



Town of Greenfield, MA Baseline Tree Inventory February 2014



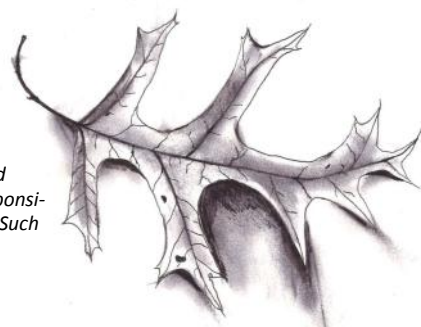
A Sustainable Franklin County

Green Infrastructure Implementation Project

funded by a HUD Sustainable Communities Grant

With support from the Greenfield Directors of the DPW and the Department of Planning and Development, the Greenfield Tree Warden, and the Greenfield Tree Committee.

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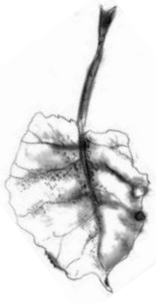
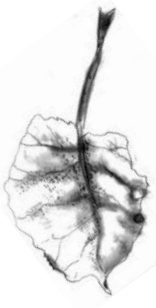


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Introduction and Purpose

There has been ongoing enthusiasm for conducting an inventory of street trees in the Town of Greenfield. The Directors of the Greenfield DPW and Department of Planning and Development, as well as the Greenfield Tree Warden and the Greenfield Tree Committee all recognize the value of having a baseline inventory from which to plan and take action. These groups identified many purposes and goals for conducting the inventory. They include:

- * Establishing a baseline with which trends—such as trees removed and trees planted—can be compared
- * Considering street trees as part of the Town’s overall green infrastructure
- * Helping the DPW manage maintenance and planting schedules
- * Helping the DPW to set planting goals and determine budgets
- * Supporting claims to FEMA in the case of significant losses due to severe weather and other hazards
- * Supporting applications for funding tree planting and planning projects





Methodology

The baseline tree inventory was conducted in the fall of 2013 by FRCOG staff. Greenfield's Director of the DPW, Tree Warden, and Director of Planning and Development—as well as the Greenfield Tree Committee—provided input on the data that should be collected as part of the inventory.

Project area: The project area was defined as all street trees located on or within the bounds of Silver, High, Main, and Elm Streets.*



* A phase 2 baseline inventory should include any densely populated areas on the perimeter of the project area



Methodology (cont.)

Technology used:



Data was collected using [Collector for ArcGIS](#) on an Android device. A GIS-based map which included a tree layer with data fields, a street base map, parcel data and impermeable surfaces was created and shared on ArcGIS Online. The map was accessed in the field with an Android phone. Each tree was inventoried and saved as a data point on the map, which was automatically synced with the online map.



The Town of Greenfield's DPW was provided the final baseline data and shapefile. They have since shared the map on their server. The Greenfield Tree Warden can access the map with his tablet and can input additional information on each tree, such as any maintenance that is performed. The new data should be saved annually so that the data can be compared from year to year.



Methodology (cont.)

Data fields:

ID: Unique identification number

Lat/Long: Latitude and longitude point data

Inventory Date: Date of baseline inventory

Street: Street name and corner location, where appropriate

Street Number: Nearest street number

Genus: Scientific genus name

Species: Scientific species name

Common: Common Name, Cultivar

DBH: Diameter to nearest inch at 4-½ feet above the ground

Tree Height: Estimated height rounded to the nearest 5' foot Increment

Tree Age: A rough estimate of tree age (see age calculation in box)

Condition: Ratings based upon visual inspection. Actual condition to be determined by tree warden or arborist.

G = Good to excellent

Fair = fair to good

X = Requires tree warden inspection

Overhead Utilities: Overhead utilities at the tree site.

y: Yes. Overhead utilities are present at the site.

n: No. Overhead utilities are not present at the site.

Sidewalk: Tree roots have disrupted sidewalk.

n: No disruption present

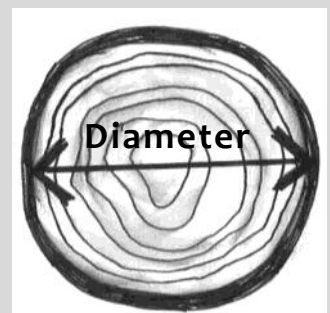
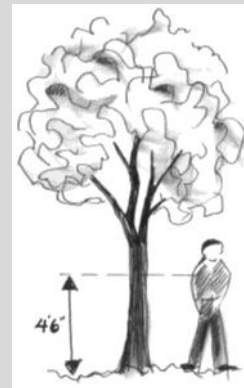
m: Minor disruption present

s: Significant disruption present

Notes: Any distinctive characteristics or immediate needs

$$\text{Age}^* = \text{DBH} \times \text{growth factor}$$

An estimate of tree age was determined using a formula published by Missouri Department of Conservation and growth factors by the International Society of Arboriculture.**



*Note: Ages are approximate given the significant variation in the growth rates of individual urban trees.

