revitalization Plan

The City's primary goal through the adoption of this Local Waterfront Revitalization Plan is to reconnect the Hudson River and the waterfront land to the City by restoring transportation and pedestrian links, reconnecting hydrology, encouraging compatible residential, commercial and industrial uses within the waterfront boundary area which build upon and support the revitalization efforts in the upland portions of the City; restoring and maintaining the City's historic connection to the river for shipping via the port; restoring and maintaining viewsheds to and from the waterfront and the river; and improving existing and ensuring additional public access to the River and the entire waterfront for water dependent and enhanced recreational and other purposes where ever possible. In the City of Hudson Local Waterfront Revitalization Plan there are many sections that speak to goals and objectives that can be achieved via urban forestry. Elements from Appendix G: Design Guidance Template (sections C and D) that have informed this CFMP are paraphrased below.

C-Parking and Outdoor Spaces, section (3) Outdoor Spaces

Courtyards and outdoor areas should be designed to enhance surrounding buildings and provide appropriate amenities for users (e.g. textured paving, landscaping, lighting, street trees, benches, trash receptacles, street furniture). Courtyards should have recognizable edges defined on at least three sides by buildings, walls, landscaping, and street furniture.

D-Streetscape, section (1) Sidewalks

The planned expansion of sidewalks and pedestrian connections discussed (in Section IV of the LWRP) above will play an important role in upgrading the overall design quality of the area. Consistent design treatment of sidewalks will help establish a sense of place and careful selection of materials will make the pedestrian experience more attractive and safer for future users. Where feasible sidewalks should include the following features:

- The main pathway should be a minimum 4'0" width, of scored concrete. Consideration should be given to adding a grey pigment to the concrete mix.
- Where feasible, a paved strip, 2'0" to 3'0" wide, should be incorporated, abutting the sidewalk. This strip should be designed to accommodate street furnishing such as trees, light poles, signage etc. and to provide adequate separation between pedestrians and vehicles on the roadway.
- Paving for the strip should be bluestone or grey concrete pavers. The use of pavers will ensure adequate moisture reaching tree roots, thus avoiding the need for tree grates or other tree pit treatment.

D-Streetscape, section (2) Street Trees

The planting of continuous rows of street trees along roadways and sidewalks forms an important goal for the area. Street trees are the most effective physical solution to make sidewalks seem more welcoming and walkable. Regularly spaced street trees, located close to the road, provide a sense of protection from traffic for pedestrians. Lines of trees will also help to visually unify parking lots, vacant sites, and buildings that occur in many areas with the LWRP area. Trees should be spaced approximately 30-40 feet apart.

Nature in the City; A Natural Resource and Open Space Inventory of Hudson NY

The Natural Resource and Open Space Inventory of Hudson NY spells out reasons to protect open spaces and natural resource, which includes all the urban trees in forests, parks, and street trees. The NRI then recommends steps to take to enact management which in turn supports these natural resources.

Forests

Forest makes up most of the natural habitat in Hudson, covering about 19% of the City. This includes upland conifer forest, upland mixed forest, upland hardwood forest, and red cedar woodlands. The majority of Hudson's forests, both large and small, are found in settings with steep clay bluffs and ravines, which is not surprising because remnant natural areas in cities are often found in places that are difficult or impossible to develop.

Parks

Parks and green spaces provide places for physical activity, social interaction, and quiet contemplation. There are 13 public parks and open spaces in the City of Hudson. Hudson City and Cedar Park Cemeteries are included as parks because they are publicly accessible open spaces for walking and recreation. Recent analyses found that 83% of Hudson residents and 87% of Hudson youth live within a 10-minute walk, or a half mile, of a park. However, the CAC's survey revealed that the park maintenance and amenities are insufficient. Concerns about the parks included lack of maintenance and lack of facilities and programming. The most common suggestions for improving parks were: clean up or maintain parks, improve landscaping/street trees, and add amenities, including trails, seating, and things for kids to do.

Street Trees

A 2017 partial Street Tree inventory revealed that there were many parts of the City that had few or no street trees. There were large gaps in the newer parts of Hudson, on streets east of Harry Howard Avenue and north and east of Oakdale Lake, where there are few or no sidewalks. But even in the dense urban grid, many existing street trees are in poor condition, and many blocks have few street trees or none at all. In some places, unfortunately, sidewalks are too narrow for street trees. In addition, many existing trees need pruning and other maintenance. Some trees are heaving adjacent sidewalks. The inventory revealed that street tree and sidewalk conditions are intimately connected, because both are the legal responsibility of adjacent property owners.

Key Findings

- A Public survey showed people want more maintenance and amenities in Hudson's parks.
- A street tree inventory conducted for this report showed that there are many parts of the City with few or no street trees, many street trees in need of maintenance, and the need for a comprehensive, citywide approach to promoting a healthy street tree population.

Suggested Actions

- Encourage a comprehensive plan to enhance facilities and programming in parks.
- Complete and publish the 2017 tree inventory and apply for funding to create a citywide plan to improve the street tree canopy.
- Encourage efforts to resolve the connected problems of responsibility for and condition of sidewalks and street trees.
- Develop a pedestrian and bicycle circulation plan for the City.

Next Steps

In conducting this inventory, we (the CAC) have identified as priorities the following challenges for the City and the CAC:

- Develop conservation planning guidelines, based on the findings of this inventory, to be adopted as City policy.

- Update and complete the street tree inventory.
- Develop a comprehensive, citywide street tree and sidewalk plan, incorporating green infrastructure to address stormwater issues wherever possible.
- Confront the expectation of higher tides and inundation in the low-lying parts of the City, by proposing robust design requirements for any new construction or adaptive reuse of buildings in the flood plain; and urging realistic decisions about how much, and what, should be invested there.
- Identify poor condition and lack of amenities and programming in City parks.

Note: Sewer issues were also mentioned in The Natural Resource and Open Space Inventory of Hudson NY due to it's condition as a MS4 community. Hudson has taken steps using nature-based solutions, called green infrastructure, to absorb or trap water and reduce the volume of stormwater before it enters the combined sewer system. In 2018 and 2019, with state funding, stormwater retention cells that also serve as street tree planters were installed along upper Union Street to absorb rainwater and reduce runoff. Other green infrastructure technologies and solutions include permeable pavement, rain gardens, and green roofs. Even simply planting urban trees will intercept stormwater and slow the peak flows of stormwater.

EDUCATION, COMMUNITY INVOLVEMENT AND PUBLIC INPUT

There have been a number of tree planting events in Hudson in recent years. One of the most recent and notable events was held in the fall of 2021. Hudson's 1st Annual Autumn Arbor Day was a success on Saturday, October 16th 2021. A strong group of 17 volunteers showed up to help plant five trees in the city, one per ward. (Due to unforeseen digging dangers, only three were planted on the celebration day. The trees for the 1st and 3rd Wards will be planted as soon as the City has clearance from Dig Safe NY and DPW on new locations.)

The CAC strives to reach all residents with interactive programs, such as these plantings, that increase understanding that the urban forest belongs to the whole city and everyone who lives here. These programs help to spread the word about the health benefits of a strong, diverse urban forest for every living creature. Street trees create oxygen, sequester carbon, provide habitat for pollinators, and reduce heat, which has a positive economic impact. The CAC also makes people more aware that trees are not merely what we see above ground; underground, the root system is also constantly working for the environment and every citizen by absorbing storm water, controlling runoff and retaining soil. The CAC is committed to creating the awareness that within the city of Hudson "A single tree belongs to our whole community and the whole forest belongs to each individual"; with this message comes the underlying truth that each person contributes to the whole and that the whole contributes to the well-being of each person.

CHAPTER TWO

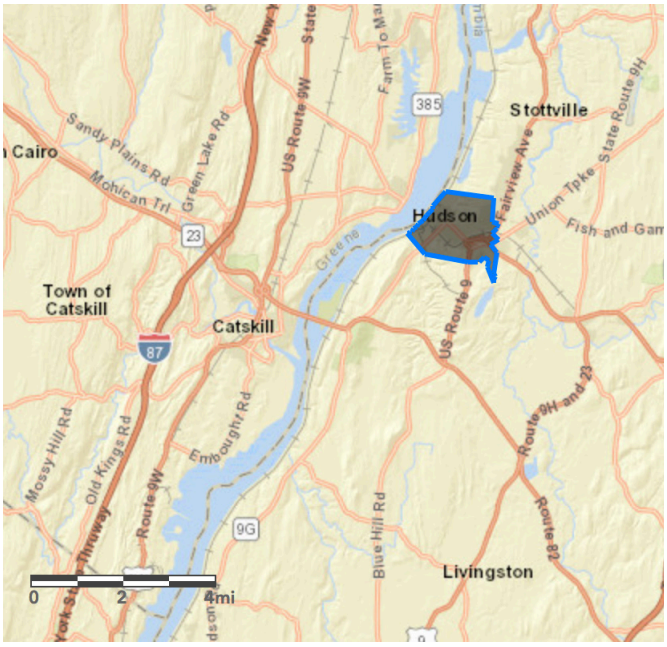
EXISTING CONDITIONS

This Silver Maple Tree may be the largest street tree in the City of Hudson.

Existing Conditions of Hudson's Urban Forest

CITY OF HUDSON LOCATION

Hudson is located 120 miles from New York Harbor, at the head of navigation on the Hudson River, on what originally was a spit of land jutting into the Hudson River between the South Bay and North Bay. Both bays have been largely filled in. Across the Hudson River lies the town of Athens in Greene County; a ferry connected the two municipalities during much of the 19th century. Between them lies Middle Ground Flats, a former sandbar that grew due to both natural silting and also from dumping the spoils of dredging; today it is inhabited by deer and a few occupants of quasi-legal summer shanties. The Town of Greenport borders the other three sides of the city. (wikipedia)

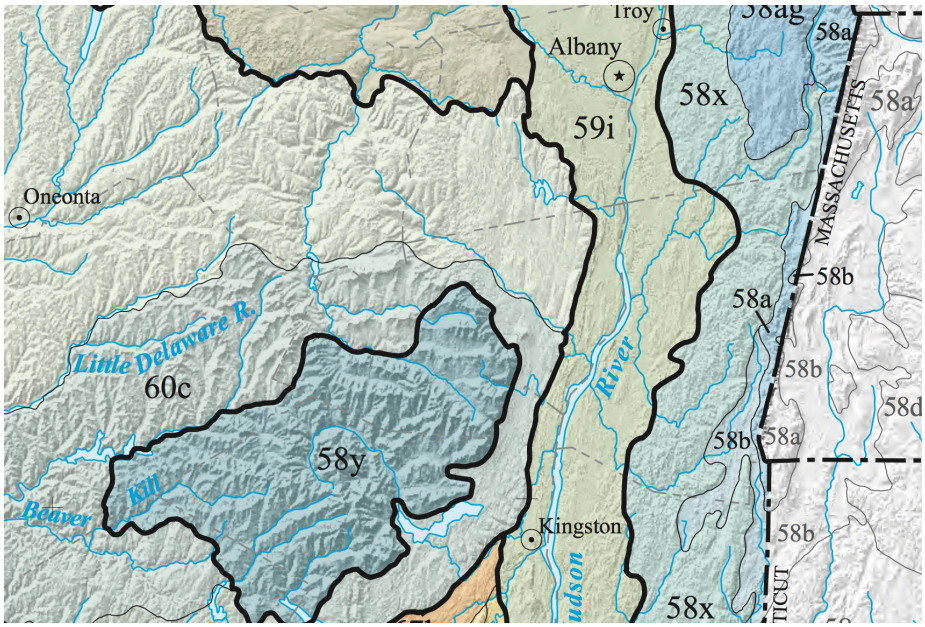


[Images] (above)
Location and map of Hudson, NY

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 and others, 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 and others, 2000).

Hudson is located in the Northeastern Coastal Zone ecoregion (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.

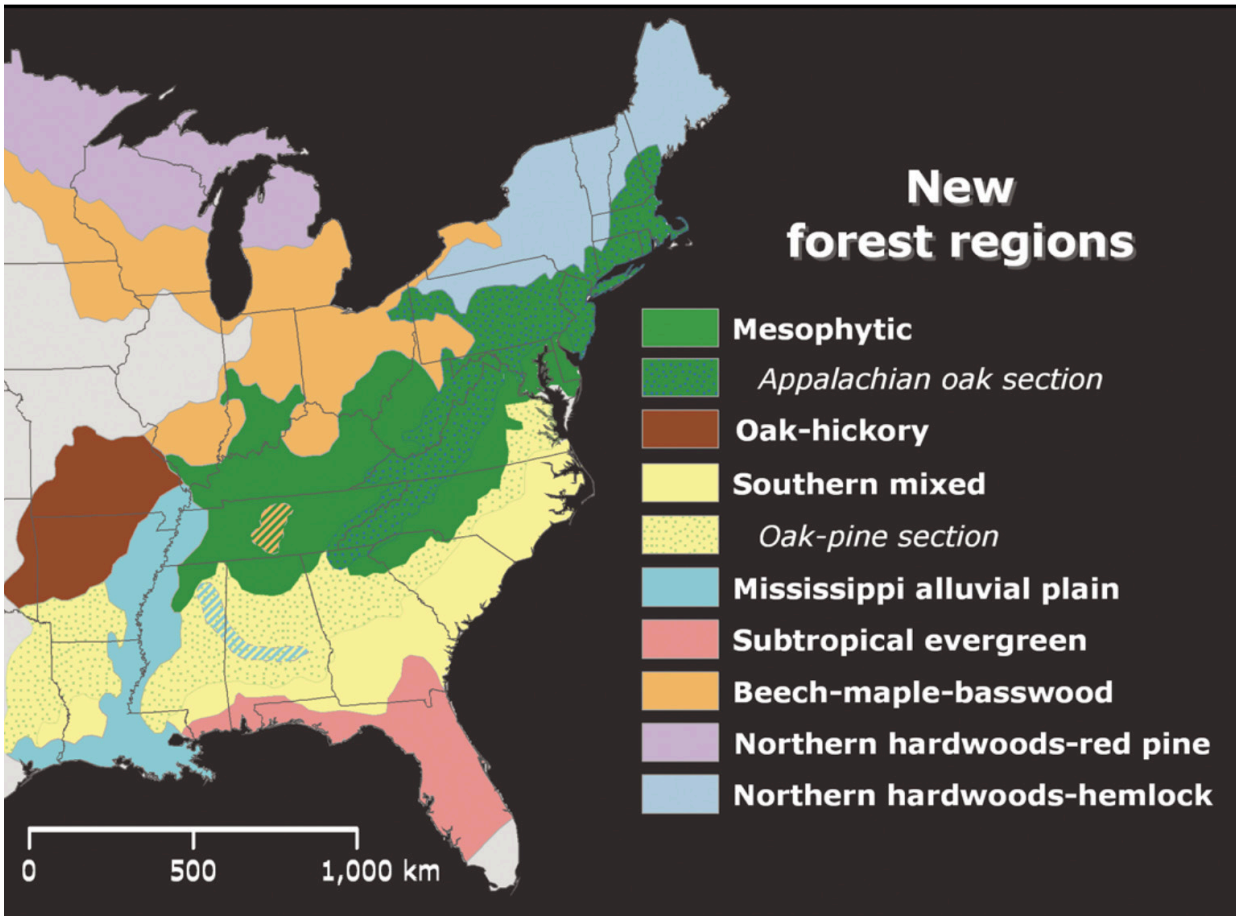


[Image] (above)
Ecoregion of Hudson NY.

More specifically, Hudson is located the Hudson Valley ecoregion (59i). The Hudson Valley ecoregion includes the valley from the Glaciated Reading Prong/Hudson Highlands (58i) to the Eastern Adirondack Foothills (58ac) and Champlain Lowlands (83b) in the north. The underlying geology of the Hudson Valley includes mostly Ordovician shales and siltstones. The shales were more easily eroded than the surrounding gneiss, schist, and sandstone-capped shales of the surrounding highlands. During the Pleistocene Epoch, glacial flood waters shaped Hudson Valley topography, and Glacial Lake Albany filled the valley from Bear Mountain to Glens Falls. Sediments deposited into Glacial Lake Albany cover the valley floor today. The coarser-grained sands deposited in the area surrounding Albany form the dunes and sand plains known as the Pine Bush, where pitch pine and scrub oak predominate. Low elevations and the moderate climate of the Hudson Valley allow Appalachian oak-hickory forest to penetrate northward. Some of the Appalachian species are at the northern extent of their distribution, but as the climate warms they are expected to expand their range into areas now dominated by northern hardwoods.

NATURAL VEGETATION

Hudson exists in the Northern Hardwoods-Hemlock region of the Deciduous Forests of Eastern North America. The Northern Hardwoods-Hemlock forest is a mixed forest that typically occurs on middle to lower slopes of ravines, on cool, mid-elevation slopes, and on moist, well-drained sites at the margins of swamps. Eastern hemlock (Tsuga canadensis) is codominant with any one to three of the following tree species: American beech (Fagus grandifolia), sugar maple (Acer saccharum), red maple (A. rubrum), black cherry (Prunus serotina), white pine (Pinus strobus), yellow birch (Betula alleghaniensis), black birch (B. lenta), red oak (Quercus rubra), and basswood (Tilia americana). The relative cover of eastern hemlock is quite variable, ranging from nearly pure stands in some steep ravines to as little as 20% of the canopy cover. Striped maple (Acer pensylvanicum) is often prominent as a mid-story tree. This is a broadly defined and very widespread community with many variants. For example, in the Hudson Valley, eastern hemlock is sometimes codominant with red oak; in the Adirondacks, yellow birch and sugar maple are sometimes codominant. (NYNHP)

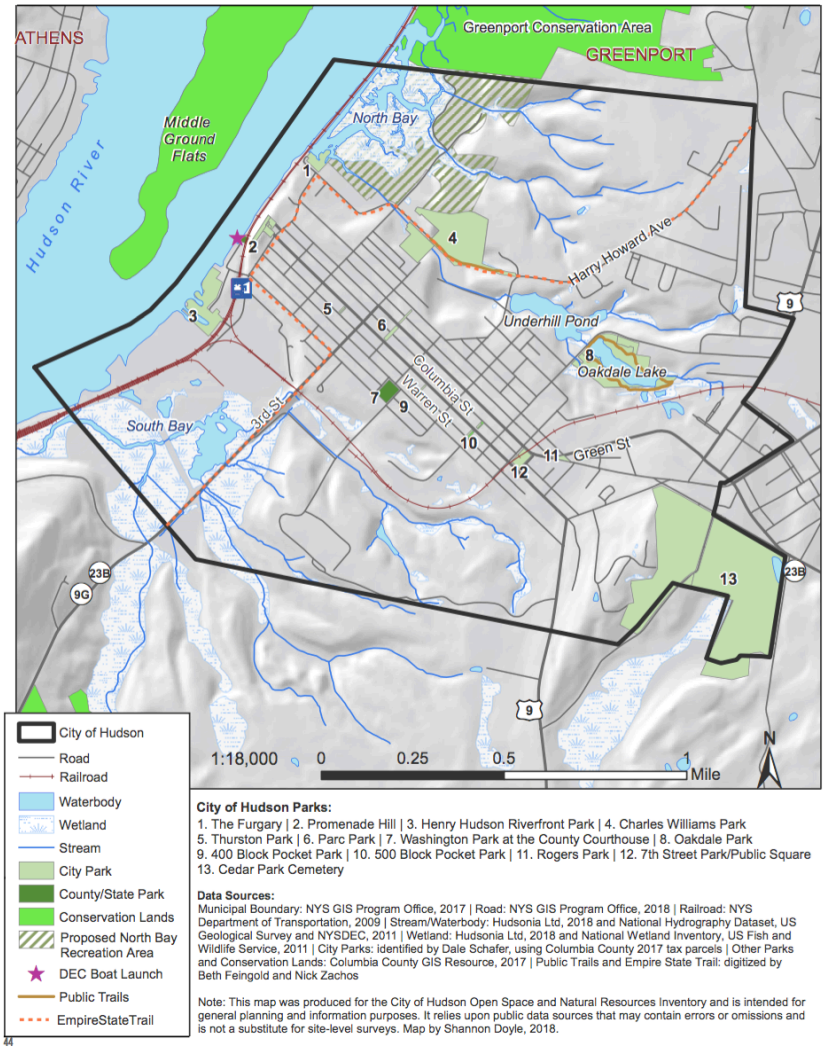


[Image] (above)

Forest Regions of the Eastern USA (Dyer, 2006)

MAP OF THE CITY OF HUDSON PARKS

There are several parks in the City of Hudson that are enjoyed by walkers/hikers, dog-walkers, students, birdwatchers, and others. During the tree inventory the park location was noted for each large park tree (this includes Henry Hudson Riverfront Park, Oakdale Park, and Cedar Park Cemetery. The smaller parks and 'pocket-parks' have trees listed in their respective ward location rather than park location.



