# Mapping and Inventory of Grinnell's Street Trees

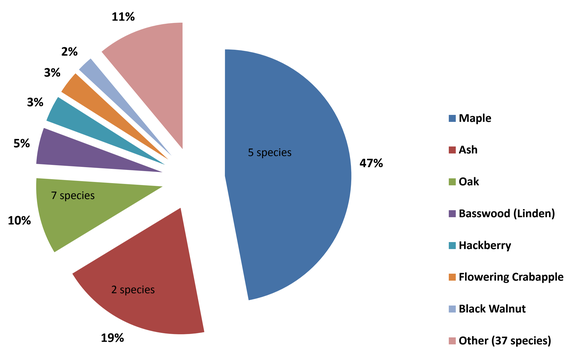
Larissa Mottl, Luc Moisan, Ben Schwamb, Earl Kinnaird and Ryan Ness

GRINNELL COLLEGE

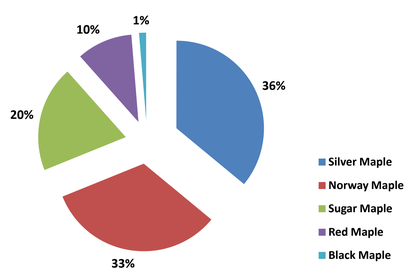
Grinnell Jewel of the Prairie

Imagine Grinnell
A QUALITY OF LIFE FOUNDATION

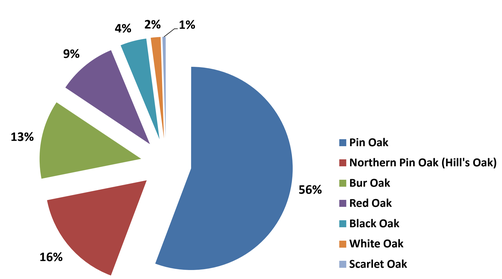
## Overall Species Composition




## Proportion of Maple Species (925 trees)



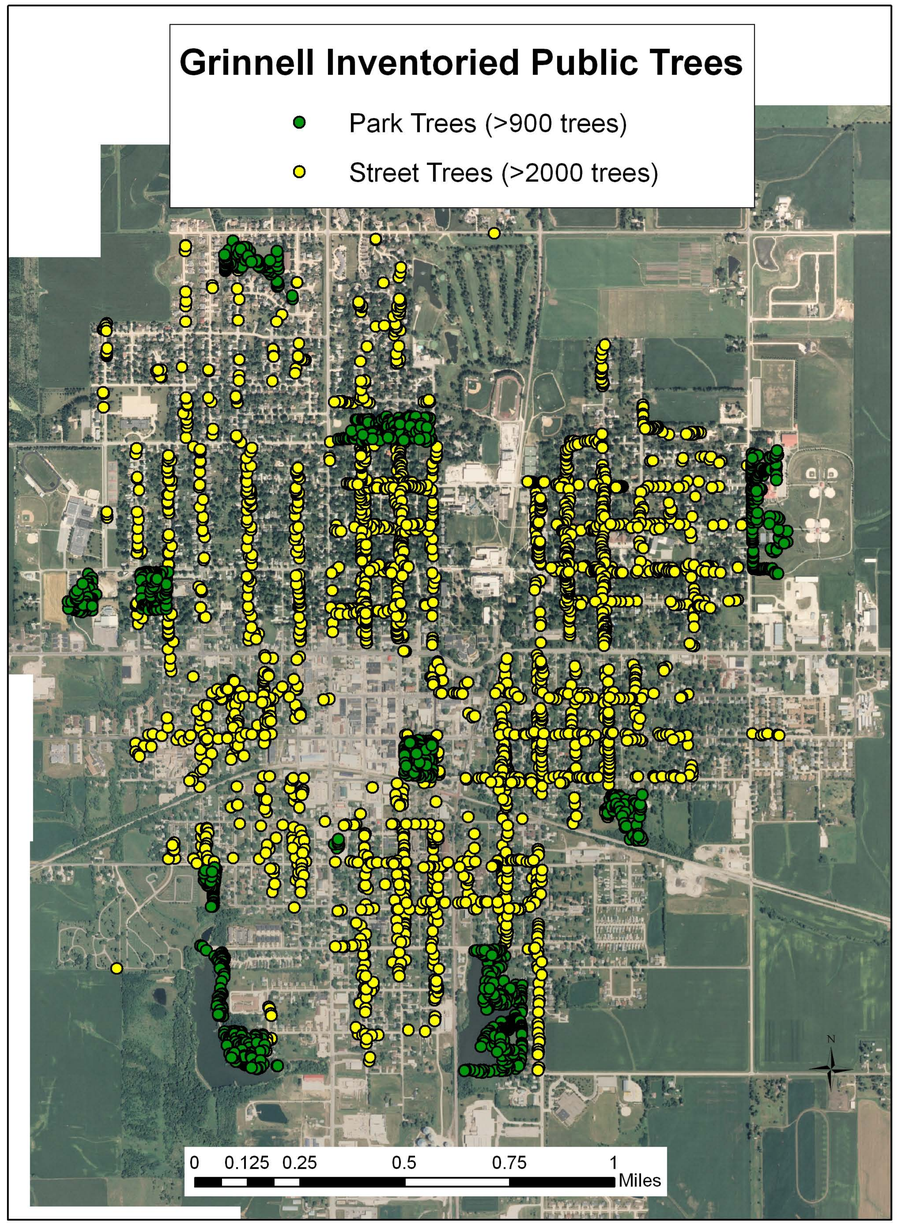

## Proportion of Oak Species (192 trees)




Of 1,976 street trees in Grinnell, maples compose the largest proportion, followed by ash and oak. A general rule of thumb for urban forest management is to avoid having any single group compose more than 20% of the total population or for any single species to compose more than 10% (~200 trees in Grinnell).

**Grinnell's street tree population needs diversification.** Maples and ashes should be avoided for future planting/replacement efforts. Silver and Norway maples and green ash each compose over 10% of Grinnell's street tree population. Grinnell maintains a list of suitable trees for planting in street right-of-ways.

**Project Goals:** Map and inventory Grinnell's street trees to:
(1) assist the City of Grinnell in planning for annual and long-term maintenance,
(2) assist with planning for an inevitable emerald ash borer infestation, including establishment of a citizen monitoring program, and
(3) increase public awareness of the values of Grinnell's street trees