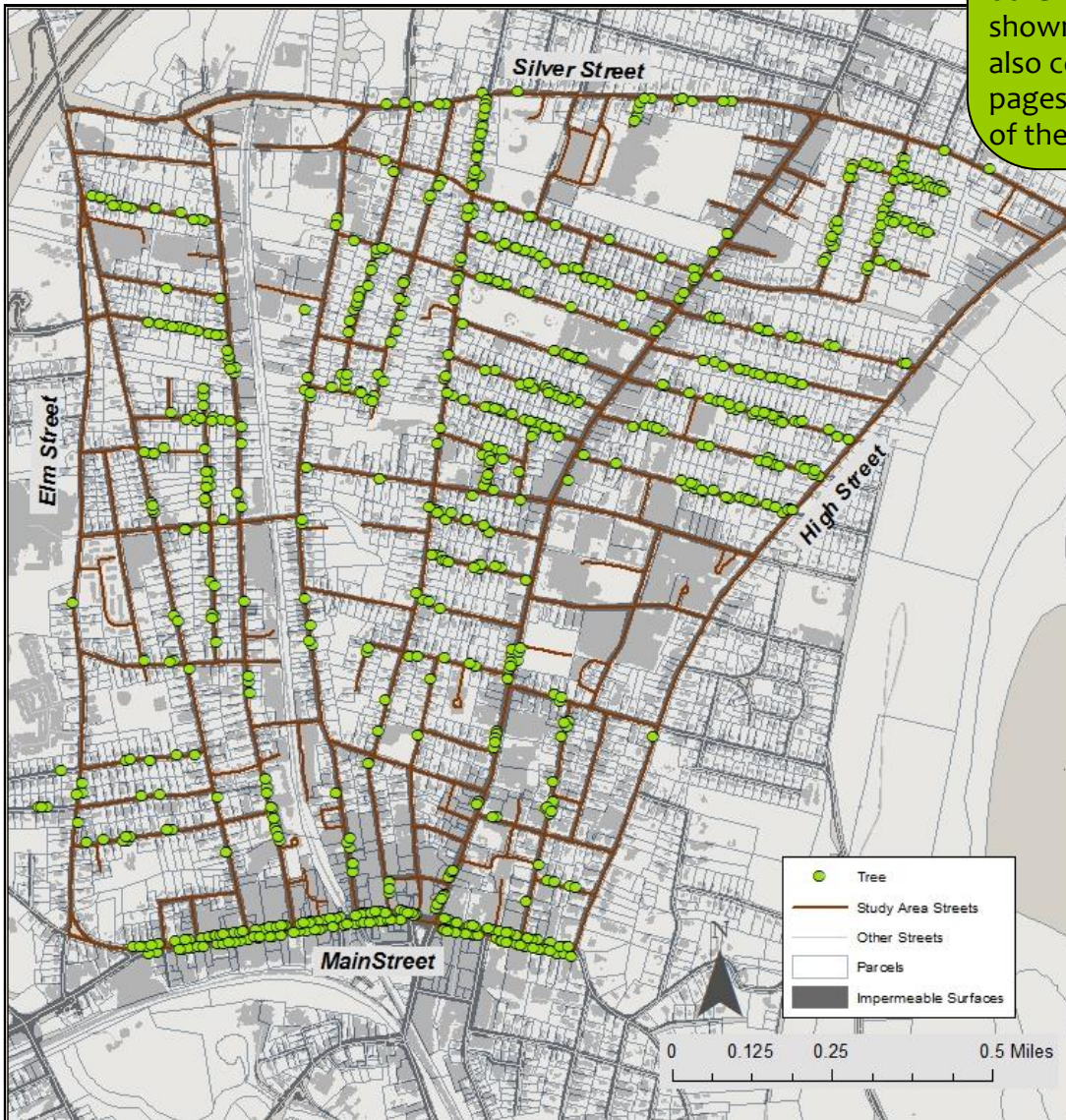
** See Appendix for Tree Growth Rate table



Findings

Total trees inventoried: 752

A total of 752 trees located on town-owned land (primarily tree strips) were geo-located, identified by genus, species, and common name. Data such as DBH, height, condition and other properties (complete list shown on previous page) were also collected. The following pages analyze the implications of the findings.



Main Street and the northernmost block of Davis Street have distinctly different conditions where trees are concerned, as compared with the rest of the project area. Main Street trees are faced with more challenging growing conditions than other parts of town (high pedestrian traffic, vandalism, inadequate tree pits, lack of water, etc) and die more frequently. Main Street trees are prioritized for replacement more often than other areas of town, especially given their importance in the overall appearance of downtown.