City of Hudson Parks:
1. The Furgary | 2. Promenade Hill | 3. Henry Hudson Riverfront Park | 4. Charles Williams Park
5. Thurston Park | 6. Parc Park | 7. Washington Park at the County Courthouse | 8. Oakdale Park
9. 400 Block Pocket Park | 10. 500 Block Pocket Park | 11. Rogers Park | 12. 7th Street Park/Public Square
13. Cedar Park Cemetery

Data Sources:
Municipal Boundary: NYS GIS Program Office, 2017 | Road: NYS GIS Program Office, 2018 | Railroad: NYS Department of Transportation, 2009 | Stream/Waterbody: Hudsonia Ltd, 2018 and National Hydrography Dataset, US Geological Survey and NYSDEC, 2011 | Wetland: Hudsonia Ltd, 2018 and National Wetland Inventory, US Fish and Wildlife Service, 2011 | City Parks: identified by Dale Schafer, using Columbia County 2017 tax parcels | Other Parks and Conservation Lands: Columbia County GIS Resource, 2017 | Public Trails and Empire State Trail: digitized by Beth Feingold and Nick Zachos

Note: This map was produced for the City of Hudson Open Space and Natural Resources Inventory and is intended for general planning and information purposes. It relies upon public data sources that may contain errors or omissions and is not a substitute for site-level surveys. Map by Shannon Doyle, 2018.

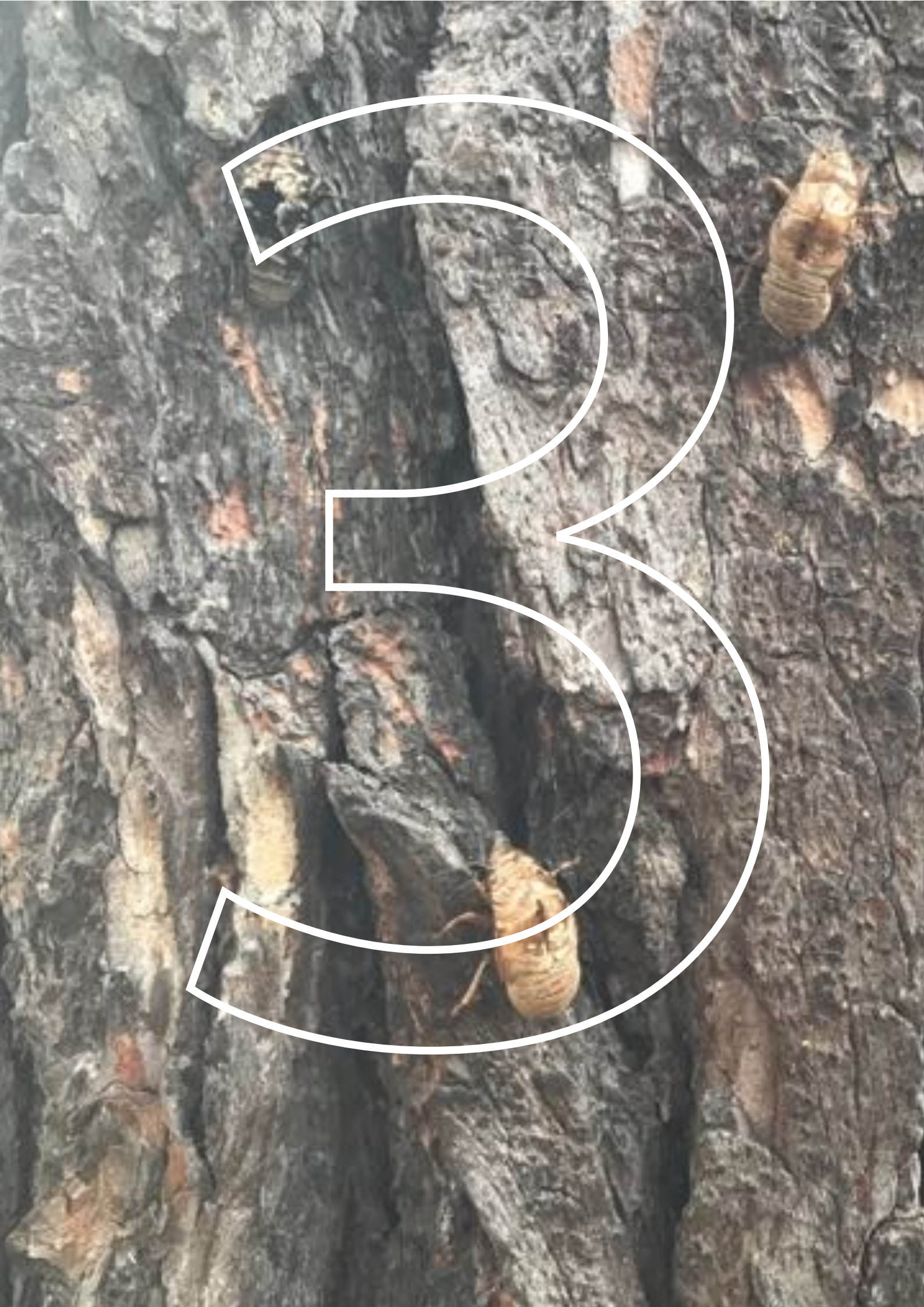
1. The Furgary	Waterfront historic fishing village, currently provides kayak access and fishing; under consideration for development for historic interpretation and recreation
2. Promenade Hill	Views of Hudson River and Catskills, playground
3. Henry Hudson Riverfront Park	Boat launch and limited dock space, pavilion, picnic areas, event space and restrooms
4. Charles Williams Park	pavilion, playground, sports fields
5.Thurston Pocket Park	Playground, seating
6. Parc Foundation Park	Seating, planting
7. Washington Park	Seating, pavilion, memorials
8. Oakdale Park	Lake with swimming beach, trails, playground, pavilion, picnic areas, basketball court, skate park; home to Hudson Youth Department summer program; currently under consideration for renovation
9. 400 Block Pocket Park	Seating
10. 500 Block Pocket Park	Seating
11. Rogers Park	Olympic torch, currently a traffic island
12. 7th Street Park/Public Square	Seating, strolling. In the public survey it had the most mentions of any park
13. Hudson City Cemetery and Cedar Park Cemetery	City-owned cemeteries with walking paths; former wading pool area, not used as cemetery, could be reimagined for recreation

Table 3.
Parks in the City of Hudson.

[Images] (above)
Map and Park Table from the City of Hudson Open Space and NRI

MAP OF THE CITY OF HUDSON WARDS

There are 5 wards that make up the City of Hudson. During the tree inventory the ward location was noted for each street tree, and all trees located within smaller parks and 'pocket-parks' (not including Henry Hudson Riverfront Park, Oakdale Park, and Cedar Park Cemetery as noted above).



CHAPTER THREE

FOREST INVENTORY

Current State of the Urban Forest - iTree

I-TREE ECOSYSTEM ANALYSIS, URBAN FOREST EFFECTS AND VALUES

Data from the Inventory was 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 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.
- Effects 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.

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

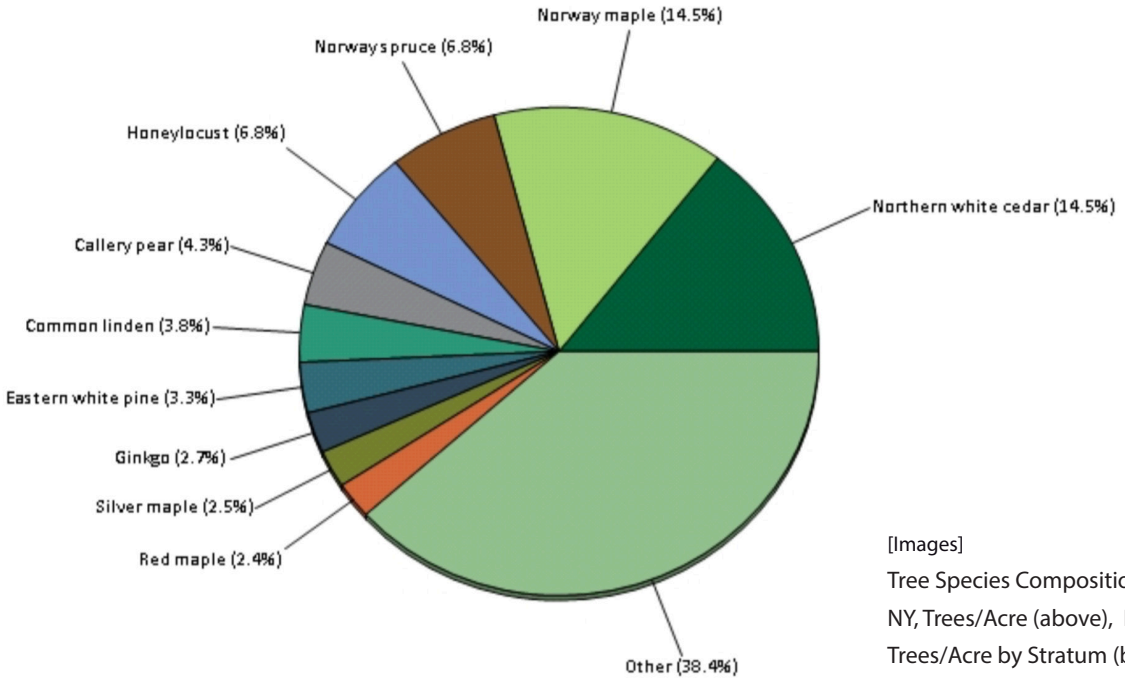
I-TREE SUMMARY

Understanding an urban forest's structure, function and value can promote management decisions that will improve human health and environmental quality. An assessment of the vegetation structure, function, and value of the Hudson urban forest was conducted during 2021. Data from 1,739 trees located throughout Hudson were analyzed using the i-Tree Eco model developed by the U.S. Forest Service, Northern Research Station.

- Number of trees: 1,739
- Tree Cover: 4.1 %
- Most common species of trees: Northern white cedar, Norway maple, Norway spruce
- Percentage of trees less than 6" (15.2 cm) diameter: 20.8%
- Pollution Removal: 1585 pounds/year ($5.39 thousand/year)
- Carbon Storage: 1.655 thousand tons ($282 thousand)
- Carbon Sequestration: 22.2 tons ($3.79 thousand/year)
- Oxygen Production: 59.21 tons/year
- Avoided Runoff: 81.89 thousand cubic feet/year ($5.47 thousand/year)
- Structural values: $6.48 million

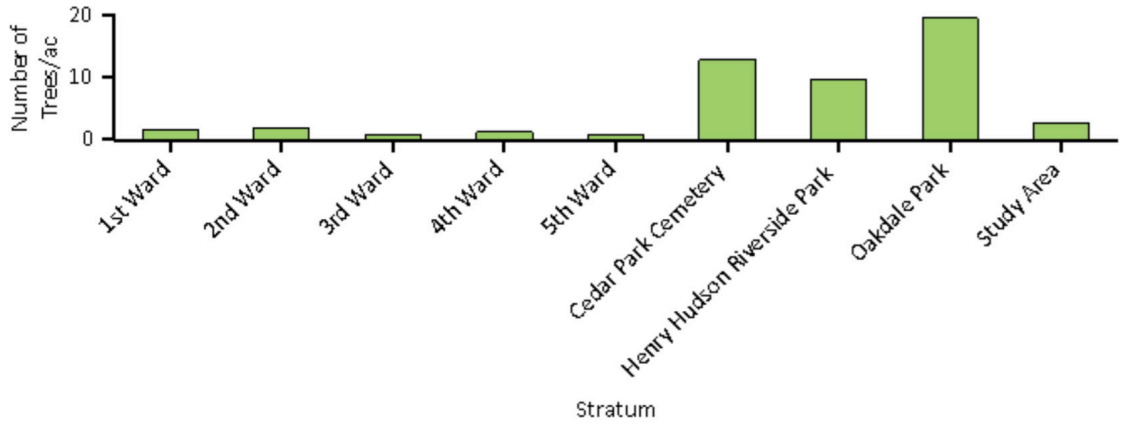
I-TREE CHARACTERISTICS OF HUDSON NY

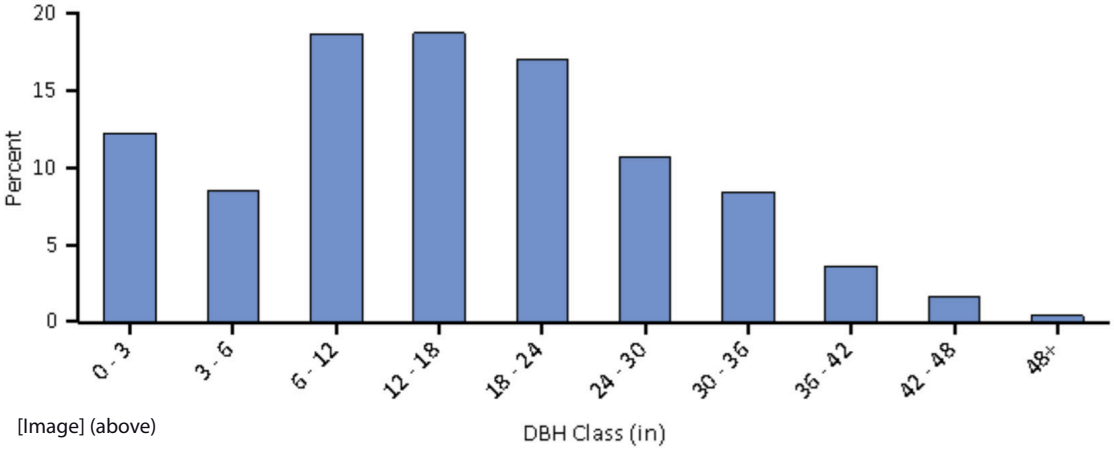
The urban forest of Hudson has 1,739 trees with a tree cover of 4.1 percent. The three most common species are Northern white cedar (14.5 percent), Norway maple (14.5 percent), and Norway spruce (6.8 percent).



[Images]
Tree Species Composition of Hudson NY, Trees/Acre (above), Number of Trees/Acre by Stratum (below)

The overall tree density in Hudson is 3 trees/acre. For this stratified project, the highest tree densities in Hudson occur in Oakdale Park followed by Cedar Park Cemetery and Henry Hudson Riverside Park. Street trees in the five wards have a lower density and can be compared in the image below.

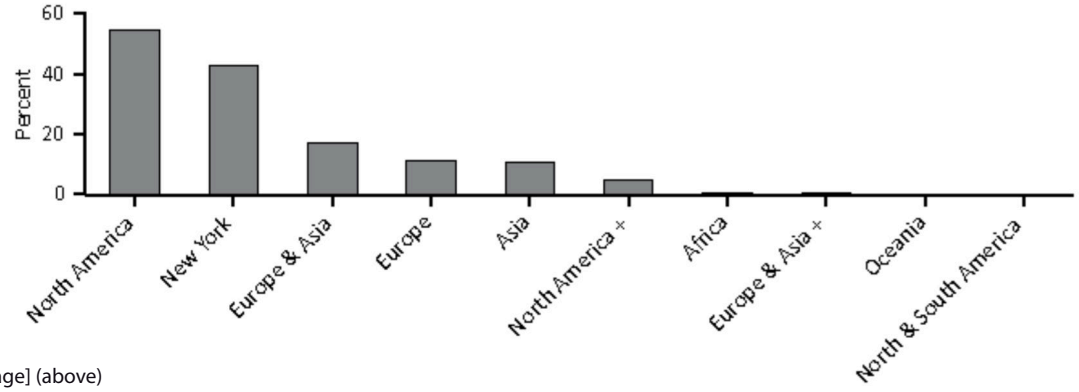




[Image] (above)

% 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 Hudson, about 55 percent of the trees are species native to North America, while 43 percent are native to New York. Species exotic to North America make up 45 percent of the population. Most exotic tree species have an origin from Europe & Asia (17 percent of the species).



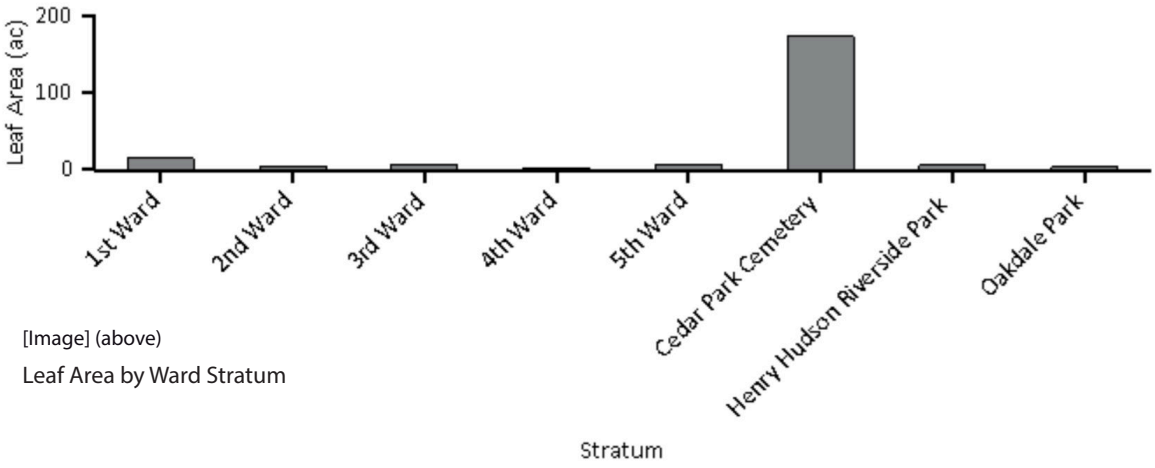
[Image] (above)

% of Live Tree Population by Area of Native Origin

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. Four of the 81 tree species in Hudson are identified as invasive on the state invasive species list. These invasive species comprise 19.8 percent of the tree population though they may only cause a minimal level of impact. The three most common invasive species are Norway maple (14.5 percent of population), Callery pear (4.3 percent), and Tree of heaven (0.6 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 4.1 percent of Hudson and provide 221.5 acres of leaf area. Total leaf area is greatest in Cedar Park Cemetery followed by 1st Ward and 3rd Ward.



[Image] (above)

Leaf Area by Ward Stratum

In Hudson, the most dominant species in terms of leaf area are Norway maple, Norway spruce, and Northern white cedar. 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.