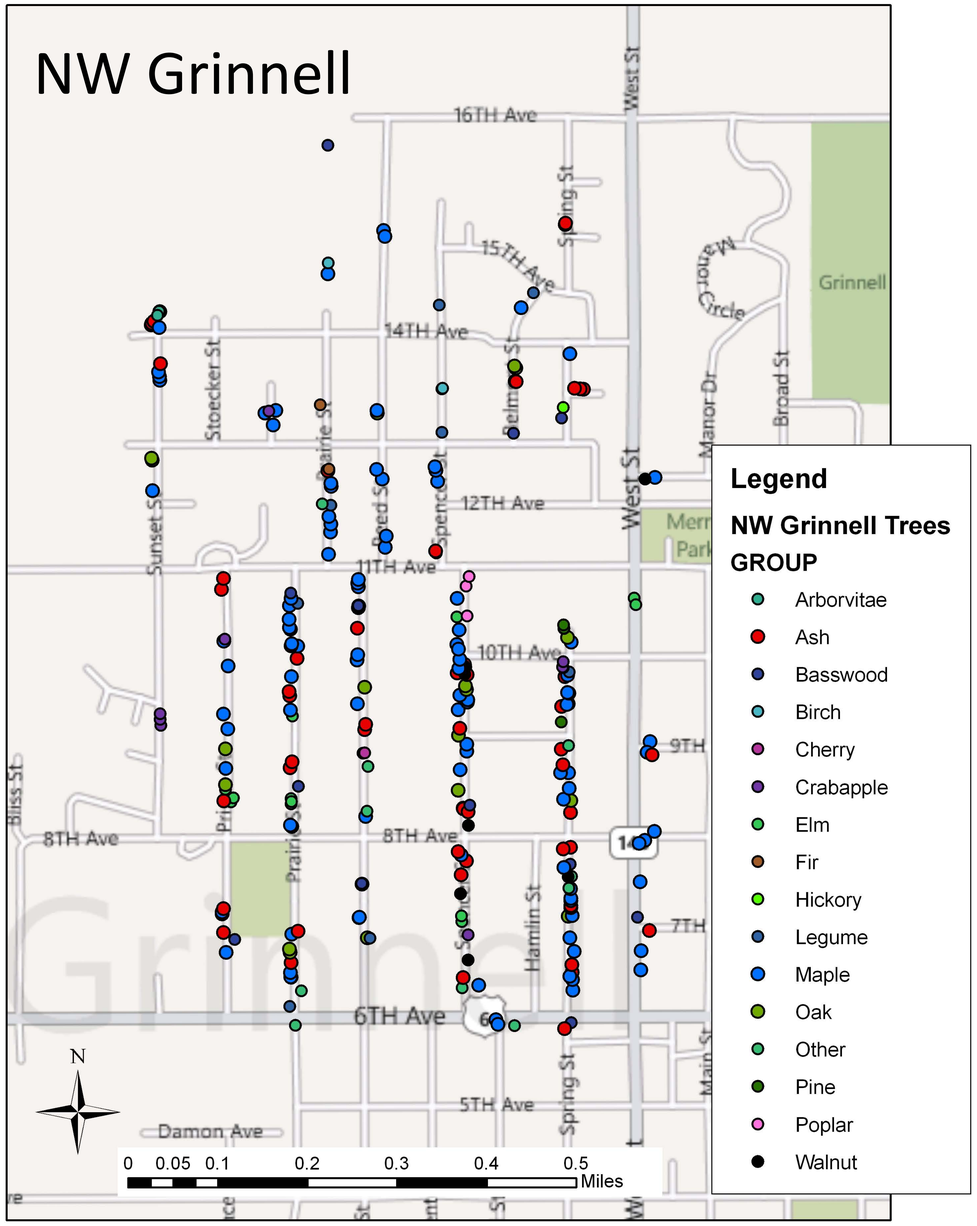

## Street Tree Species List

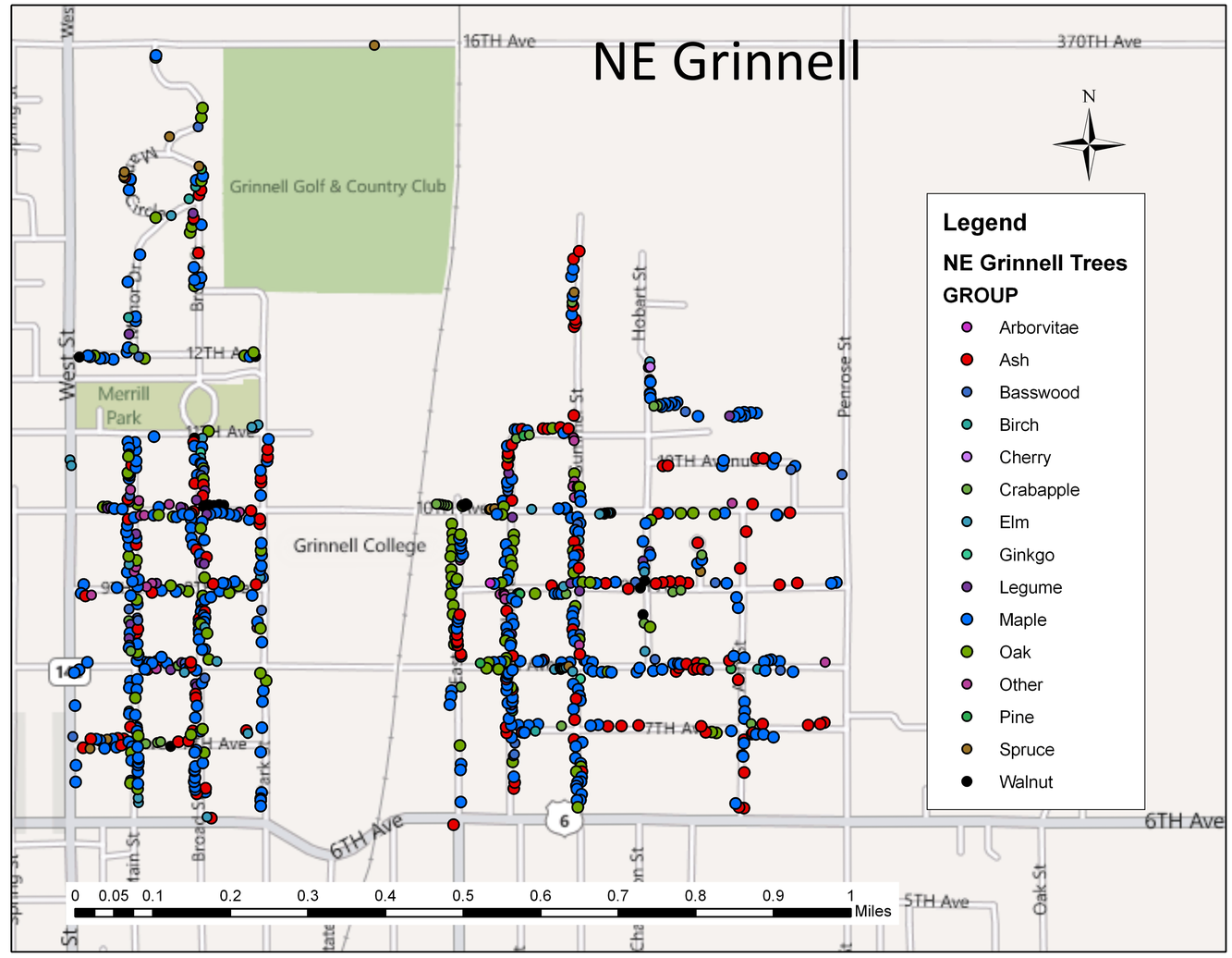
| | COMMON NAME | LATIN NAME | FAMILY | ORIGIN: E=exotic N=native to Iowa | GROWTH FORM: D=deciduous E=evergreen |
|---|---|---|---|---|---|
| 1 | American Beech | *Fagus grandifolia* | Fagaceae | E | D |
| 2 | American Hornbeam (Musclewood) | *Carpinus caroliniana* | Betulaceae | N | D |
| 3 | Apple | *Malus spp* | Rosaceae | E | D |
| | Ash | | | | |
| 4 | Green Ash | *Fraxinus pennsylvanica* | Oleaceae | N | D |
| 5 | White Ash | *Fraxinus americana* | Oleaceae | N | D |
| | Basswood (Linden) | | | | |
| 6 | American Basswood | *Tilia americana* | Tiliaceae | N | D |
| 7 | Little Leaf Linden | *Tilia cordata* | Tiliaceae | E | D |
| 8 | White Basswood | *Tilia heterophylla* | Tiliaceae | E | D |
| | Birch | | | | |
| 9 | Gray Birch | *Betula populifolia* | Betulaceae | E | D |
| 10 | River Birch | *Betula nigra* | Betulaceae | N | D |
| 11 | European White Birch | *Betula pendula* | Betulaceae | E | D |
| 12 | Black Cherry | *Prunus serotina* | Rosaceae | N | D |
| 13 | Black Locust | *Robinia pseudoacacia* | Fabaceae | E | D |
| 14 | Black Walnut | *Juglans nigra* | Juglandaceae | N | D |
| 15 | Boxelder | *Acer negundo* | Aceraceae | N | D |
| 16 | Bradford Pear | *Pyrus calleryana 'Bradford'* | Rosaceae | E | D |
| | Catalpa | | | | |
| 17 | Northern Catalpa | *Catalpa speciosa* | Bignoniaceae | E | D |
| 18 | Southern Catalpa | *Catalpa bignonioides* | Bignoniaceae | E | D |