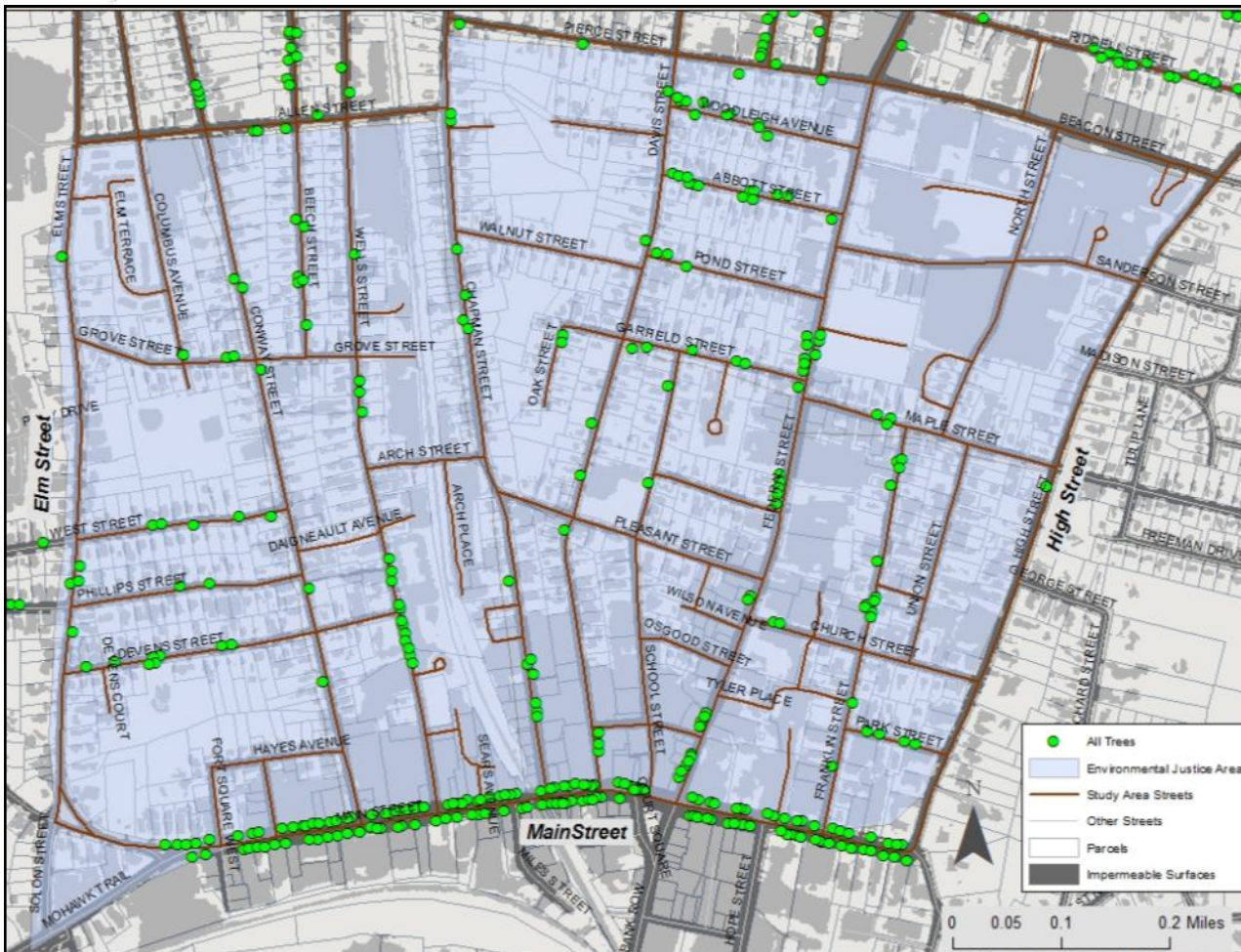
The northernmost block of Davis Street's trees are also outside the norm of the rest of the project area. A microburst in the early 2000s destroyed the street trees in that area. They were replaced in a single planting, leaving that part of Davis with a distinctly younger and more populated tree population than other parts of town. For these reasons, data is presented at times with Main Street and the northernmost block of Davis Street omitted from the analysis.

Note: See the Appendix for the complete baseline tree data.



Findings

Trees and Environmental Justice



Environmental Justice Populations

Based upon census data, Environmental Justice Populations are defined as those people who meet criteria related to income, race, residency, and/or language. In the case of Greenfield, EJ populations have been identified based upon income (households earn 65% or less of the statewide household median income). Mapped in the blue overlay above, EJ populations are located in the lower half of the project area.

EJ populations can often face challenges above and beyond limited wealth. Frequently, EJ populations may be subjected to conditions such as substandard housing, living next to highways and railroads, having more impermeable surfaces (parking lots) and having undesirable businesses or industry located in their neighborhoods.

In considering the relationship between trees and EJ populations, areas with fewer street trees typically have lower property values, have higher summer cooling costs, and are less pleasant for pedestrians. This map shows the segments of streets located within EJ areas that lack street trees. The Town should consider prioritizing these areas for replanting. Major streets which should be prioritized include the north/south streets including Elm, Conway, Chapman, Davis, North, Union, and the north part of Federal Street. East/west streets include Beacon, Pierce, Sanderson, Maple, Pleasant, Pond, and Church.

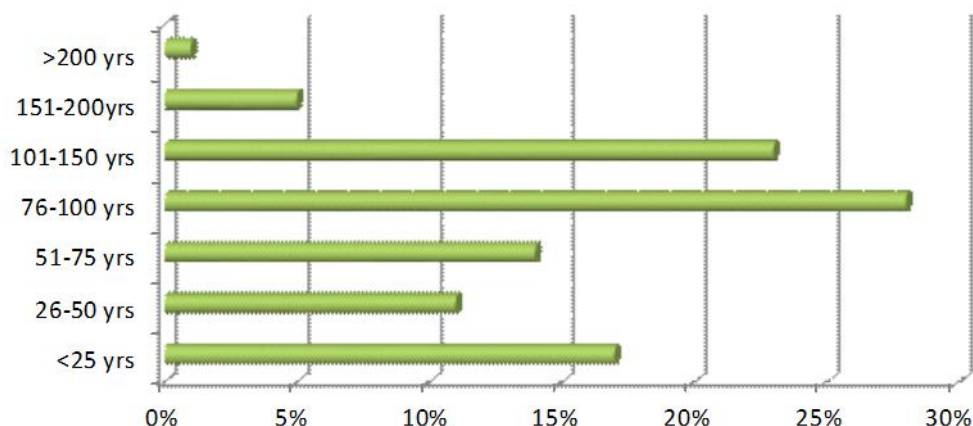
Note: This list is not all-inclusive. Further study of planting conditions and other factors is needed.



Findings

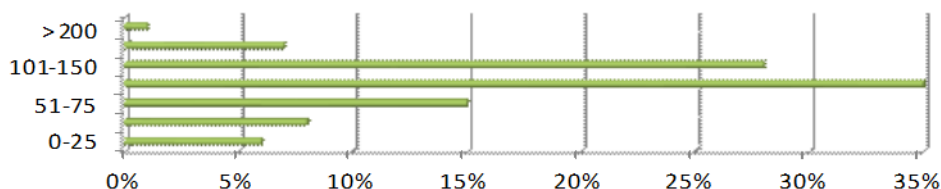
Tree age*

Tree Age: Percent of All Trees



71% of all trees are **over the age of 50.**

Tree Age: Percent of All Trees except Main St and north block of Davis Street



Factoring out Main and north Davis, **86%** of all trees are **over the age of 50**

Implications:

A low diversity of tree age—and a large percentage of older trees—means that trees could die out in large numbers as they reach the end of their lives and/or succumb to stressors common to street trees.