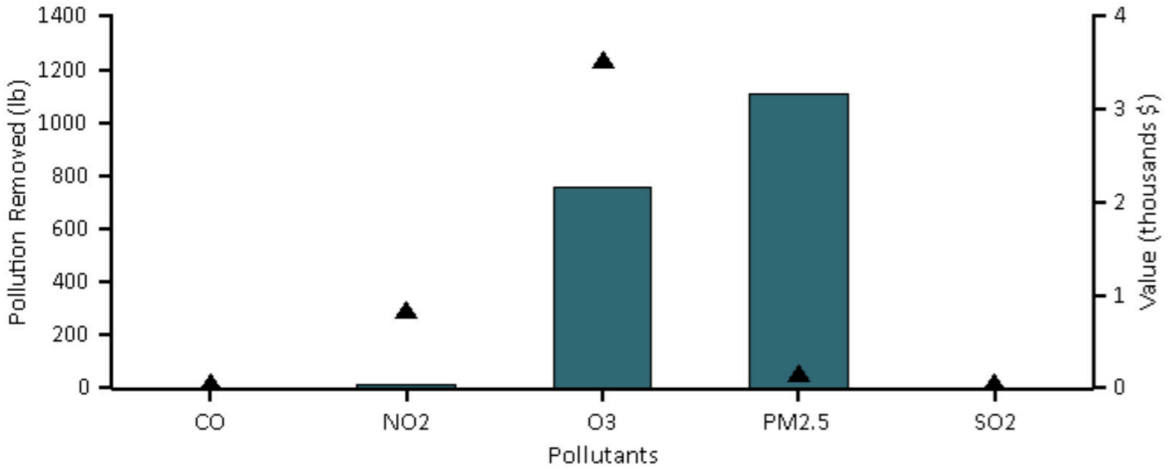
Species Name	*Percent Population*	*Percent Leaf Area*	*IV*
Norway maple	14.5	17.5	32.0
Northern white cedar	14.5	12.3	26.9
Norway spruce	6.8	15.0	21.9
Eastern white pine	3.3	6.5	9.8
Honeylocust	6.8	2.5	9.2
Silver maple	2.5	5.7	8.1
Sugar maple	2.2	3.4	5.6
Callery pear	4.3	1.1	5.3
Common linden	3.8	1.5	5.3
American basswood	1.7	3.4	5.0

[Table]

Most important species in Hudson 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 the 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).



[Images] (above)

Annual Pollution Removal by Trees in Hudson

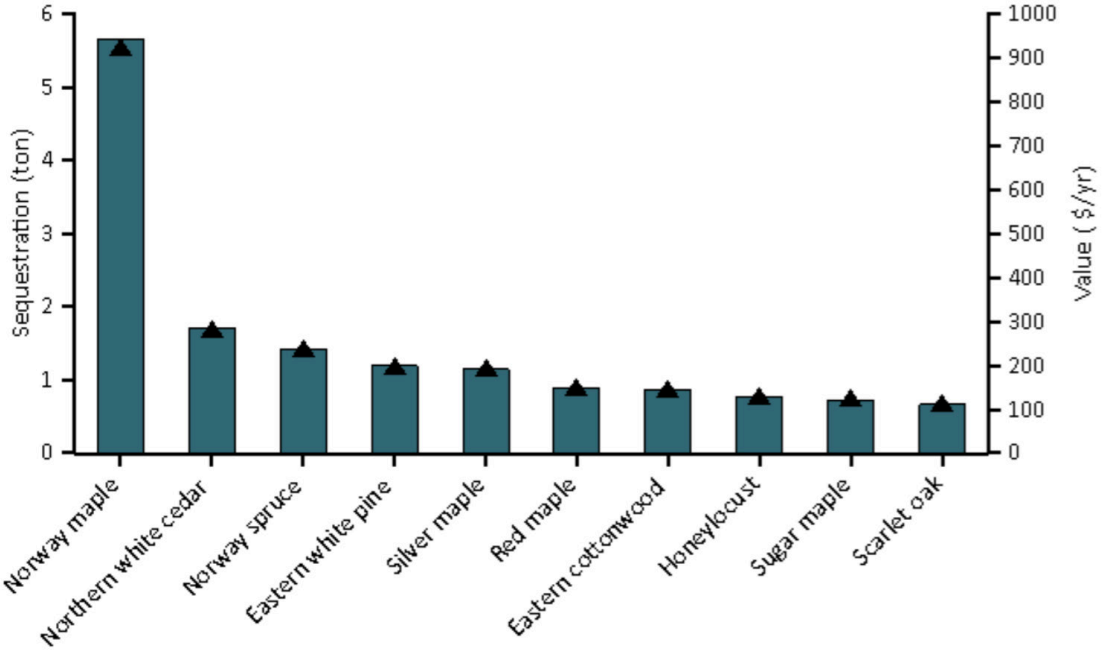
Pollution removal by trees in Hudson was estimated using field data and recent available pollution and weather data available. Pollution removal was greatest for ozone. It is estimated that trees remove 1585 pounds of air pollution (ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 2.5 microns (PM2.5), and sulfur dioxide (SO2)) per year with an associated value of $5.39 thousand.

In 2021, trees in Hudson emitted an estimated 1346 pounds of volatile organic compounds (VOCs) (403.6 pounds of isoprene and 942.7 pounds of monoterpenes). Emissions vary among species based on species characteristics (e.g. some genera such as oaks are high isoprene emitters) and amount of leaf biomass. Forty- eight percent of the urban forest's VOC emissions were from Norway spruce and White oak. These VOCs are precursor chemicals to ozone formation.

CARBON STORAGE AND SEQUESTRATION

Climate change is an issue of global concern. Urban trees can help mitigate climate change by sequestering atmospheric carbon (from carbon dioxide) in 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 is increased with the size and health of the trees. The gross sequestration of Hudson trees is about 22.2 tons of carbon per year with an associated value of $3.79 thousand.



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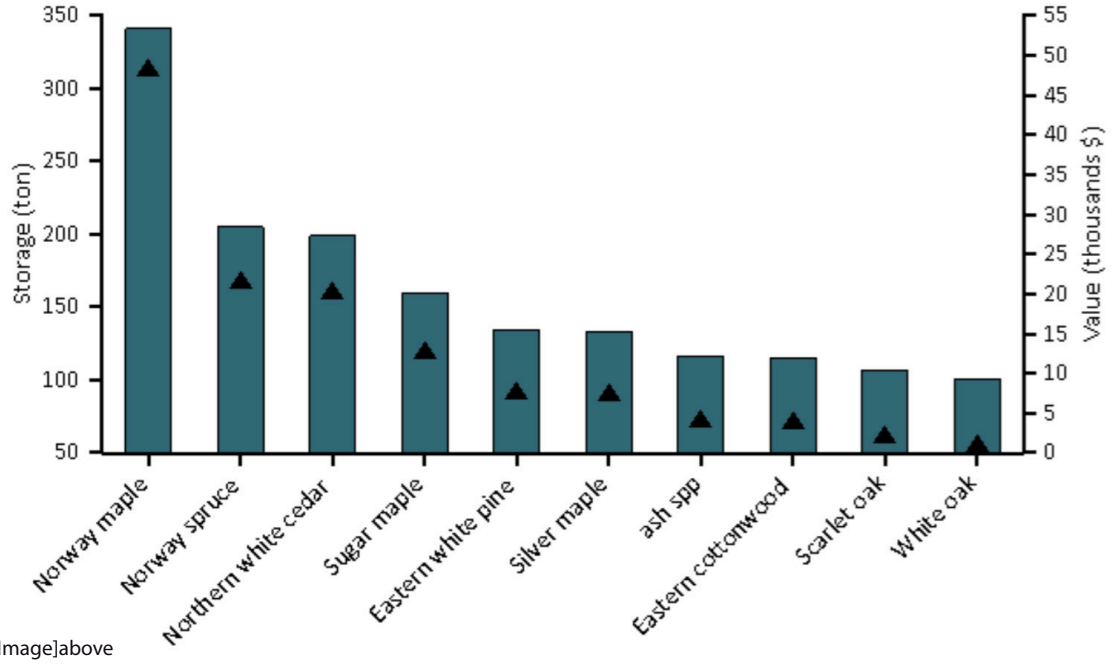
Annual Gross Carbon Sequestration by Tree Species

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). When a tree dies, using the wood in long-term wood products, to heat buildings, or to produce energy will help reduce carbon emissions from wood decomposition or from fossil- fuel or wood-based power plants.

Trees in Hudson are estimated to store 1650 tons of carbon ($282 thousand). Of the species sampled, Norway maple stores and sequesters the most carbon (approximately 18.9% of the total carbon stored and 24.9% of all sequestered carbon.)



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Estimated Carbon Storage by Tree Species

OXYGEN PRODUCTION

Oxygen production is one of the most commonly cited benefits of urban trees. The 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 Hudson are estimated to produce 59.21 tons of oxygen per year. However, this tree benefit is relatively insignificant because of the large and relatively stable amount of oxygen in the atmosphere and extensive production by aquatic systems. Our atmosphere has an enormous reserve of oxygen. If all fossil fuel reserves, all trees, and all organic matter in soils were burned, atmospheric oxygen would only drop a few percent (Broecker 1970).

Species	*Oxygen (ton)*	*Gross Carbon Sequestration (pound/yr)*	*Number of Trees*	*Leaf Area (acre)*
Norway maple	14.74	11,055.79	252	38.68
Northern white cedar	4.46	3,344.25	253	27.32
Norway spruce	3.71	2,780.26	119	33.33
Eastern white pine	3.11	2,331.71	58	14.41
Silver maple	3.00	2,249.87	43	12.52
Red maple	2.33	1,745.67	42	5.31
Eastern cottonwood	2.26	1,696.45	21	5.20
Honeylocust	2.02	1,513.15	118	5.44
Sugar maple	1.91	1,434.73	39	7.53
Scarlet oak	1.73	1,299.00	12	3.44
ash spp	1.72	1,290.39	37	3.08
American basswood	1.43	1,072.20	29	7.42
Northern red oak	1.34	1,003.87	36	3.66
Tulip tree	1.17	877.47	20	5.77
White oak	1.14	851.49	19	4.62
Callery pear	1.13	851.18	74	2.35
Common linden	0.92	689.48	66	3.29
Black oak	0.80	596.63	8	1.41
Crimson king norway maple	0.73	545.27	11	1.61
Northern catalpa	0.73	545.01	24	3.36

[Table] (above)

Top 20 Oxygen Producing Species

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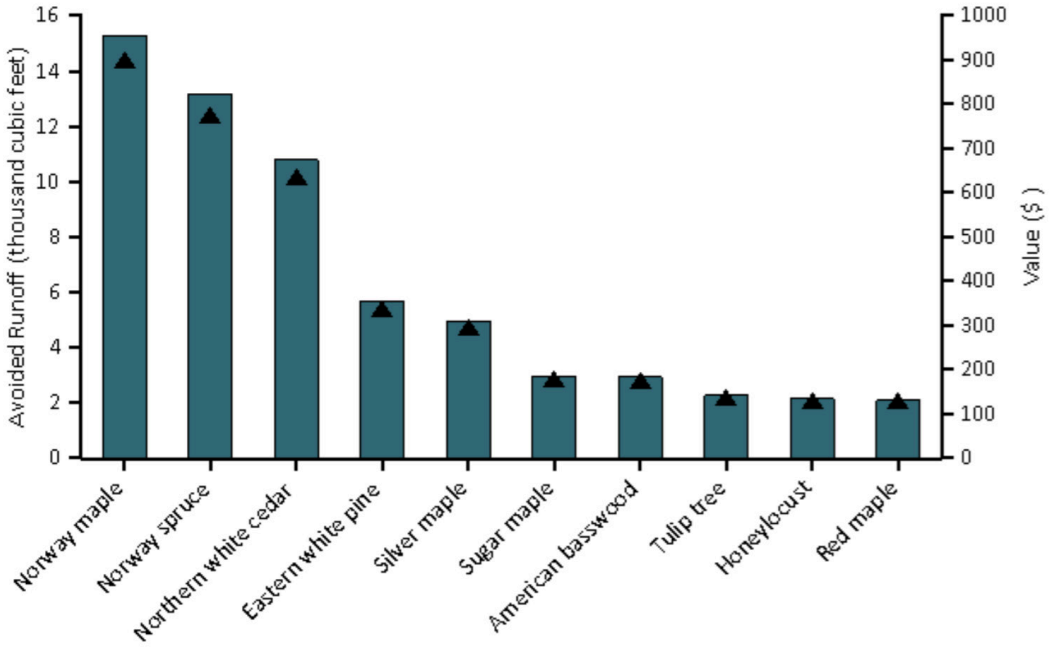
AVOIDED RUNOFF

Surface runoff can be a cause for concern in many urban areas as it can 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 Hudson help to reduce runoff by an estimated 81.9 thousand cubic feet a year with an associated value of $5.5 thousand. Avoided runoff is estimated based on local weather from the user-designated weather station. In Hudson, the total annual precipitation in 2016 was 33.8 inches.



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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.

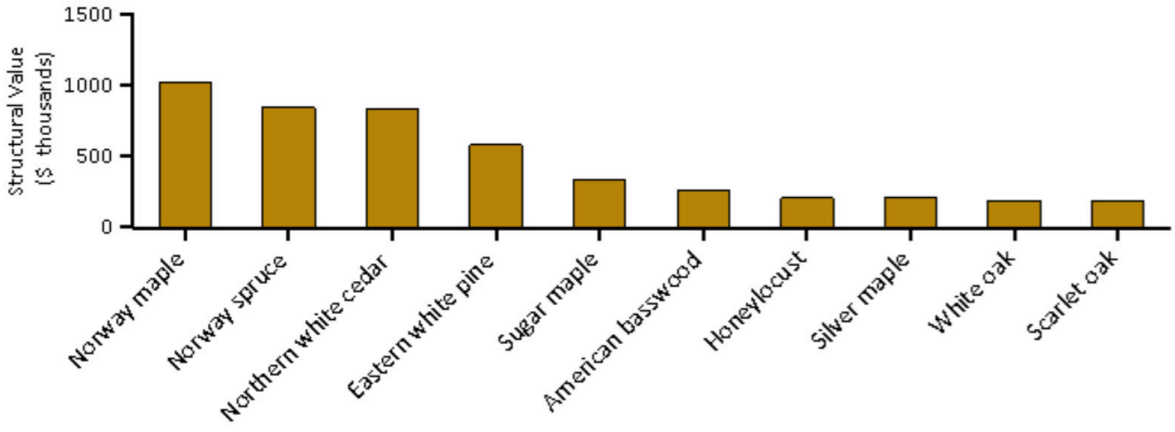
Urban trees in Hudson have the following structural values:

- Structural value: $6.48 million
- Carbon storage: $282 thousand

Urban trees in Hudson have the following annual functional values:

- Carbon sequestration: $3.79 thousand
- Avoided runoff: $5.47 thousand
- Pollution removal: $5.39 thousand

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 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) for the conterminous United States to determine their proximity to Columbia County. Thirteen of the thirty-six pests analyzed are located within the county.

Beech bark disease (BBD) (Houston and O'Brien 1983) is an insect-disease complex that primarily impacts American beech. This disease threatens 0.1 percent of the population, which represents a potential loss of $1.73 thousand in structural value.

Butternut canker (BC) (Ostry et al 1996) is caused by a fungus that infects butternut trees. The disease has since caused significant declines in butternut populations in the United States. Potential loss of trees from BC is 0.4 percent ($25 thousand in structural value).

The most common hosts of the fungus that cause chestnut blight (CB) (Diller 1965) are American and European chestnut. CB has the potential to affect 0.0 percent of the population ($0 in structural value).

Dogwood anthracnose (DA) (Mielke and Daughtrey) is a disease that affects dogwood species, specifically flowering dogwood. This disease threatens 0.2 percent of the population, which represents a potential loss of $399 in structural value.

American elm, one of the most important street trees in the twentieth century, has been devastated by the Dutch elm disease (DED) (Northeastern Area State and Private Forestry 1998). Since first reported in the 1930s, it has killed over 50 percent of the native elm population in the United States. Although some elm species have shown varying degrees of resistance, Hudson could possibly lose 0.3 percent of its trees to this pest ($4.92 thousand in structural value).

Emerald ash borer (EAB) (Michigan State University 2010) has killed thousands of ash trees in parts of the United States. EAB has the potential to affect 2.2 percent of the population ($103 thousand 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 20.2 percent of the population, which represents a potential loss of $1.18 million in structural value.

As one of the most damaging pests to eastern hemlock and Carolina hemlock, hemlock woolly adelgid (HWA) (U.S. Forest Service 2005) has played a large role in hemlock mortality in the United States. HWA has the potential to affect 2.1 percent of the population ($102 thousand in structural value).

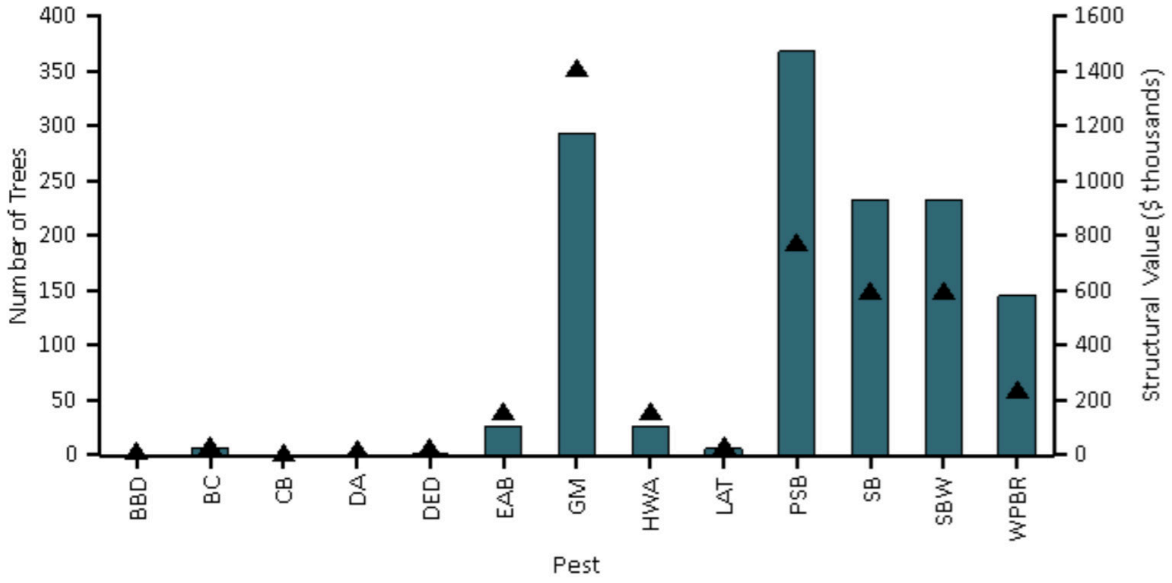
Quaking aspen is a principal host for the defoliator, large aspen tortrix (LAT) (Ciesla and Kruse 2009). LAT poses a threat to 0.4 percent of the Hudson urban forest, which represents a potential loss of $23 thousand in structural value.

The pine shoot beetle (PSB) (Ciesla 2001) is a wood borer that attacks various pine species, though Scotch pine is the preferred host in North America. PSB has the potential to affect 11.0 percent of the population ($1.47 million in structural value).

Spruce beetle (SB) (Holsten et al 1999) is a bark beetle that causes significant mortality to spruce species within its range. Potential loss of trees from SB is 8.5 percent ($929 thousand in structural value).

Spruce budworm (SBW) (Kucera and Orr 1981) is an insect that causes severe damage to balsam fir. SBW poses a threat to 8.5 percent of the Hudson urban forest, which represents a potential loss of $933 thousand in structural value.

Since its introduction to the United States in 1900, white pine blister rust (Eastern U.S.) (WPBR) (Nicholls and Anderson 1977) has had a detrimental effect on white pines, particularly in the Lake States. WPBR has the potential to affect 3.3 percent of the population ($582 thousand in structural value).



[Image] (above)

# of Trees at Risk for Most Threatening Pests located in the County

CHAPTER FOUR

URBAN FORESTRY RECOMMENDATIONS

Review of Current Maintenance Practices

A comprehensive review and evaluation of the City of Hudson's current tree management practices was conducted. Aspects of management included in the evaluation were routine trimming and pruning, summer watering, mowing and mulching around trees, brush pick-up and chipping, new tree plantings, removal of hazardous trees, and utilization of the tree inventory. Recommendations for improving management practices follows.

