

***Town-Wide Public Tree Planting and Management Plan: Laying the Groundwork***

The project team, led by FRCOG staff, analyzed GIS data layers, maps and findings of the 2014 baseline tree inventory. FRCOG staff then conducted a windshield re-inventory of the baseline tree inventory project area, excluding Main Street. This document is intended to lay the groundwork and help the DPW and the Town to budget for the creation of a Town-Wide Street Tree Management Plan in the near future. Following are:

- Goals, recommendations and strategies, as well as priority levels and funding sources, for a street tree management plan
- Findings of the analysis and re-inventory
- Strategies for difficult-to-plant areas
- Proposed updated tree list

**Goals, Recommendations and Strategies for the Town of Greenfield**

Goals	Strategies	Responsible Groups(s)	Priority (High, Med, Low)	Potential Funding
Use the tree inventory and findings.				
	Utilize GIS existing GIS tree datalayers from 2014, as well as findings from this report to help plan priority tree planting needs.	DPW; Tree Warden; Town Engineer staff	High	Existing DPW budget
	Track tree removals and tree planting and update GIS datalayer regularly. Real-time tracking using Collector for ArcGIS.	DPW; Tree Warden; Town Engineer staff	High	Existing DPW budget
Build on the tree inventory.				
	Seek funding to conduct a phase 2 baseline tree inventory to include any densely populated areas and/or streets not included in the baseline inventory.	DPW; Tree Warden; Dept. of Planning and Development; Tree Committee; FRCOG	High	DCR Urban and Community Forestry Challenge Grant; District Local Technical Assistance/ 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	High	DCR Urban and Community Forestry Challenge Grant; District Local Technical Assistance/ FRCOG
Pursue a substantial tree-planting initiative.				
	Dedicate a more robust funding stream for tree planting and maintenance.	DPW; Town Council	High	Town
	Pursue targeted funding for planting trees in Environmental Justice Areas, shown on the map on page xx.	DPW; Tree Warden; Dept. of Planning and Development; Tree Committee; FRCOG	High	DCR Urban and Community Forestry EJ Challenge Grant
	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	Medium	DCR Urban and Community Forestry Challenge Grant; MassDOT; TD Bank GreenStreets
	Use techniques such as structural soil, root guards and tree break-out zones to improve the viability of trees and to reduce the potential for damage to sidewalks from tree roots.	DPW; Tree Committee	Medium-high	TD Bank GreenStreets; Foundation funding
	Avoid planting small-stature trees in sites where a shade tree can be accommodated, to increase the benefits of the tree.	DPW; Tree Warden; Tree Committee	High	N/A

Goals	Strategies	Responsible Groups(s)	Priority (High, Med, Low)	Potential Funding
	Update DPW’s standard practices and procedures for sidewalk and street construction / replacement to include street trees as a standard and necessary component.	DPW; Tree Warden	High	Existing DPW budget
	Include funding for tree planting for sidewalk and street projects in grant applications to MassDOT.	DPW; Tree Warden	High	MassDOT
<b>Increase staff and volunteers dedicated to trees.</b>				
	Hire a part-time tree warden who is not otherwise already employed by the Town of Greenfield, so that they can dedicate time to the job of Tree Warden.	Town Council; DPW	High	Town
	Collaborate to implement new tree watering initiatives to help reduce staffing demands on the DPW.	DPW; Tree Committee; Youth groups	Medium	DCR Urban and Community Forestry Challenge Grant; TD Bank GreenStreets; donations
<b>Educate and involve the public.</b>				
	Conduct public education and outreach extolling the benefits of trees.	Tree Committee; FRCOG	Medium	DCR Urban and Community Forestry Challenge Grant; District Local Technical Assistance/ FRCOG; New England Grassroots
	Recruit new members to the Tree Committee and pursue partnerships with existing Town groups.	Tree Committee	Medium	
	Maintain Greenfield’s Tree City USA status.	DPW; Tree Warden; Dept. of Planning and Development; Tree Committee	Medium	

## Analysis of 2014 Baseline Tree Inventory

The FRCOG conducted a re-inventory of the 2014 baseline inventory project area, with the exception of Main Street. The 2014 project area included all public street trees in the area bounded by Silver, High, Main and Elms Streets. Unlike the 2014 detailed physical inventory, the 2016 re-inventory was a “windshield inventory”, or an inventory taken from inside a car, confirming only whether trees inventoried in 2014 were still living.