A population of street trees with diverse ages will only be achieved if the Town of Greenfield pursues an aggressive planting plan. Planting must outpace tree death / removal for many years to come in order for the Town to methodically address the lack of street tree age diversity.

Town of Greenfield Tree Planting Stats 2013

Trees Planted: 17

Trees Removed: 52

Data provided by Greenfield DPW

*Approximate age. See page 8 for notes on method for determining tree age.

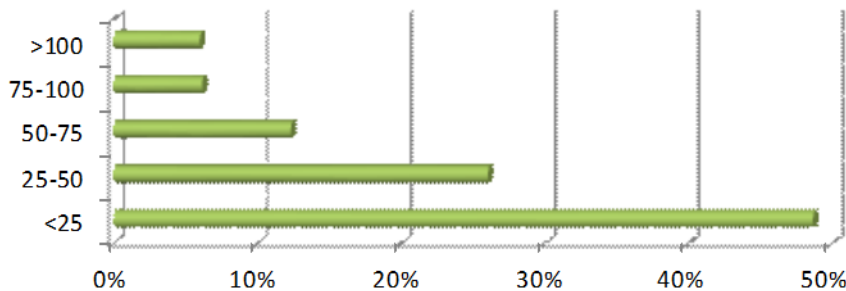


Findings

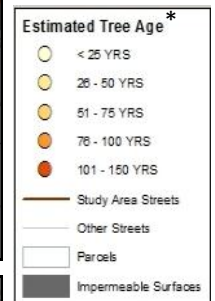
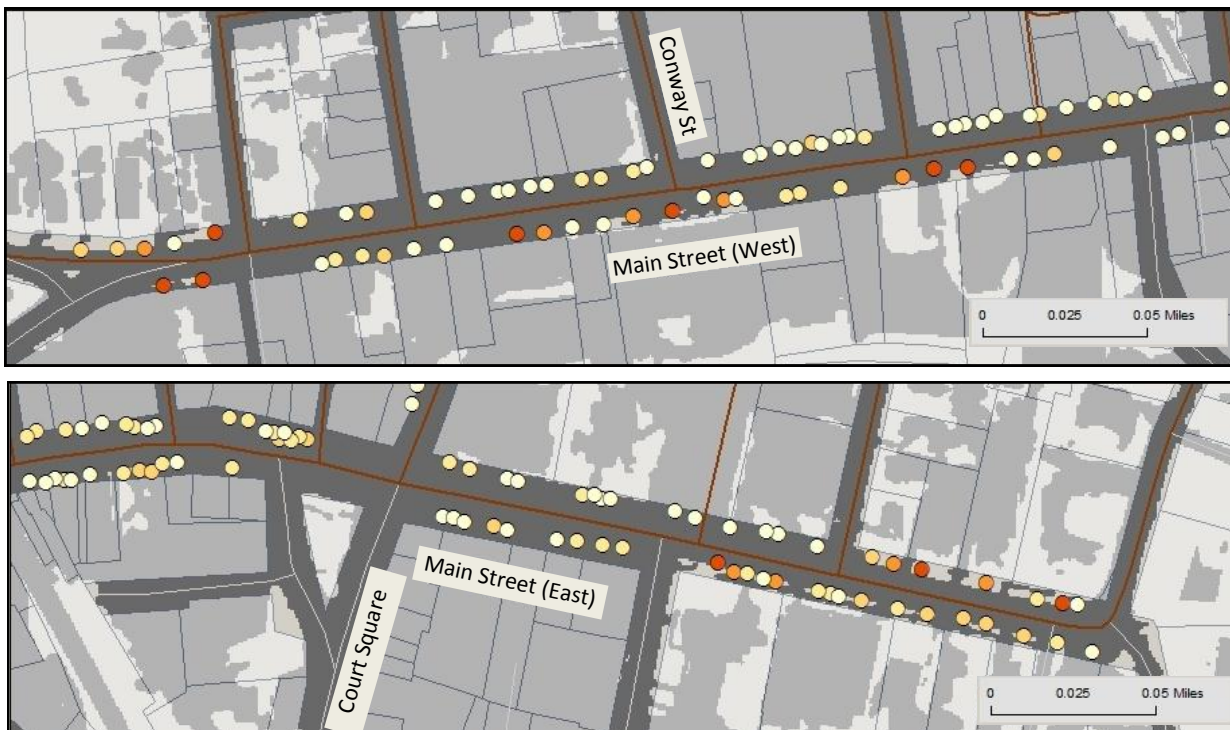
Tree age - Main Street