Routine trimming and pruning – there has been little routine pruning on any public trees, with most trees being pruned only to correct major defect failures. There seems to be only minor young tree formative pruning, or mature tree maintenance pruning. The City can take more responsibility to maintain urban trees to improve tree structure and health, and to reduce risk.

[Image] (above)
This Elm is doing well, but would benefit from formative pruning and having it's canopy raised so that pedestrians can pass by easily and views are not blocked for traffic.

[Image] (above)
A line of Honeylocust that has experienced transplant shock from lack of watering and being planted in small tree pits with poor soil.

Summer watering – the importance of watering new trees has been underestimated, such that several new trees were noticed to be in decline, stunted in growth, and even dead. When trees are planted there may not be enough planning for the establishment and maintenance of these trees. The City should prioritize early tree care and maintenance so that newly planted trees establish more successfully.

Mowing and mulching around trees – some trees have been negatively affected by mowers and string trimmers. This is common after mulch has biodegraded and isn't replaced on a schedule, and is more common in park settings such as Cedar Park Cemetery or grassed plazas within the city. Maintenance crews can be trained to avoid exposed tree roots and the root collar.

Brush pick-up and chipping – after yearly cleanups, storms, and maintenance of urban trees, there is a need to dispose of debris. This process has been working effectively for the City and no brush or debris was noted to be accumulating on streets or in parks.

[Image] (above)
Mower injury to a tree's root system can harm the tree and allow for disease to set in. This is a common issue in park settings

New tree plantings – tree plantings that the City has been undertaking have been quite impressive. Most plantings have been installed well, with proper trees for the zone/region. Some plantings however (mostly done by homeowners or businesses) were done poorly, and little thought was given to spacing, mature tree height, etc. Also, as mentioned above, summer watering and establishment of plants in the long term should be addressed so that plantings do not fail. The Hudson Street Tree permit and guidelines found in the appendix should be utilized for planting.

Removal of hazardous trees – several hazard trees have been highlighted in the inventory and need removal in the short term. Going forward, an annual inspection of potentially hazardous trees should be conducted and a budgetary request should be made within the City from the inspection and from the Maintenance Table included in this CFMP.

Utilization of the tree inventory – Although a previous inventory (2017) exists it has been difficult for the City to adequately use it for planning purposes. It has been useful in some respects, such as determining certain areas that are lacking trees, but no useful planning goals or objectives can be made now because the previous inventory wasn't a complete inventory and hadn't been updated adequately. Street trees are a resource that changes continually, as new ones are planted and old ones die. The inventory completed with this CFMP should be updated as trees are planted and other trees are removed.

[Images] (above)
This dead Honeylocust is going to begin to fall apart and drop branches soon. Because it was girdled by its tree protection, it may also snap at the base and cause more significant damage to buildings or cars.

Urban Tree Planting and Reforestation

Urban forests provide a diverse assortment of benefits ranging from environmental and ecological to social and economic. While maintaining existing trees for long term sustainability can help protect the sources of these benefits, re-planting or establishing new trees is an important factor as well.

Examination of the tree inventory data identified existing urban forest resources within the City of Hudson. The inventory data also has revealed opportunities for expansion of the urban forest environment. This information coupled with information on areas lacking trees gleaned from previous planning exercises paints a good picture of where future tree plantings can be planned.

Goals for planting in the City of Hudson are:

1. Plan to grow the urban forest. Plant at least 25 trees each year in order to increase urban tree canopy.
2. Plant trees in areas of the City that have low canopy coverage and small planting numbers.
3. Add to the diversity of the urban forest tree composition.
4. Avoid the planting of undesirable trees or invasive trees
5. Plant appropriate trees in appropriate places (use proper species and zone choices, avoid infrastructure/wire conflicts)
6. Create appropriate spaces for planting

[Image] (above)
Volunteers and CAC members plant a new tree in a vacant planting strip. Notice the watering bag that will slowly water the tree and can be refilled when empty.

GOAL 1: PLAN TO GROW THE URBAN FOREST

Objectives: Plant 25+ trees yearly throughout the City. There has been a concerted effort to plant trees in the City of Hudson, however there have been no actual planting goals set. Adding a consistent number of trees to the urban forest each year can keep the tree canopy growing in size, thus increasing benefits from the urban forest. This addition of trees will also be useful in offsetting any tree losses due to inclement weather, diseases and pests, natural mortality, etc.

Costs of Tree Planting: Trees vary in price depending on the size of the tree and type of nursery stock. A cheaper bare root tree for example may cost $50-$250 depending on the species or cultivar. Tree staking and protection is an additional cost of approximately $5-$25 depending on materials used. If the City plants the tree there is no additional cost associated, but if a contractor plants the tree an additional labor and delivery cost will be incurred, and costs may be approximately $200-$500 per tree installed. Any soil amendments or alterations of the planting spots also could add to total costs per tree. Tree planting costs are noted on the five-year tree management cycle table on page 71.

Types of Tree Stock: When you are ready to buy your tree(s), you'll find they can be purchased in one of three ways.

- bare root,
- container grown, or
- balled and burlapped (B&B).

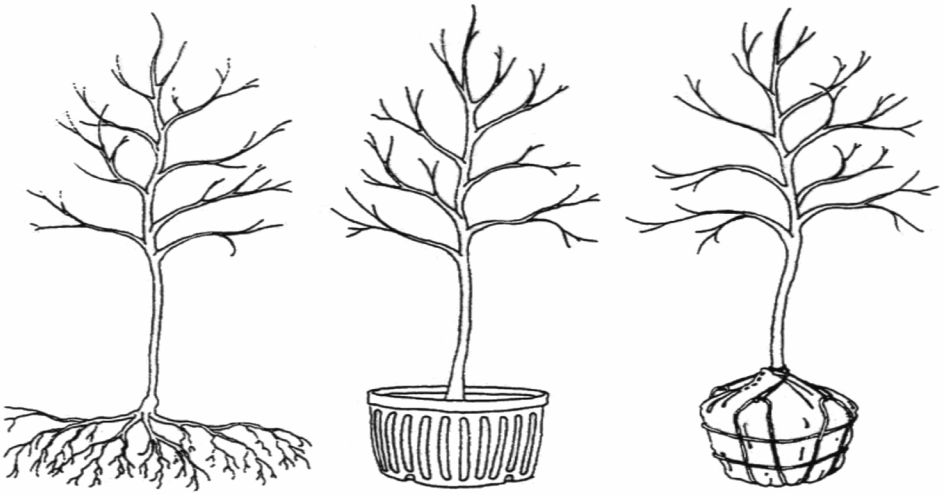
Bare root trees are usually only available through catalogs and are shipped during short periods in the spring and fall. The majority of the trees and shrubs sold by DEC's Saratoga Tree Nursery are bare root. The benefits of bare root trees include a lower cost per tree, lighter handling weight because there is no soil around the roots, and if dug properly, bare root trees have a greater portion of roots kept intact than B&B trees.

Container grown trees may have roots that encircle the root ball in the pot. Spiral roots can harm the tree and even kill it if they are left to develop, so it is important to unwrap the roots before planting. The benefits of container grown trees are that they usually weigh less than B&B trees, there is less disturbance to the roots when planting containerized trees, and they are available at most nurseries.

Balled and burlapped (B&B) trees are much heavier than bare root trees and lose a substantial amount of roots when dug at the nursery. But a large amount of soil in the root ball does benefit the tree by protecting its roots from injury and helps keep them moist. Roots should be kept covered, out of direct sunlight and moist until the tree can be planted, and then removed from the cage and burlap prior to planting.

More information on tree planting and the benefits and constraints of bare root, container grown, and balled and burlapped trees is available from the DEC at https://www.dec.ny.gov/lands/5303.html and additional information from the Cornell Urban Horticultural Institute is available at http://www.hort.cornell.edu/uhi/outreach/pdfs/bareroot.pdf

It is recommended to work with your local DEC forester (alternatively, a contracted arborist or internal appropriately trained staff) for suggestions on locations, species and to observe the health of trees purchased prior to planting. Remember also to keep the tree inventory updated as new trees are planted.



[Image] (above)

Bare root, container grown, and balled and burlapped tree stock.

Tree Selection

It is critical to wisely choose the actual tree stock for planting. Without a proper choice of growing stock, all the planning, design, and installation, and maintenance may be in vain. The following recommendations should be followed when selecting trees to plant from the nursery.

- Choose trees that have good form, and have a strong central leader.
- Choose trees that are free from defect such as codominant stems.
- Choose trees that show no signs of pests or pathogens.
- Choose trees that are actively growing and show no signs of stress or dieback.
- Choose trees that have no signs of injury, missing bark, or broken stems.
- Choose trees that have lush green leaves and no signs of chlorosis.
- Verify that there are no girdling roots (containerized plants) or major root issues.
- Verify that the trunk flare is obvious and that roots are situated around the stem rather than existing only on one side or portion of the root mass
- Verify that the tree roots stabilize the stem of the tree. If a tree is very loose there may be an issue and the tree failing by tipping over is a possibility, even with staking.

Tree Size

'Bigger is better' when tree planting is NOT a good rule of thumb. Smaller trees have been shown to transplant easier with better survivorship than large trees. Smaller caliper or diameter trees are also cheaper to plant, and more simply planted with hand tools. The following size recommendations should be followed:

- If the tree is a balled and burlapped tree, 1.5 to 2.5 inches caliper is ideal. Trees over 4 inches caliper should be avoided.
- If the tree has been grown in a pot or other container, a larger tree may be used, but 1.5 to 2.5 inches caliper is still an ideal size. Container-grown trees should have any circling roots cut off.
- 1.5 - 2 inches caliper trees should be chosen for bare root trees. Caliper size greater than 2 inch is not recommended for bare root transplanting. Even a 2 inch tree will be more difficult to transplant than a 1.5 or 1.75 inch tree, so the smaller the caliper, the better.

Tree Planting Specifications

When it comes time to plant the tree, there are recommendations to follow:

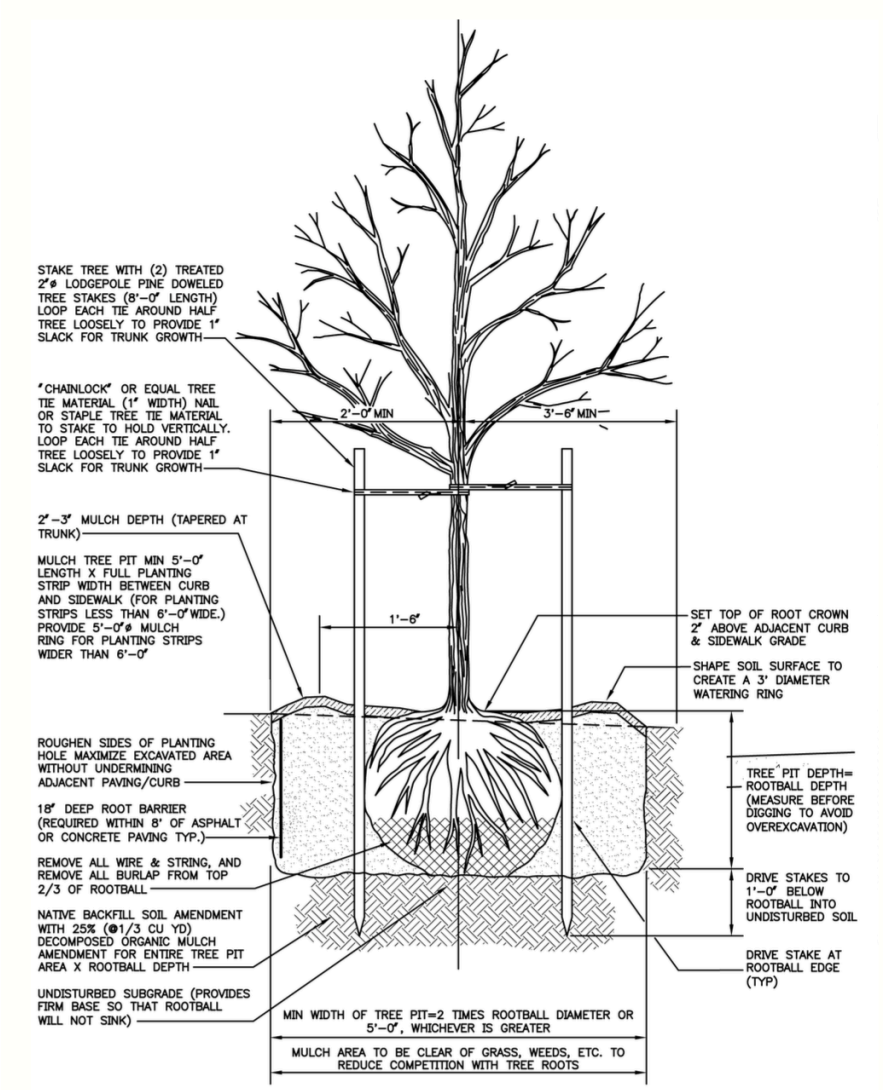
- The planting hole should be wide, not deep. A good hole will be bowl shaped, and be three times the width of the root ball.
- Provide a firm base for the root ball to sit, without settling downward.
- Amend the soil in the planting hole if possible with bio-char, bio-solids, compost, or some combination of the three. Organic soil amendments are preferred for soil quality and health.
- Plant the tree with the root flare at or just above the soil level. Planting too low will cause issues with stem rot and could kill the tree.
- The tree should be staked for the first couple growing season if it is likely to need support. If the tree is secure in it's hole without stakes then there is no need to add staking, as this step can inadvertently cause harm to the tree as well, or cause it to not establish structural roots.. Ensure the stakes are removed after it is secure as to not inadvertently interfere with the tree's growth.
- It is recommended to add .5 inches of compost over the top of the root ball.
- Mulch should be spread over the planting area. It should be 1-2 inches deep over the root ball, and then increase to 3 inches deep around the root ball. This forms a slight bowl to collect moisture. The wider you can mulch around the tree, the better, but it should never be less than the hole size.
- Pass on tree grates and spend your money creating a larger soil volume for trees. Tree grates can damage and girdle trees over time, and are expensive. Invest in soil for superior tree health!

PLANTING DETAILS

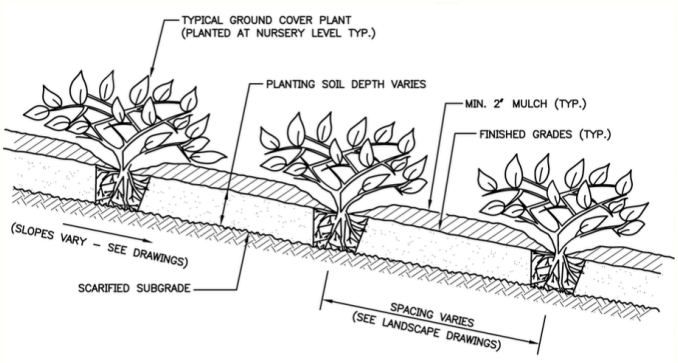
Below are planting details for trees, shrubs, and perennials. Additional resources for tree planting can be found at the DEC website for 'Planting and Caring for your Seedlings', and at the Cornell University Urban Horticultural Institute's 'Creating the Urban Forest, the Bare Root Method':

https://www.dec.ny.gov/docs/lands_forests_pdf/tftplantmaint.pdf

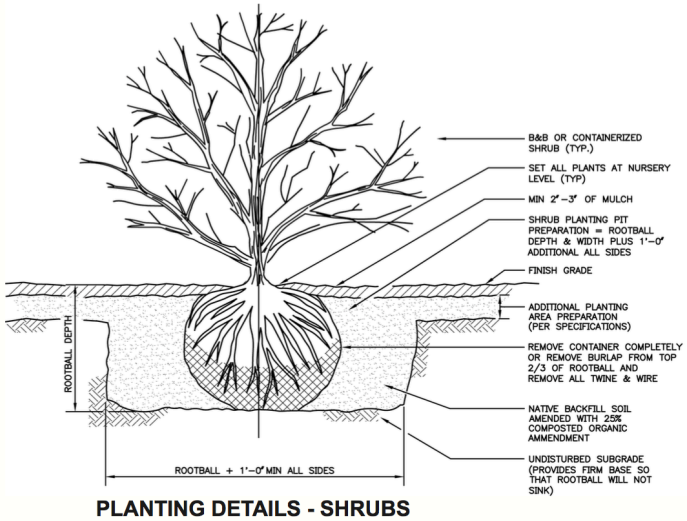
http://www.hort.cornell.edu/uhi/outreach/pdfs/bareroot.pdf



PLANTING DETAILS - TREES



PLANTING DETAILS - PERENNIALS



PLANTING DETAILS - SHRUBS

GOAL 2: PLANT TREES IN AREAS OF THE CITY THAT HAVE LOW CANOPY COVERAGE AND PLANTING NUMBERS

Objectives: When planting new trees, areas that are lacking in tree numbers and canopy coverage should be prioritized for planting. Using the current inventory, gaps in tree coverage were noted in the following areas (areas with a ROW/sidewalk, lacking trees and tree cover, or in parks):

Priority Planting Areas for Hudson's Wards and Parks

For this plan, the 5 Wards of the City were stratified within the data set so that each Ward's trees could be understood separately. The analysis of Wards reveals that there aren't any Wards that are far out of balance in terms of tree numbers and tree cover. Density (trees per acre) is lowest in the 5th and 3rd Wards, but not drastically different from the other three Wards. Leaf Area % of total is lowest in the 4th and 2nd Wards, but again not drastically as compared to the other three Wards. Because this analysis shows a similar need for planting in each Ward, future plantings should be evenly distributed throughout the wards, prioritizing specific planting areas within each ward.