Of the 676 inventoried in 2014 (not including Main Street), 108 trees have been removed. This is a 16% reduction in trees growing on tree belts in the project area. A substantial reduction in street trees was predicted in the 2014 inventory, based on the poor condition of many trees inventoried. Very few trees have been planted on tree belts during the same period of time. Data was not available from the DPW for locations and types of trees removed.

**16% of trees on public tree belts were removed between 2014 and 2016.**

### Re-Inventory of 2014 Baseline Inventory Project Area





## The value of the trees removed was nearly \$20,000 annually.

The 108 trees removed between 2014 and 2016 had a value of nearly \$20,000 a year in benefits.<sup>1</sup> These benefits include the gallons of stormwater intercepted, the amount of summer cooling costs saved due to shading from trees, and higher property values. Calculated over the next decade, the trees removed would have provided over \$200,000 in benefits.

Some streets in the project area were harder hit than others in terms of the number of trees removed. The map below shows the top four streets with the most removals. Of the 20 trees located on tree belts on Hastings Street, half of them were removed. These removals spurred objections from residents who were concerned about their street's decline in character and decreased property values. Haywood Street residents' concern about the rate of tree removals in recent years (one third of tree belt trees) spurred this year's volunteer street tree planting lead by the Tree Committee, during which about two dozen trees were planted.

Woodleigh Street residents have seen most of their street trees removed in the last two years. Of the ten trees that were present on tree belts, all but three have been removed. The DPW did plant a few small, ornamental trees, none of which will reach the stature of the shade trees that have been removed, and all but one of which were planted in private residents' front yards.

### Tree removals by street



### Tree removals by street: top four streets



<sup>1</sup> <http://www.treebenefits.com/calculator/index.cfm>



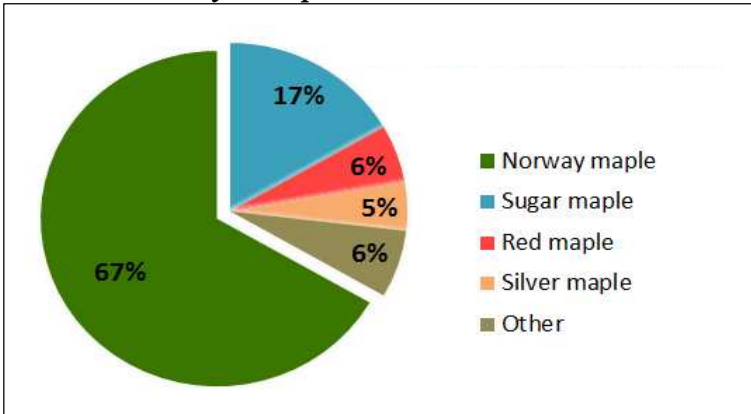
*Trees on Hastings Street were removed – almost all in the same season and with no new trees planted in their place.*



*Trees on Woodleigh Street were removed in 2016 as part of a sidewalk project, which has not yet been started.*



### Tree removals by tree species



Examining the trees by species, just over two thirds, or 67%, of the 108 trees removed were Norway maples. The 2014 baseline inventory found that over 50% of all tree inventoried were Norway maples and that many of them were in fair to poor condition.

In addition to Norway maples, other maple species were among the most prevalent species removed. Seventeen percent of all trees removed were sugar maples, while 6% were red maples and 5% were silver maples.