Total trees inventoried on Main Street: 145

Tree Age: Percent of All Trees on Main St



76% of all trees on Main Street are **under the age of 50.**



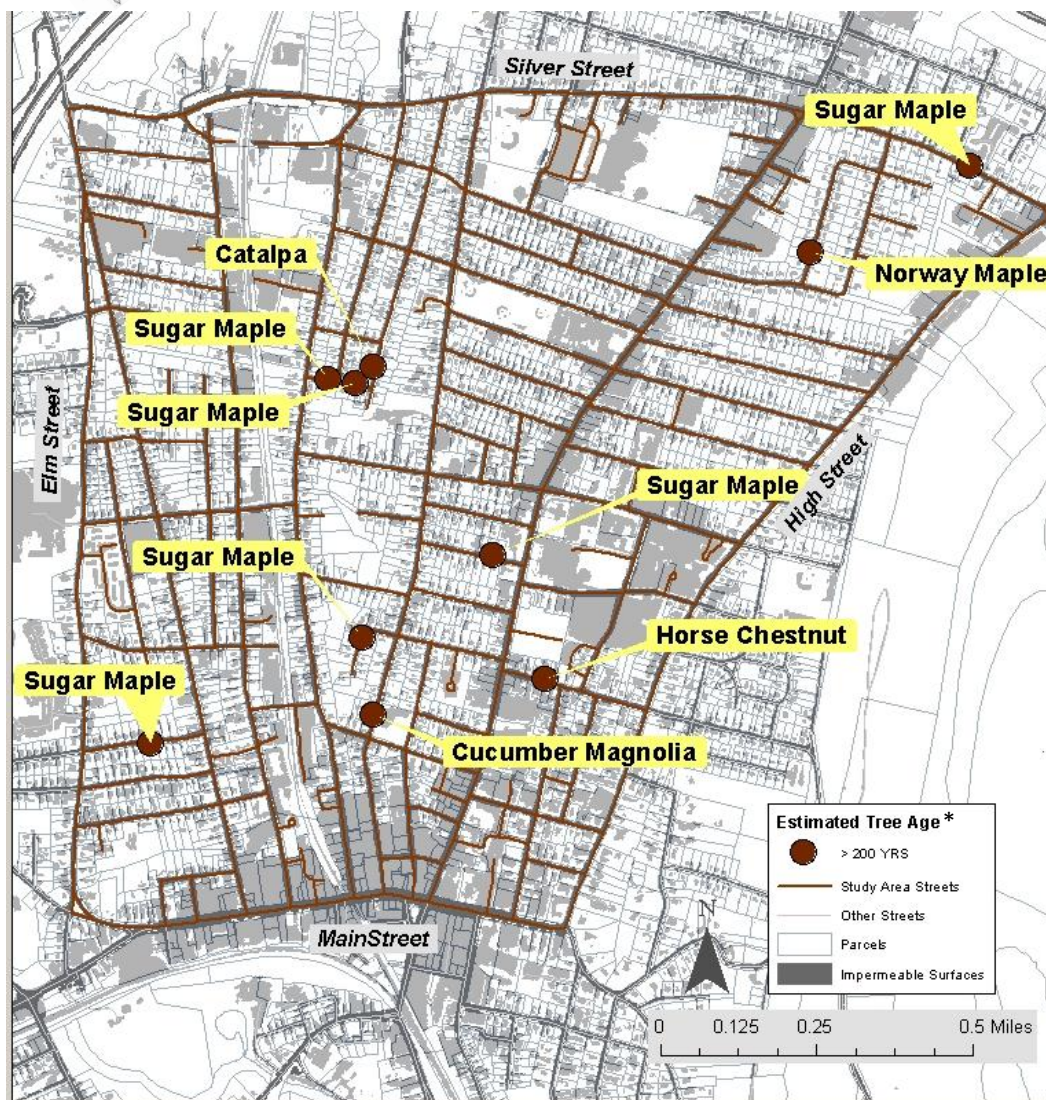
**Approximate age. See page 8 for notes on method for determining tree age.*

Implications: With over 3/4 of all of Main Street’s trees under the age of 50, most do not achieve an adequate height or spread to provide significant green infrastructure benefits that larger trees provide, including reducing energy use, reducing stormwater runoff, improving air quality, providing habitat for pollinators and song birds, and enhancing human health and well-being. Challenges to Main Street’s trees longevity include poor soil quality, small tree pits, soil compaction, inadequate water, vandalism, and injuries caused by cars, bikes, and plows.



Findings

Tree age - the matriarchs



The ten “matriarchs” of Greenfield’s tree population—trees estimated to be greater than 200 years old—are located throughout the project area. Six of the ten are sugar maples (*Acer saccharum*) - especially noteworthy given that sugar maples account for less than 9 percent of the project area’s total tree population. There is also one Norway maple (*Acer plantanoides*), one horse chestnut (*Aesculus hippocastanum*), one catalpa (*Catalpa speciosa*), and one cucumber magnolia (*Magnolia acuminata*).

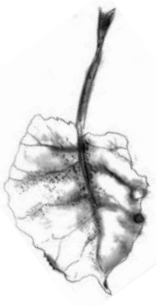
*Approximate age. See page 8 for notes on method for determining tree age.

Cucumber Magnolia (*Magnolia acuminata*)

These trees are native to eastern North America and reach their greatest size in moist soils of slopes and valleys in the mixed hardwood forests of the southern Appalachian Mountains. They are widespread but not abundant. Unusual in urban settings, the (likely) sole cucumber tree in Greenfield is perched above a sidewalk across the street from the Davis Street School. The tree is so named because of its cucumber-shaped fruits, which develop after white flowers bloom singly at the ends of the tree’s branches. The massive cucumber magnolia on Davis Street is a stunning species and is worth a visit!

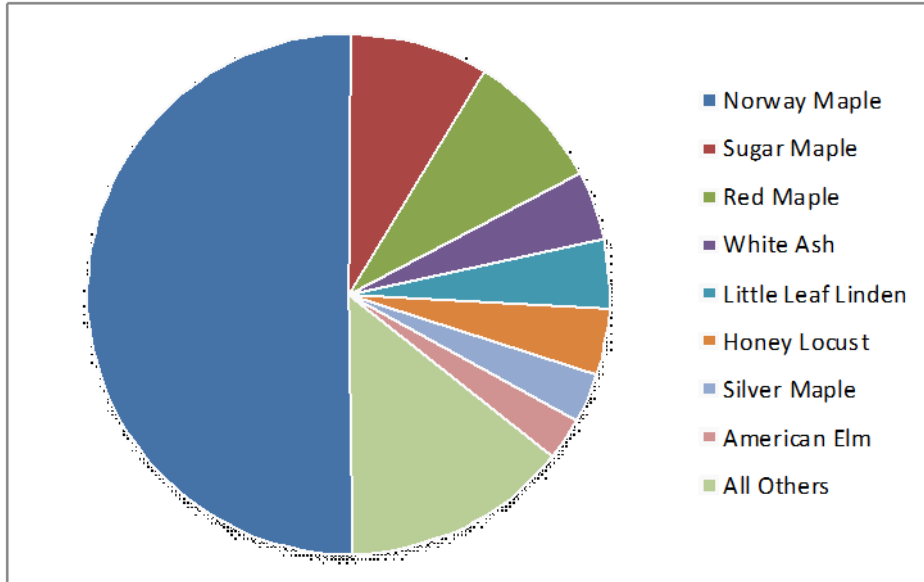


Source: www.wikimedia.org/commons



Findings

Tree Species



51% of all trees in the project area are **Norway maples**.