The table below summarizes each ward's analysis of tree cover, and the descriptions that follow elaborate on describing priority planting areas:

Hudson Wards and Parks Urban Forest Analysis

	1st Ward	2nd Ward	3rd Ward	4th Ward	5th Ward	Cedar Park Cemetery	Henry Hudson Riverside Park	Oakdale Park
Total Acres (urbanized area)	163	48	112	93	130	75	4.7	2.5
Density/TPA	1.6	2.0	0.9	1.3	0.8	12.9	9.8	19.6
# Trees	258	96	100	121	98	971	46	49
Trees % of total	14.8	5.5	5.8	7.0	5.6	55.8	2.6	2.8
Leaf Area (acres)	14.99	4.58	7.72	2.91	6.38	174.65	6.33	3.94
Leaf Area % of total	6.8	2.1	3.5	1.3	2.9	78.9	2.9	1.8
Leaf Area Density (sq. ft/acre)	4005	4155	3001	1362	2137	101434	58499	68675

1st Ward - West

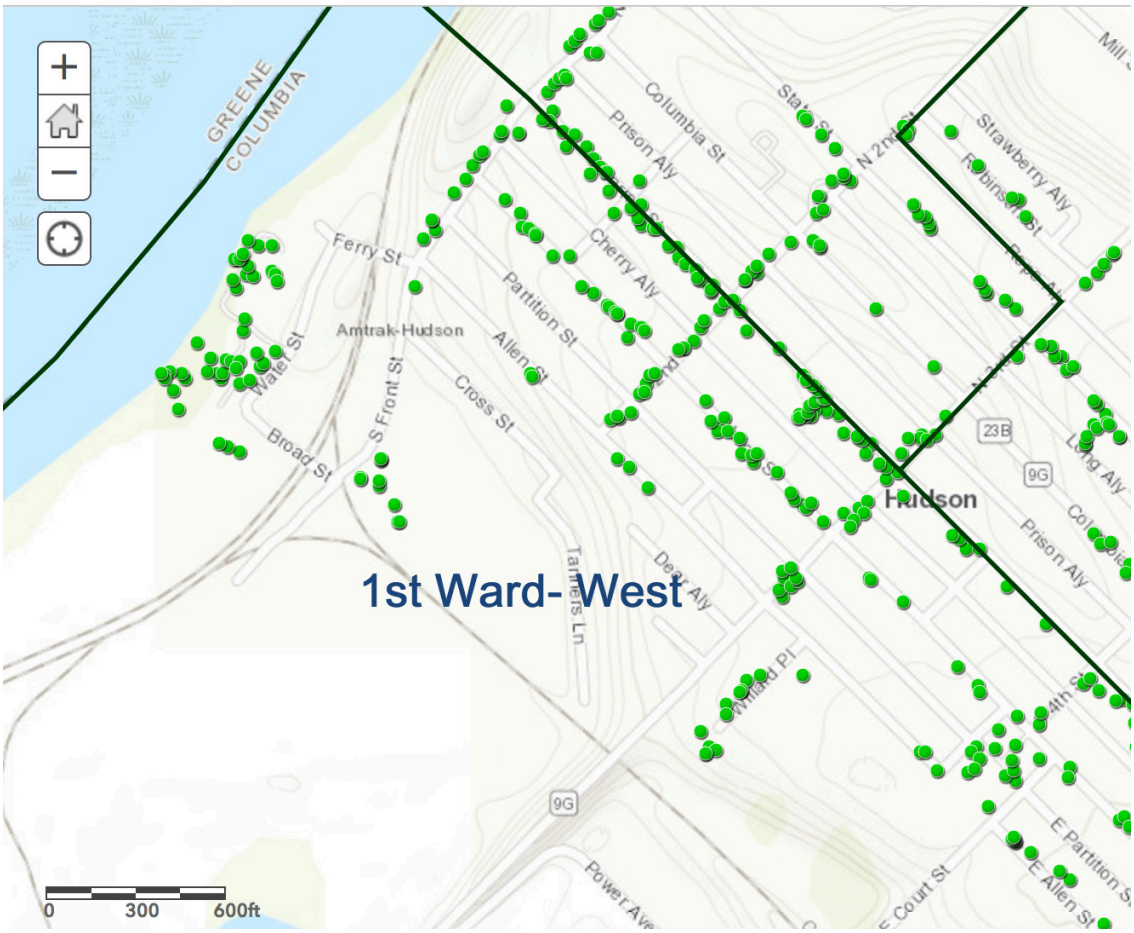
Hudson's 1st Ward is the southernmost ward of the City. It covers the entire City south of Warren St. (continuing down Worth Ave.). The 1st Ward has a tree density of 1.6 trees per acre and a total of 258 trees. This represents 14.8% of the tree population in Hudson. It has a leaf area of 14.99 acres, representing 6.8% of the total leaf area in the City. The leaf area density in the 1st Ward is 4005 ft2/ac.

Within the 1st Ward, to the west of the City, there are a few areas that should be prioritized for planting. Front street is a top priority candidate for planting because there are many ash trees on the street that are succumbing to emerald ash borer (EAB). This pest will kill all the ash trees here, and these planting spots should be replanted.

The municipal parking lot located across the road from the train station is another candidate for planting, again because of the EAB pest pressure. All of the ash here are dead or dying, and should be replaced with new trees. The planting spots here are small and lack root space. Small trees would be a good fit for replacements.

Allen Street should be prioritized for plantings on the west side of the City of Hudson. Allen Street has far fewer trees than other streets in the 1st Ward, and has some vacant planting spots that would allow for several trees to be planted quite simply.

3rd Street is a main artery bringing people into Hudson from the south, and could be more heavily planted to accent this gateway to the City. Plantings should be prioritized on 3rd Street from Allen Street south toward the railroad bridge, and between Union and Partition.

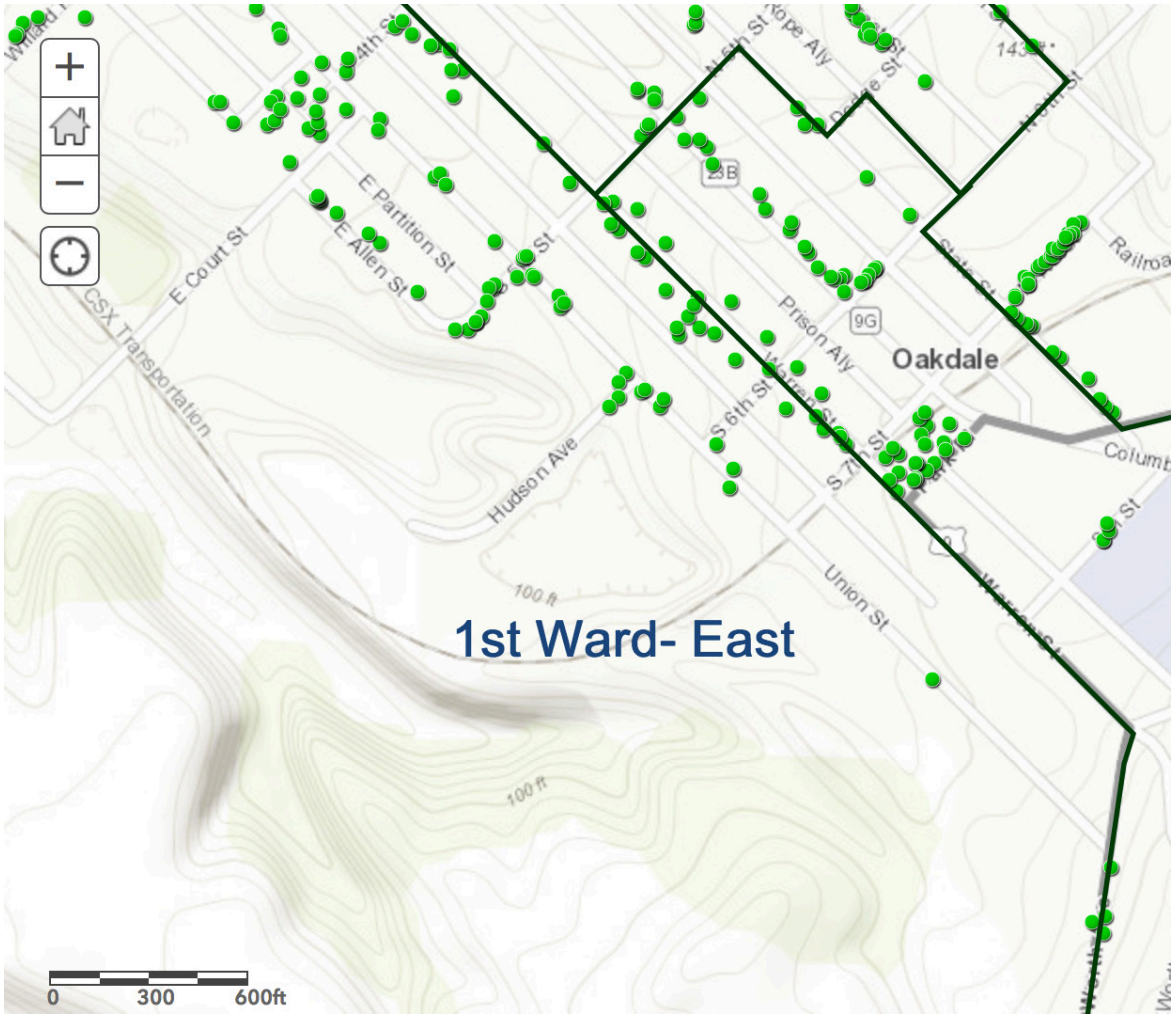


1st Ward - East

On the Eastern side of the 1st Ward, there are also several areas that were noted as priority planting areas. Union Street to the east of 3rd Street is one such area. This street has an ample planting strip, and several vacant tree pits that would be easily planted.

Warren Street has fewer trees planted between 3rd and 5th Street in the 1st Ward, as compared to other areas along this main street of Hudson. Adding trees here will add to the aesthetic beauty of Warren Street, and also fill gaps within a major green corridor in the most highly urbanized area in Hudson.

Worth Street is another priority planting area. This street heads south from Warren, and acts as another main artery to the south from the City. Although less of a 'gateway' than 3rd Street, this street has good planting strips and planting pits that could accommodate many tree plantings quite easily.



2nd Ward

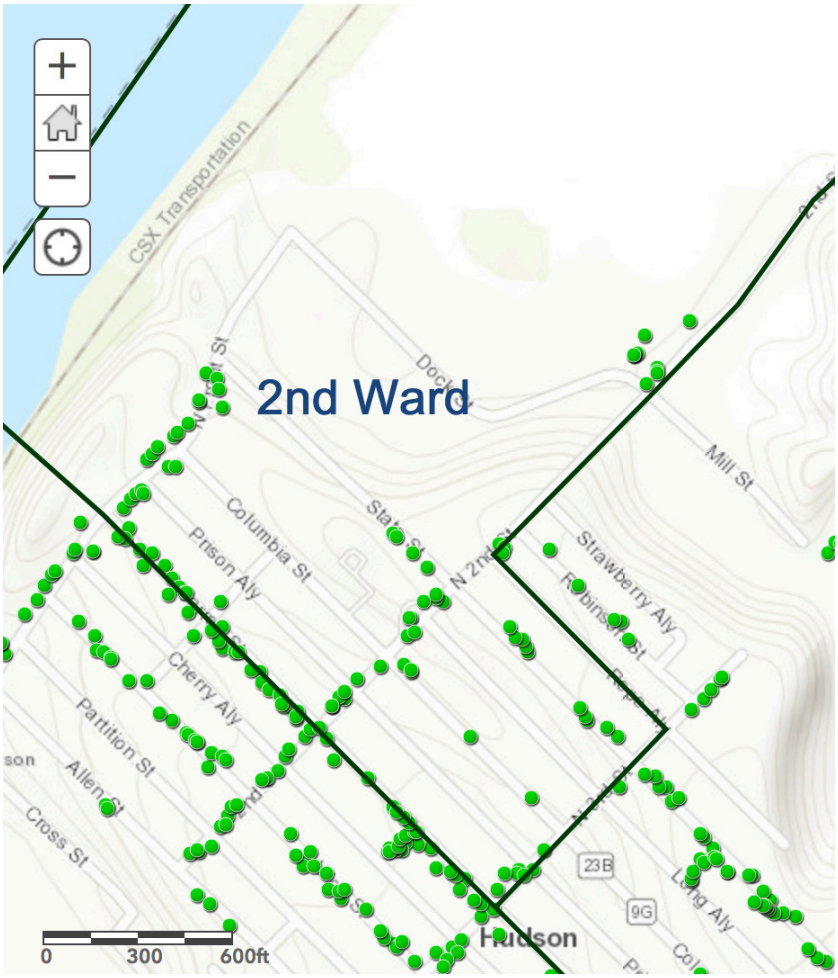
Hudson's 2nd Ward is situated in the northwest of the City. It covers the area in the City north of Warren Street, from Front Street to 3rd Street (actual ward boundaries jog through the City, see Ward Map for actual boundary). The 2nd Ward has a tree density of 2.0 trees per acre and a total of 96 trees. This represents 5.5% of the tree population in Hudson. It has a leaf area of 4.58 acres, representing 2.1% of the total leaf area in the City. The leaf area density in the 1st Ward is 4155 ft2/ac.

In the 2nd Ward, there are a few priority areas for planting worth mentioning. Front Street (similarly to the 1st Ward) is a candidate for planting because more than half of it's current street trees are ash trees which are infested with emerald ash borer (EAB). As these trees die they should be replaced.

Columbia Street lacks trees in the 2nd Ward for nearly it's entire length. Priority areas on Columbia are between Front and 1st, and between 2nd and 3rd Streets.

State Street between 2nd and 3rd Streets is another area with some plantings, but a lot of room for improvement. There are few good planting places, but some vacant tree pits that could be planted with limited effort.

N. 3rd Street also lacks trees from Columbia Street to the north, although this area has few plantable areas and it would be more difficult to accomplish plantings.



3rd Ward

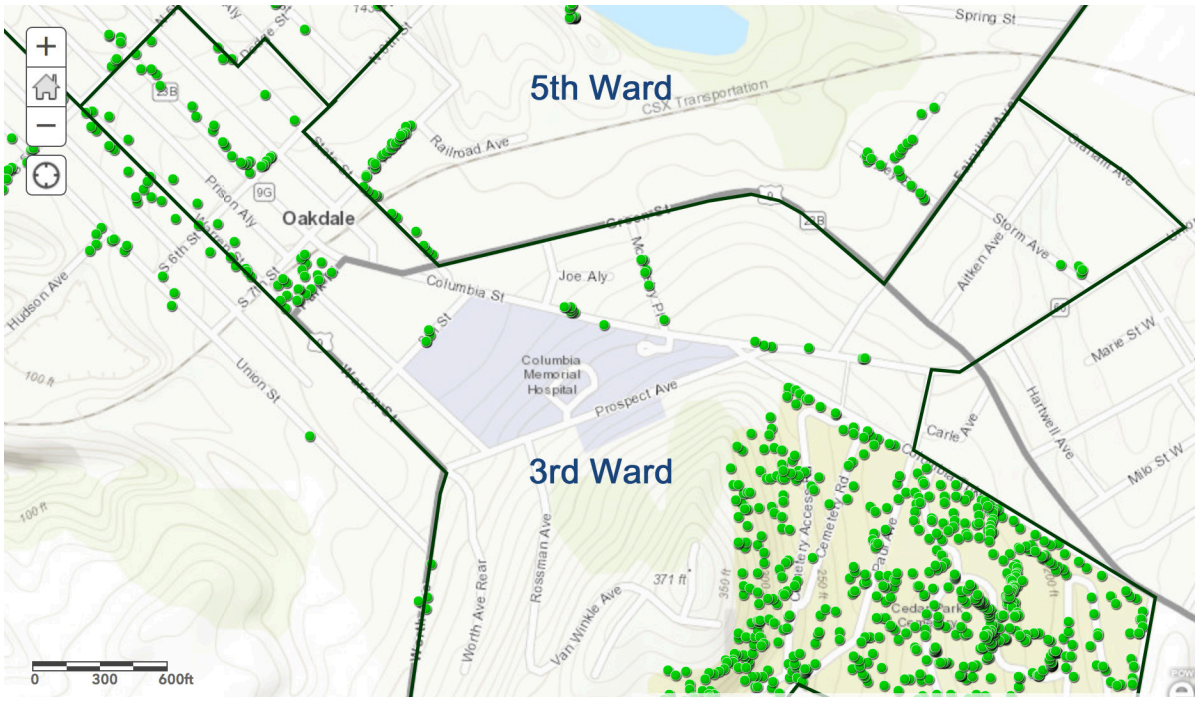
Hudson's 3rd Ward is situated on the east side of the City. It covers the area in the City north of Warren Street, from 5th Street to 8th Street and includes the area surrounding the hospital (actual ward boundaries jog through the City, see Ward Map for actual boundary). Cedar Park Cemetery is located in the 3rd Ward, but data from the cemetery was kept separate from the rest of the 3rd Ward for this CFMP because of its differing land use and tree cover. The 3rd Ward has a tree density of 0.9 trees per acre and a total of 100 trees. This represents 5.8% of the tree population in Hudson. It has a leaf area of 7.72 acres, representing 3.5% of the total leaf area in the City. The leaf area density in the 3rd Ward is 3001 ft2/ac.

The first priority planting areas in the 3rd Ward is 6th Street. This Street is within the more dense urban core of Hudson, and has some potential planting spots available. Dodge Street is similar, and the one block in the 3rd Ward that it exists lacks trees.

Columbia Street, to the east of 6th Street is another area with low canopy coverage. There are few trees as this street heads east and up the hill. Green Street is similarly lacking trees and could be planted. These areas unfortunately do not have good tree planting pits or strips.

Warren Street is another candidate in the 3rd Ward for plantings. To the east of 7th Street there are almost no trees planted. Sidewalks are wide but there are limited planting pits, so it may prove a challenge to plant without cutting sidewalk.

Worth Street is another priority planting area. This street heads south from Warren, and acts as another main artery to the south from the City. Although less of a 'gateway' than 3rd Street, this street has good planting strips and planting pits that could accommodate many tree plantings quite easily.



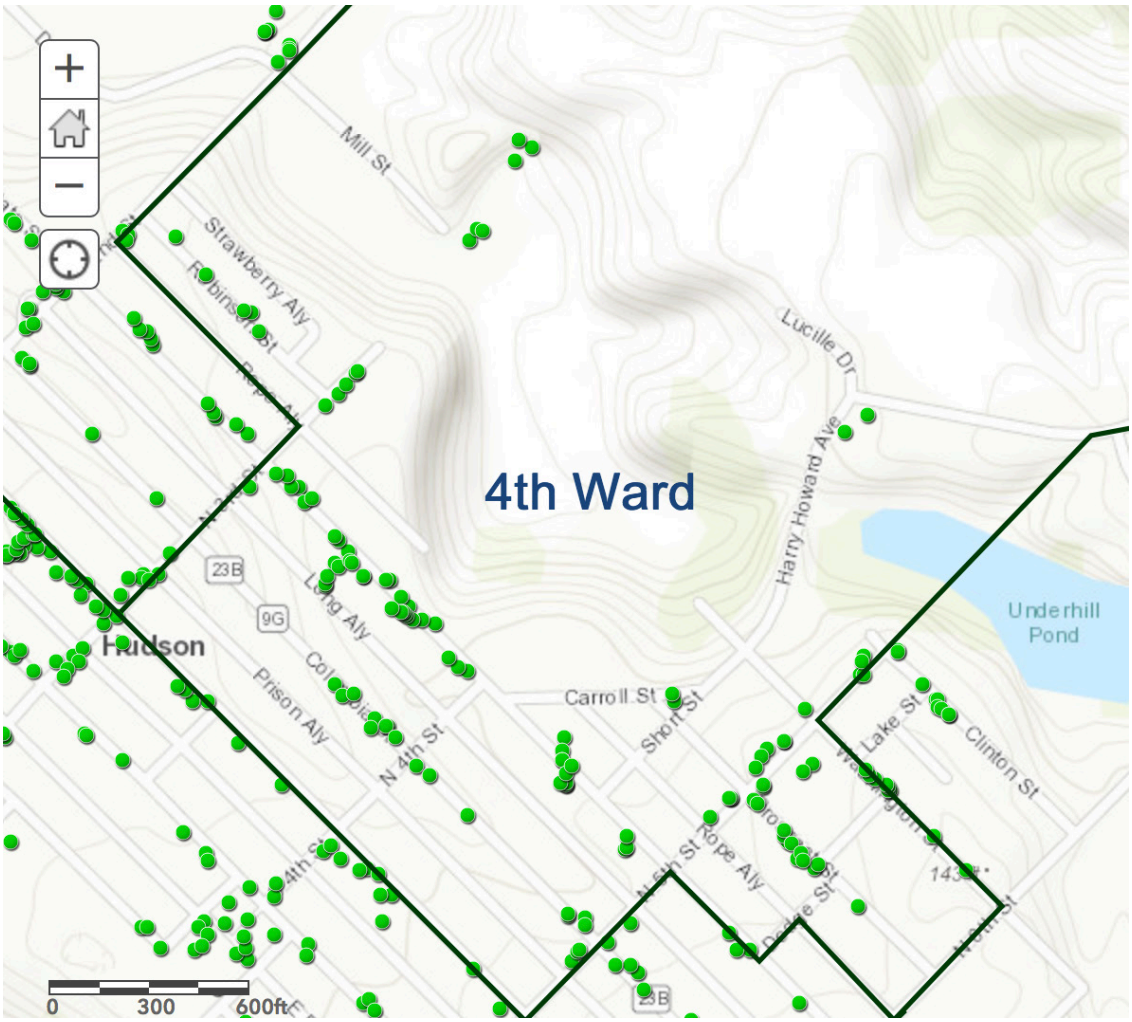
4th Ward

Hudson's 4th Ward is situated in the north of the City. It is situated between the 2nd Ward and 5th Ward, north of Warren Street, from approximately 3rd Street to 5th Street (actual ward boundaries jog through the City, see Ward Map for actual boundary). The 4th Ward has a tree density of 1.3 trees per acre and a total of 121 trees. This represents 7.0% of the tree population in Hudson. It has a leaf area of 2.91 acres, representing 1.3% of the total leaf area in the City. The leaf area density in the 4th Ward is 1362 ft2/ac.