In 2015, the FRCOG updated Environmental Justice area data, those areas (census block groups) that have high concentrations of minority populations and/or low income households. These areas are often unfairly subjected to environmental and health hazards. Given the myriad of known environmental and health benefits of trees (better air quality, lower respiratory illnesses, better well-being and lower crime rates, to name a few) , a lack of trees in a neighborhood or street could be an environmental and/or health hazard.

### Tree removals in Environmental Justice areas



As illustrated in the map on the previous page, the lower half of the 2014 baseline inventory project area is classified as Environmental Justice areas, shaded in pale yellow. Within this Environmental Justice area, there are a number of streets, labeled in white, that have few or no trees on tree belts. They include Beacon, Chapman, Conway, Davis, Elm, Pond, Pleasant, School, Walnut and Woodleigh Streets. Photos of Pond and Woodleigh Streets, shown on the following pages, illustrate the appearance of streets without any trees on tree belts. People living on these streets may not experience some of the same benefits as those living on tree-lined streets, such a mental well-being, higher property values and lower cooling cost. Tree-lined streets, labeled in yellow, include Linden, Forest, Shattuck and Spruce Streets, to name a few. Any town-wide tree planting and maintenance plan should prioritize planting in Environmental Justice neighborhoods.

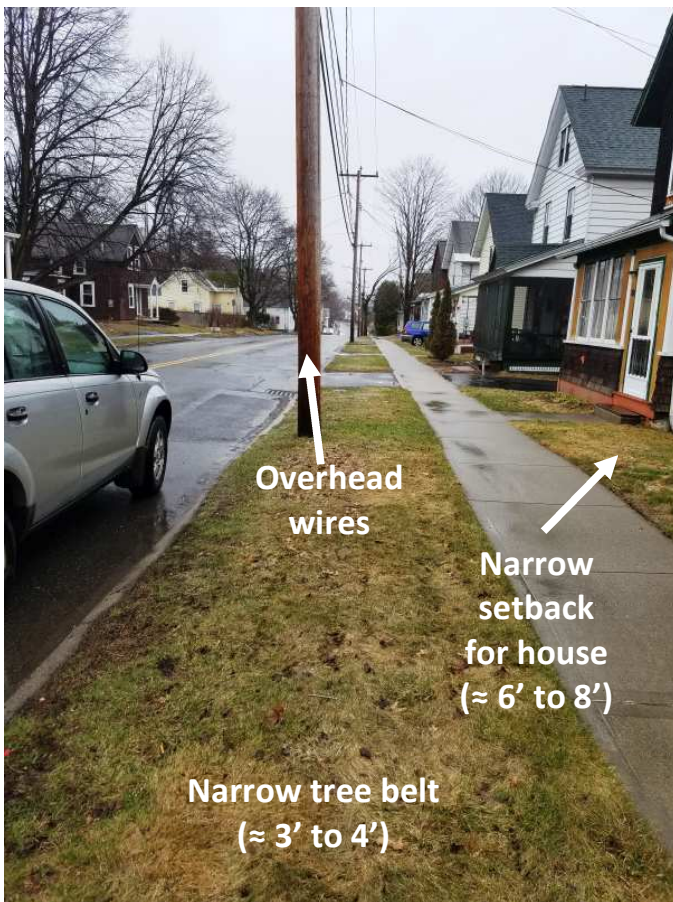


## Strategies for Difficult-to-Plant Areas

There are a number of obstacles to planting public trees in Greenfield, besides funding. Physical conditions make planting trees on some streets very difficult. Obstacles observed during field work include:

- Overhead and underground utilities
- Narrow tree belts
- Signs, intersections and driveways
- Proximity to buildings
- Soil compaction

In the left hand photo below, a relatively narrow tree belt (between three and four feet wide) and overhead lines make planting trees on this street somewhat challenging. These conditions are further complicated by houses that are set fairly close to the sidewalk, in some cases only six to eight feet. The right hand photo demonstrates a simple solution of using small stature trees with narrow forms in the tree belt as well as in willing property owners' front yards.