| 19 | Cottonwood | Populus deltoides | Salicaceae | N | D |
| 20 | Crabapple | *Malus* sp (many varieties) | Rosaceae | E | D |
| 21 | Dawn Redwood | *Metasequoia glyptostroboides* | Taxodiaceae | E | D |
| | Elm | | | | |
| 22 | American Elm | *Ulmus americana* | Ulmaceae | N | D |
| 23 | Siberian Elm | *Ulmus pumila* | Ulmaceae | E | D |
| 24 | Slippery Elm | *Ulmus rubra* | Ulmaceae | N | D |
| 25 | Flowering Crabapple | *Malus* sp (many varieties) | Rosaceae | E | D |
| 26 | Flowering Dogwood | *Cornus florida* | Cornaceae | E | D |
| 27 | Ginkgo | *Ginkgo biloba* | Ginkgoaceae | E | D |
| 28 | Hackberry | *Celtis occidentalis* | Ulmaceae | N | D |
| 29 | Honey Locust | *Gleditsia triacanthos* | Fabaceae | N | D |
| 30 | Horsechestnut | *Aesculus hippocastanum* | Hippocastanac | E | D |
| 31 | Kentucky Coffee | *Gymnocladus dioicus* | Fabaceae | N | D |
| | Maple | | | | |
| 32 | Black Maple | *Acer nigrum* | Aceraceae | N | D |
| 33 | Norway Maple | *Acer platanoides* | Aceraceae | E | D |
| 34 | Red Maple | *Acer rubrum* | Aceraceae | N | D |
| 35 | Silver Maple | *Acer saccharinum* | Aceraceae | N | D |
| 36 | Sugar Maple | *Acer saccharum* | Aceraceae | N | D |
| 37 | Mountain Ash | *Sorbus americana* | Rosaceae | E | D |
| 38 | Northern White Cedar | *Thuja occidentalis* | Cupressaceae | E | E |
| | Oak | | | | |
| 39 | Black Oak | *Quercus velutina* | Fagaceae | N | D |
| 40 | Bur Oak | *Quercus macrocarpa* | Fagaceae | N | D |