There are several priority planting spots in the 4th Ward. Columbia Street is one area that could use more trees. There are several trees planted near 4th Street, but otherwise there is little canopy coverage.

4th Street itself also is in need of plantings. There are no plantings here, but few good areas to plant trees as there are no available tree pits of strips.

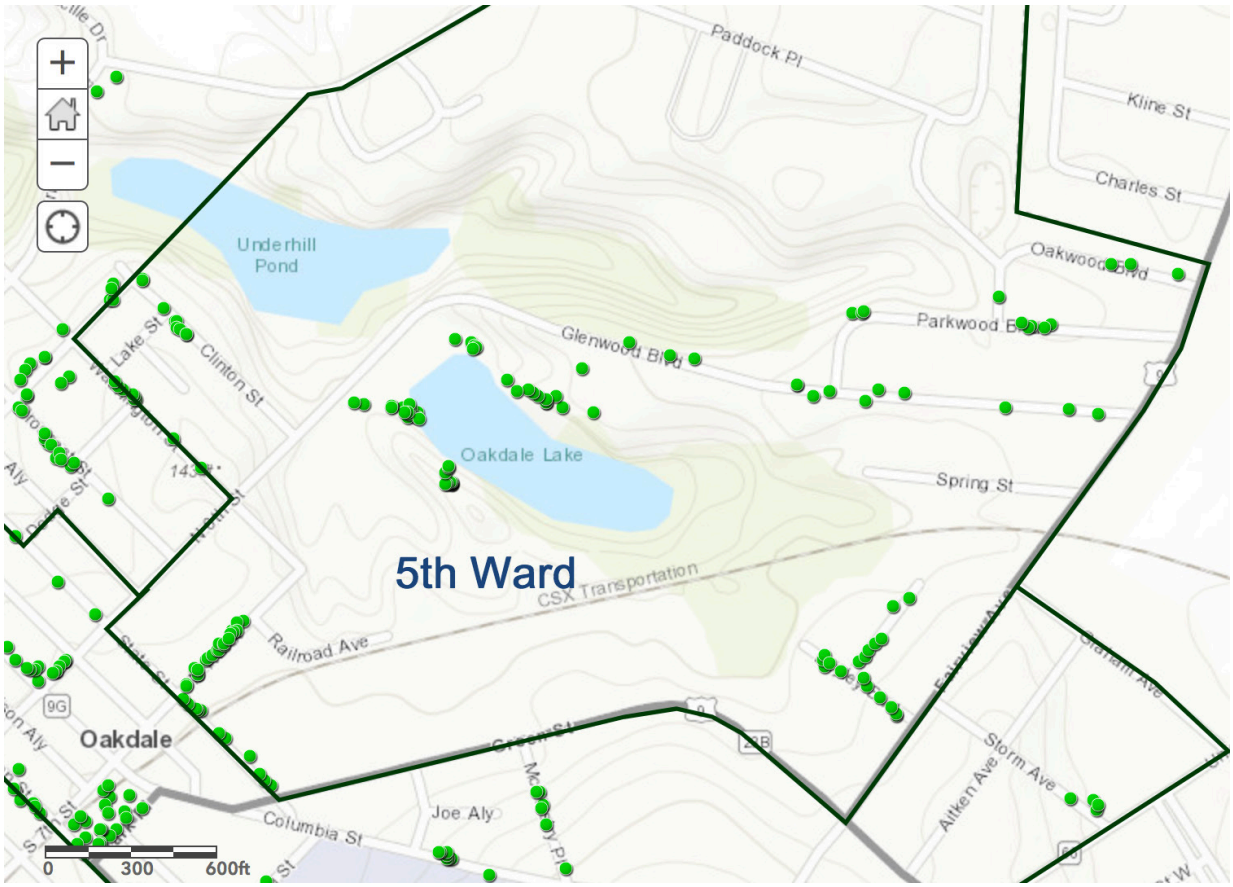
An area in the 4th Ward that lacks trees but has a lot of potential for planting is the neighborhood between 5th and 6th Streets, situated from State Street to Washington St. This area lacks canopy throughout many of it's streets (especially Washington and N. 6th Street) but there are excellent planting strips (and some pits) in most areas. Tree density in this area could be much higher, and because of its location in Hudson's urban core, it should be prioritized.



5th Ward

Hudson's 5th Ward is situated in the northeast of the City. It covers the area in the City surrounding Underhill Pond and Oakdale Lake (actual ward boundaries jog through the City, see Ward Map for actual boundary). The 5th Ward has a tree density of 0.8 trees per acre and a total of 98 trees. This represents 5.6% of the tree population in Hudson. It has a leaf area of 6.38 acres, representing 2.9% of the total leaf area in the City. The leaf area density in the 1st Ward is 2137 ft2/ac.

Hudson's 5th Ward has just a few priority areas. None of these areas are completely without trees, but there is plenty of room for improvement, and there are plenty of good planting areas here with either tree pits of tree strips available for plantings. The area of the 5th Ward between 5th and 6th Streets, along Clinton and Washington Streets are top priority for tree planting because this area is located in the urban core of Hudson. To the northeast in the 5th ward the city becomes more suburban in character, and the neighborhood encompassing Glenwood, Parkwood, and Oakwood Blvd's is another priority area. This area is unique in that it has planting strips throughout, and could easily be planted.



Cedar Park Cemetery

Cedar Park Cemetery is situated in the east of the City, bordering the Town of Greenport. Cedar Park Cemetery has a tree density of 12.9 trees per acre and a total of 971 trees. This represents 55.8% of the tree population in Hudson. It has a leaf area of 174.65 acres, representing 78.9% of the total leaf area in the City. The leaf area density in Cedar Park Cemetery is 101434 ft2/ac.

Cedar Park Cemetery is not a priority for planting because it has more trees and leaf area than any other area in the City. There are no areas severely lacking trees in the Cemetery, and priority should be yielded to the Wards for plantings.

Henry Hudson Riverfront Park

Henry Hudson Riverfront Park is situated in the southwest of the City, along the shore of the Hudson River. Henry Hudson Riverfront Park has a tree density of 9.8 trees per acre and a total of 46 trees. This represents 2.6% of the tree population in Hudson. It has a leaf area of 6.33 acres, representing 2.9% of the total leaf area in the City. The leaf area density in Henry Hudson Riverfront Park is 58499 ft2/ac.

Henry Hudson Riverfront Park is not a high priority for plantings. The only area in the Park that was noted for tree planting was the westernmost area to the north of the parking lot. This area has some trees slated for removal, which should be replaced with new plantings.

Oakwood Park

Oakwood Park is situated in the east of the City, surrounded by the 5th Ward. Oakwood Park has a tree density of 19.6 trees per acre and a total of 49 trees. This represents 2.8% of the tree population in Hudson. It has a leaf area of 3.94 acres, representing 1.8% of the total leaf area in the City. The leaf area density in Oakwood Park is 68657 ft2/ac.

Oakwood Park is largely a forest park, with limited space overall for planting trees. There has been some active tree planting going on in the park, and there is a good overall number of trees and leaf area percentage, so priority should be yielded to the Wards for plantings.

GOAL 3: ADD TO THE DIVERSITY OF THE URBAN FOREST TREE COMPOSITION

Objectives: Plant a number of different genera and species of trees, so that the urban forest remains resilient to pests and pathogens, as they spread or become newly established in and throughout the state. Diversity of the urban forest is critical to the health of the urban forest, and with continuously expanding pest pressure, this goal is becoming more important. Planting various types of trees with varying size at maturity (i.e., species types, deciduous, evergreen, small or large trees) also diversifies the urban forest structure, enhancing the quality of both habitat value and aesthetics. Tree planting recommendations that promote this objective are below:

Deciduous Shade Trees

Deciduous trees selected to provide shade and aesthetics to a landscape are widely available from a variety of sources. These species include individuals which are suitable across a broad spectrum of soil types and soil moisture availability. However, as most are considered canopy species, they generally require partial to full sun and grow to be up to 100 feet in height with a crown up to 60 feet in width. Ash species (Fraxinus spp.), while excellent native shade trees, should not be planted due to concerns regarding the spread of the emerald ash borer (EAB). Additionally, when replacing deciduous shade trees, a minimum caliper size of 1.5-2 inches is recommended. LBS Ecological recommends installation of trees native to NY due to suitability for seasonal changes and soil conditions. Non-native species may require additional maintenance to ensure success, which would incur additional costs to the City, but may be added in small numbers to add diversity, as long as they have not shown potential for being invasive.

Evergreens and Conifers

Year-round retention of dense foliage and a wide base as compared to deciduous trees make evergreens a frequent choice for screening. Although less common than deciduous trees in the inventory, evergreens represented a larger percent of the total population located in landscaped and park areas. In general (although there are plenty of exceptions), evergreens tend to grow well in average to dry conditions. For this reason, they are commonly planted in raised mounds for landscaping purposes, and therefore may become stressed during extended periods of low precipitation. When possible, native species are preferred for plantings and replacements, because they can be more adaptable to site conditions. For evergreens, a minimum tree height of 5 feet is recommended, and trees usually are sourced as Balled and Burlapped (B&B).

Ornamental Deciduous Trees and Shrubs

For the purposes of this inventory, ornamental deciduous trees and shrubs consist of either a cultivar species developed specifically for ornamental purposes or an understory or shrub-form species which occur as native individuals but are primarily used as ornamental species. Examples of these include various cultivars of crabapple (Malus spp.) and hawthorn (Crataegus spp.) as well as redbud (Cercis canadensis). As with other deciduous and evergreens, native species are preferred for plantings and replacements.

GOAL 4: AVOID PLANTING INVASIVE OR UNDESIRABLE TREES

Objectives: DO NOT plant trees that have proven to be undesirable in the urban forest. Certain trees are considered invasive, and others are not appropriate and do poorly in urbanized environments. Other trees may have qualities and traits that are not preferred in the urban forest as well (or in certain places in the urban forest) such as messy fruits, drippy sap, or strange odors.

Trees to avoid planting

- invasive plants (see DEC website: https://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf and watch for updates to the lists)
- plants from DEC list of Street Trees Not Recommended for Planting (see appendix)
- well-represented or overrepresented in the existing inventory (10-20-30 rule is a guideline to reduce the risk of catastrophic tree loss due to pests. The rule suggests an urban tree population should include no more than 10% of any one species, 20% of any one genus, or 30% of any family).
- poor survivorship in urban environment
- weak wooded trees or trees that are prone to breaking apart
- trees that drop a lot of debris (large or smelly fruit, seed, sap)

[Image] (above)
Hemlock Wooly Adelgid (HWA) is a disease that weakens it's host and can kill in the long run. Pest prone trees should not be planted unless the trees can be treated adequately.

GOAL 5: PLANT APPROPRIATE TREES IN APPROPRIATE PLACES

Objectives: Certain qualities of certain trees make them more or less appropriate for different planting places. A tree that is great in a park setting may not be a good choice for a street tree planting, and vice versa. Certain trees may never be appropriate because they are not winter hardy, or because they cannot survive certain urban conditions. Tree qualities to consider are tree size and stature, growth habit, fruit/seed production, and hardiness zone. The quality of planting places is also important for tree health, and certain spots may be more difficult to grow trees. Proven varieties should be chosen for difficult planting places, or those places should be avoided completely. Recommendations for Street Tree Plantings and Park Tree Plantings are noted below:

Street Tree Planting Guidelines

Urban tree planting efforts are constrained by the relatively limited space for tree planting in denser urbanized areas, and by factors such as air pollution, soil compaction, wide pH ranges, heat, and general abuse caused by the urban environment. This can make it difficult to establish new trees and maintain existing ones, especially street trees. The complexity required to manage for this wide array of challenges in an era of budget constraints makes it ever more important to plant the right tree in the right place to maximize the benefits provided by each tree and to build a more resilient urban forest overall. Below are recommendations for street tree planting:

Overall setback recommendations for street tree planting

- Underground lines – 5’
- Driveways – 10’
- Utility Poles – 15’
- Wires – 10-15' either laterally or in height (choose low-growing species)
- Street Lights – 20'
- Other Tree – 20' (smaller or larger per tree sizes)
- Intersections – 20’ (35’ if stop sign)

Factors affecting street tree species selection

- Space available in planting pit
- Available space (horizontal and vertical) Performance in compacted soil
- Low hanging branches
- Expected life span
- Species with weak wood
- Fruit, nut, or seed production
- Susceptibility to insects or disease

Park and Landscape Tree Planting Guidelines

Parks within the City of Hudson provide valuable active and passive recreation opportunities for all residents of the community. Trees within active use areas of parks are generally planted and maintained at a lower density than forested areas. Areas of parks with less open-space needs are suitable for higher density tree plantings. These consist of areas which are more peripheral, naturalized areas, and areas not currently designated for another use which would conflict with tree plantings such as playgrounds or athletic fields. Many tree species that would not be suitable for street tree plantings are good candidates to plant in parks, and adding these trees to the urban forest in parks can promote diversity. Examples include evergreens that would otherwise block views along streets (or do poorly in a tree pit/ utility strip due to wintertime salt deposition), fruit and nut trees that would otherwise be too messy, and weak wooded species.

GOAL 6: CREATE APPROPRIATE SPACES FOR PLANTING

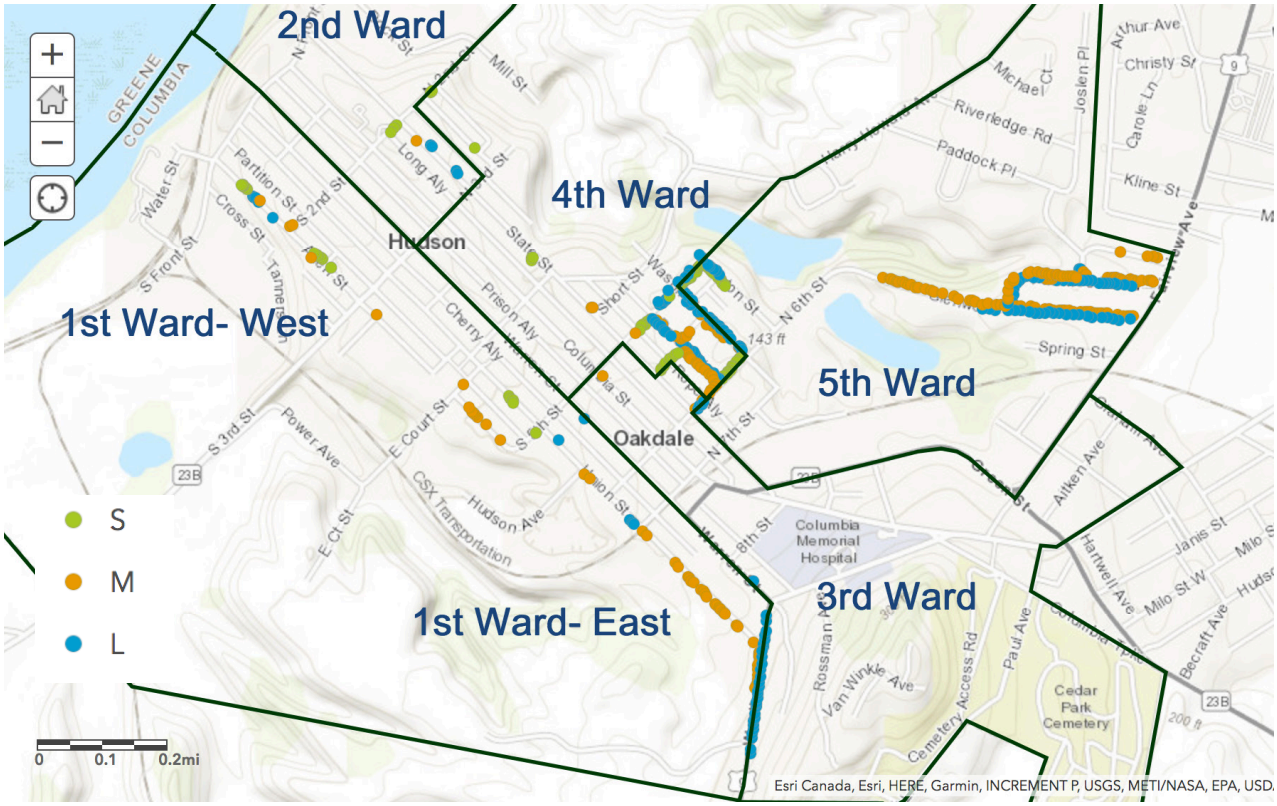
Objectives: Trees planted in open areas, parks, lawns, and forests often have unlimited root space, and good quality soils. Trees that are planted in urban settings often do not have similar access to soil and rooting space. Minimum requirements for tree planting spots should be met whenever planting is accomplished. When creating new planting spaces, the following recommendations shall be followed:

- Tree lawns shall be equal to or greater than 4 feet wide.
- Tree pits shall have a porous opening at least 50 square feet (e.g.5' x10', 8' x 8', etc.).
- Trees shall not be planted:
  - within 20' from the corner of intersecting streets - within 35' in front of a stop sign
  - within 15' from hydrants
  - within 15' from a utility or street light pole
  - within 10' of a driveway
- Underground soil paths between tree lawns/pits and adjacent private green space should be considered when planting strip/pit size is smaller than recommended size. Approximately 10 feet of sidewalk slabs should be removed where the tree is planted and 24" or more, preferably 36", of structural soil placed under the replacement sidewalk slabs. This provides a deep path for tree roots to grow into the adjacent private property while minimizing sidewalk damage as the tree grows.
- No tree is to be planted directly under or in competition with a large tree on private property.
- All planting locations must be approved by the Superintendent of Public Works and/or CAC.

Currently, many of the tree pits in Hudson would be considered too small for planting large trees. Some tree pits may even be too small to successfully plant smaller trees. In the past when sidewalks and street paving were built around established trees, space between cobblestone pavers allowed water to reach the roots, so tree pit size was not that crucial. But today, with tree pits surrounded by impermeable surfaces, tree pits can be too small to enable replacement trees to establish themselves. Plantings are often stressed and will not survive without larger openings, severe pruning and possible soil amendment.

[Images] (above)
Small planting pits limit tree root growth and stress trees. These pits are no more than 2 feet in diameter, and even diminutive trees may have trouble establishing.

An inventory of vacant planting places was accomplished for this CFMP. The map below depicts where there are adequate planting places for small, medium, and large trees:



[Image] (above)
Planting Places Map of Hudson NY

Comprehensive data for planting places is contained in the tree inventory data.

These planting places should be filled per recommendations in "Goal 2: Plant trees in areas of the City that have low canopy coverage and low planting numbers." Most places in the city core would be planted before all the planting strips in the northeast are filled. Additionally, our recommendation would be to cut tree pits in the urban core (distributed equally throughout the Wards) such that priority planting areas without adequate planting areas can be planted before every available planting place is filled.

Pruning and Removals

Trees may need to be pruned or removed for many reasons. Often trees may need to be pruned if they are growing close to roadways, sidewalks, utility lines or poles, signage and lighting, or buildings and other built environment. Mature trees may need to be pruned to maintain health and vigor, or to lessen the impacts of various defects the tree may have. Young trees benefit from maintenance pruning as well, with the addition of training or formative pruning which helps them to develop good form as they grow in their establishment period. Sometimes trees pose a risk to the general public and pruning or removal mitigates for that risk.

RISK TREE INVENTORY METHODOLOGY

All of the trees from the inventory were assessed for risk . These trees were identified, GPS located, and then assessed for several factors. Factors noted were Location (Lat/Long), street location, species, DBH, Crown Dieback, Canopy/Crown Condition, Trunk Condition, Root and Root Collar Condition, Maintenance Task, Maintenance Recommendation/Priority, and Additional Notes/Comments.