Design Challenge 1: Relatively narrow tree belts contain overhead wires. Houses are set very close to the sidewalk. No trees exist in front yards or on tree belts. Street is in an Environmental Justice neighborhood, based on the concentration of low income households.



Solutions for Design Challenge 1: Fund planting of trees species appropriate for the narrow spaces and short enough to grow under wires, such as Malus 'Red Jewel', a variety of crabapple, or the columnar Sargent Cherry, Prunus sargentii 'Columnaris'.

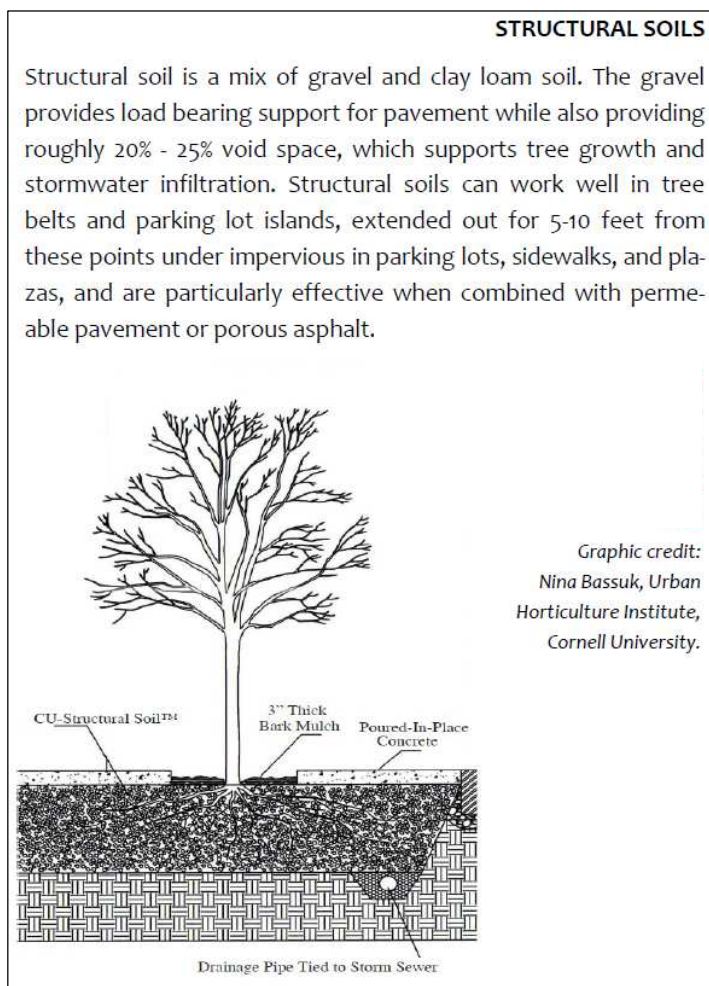
### Results of tree planting could be:

- traffic calming
- better sense of well-being for residents
- lower cooling costs
- more neighborhood pride and sense of ownership



In areas with narrow tree belts, smaller stature trees can be planted in tree belts, while shade trees could potentially be planted in set-back plantings in front yards. In set-back tree plantings, private property owners can give permission to allow a tree to be planted by the Town in their front yard, up to 20' back from the sidewalk. In Greenfield, a year after the tree is planted, maintenance becomes the responsibility of the homeowner. While this can result in a cost savings for the Town in maintenance costs, some private property owners may lack the financial resources to be able to take care of a set-back tree.

There are several strategies for improving the survival rate of trees in tree belts and for reducing the incidences of tree roots pushing up sidewalks. They include planting the right tree in the right place and using structural soil and tree break-out zones. In Greenfield's ***Low Impact Development: A Developer's Guide to Innovative Stormwater Management Techniques***, still in draft form, information is provided on the use of structural soil. Insets from two pages of the draft publication are shown on this page.