Implications: With over 1/2 of all trees in the project area identified as **Norway maples** (*Acer platanoides*), Greenfield's street trees lack a healthy species diversity. As seen throughout history, lack of tree species diversity can have catastrophic consequences. Historic photos of Greenfield show stately elms lining its streets. Because so many street trees were elms, Dutch Elm Disease, introduced into the states in the 1930s, had a devastating impact on the Town's stately elms, most of which succumbed to the disease. In the project area, only 20 American Elms (*Ulmus americana*) were identified.

In addition to the large percentage of Norway maples contributing to lack of tree species diversity in Town, they are also non-native trees and are considered invasive. They are listed on the MA Department of Agricultural Resources **Massachusetts Prohibited Plant List**, which prohibits the importation, sale, and trade of the plants. Individual trees can produce large quantities of seeds that are dispersed by wind and invade forests, forest edges, and urban areas alike. The dense canopy formed by Norway maple inhibits the regeneration of sugar maples and other diverse tree species, important to our mixed hardwood forests.

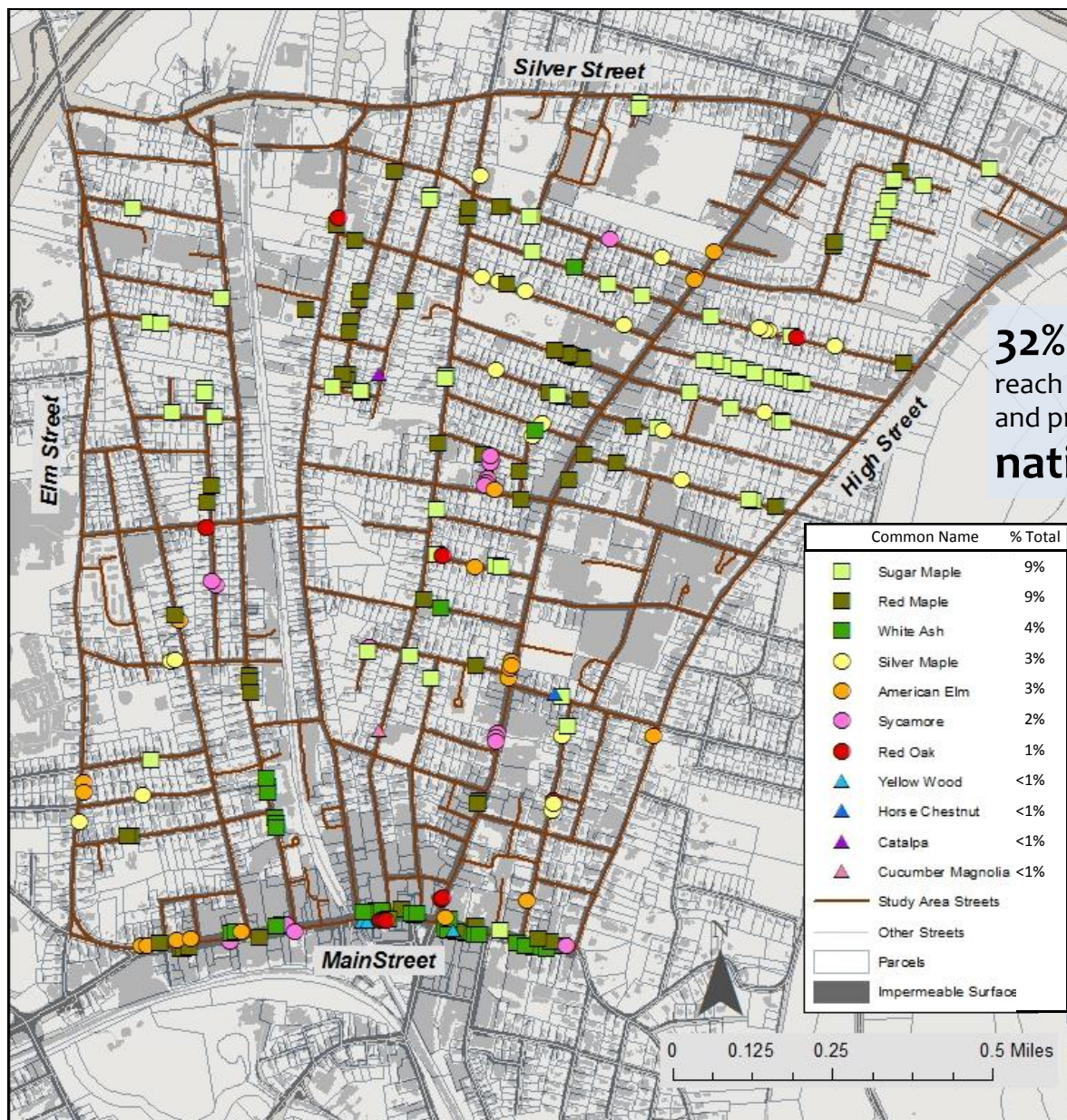


Norway maple (*Acer platanoides*), which makes of 51% of street trees in the project area, is on **Massachusetts Prohibited Plant List**.