Tree Locations were recorded in Lat/Long (2.5 meter accuracy), and road or park position in Hudson was also noted from the Inventory. Species was verified for each tree, along with DBH in inches. Crown Dieback was recorded on a scale of 1-100. Canopy/Crown Condition was recorded on a scale of 1 to 4 (low, moderate, high, critical). 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 (low, moderate, high, critical). 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 (low, moderate, high, critical). 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. Maintenance Task was recorded for trees including none, formative pruning, crown clearing, crown raising, crown reduction, remove, treat pest/disease, and crown cleaning. Maintenance Recommendation/Priority was also rated on a scale of 1 to 4 (none, routine, immediate, and critical concern). Additional Notes/Comments elaborate on canopy condition, trunk condition, root and root collar condition, and priority level.

RISK TREE MAINTENANCE RECOMMENDATIONS/PRIORITY.

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

<u>Maintenance Recommendations/Priority</u>

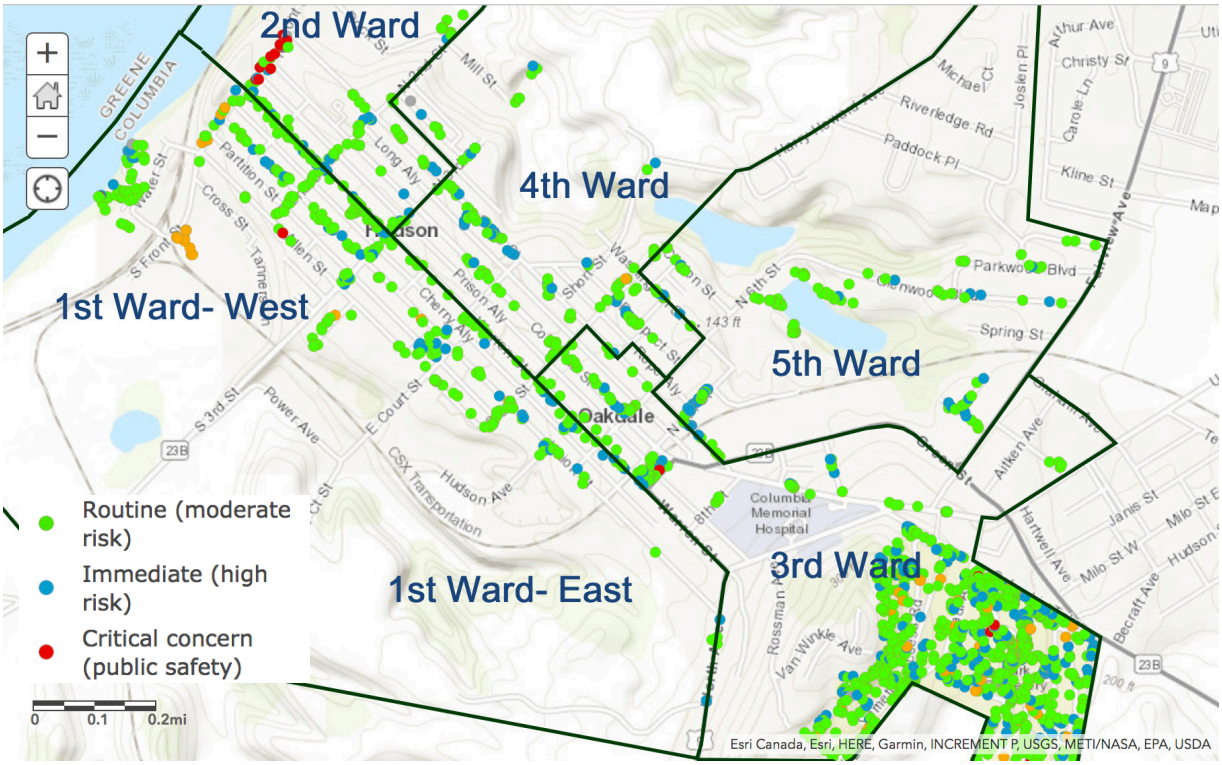
- Trees that are a none (low risk) are healthy trees with no need for any maintenance unless noted.
- Trees that are a routine (moderate risk) are trees that show minor signs of decline/wounds/disease, and should be pruned or monitored in future inventory work.
- Trees that are a immediate (high risk) are trees that show moderate signs of decline, that are in need future maintenance pruning or removal in order to reduce current risk.
- Trees that are a critical concern (public safety) are recommended for immediate maintenance, whether removal or pruning, because they are a public safety concern.

The inventory reveals that there are:

- 1324 None (Low risk);
- 325 Routine (Moderate Risk);
- 51 Immediate (High Risk);
- 36 Critical Concern (Public Safety);

Comprehensive Risk Tree data is found on an updatable excel file.

RISK TREE MAP



[Image] (above)
Risk Tree Map of Hudson NY

RISK TREE 5-YEAR CYCLE

A five-year tree management cycle based on the tree inventory data was developed to support Hudson's vision for preserving its urban forest. The program is designed to reduce risk through prioritized tree removal and pruning, and a routine pruning cycle for moderate risk trees.

While implementing a tree care program is an ongoing process, tree work must always be prioritized to reduce public safety risks. LBS Ecological recommends completing the work identified during the inventory based on the assigned Maintenance Recommendation (Priority Level); however, routinely monitoring the tree population is essential so that other Critical or High Risk trees can be identified and systematically addressed. While routine pruning cycles is important, priority work (especially for Critical or High Risk trees) must take precedence to ensure that risk is expediently managed.

The table on the following page describes the five-year tree management cycle and associated costs (costs to the City of Hudson depend on ownership of the trees involved. The City of Hudson would only be required to pay for costs associated with risk trees in it's parks, cemetery, and on other City property. Costs associated with risk trees not on City property would be passed on to private owners). Tree planting costs are also noted on the five-year tree management cycle table (tree planting recommendations are found beginning on page 53).

Estimated Cost for Maintenance Activity			All		2022		2023		2024		2025		2026	
Maintenance Activity	Diam.	Cost/Tree	# Trees	Total Cost	# Trees	Total Cost	# Trees	Total Cost	# Trees	Total Cost	# Trees	Total Cost	# Trees	Total Cost
Critical and Immediate Removals	1-6”	200	3	600	3	600	0	0	0	0	0	0	0	0
	7-12”	750	19	14250	19	14250	0	0	0	0	0	0	0	0
	13-18”	1400	13	18200	13	18200	0	0	0	0	0	0	0	0
	19-24”	1750	19	33250	19	33250	0	0	0	0	0	0	0	0
	25-30”	2100	9	18900	9	18900	0	0	0	0	0	0	0	0
	31-36”	2300	9	20700	9	20700	0	0	0	0	0	0	0	0
	37-42”	2750	7	19250	7	19250	0	0	0	0	0	0	0	0
	43”+	3500	0	0	0	0	0	0	0	0	0	0	0	0
Activity Tot.			79	125150	79	125150	0	0	0	0	0	0	0	0
Routine Removals	1-6”	200	5	1000	0	0	1	200	1	200	1	200	2	400
	7-12”	600	5	3000	0	0	2	1200	1	600	1	600	1	600
	13-18”	1250	4	5000	0	0	1	1250	1	1250	1	1250	1	1250
	19-24”	1600	2	3200	0	0	0	0	1	1600	1	1600	0	0
	25-30”	1900	2	3800	0	0	1	1900	0	0	1	1900	0	0
	31-36”	2100	1	2100	0	0	1	2100	0	0	0	0	0	0
	37-42”	2500	2	5000	0	0	1	2500	0	0	0	0	1	2500
	43”+	3000	0	0	0	0	0	0	0	0	0	0	0	0
Activity Tot.			21	23100	0	0	7	9150	4	3650	5	5550	5	4750
Critical and Immediate Pruning	1-6”	200	0	0	0	0	0	0	0	0	0	0	0	0
	7-12”	750	0	0	0	0	0	0	0	0	0	0	0	0
	13-18”	1250	0	0	0	0	0	0	0	0	0	0	0	0
	19-24”	1500	0	0	0	0	0	0	0	0	0	0	0	0
	25-30”	1700	2	3400	2	3400	0	0	0	0	0	0	0	0
	31-36”	1850	4	7400	4	7400	0	0	0	0	0	0	0	0
	37-42”	2000	1	2000	1	2000	0	0	0	0	0	0	0	0
	43”+	2250	1	2250	1	2250	0	0	0	0	0	0	0	0
Activity Tot.			8	15050	8	15050	0	0	0	0	0	0	0	0
Routine Pruning	1-6”	200	83	16600	0	0	20	4000	21	4200	21	4200	21	4200
	7-12”	600	29	17400	0	0	8	4800	7	4200	7	4200	7	4200
	13-18”	900	37	33300	0	0	9	8100	10	9000	9	8100	9	8100
	19-24”	1250	62	77500	0	0	16	20000	15	18750	16	20000	15	18750
	25-30”	1500	16	24000	0	0	4	6000	4	6000	4	6000	4	6000
	31-36”	1700	32	54400	0	0	8	13600	8	13600	8	13600	8	13600
	37-42”	1900	21	39900	0	0	6	11400	5	9500	5	9500	5	9500
	43”+	2100	11	23100	0	0	3	6300	2	4200	3	6300	3	6300
Activity Tot.			291	286200	0	0	74	74200	72	69450	73	71900	72	70650
Activity Grand Total			399		87		81		76		78		77	
Cost Grand Total				449500		140200		83350		73100		77450		75400
Cost Tree Planting (25 Trees/yr)				43750		8750		8750		8750		8750		8750
Total Cost Maintenance and Planting				493250		148950		92100		81850		86200		84150

[Table] (above)

5-Year Tree Management Table, Hudson NY

RISK 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.

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 City Employees and City Trees

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.
- Make clean cuts.
- Be careful with all tools.
- 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. 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 trees

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.

Young tree pruning tips:

- On young 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.

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, and should be removed promptly. The same is true for deadwood.

Mature trees may also need to be pruned in order to provide clearance for various situations, a type of pruning called clearance pruning. Recommendations for clearance distances are as follows:

- Streets/roadways – 14 feet above road.
- Sidewalks – 10 feet above sidewalk.
- Buildings & structures – 6 feet.
- Street signs & lights – remove sufficient branches to allow adequate sight lines and lighting patterns.

Mature tree pruning tips:

- 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.

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 at the boundary between the branch collar and the actual branch, which has low taper by comparison to the collar. Basic pruning can be accomplished using the 3-Cut method:

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. The exception to the rule is when oaks are being trimmed over the summer – these should be sprayed with paint spray (a natural color is best) to mask the smell of oak cuts, which helps to reduce the spread of flatheaded borers (or other insect vectors), which can carry the oak wilt fungal spores.

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. An ISA Certified Arborist has created this plan for the removal of your trees over time based on known vulnerabilities and expected lifespan.

To avoid unnecessary removals, prune your trees carefully. 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 recommendations.

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.

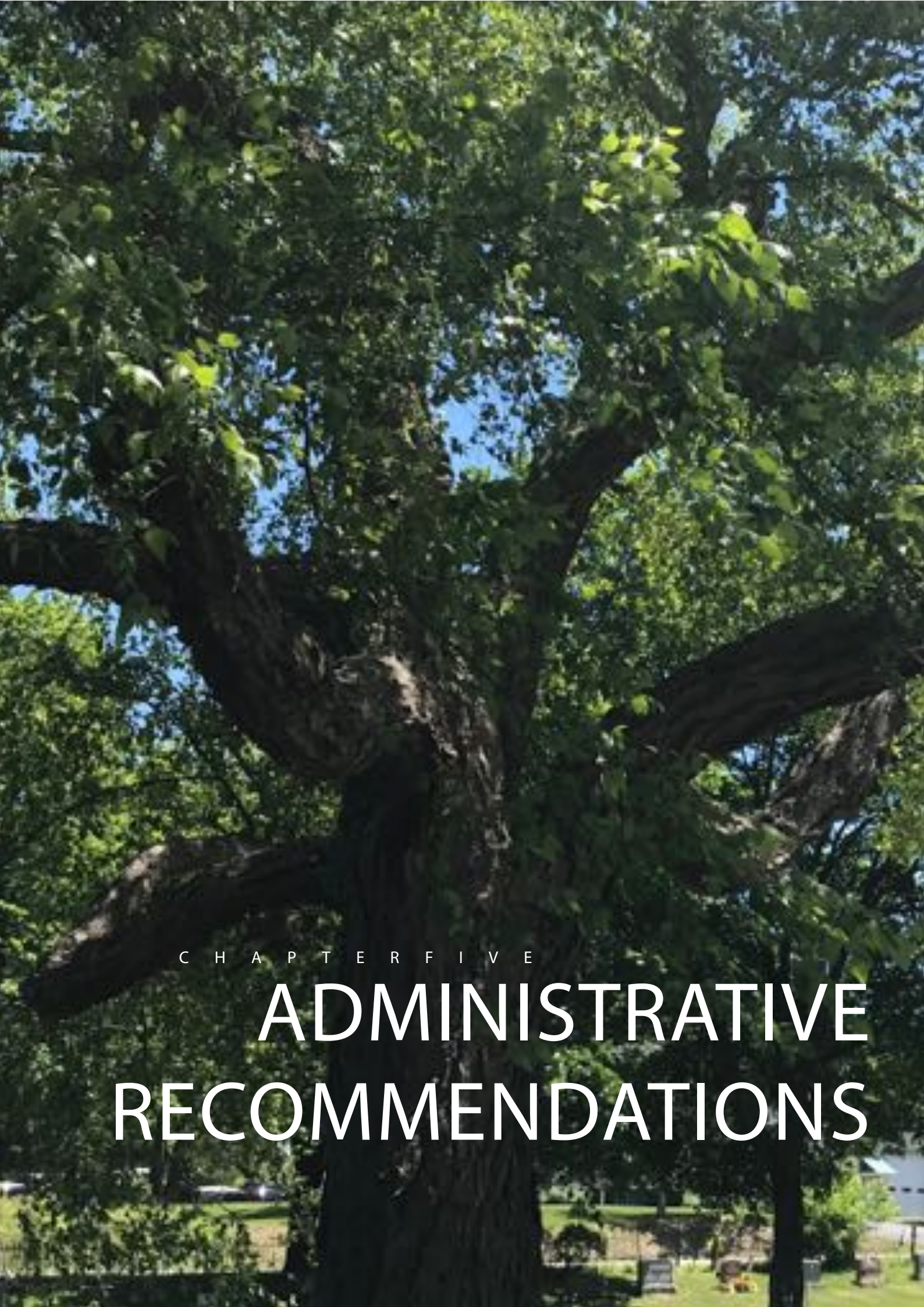
If a tree has heritage or historic value but has a high risk of becoming a hazard, consider restricting public access or moving valuable structures instead of removing it. There are other options, such as disease treatments, cabling, bracing, structural pruning, among others that may allow the tree to be retained for decades prior to removal. 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 on private property, follow the above-outlined procedure to inform the landowner of potential dangers followed by subsequent civil action to remove the tree and recover costs.

Do not attempt to remove a tree alone or direct an employee to remove a tree alone, due to safety concerns associated with not being able to perform first aid. Never attempt to remove a tree if you are unqualified to do so safely. Consult with or hire experienced professionals (ISA Arborist) 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.

[Image] (above)
This tree was pruned poorly (cut from the top only, not the 3-cut method), and had its bark torn and stem injured when the branch fell. This invites disease and decay, and the tree stem is weakened.



CHAPTER FIVE

ADMINISTRATIVE RECOMMENDATIONS

Administrative Recommendations

The City of Hudson has been making strides to develop its urban tree and forest management. The CAC believes that every Hudson resident can play a role in caring for our trees. With this in mind, the CAC has proposed that the city adopt a Tree Ordinance and create an all-volunteer Hudson Tree Board. We support this guidance, and include additional recommendations below to further improve and enhance management in relation to this project and beyond:

TREE BOARD

A Hudson Tree Board consisting of representatives of each ward with diverse skill sets such as horticulture, pruning, community organization and communications could meet regularly to discuss goals and objectives of the CFMP, and if a tree ordinance is adopted, to possibly review site plans and/or tree removal or planting requests. Currently the CAC carries out the role of a Tree Board but with less capacity, because it has other directives to carry out in addition to urban tree management. A Tree Board would allow for dedicated urban forest management, and give the CAC more potential to plan for other conservation projects.

TREE ORDINANCE

Background

A tree ordinance is a tool to help protect and manage a community's trees. It can be designed to regulate various aspects of tree planting, removal, and maintenance on public and private property within a municipality. By protecting trees, a well-planned, written, and implemented ordinance can enhance a community's beauty, reduce air pollution, lower air conditioning costs, and increase biodiversity.

The International Society of Arboriculture categorizes arboriculture-focused tree ordinances, which relate to maintaining trees for aesthetic and environmental benefits, into three main categories:

1. Street and park tree ordinances regulate the planting, removal, and maintenance of trees in parks or along public rights-of-way, including private trees that could endanger the traveling public. These ordinances can include tree planting specifications (e.g., requiring tree planting in parking lots) and tree care standards (e.g., standards for pruning and removal). The City of Hudson currently has a very simplified version of this type of ordinance.
2. Tree protection ordinances protect specific tree species, trees of a certain circumference or height, or trees with historical significance on private property. These ordinances usually stipulate that permits are required to remove, encroach upon, or prune such trees. They also provide for the replacement of removed trees. Hudson has no current tree protection ordinance.
3. View ordinances help resolve conflicts between property owners that occur when trees block views or sunlight. Hudson has no current view ordinance and we don't recommend one at this point.

Tree Ordinance Recommendation

The City of Hudson has an extremely basic street and park tree code (C22-22 City of Hudson Code - Power to control trees in public places) that covers only some elements of planting, maintenance, and removal of trees on the public property ROW. This code could be improved and expanded upon greatly. To modernize code and extend protection of trees within the City, a more robust Tree Ordinance is recommended. Recommendations for this ordinance includes:

- Protect trees from removal - although there is code that directs all plantings to be overseen by the Superintendent of Public Works, there is no similar code regarding removals. Currently, if the adjoining land owner wants to remove a tree they may do so at their own judgement and discretion.
- Protect trees from harm - Currently, if the adjoining land owner wants to prune a tree they may do so at their own judgement. The land owner can prune the tree, even if they have no previous experience, which could easily lead to inappropriate pruning or injury/death of the tree. Also, there is no impetus to protect urban trees from harm caused by people screwing/nailing into trees, arbitrarily cutting branches off, or or other unsavory practices that inadvertently harm trees.
- Add code to cover and describe the tree planting permit process. There is a permit process in place to plant trees but this has not been adopted into the City Code, and may not have teeth.
- Add code to give the Supervisor of Public Works the power and duty to regulate some trees on private property. Currently the only trees that are regulated are ones that 'overhang' onto public ROW or roadways, etc. This could be expanded to include hazardous trees (due to defect or pests/pathogens) that may not be overhanging, but nonetheless could cause public harm.
- Create standards and specifications for planting, pruning, and removals. Hudson does have a permit process to plant trees with some good recommendations for species and planting in it's associated guide. Standards and specifications could be drafted using this information, and information for pruning and removals could be added as well.
- Create a system to identify and remediate risk trees. Without a dedicated arborist or forester on staff, the City of Hudson relies on consultants to adequately identify risk trees. We believe that the risk assessment included in this CFMP is the first time that the urban tree population has been surveyed to locate and prioritize potentially hazardous trees. This process should be updated regularly, and be carried out at least as often as complete tree inventories are conducted (every 5-years).

Developing the Tree Ordinance

To evaluate the feasibility of an ordinance, the Hudson community should create a working group to assess the City's needs and wants, resources, and existing ordinances. In the beginning, the group should develop rules governing information sharing, decision-making, and conflict resolution.

An ideal group is composed of people who mirror the demographics of the community. It should include experts in relevant topics like forestry and public works, as well as people from other fields. A sample group could include a realtor, developer, garden club member, arborist, planner, environmental group representative, landscape architect, forest landowner, public works official, business owner, lawyer, and interested citizen.