Structural soil replaces compacted soil – usually the top 24” to 36” of soil – and allows more spaces for roots to grow, without undermining sidewalks. In compacted soil, such as that found along tree belts and in parking lots, tree roots sometimes cannot penetrate the soil and end up either growing just below the surface or not growing at all.

In the case of tree break-out zones, structural soil can be used as a channel for roots to more easily grow under pavement into green spaces, such as from tree belts to front lawns. According to Cornell University's Using CU-Structural Soil™ in the Urban Environment, generally two 5' concrete flags are removed, then the area is excavated to 24”- 36” and structural soil is backfilled into them. Paving slabs are then replaced in a conventional manner. See the photo below.



*A tree root break-out zone is created between a tree belt and front lawn. Photo credit: N. Bassuk, B. Kalter, & P. Trowbridge*

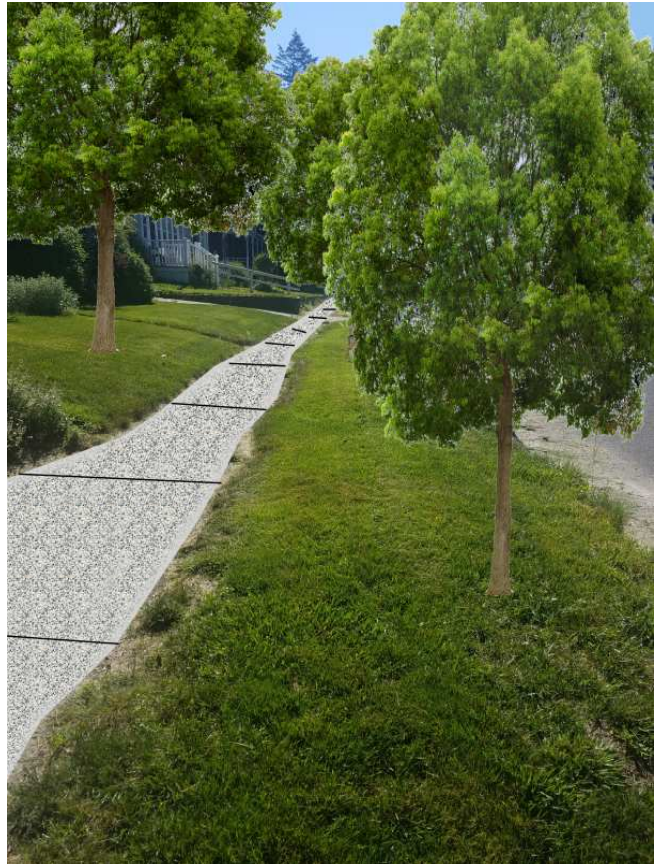
As Greenfield works to rebuild its urban tree canopy, the use of these techniques could help expand the areas in which the Town could plant trees. An investment in soil preparation prior to planting would likely be repaid by reducing repairs needed to sidewalks and reducing tree replacements in the future.

Another strategy for increasing the Town of Greenfield's urban tree canopy is to modify the standard practices and procedures followed by the DPW and its subcontractors in sidewalk and street projects. Adopting new practices and procedures which prioritize trees as integral elements of all sidewalk and street projects will help to rebuild the dwindling public tree populations. Strategies that could be employed to change practices include:

- Adopting a standard number of street trees needed/required per section of street
- Including trees in infrastructure funding requests
- Using small stature, ornamental trees only when conditions make it impossible to plant a shade tree
- Removing trees during sidewalk and street projects only as a last resort, instead standard operating procedure
- Creating a simple tree planting and protection plan for sidewalk and street projects
- Conducting outreach and seeking buy-in from residents for planting trees on sidewalk and street projects



Design Challenge 2: Sidewalk in need of replacement. Relatively wide tree belts with no overhead wires. House set-backs up to 20' back from sidewalk. On other side of street, relatively narrow tree belt under power lines. Wide street with no striping encourages faster traffic.