Findings

Tree Species - Native Shade Trees



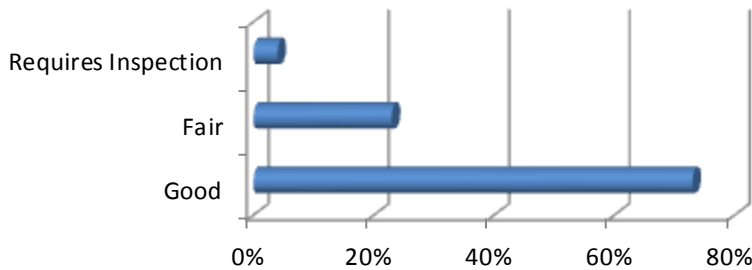
Implications: Greenfield is graced with a number of native trees—32% of all street trees—which typically reach sizes substantial enough to provide significant shade. They are listed above in descending order of prevalence. Shade trees, particularly native species, are important to Greenfield for the ecological services and the green infrastructure functions they provide. As Greenfield plants more street trees in the coming years, selecting native species that will grow to have a significant canopy is particularly important, especially given the anticipated impacts of climate change. More research into climate change-resilient and insect-tolerant native tree species should be conducted so that trees planted by the Town have the best possible chances of survival.



Findings

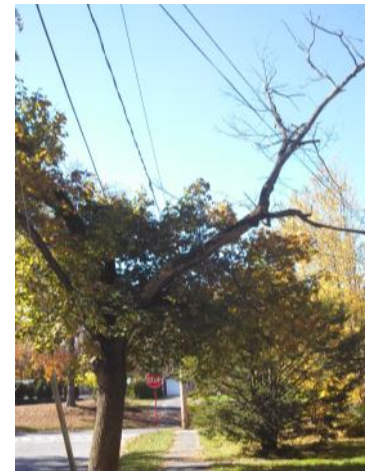
Other Tree Stats

Tree Condition* - Percent of All Trees



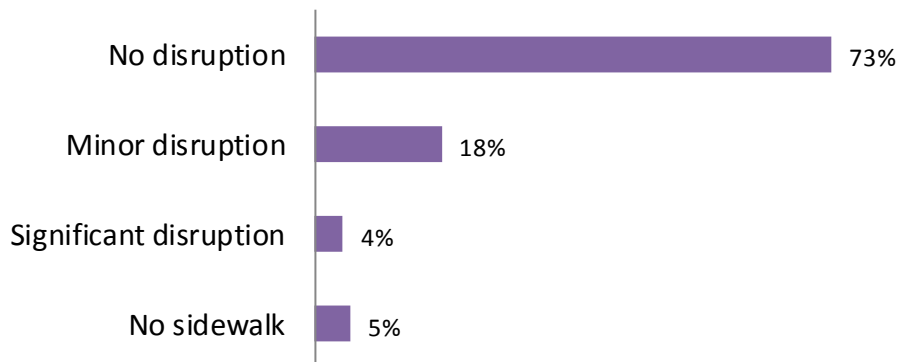
*Tree condition was determined based upon an informal visual assessment. Actual condition should be determined by the Greenfield Tree Warden or other certified arborist.

An informal assessment was conducted of tree condition. While most trees were judged to be of good or fair condition, about four percent of trees were rated as needing an assessment by the Greenfield Tree Warden, due to visible signs of severe rot, deterioration, or dead or hanging limbs, potentially posing a risk to pedestrians. Many of the trees deemed fair were assessed as such due to heavy pruning, misshapen forms and other similar factors.



Trees with conditions rated as needing assessment by the Greenfield Tree Warden included those with substantial rot and broken and dead limbs.

Sidewalk Disruptions



Sidewalks were assessed for damage or disruptions due to the proximity of trees and tree roots. Seventy three percent of street trees were adjacent to sidewalks that showed no disruption, eighteen percent were adjacent sidewalks with minor disruptions, and four percent were adjacent sidewalks with significant disruptions. Five percent were located where sidewalks were not present.



Recommendations

Based upon the findings of this Baseline Tree Inventory, the following goals and strategies are recommended:

| Goals | Strategies | Responsible Group |
|---|--|---|
| Use the baseline inventory. | | |
| | Utilize inventory results to help plan priority tree maintenance needs. Any trees receiving an “x” rating for condition should be prioritized to be formally assessed by the tree warden. | DPW; Tree Warden |
| | Utilize baseline tree inventory to track tree condition, maintenance and planting via a tablet or Smartphone , updating annually with an annual report and datalayer. | DPW; Tree Warden |
| | Incorporate street trees into overall strategies to improve or add new green infrastructure elements to Town. | DPW; Dept. of Planning and Development |
| Build on the baseline inventory. | | |
| | Seek funding to conduct a phase 2 baseline tree inventory to include any densely populated areas and/or streets on the perimeter of the project area. | DPW; Tree Warden; Dept. of Planning and Development; Tree Committee; FRCOG |
| | Seek funding to conduct a Town-wide tree planting and maintenance plan, including priority planting areas and best planting and maintenance practices, as called for in the 2013 Sustainable Greenfield Master Plan. | DPW; Tree Warden; Dept. of Planning and Development; Tree Committee; FRCOG |
| Pursue a substantial tree-planting initiative. | | |
| | Dedicate a funding stream for tree planting. | DPW; City Council |
| | Pursue targeted funding for planting trees in Environmental Justice Areas. | DPW; Tree Warden; Dept. of Planning and Development; Tree Committee; FRCOG |
| | Pursue funding for tree planting with the goal of improving the conditions and beauty of walking and biking routes to encourage more walking and biking. | DPW; Tree Warden; Dept. of Planning and Development; Tree Committee; GBA; FRCOG |
| | Once good tree coverage has been achieved, improve the tree canopy by planting three trees for each tree that dies or is removed. | DPW; Tree Warden |
| Educate and involve the public. | | |
| | Conduct public education and outreach extolling the benefits of trees. | DPW; Tree Warden; Dept. of Planning and Development; Tree Committee; FRCOG |
| | Recruit new members to the Tree Committee and pursue partnerships with existing Town groups. | Tree Committee |
| | Maintain Greenfield’s Tree City USA status. | DPW; Tree Warden; Dept. of Planning and Development; Tree Committee |