For in-depth information on the process, see Guidelines for Developing and Evaluating Tree Ordinances. Published by the International Society of Arboriculture in 2001, it remains the most comprehensive guide on the subject, addressing everything from planning and implementation to evaluation and enforcement. Tree ordinance recommendations from the NYS DEC are another excellent resource, which are compiled below:

DEC Recommended Tree Ordinance Components (https://www.dec.ny.gov/lands/5276.html)

I. Purpose

A clear statement of purpose or intent of this ordinance will help avoid ambiguity in interpretation. For example, "It is the purpose of this ordinance to promote and protect the public safety, and general welfare by providing for the regulation of the planting, maintenance, and removal of trees, shrubs, and other plants within the city of Hudson."

II. Definitions

Definitions of terms used in the ordinance such as street tree, adjacent property owner, dripline, nuisance, etc., will prevent confusion in interpretation and enforcement of the ordinance.

III. Establishment of a Tree Board

(This may be in a separate ordinance.)

Establishment includes defining membership, terms, duties, and meetings.

IV. Municipal Authority and Responsibility

Who within the municipal government is responsible for administration of the ordinance? Is there a municipal forester or ISA certified Arborist? Does this person have authority for enforcement action? This section also defines and designates who is responsible for planting, care and protection of the urban trees.

V. Clarification of Title to and Responsibility for Trees

This section clarifies which trees are publicly owned and which are privately owned. This section may also describe a process by which adjacent landowners may work on a street tree abutting their property within the standards set by the municipality.

VI. Planting, Maintenance and Removal

This section clarifies responsibility of adjacent property owners in cases of street-sides or other easements, and minimum specifications. It covers planting and maintenance requirements and may include permits, an official species list, spacing and location, or it may reference planting standards and specifications in a separate document. Trees that pose a threat to the health and safety of people or property may need to be removed. This section describes the process by which trees are identified as hazardous and who is responsible for the work. In addition to new development, renovations to existing developed areas should be covered.

VII. Trees on Private Property

Trees on private property may pose threats to public safety or other private property. This section provides the authority to inspect private trees and require action by the owner to eliminate any problems, if necessary.

VIII. Requirements of Professionals

This section protects homeowners and the community forest from inadequately trained and unscrupulous people who claim to be professionals.

IX. Prohibited Activities

This section protects trees in the public right of way from negligent or intentional damage.

X. Tree Protection

Protecting trees is always a challenge. This section is used to protect against insect or disease epidemics, during

construction, and those of historic or sentimental value. Sometimes this section may create conflicts if any of the trees covered in this section pose a safety hazard. It helps to plan for this possibility.

XI. Permits

Adjacent landowners may want to plant trees and work on trees on the public right-of-way abutting their property. This section describes how a landowner may do this in accordance with the forest management practices recommended in your ordinance. Be aware that if the process or cost of obtaining a permit is considered excessive, citizens will be less likely to comply with the ordinance.

XII. Enforcement, Penalties and Appeal

This section designates who is responsible for enforcement. Without penalties, enforcement of any ordinance is difficult. In addition, penalties need to be sufficient to deter violations. Depending on the length and complexity of the ordinance, penalties for violations may be listed in a single provision or in several different parts of the ordinance, and the penalties may be simple or complex. Appeals provide checks against the authority of the tree program manager.

XIII. Severability

A statement protecting the validity of the rest of the ordinance if any part of it is found to be invalid by a court. For instance, "Should any part or provision of this ordinance be declared by a court of competent jurisdiction to be invalid, the same shall not affect the validity of the ordinance as a whole or any part thereof other than the part held to be invalid."

XIV. Other

Because circumstances can vary greatly between municipalities, other sections may need to be added. The ordinance should fit your individual community.

It is recommended that an appended "standards and specifications" document be created. This document lists up-to-date detailed tree planting and maintenance standards and specifications. Standards change as more knowledge is gained in the field. It is better to reference this document in the ordinance so the ordinance does not need to be amended as standards change. The International Society of Arboriculture is a professional organization that sets standards and specifications for planting and care. The American Association of Nurserymen's American Standard for Nursery Stock is also a good reference.

Public input in developing the ordinance is essential to its successful passage and implementation. They should be involved in the determination of needs, drafting, and public review and hearings.

ARBORIST STAFFING/TRAINING

Create a position (or train a current employee) for someone with proper education in arboriculture/silviculture to bring modern forestry techniques to the management of the urban forests in Hudson. Routine maintenance of urban forest databases of information will allow the City 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 Hudson DPW to have more involvement with this project and other 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 City.

Train a Staff member to have Arborist Credentials (ISA)

Successful stewardship of a thriving urban forest requires the in-house expertise of a certified arborist who has clearly defined responsibility at DPW for overseeing the urban forest (planning, training and supervision, scheduling, developing further DPW protocols, etc.)

- The Arborist will lead a DPW crew specifically trained to provide the necessary work force to improve the trees of 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 DPW or by consultants.

Inventory and Plan Review and Updates

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

- Develop a process for regularly sharing information, between the DPW, Conservation Advisory Council (or Tree Board), and other NGO groups regarding plantings, removals, and trends in tree conditions.
- Charge the Conservation Advisory Council (or Tree Board) with developing a process (to be approved by the City ISA Arborist if possible) 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.
- Dedicate a staff responsibility for updating the tree inventory on software (ESRI) and manually on Excel.

SET ADDITIONAL PLANTING TARGETS FOR PROGRESS ON THE URBAN FOREST:

- The DPW should work with the Conservation Advisory Council (or Tree Board) to set additional future planting targets and priority planting areas for all urban forest areas within Hudson.
- Determine the metrics that will be used to measure progress towards goals for an expanded urban forest (Most relevant measurements to consider: urban forest cover and leaf area index, number of trees, native species vs. invasive species, environmental/social/economic benefits (from i-Tree analysis)) and adopt targets for those metrics.
- Progress with planting in all wards of the City at a similar pace, understanding that certain areas may be more easily planted due to land use, density, and makeup of the ROW.

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

- This strategy adds resiliency to the City's urban forest in anticipation of Global Climate Change
- Encourages wildlife and pollinator habitat

BASE FORESTRY PRACTICE ON CURRENT SCIENTIFIC INFORMATION

- Draw on local or regional resources for expert recommendations (Private Forestry/Arborist Consultants, Cornell Cooperative Extension,, NYS DEC, NRCS, Soil and Water Conservation District, and

others)

BECOME AN ARBOR DAY "TREE CITY USA"

If Hudson were to have a Tree Ordinance, a Tree Board and budget $2 per capita (~$12,000.) per year for tree planting and maintaining trees, Hudson could attain the “Tree City, USA” designation. This Arbor Day Foundation category would put Hudson in a very beneficial position for being awarded future planting and maintenance grants. This would also signal that the City supports sustainable, economical and community initiatives. This is not simply an aesthetic proposal, it is vital for the health of the community and environment. The City can work with the local DEC Forester for further assistance and application.

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 CITY 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 or maintenance.
- Research and apply for other federal, state, foundational or private environmental stewardship grants.
- Several banks and utility companies have incentives for tree planting via grants and reimbursement agreements.

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 a diversity of species trees wherever possible – planting small species when necessary (line conflicts, etc).
- In areas that there is a utility ROW engage the utility to aid in tree management.

PROMOTE COMMUNITY AND GRASSROOTS EFFORTS

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

- Raise awareness - through education, collaboration, and the exchange of information—among stakeholders about the value and needs of the urban forest.
- Engage with the City's property owners, local businesses, developers and the design community, and City 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 City 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 CAC, DPW, or other City entities to distribute.
- Encourage the public to value diversity and to eliminate invasive species trees and shrubs from the City.
- 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 City.
- Organize community planting days and pruning sessions. New approaches to using volunteers should be considered, such as volunteer pruning (https://treesny.org/citizen-pruners-stewardship/) or tree watering.
- Train volunteers to assist the DPW and CAC 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 City efforts.
- Solicit citizen input for planning, prioritizing, and updating the tree inventory

[Image] (above)

Citizens play a huge role in tree planting events

Storm Preparedness Planning

The City of Hudson, with this CFMP, has a roadmap for urban tree management, and an option to adopt ordinances promoting urban tree protection and management. This management program includes the overall urban forest management plan that identifies professional standards, best management practices, detailed tree planting priorities, and a comprehensive urban forest risk management plan. Associated reports include a public tree inventory and an assessment of the tree inventory via i-Tree Eco. This urban forest management program promotes a healthy, diverse tree populations, which is integral to storm preparedness.

Regardless of the level of urban forest management in a community, trees remain vulnerable to damage and death from natural disasters that include wind storms, ice storms, and even hurricanes. Climate change is exacerbating the affects of these natural disasters. The resulting storm damage increases the immediate risk to residents and visitors in the City, and in the long term adversely affects production of environmental services (see i-Tree section). The purpose of urban forest management as a disaster planning tool is to improve overall urban forest health, identify tree defects, assess risk, and prioritize mitigation that reduces storm impacts on the trees in the urban forest.

Extreme wind and ice events result in tree damage that is immediate and that requires mitigation to reduce risk to the public and begin the recovery of affected communities. It has been estimated that 80 percent of tree damage during natural disasters is associated with a preexisting defect (e.g., trunk decay and/or cavity, codominant stems, limb structure, damaged roots). Consequently, wind and ice events result in broken branches and limbs, split trunks, and toppled trees.

Communities that maintain healthy trees, reduce tree defects and their associated risk with appropriate mitigation (i.e., pruning or removal), and have a protocol in place to respond and recover from disasters or extreme storm events will reduce short-term risk and be able to maintain a higher level of environmental services over the long-term by keeping damaged but viable trees.

STORM PREPAREDNESS PROCESS

In planning for storm preparedness, there are 4 phases to consider: mitigation, preparation, response, and recovery. In each stage there are processes to mitigate risk and reduce damage from storms. Each of these phases is described as follows:

Mitigation

Mitigation is the action of reducing the severity, seriousness, or painfulness of something, in this case storm damage. The goal is preventing future emergencies or minimizing their effects. Examples of activities include proper tree care before the storm and planting the right trees in the right places to start with.

- Tree Care Prior to a Storm - Existing tree management taking into consideration all of the lessons we have learned from recent and past storms.
- Planting the Right Tree in the Right Place - the most appropriate species should be planted for each planting space available

This phase includes also understanding the makeup of the City, such as its geography and size. Also we consider how storms may affect the City of Hudson. This includes storm history and exposure, and climatological or/or meteorological conditions that are expected. The level of management of the urban forest also plays a role in storm preparation.

Preparation

The next phase of management for storm preparedness is storm preparation. Examples of activities for storm preparation include disaster planning and warning activities. Also, technical and practical training helps prepare professionals and laypersons for rapid and efficient mobilization. Examples of preparation activities include identification of an early warning system for severe weather, development of a disaster/emergency response plan, identification of roles of various individuals and municipal departments during disasters (ICS management systems; ICS is a standardized hierarchical structure that allows for a cooperative response by multiple agencies, both within and outside of government, to organize and coordinate response activities without compromising the decision-making authority of local command.), and identification of groups or communities to contact for additional assistance when necessary.

Response

The response phase consists of immediate activity during and after the disaster. Communities must recognize that disaster damage often exceeds what can be handled by municipal workers. Thus, a list of private and public cooperators should be developed and kept up-to-date. Examples of activities include tree damage clean up, utility clearance, identification of methods of communication from the field to the office (if storm has taken out communications such as phone/internet), determination of debris disposal options, use the use of efficient record-keeping methods.

Recovery

The recovery phase consists of activities that occur after the disaster that attempt to restore conditions prior to the disaster. After a storm, removal or repair of hazardous trees takes priority. Any remaining hazardous trees that were not dealt with during the immediate response to the storm should now be dealt with. Next, tree damage assessments should be done if possible or necessary. Using the Tree Inventory, an arborist or forester can determine the actual damage to the urban forest. Accurate damage (in dollars) can be assessed and submitted for potential reimbursements. Specific costs can be developed for the repair of the urban forest (pruning, removal, cabling, and rodding) and for replanting efforts.

Examples of other activities that occur later in the recovery phase include public and private tree re-planting and planting, tree care and restoration, trainings, tree planting awareness events and celebrations, and recognition activities for volunteers, citizens, municipal workers, and others.

LESSONS LEARNED FROM RECENT STORMS & RECOMMENDATIONS FOR THE CITY OF HUDSON NY

The geographical setting in Hudson Valley of NY offers unique constraints and opportunities to Urban Arborists/ Foresters. One of the largest factors that we need to consider is the effects of wind and ice storms.

Storms can be extremely damaging to communities and urban forests. Without question, trees can become hazardous and pose risks to personal safety and property. As destructive as these storms are, it is important not to forget that trees provide many environmental benefits, such as providing shade and energy conservation, reducing the well known "heat island" effect in cities caused by concrete and pavement, and increasing property values. Also, there are opportunities to better prepare for the next storm season by rebuilding a healthy urban forest. Valuable lessons can be learned from knowing more about how, when, and why trees fail in storms. A key issue facing communities is how to manage the urban forest from an ecological standpoint so urban forests are healthier and more storm-resistant.

Discussed below are critical lessons learned from previous storms:

1. More wind more failure

RECOMMENDATIONS

Establish and manage a healthy urban forest to improve wind resistance by:

- Having a comprehensive tree management plan for your community.
- Beginning a structural pruning program for young and mature trees.
- Choosing more wind-resistant species.
- Selecting the right species and designing the right planting place.
- Planting high-quality trees with central leaders and good structure.

2. Trees planted in groups fail less

RECOMMENDATIONS

- Plant trees in groups. The trees have more root space and can interlock root networks stabilizing the soil and preventing tear out. To maximize the effect plantings of at least 5 trees is recommended. Even smaller groupings is an improvement to individually planted trees.
- Plant a variety of species, ages, and layers of trees and shrubs to maintain diversity in your community.

3. Some species are better suited to survive storm and high-wind conditions (native trees)

RECOMMENDATIONS

- Plant tree species that have been shown to be more wind and ice resistant. Wind resistance is defined as the ability or capacity of a tree to survive (remain standing and living) storm-force winds, which means that they do not easily uproot or break in the winds. Ice resistant trees are less susceptible to breakage under ice-loading.
- Consider removing over-mature and hazardous tree species that have demonstrated poor survival in storms. This is especially true if trees are over-mature, endangering lives and property, and belong to the lowest wind/ice resistance classes.
- When a tree fails, plant a new tree in its place. The healthy urban forest this will create, with its mixture of young and mature trees, will provide benefits such as good canopy cover, diversity, and mitigation of high winds.
- Become familiar with the recommended tree species and how they perform in natural and urban ecosystems in your community. The same species in different locations may behave differently due to soils, climate, local disease problems, and other factors.
- Consider planting wind/ice resistant native species. Native trees should receive strong consideration when selecting trees for the urban forest. Additional benefits of using native species include their values for wildlife and native ecosystem conservation.

4. Tree age, vigor, maturity, pruning, defects etc all affect failure

Older trees are more likely to fail in storms. As trees grow and age, they become more susceptible to insects and diseases, branches and parts of the tree begin to die, they become less flexible, and they may be more vulnerable to winds.

Unhealthy trees are easily damaged in storms. Trees with decayed root systems, stem decay, or large dead branches are vulnerable to storm damage. Decay, a major cause of tree failure, is caused by fungi that weaken wood. Cracks, seams, butt swell, dead branch stubs and large, older wounds suggest internal decay.

Poor structure trees (co-dominant stems, included bark) are more likely to fail in storms. Also, poor pruning practices, such as topping or removing large branches, make trees more susceptible to wind failure.

RECOMMENDATIONS

- Remove hazard trees before the wind does. Have a certified arborist inspect your trees for signs of disease and decay.
- For a more wind and ice resistant, sustainable landscape, plant high-quality trees with central leaders and good form. Follow with a preventive structural pruning program of young and mature trees.
- Select the right tree for the right location to avoid poor pruning practices. To allow healthy crown development, plant considering the aerial space needed for a mature-sized tree.

5. Soil and rooting conditions affect failure

Trees with greater rooting space fail less. One of the most important factors in designing a healthy urban landscape is also probably the one most often overlooked —that is providing enough soil space for tree roots to grow. Good soil conditions help trees to survive major storms. Trees without deep roots can become unstable and fall over in strong winds. Trees in shallow soils are more likely to blow over than trees rooted more deeply. Trees planted in compacted soil grow very poorly and are weak and unhealthy. This is especially true when the soil is poorly drained or the water table is high. Additionally, damaged root systems make trees vulnerable to high winds.

RECOMMENDATIONS

- Give trees enough rooting space based on their mature size
- Make sure that planting sites have 3 feet of soil depth with a deep water table to allow healthy root system development.
- Keep soil compaction to a minimum.
- Consider structural soil or structural cells for tree pits and planting areas.
- Do not damage or cut main support roots during construction. Never cut roots closer than the distance of 5 times the trunk diameter. Be aware that when tree roots are cut, the anchoring system of the tree may be harmed and compromised.

Understanding these lessons, we can adapt our Urban Forest Management techniques to better prepare our urban forests for a natural disaster.

COMMUNITY FOREST STORM MITIGATION PLAN

We encourage the City of Hudson to include the urban tree resource and its professional management in local disaster plans, or to create a stand-alone community forest storm mitigation plan. This plan should incorporate all FEMA guidelines as well as local NYS Emergency Management directives, and have an ICS (Incident Command System) with no conflicting recommendations.

A template of the Community Forest Storm Mitigation Planning, Guide for Communities is included in the appendix of this CFMP. The template is intended as a tool for guiding the Hudson NY community through the development of a Community Forest Storm Mitigation Plan and as a basic plan framework. The Community Forest Storm Mitigation Planning Workbook that accompanies the template includes step-by-step instructions for completing the template. You can access the workbook and template through the Green Infrastructure Center's (GIC) website at www.gicinc.org/storm_mit.htm. Additionally, both the workbook and template are available at the U.S. Forest Services, National Urban and Community Forestry Advisory Council (NUCFAC): https://urbanforestrysouth.org/resources/nucfac/forest-storm-mitigation-manual-workbook-and-template.

As you fill in the blanks, check off completed activities, and circle the appropriate selections within brackets, you will begin the assessment of your storm readiness and the development of your plan. You can address the gaps in information, activities and programs that become apparent as you go through the template and then begin to further develop your community forest management program with storm mitigation in mind. Recommendations from the section above should be assimilated into your plan.

After completing as much of the template as possible, you can either use it as is or use the Word document version of the template available on the GIC or NUCFAC website to write a final Community Forest Storm Mitigation Plan. Your completed template or plan should be distributed to and implemented by the storm mitigation team you've assembled during the process. As community forest and storm mitigation program elements are further developed and changes are made in programs and procedures, you can revise your plan to keep it up to date. An annual review is recommended.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CHAPTER SIX

APPENDIX

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Current Urban Forest Management Planning Documents and Legislation of the City of Hudson

See attached documents

Community Forest Storm Mitigation Planning; Guide for Communities

See attached document

DEC list of Street Trees Not Recommended for Planting

See attached document

Forest Inventory Data

See attached file

CITY OF HUDSON, NY

TREE INVENTORY &
COMMUNITY FOREST MANAGEMENT PLAN

LBS (Land Beyond the Sea) Ecological, on behalf of the City of Hudson, NY has prepared this Community Forestry Management Plan as a technical and planning document for street and park trees located within the City of Hudson.

As a technical guidance document, the Community Forest Management Plan identifies current conditions of urban trees within the City. As a planning document, the Community Forest Management Plan provides a baseline of information regarding the issues, opportunities, and constraints for Urban Forestry in Hudson, and identifies and provides management recommendations. Ultimately, the purpose of this document is to provide a framework within which the City of Hudson can wholly manage the community forest and trees.