Solutions for Design Challenge 2: Tree planting plan developed during construction planning process. Funding sought for construction includes trees. Shade trees planted on wide tree belt as well as on willing property owners' front yards. Tree belt trees shade hardscape. New road striping and tree belt trees slow traffic speeds.



## ***Expanding the Selection of Approved Public Tree Species***

As part of preparing for a town wide planting plan, the Greenfield Tree Committee and FRCOG staff examined the existing Approved Public Tree Species list, maintained by the Greenfield DPW, and offered suggestions for modifying and increasing the list. The purpose for doing so was to increase the diversity of public tree species, increasing the resilience of the community's urban forest.

Following is the list as it currently appears with the Greenfield Tree Ordinance as part of the General Code of Greenfield:

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### **Large Trees 40'-80'**

- Red Maple: October Glory or Red Sunset
- European Hornbeam
- Honeylocust
- Ginkgo
- Tulip tree
- Red Oak, Pin Oak, Swamp White Oak
- American Elm(resistant)
- Zalkova
- Little leaf Linden
- London Plaintree
- Hackberry
- Black Tupelo
- Sweetgum

### **Medium Trees 30'-40'**

- Hedge Maple
- Golden Raintree
- Honeylocust (Medium size cultivar)

### **Small Trees under 30'**

- Serviceberry
  - Crabapple
  - Hawthorn
  - Japanese Lilac
  - Amur Maple
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The project team consulted recommended trees appropriate for Greenfield's growing conditions from a variety of sources including the Cornell Urban Horticulture Institute and the Cambridge and Worcester approved tree lists, in addition to recommendations from Mollie Freilicher, MA DCR Community Action Forester. The project team also evaluated availability of trees at area nurseries so as to avoid recommending trees that are not readily available to the public.

Recommendations for the existing tree list include removing trees from the list that are deemed invasive or for which there are good native alternatives, and adding trees that have proven to be vigorous and viable in more urban and/or suburban settings. What follows is the proposed new list of public tree species. Trees shaded in green are proposed additions, trees shaded in grey are proposed removals and those with no shading are trees that are currently on the Approved Public Tree Species list. The Greenfield Tree Committee is in the process of working with the DPW to update the list with these proposed changes.