Appendices

Tree Species Growth Factors

| Tree | Growth Factor |
|--|---------------|
| American beech | 6 |
| American beech | 6 |
| American elm | 4 |
| American sycamore | 4 |
| Austrian pine | 4.5 |
| Black cherry | 5 |
| Black maple | 5 |
| Black walnut | 4.5 |
| Bradford pear (invasive non-native, not recommended) | 3 |
| Common horsechestnut | 8 |
| Colorado blue spruce | 4.5 |
| Cottonwood | 2 |
| Douglas fir | 5 |
| European beech | 4 |
| European white birch | 5 |
| Green ash | 4 |
| Ironwood | 7 |
| Kentucky coffee tree | 3 |
| Littleleaf linden | 3 |
| Northern red oak | 4 |
| Norway maple (invasive non-native, not recommended) | 4.5 |
| Norway spruce | 5 |
| Pin oak | 3 |
| Redbud | 7 |
| Red maple | 4.5 |
| Red pine | 5.5 |
| River birch | 3.5 |
| River birch | 3.5 |
| Scarlet oak | 4 |
| Scotch pine | 3.5 |
| Shagbark hickory | 7.5 |
| Shagbark hickory | 7.5 |
| Shingle oak | 6 |
| Shingle oak | 6 |
| Shumard oak | 3 |
| Silver maple | 3 |
| Sugar maple | 5.5 |
| Sweet gum | 4 |
| Tulip tree | 3 |
| White ash | 5 |
| White fir | 7.5 |
| White oak | 5 |
| White pine | 5 |
| Yellow buckeye | 5 |

*A growth factor is an estimated rate of tree growth based on species and location. The growth factors listed above are more accurate for forest-grown trees, which grow thinner than street trees. Stressed trees from urban situations—such as inadequate soil, damage or topping—will grow slower and weaker than healthy trees.

Source: <http://mdc.mo.gov/your-property/your-trees-and-woods/backyard-tree-care/how-old-tree>



Appendices

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October 21, 2013

Greenfield takes stock of its downtown trees

By DIANE BRONCACCIO
Recorder Staff

GREENFIELD — If you want to know how important trees are to a town landscape, look at old photos of Main Street, where stately elms once created what Nancy Hazard calls “a cathedral of shade” above both the roadway and pedestrians.

The Dutch elm disease destroyed that “cathedral,” but the Greenfield Tree Committee, with assistance from the Franklin Regional Council of Governments, is hoping to restore the tree canopy, with a wider variety of trees, for downtown streets and neighborhoods.

With a \$7,500 HUD Sustainable Communities grant, FRCOG Land-Use Planner Mary Praus is com-

pleting a “tree inventory” that will support both the town’s “green” infrastructure and its beautification plans.

Praus says she is now mapping street trees from Main to Silver Street, and between Elm and High streets. Each tree is being identified by its GIS (Geographic Information System) coordinates, so that the tree locations can be overlaid on aerial maps, streets and utilities, and will help the town’s Department of Public Works keep track of priority areas for tree-planting and maintenance.

Also, in the event of another major storm like Irene or Sandy, the baseline tree assessment could be used to document damage, so that the town can apply for FEMA (Federal Emergency Management Agency)



This view of the corner of Main Street and Bank Row in Greenfield, circa 1890s, shows stately elms towering over downtown buildings.

file photo

reimbursement.

“The inventory will be incredibly useful to the DPW,” said DPW Director Art Baker. “Once we have an inventory, we can create a budget

for tree maintenance and replacement, more easily communicate work that needs to be done and keep

See TREES Page C2

Trees: ‘Aim is to have a 40 percent tree canopy’

From Page C1

track of work accomplished.”

The baseline assessment of trees includes each tree’s genus, species, and size. With about three-fourths of the trees already inventoried, Praus said she’s come across some surprises.

“I would say about 80 percent of the trees are mature trees — and there are very few young trees,” she said. “Also, there’s a huge gap in the diversity of the trees. Most are Norway maples.”

Norway maples were once popular trees that were widely planted on streets as replacements for the dying elms, because of their rapid growth and deep shade.

Now they are considered a non-native invasive species. Praus said a more diversified mix of trees is better for

towns: if all the trees are the same age, or of the same species, that could mean having to replace them all around the same time as they die off or, like the elms, are killed off by a common disease.

“Trees are a number-one priority in an urban environment,” said Hazard, of the

Greenfield Tree Committee.

“The aim is to have a 40 percent tree canopy. Urban centers tend to be about 10 degrees hotter in summer

than outlying areas, because of all the asphalt,” she said.

“If you have at least 40 percent tree canopy, that casts a shadow on these hard surfaces, so you get lower temperatures that are more comfortable to walk in — and you don’t have to run air conditioners as much or at all.”

She said trees also produce oxygen, filter out particulates

that cause respiratory problems, and improve rainwater absorption in the soil. They also create habitat for birds, insects and other wildlife.

Eventually, said Hazard,

the DPW will have a complete inventory that could include maintenance records, when and where trees have been planted and when they were taken down.

“Trees are a number one priority in an urban environment.”

Nancy Hazard
Greenfield Tree Committee