White = Already on Greenfield Tree List

Green = Recommend adding to list

Grey = Recommend removing due to invasiveness or other qualities

Proposed Street Tree List

Scientific name	Common name	Recommended cultivars	Size	Under utility lines?	Shade tree?	Showy flowers ?	Form	Native to U.S.?	On Gfld Tree List?	Tree List Included on	Notes
Acer campestre	Maple, Hedge		M	n	n	n	broad, rounded	N	Y		Recommend eliminating - on Invasive Plant Atlas U.S.; also noted as invasive by Cornell
Acer saccharum	Maple, Red	Autumn Flame; Red Sunset	L	n	y	n	pyramidal to spreading	Y	Y	Cornell; NE	
Acer saccharum	Maple, sugar	Green Mountain; Legacy	L	n	y	n	rounded	Y	N	Cornell; Cambridge	for front yards - sensitive to salt / compacted soils
Acer x freemanii	Maple, Freeman		M-L	n	y	n	oval	Y	N	Cornell; Cambridge	Cross between red and silver
Amelanchier canadensis	Serviceberry	Regent; Autumn Brilliance	S	y	n	y	large shrub	Y	Y	Cornell; Worcester; Cambridge; NE	
Betula nigra	Birch, River	Birch, River	M-L	n	n	n	rounded to irregular	Y	N	Cornell; Cambridge; Molly	Very adaptable
Carpinus betulus	Hornbeam, European		L	n	y		oval	N	Y		recommend eliminating; use Carpinus caroliniana
Carpinus caroliniana	Hornbeam, American		S	y	n	n	spreading crown	Y	N	Cornell; Worcester; Cambridge	Best in part shade
Celtis occidentalis	Hackberry	Chicagoland; Prairie Sentinel	L	n	y	n	cylindrical	Y	Y	Cornell; Cambridge	
Cercidiphyllum japonicum	Katsura Tree		M-L	n	y	n	Oval, pyramidal	N	N	Cambridge; Molly	
Chionanthus virginicus	Fringetree		S	y	n	y	large shrub, rounded	Y	N	Worcester	
Cladrastis kentukea	Yellowwood		M-L	n	n	y	rounded	Y	N	Cornell; Worcester	disease free
Cornus kousa	Dogwood, Kousa	Rutgers Hybrid	S	y	n	y	rounded	N	N	Worcester	
Cornus mas	Cornelian Cherry		S	y	n	y	rounded	N	N	Worcester	
Crataegus viridis	Hawthorn, Green	Winter King and others	S	y	n	n	rounded, wide crown	Y	Y	Cornell	
Ginkgo biloba	Ginkgo		L	n	y	n	open, spreading branches	N	Y	Cornell; Worcester; NE; Cambridge	Use male trees only; disease and pest free
Gleditsia triacanthos	Honeylocust	Skyline; Shademaster	M-L	n	y	n	open, spreading branches	Y	Y	Cornell; Worcester; Cambridge; NE	
Hamamelis virginiana	Witchhazel		S	y	n	y	rounded	Y	N		
Koelreuteria paniculata	Golden Raintree		M	n	n	y	rounded to broad	N	Y	Cambridge	
Liquidambar styraciflua	Sweetgum Tree		L	n	y	n	pyramidal	Y	Y	Cornell; Worcester; Cambridge	
Liriodendron tulipifera	Tulip Tree		L	n	y	y	oval	Y	Y	Cornell; Worcester; Cambridge; NE	
Malus sp	Crabapple		S	y	n	y	varies	N	Y	Worcester; Cambridge; Cornell	
Nyssa sylvatica	Tupelo Tree		L	n	y	n	irregular rounded	Y	Y	Cornell; Worcester; Cambridge	
Plantanus x acerifolia	London Planetree	Morton Circle, Bloodgood	L	n	y	n	broad, rounded	cross w Native	Y	Cornell; Cambridge; NE	
Prunus sargentii	Cherry, Sargent		S	y	n	y	vase-shaped, dense	N	N	Worcester; Cambridge	



Scientific name	Common name	Recommended cultivars	Size	Under utility lines?	Shade tree?	Showy flowers ?	Form	Native to U.S.?	On Gfld Tree List?	Tree List Included on	Notes
Prunus serrulata	Cherry, Kwanzan		S	y	n	y	rounded, broad	N	N	Worcester; Cambridge; NE	
Quercus bicolor	Oak, Swamp White		L	n	y	n	upright oval	Y	Y	Cornell; Worcester; Cambridge	
Quercus palustris	Oak, Pin		L	n	y	n	oval	Y	Y	Cornell; Worcester; Cambridge; NE	
Quercus rubra	Oak, Northern Red		L	n	y	n	upright spreading branches	Y	Y	Cornell; Worcester; Cambridge; NE	
Syringa reticulata	Japanese Tree Lilac		S	y	n	y	large shrub, rounded	N	Y	Worcester; Cambridge; NE	
Tillia cordata	Linden, Littleleaf	Greenspire and others	M-L	n	y	n	pyramidal to oval	N	Y	Cornell; Worcester; Cambridge; NE	too dense for Main St - block signs
Ulmus	Elm, American	Valley Forge; Princeton	L	n	y	n	vase shaped	Y	Y	Cornell; Molly; NE; Cambridge	disease resistant hybrid
Zelkova serrata	Zelkova		M-L	n	n	n	low vase	N	Y	Cambridge	too dense for Main St - block signs