| 41 | Northern Pin Oak (Hill's Oak) | *Quercus ellipsoidalis* | Fagaceae | N | D |
| 42 | Pin Oak | *Quercus palustris* | Fagaceae | N | D |
| 43 | Red Oak | *Quercus rubra* | Fagaceae | N | D |
| 44 | Scarlet Oak | *Quercus coccinea* | Fagaceae | E | D |
| 45 | White Oak | *Quercus alba* | Fagaceae | N | D |
| 46 | Ohio Buckeye | *Aesculus glabra* | Hippocastanac | N | D |
| 47 | Persimmon | *Diospyros virginiana* | Ebenaceae | E | D |
| | Pine | | | | |
| 48 | Red Pine | *Pinus resinosa* | Pinaceae | E | D |
| 49 | Scotch Pine | *Pinus sylvestris* | Pinaceae | E | D |
| 50 | White Pine | *Pinus strobus* | Pinaceae | N | E |
| 51 | Plume tree | | | | |
| 52 | Redbud | *Cercis canadensis* | Fabaceae | N | D |
| 53 | Saucer Magnolia | *Magnolia x soulangeana* | Magnoliaceae | E | D |
| 54 | Serviceberry | *Amelanchier arborea* | Rosaceae | N | D |
| 55 | Shagbark Hickory | *Carya ovata* | Juglandaceae | N | D |
| 56 | Sourwood | *Oxydendrum arboreum* | Ericaceae | E | D |
| | Spruce | | | | |
| 57 | Black Spruce | *Picea mariana* | Pinaceae | E | E |
| 58 | Colorado Spruce | *Picea pungens* | Pinaceae | E | E |
| 59 | Norway Spruce | *Picea abies* | Pinaceae | E | E |
| 60 | White Spruce | *Picea glauca* | Pinaceae | E | E |
| 61 | Sycamore | *Platanus occidentalis* | Platanaceae | N | D |
| 62 | Trembling (Quaking) Aspen | *Populus tremuloides* | Salicaceae | N | D |
| 63 | Tuliptree | *Liriodendron tulipifera* | Magnoliaceae | E | D |
| 64 | White Fir | *Abies concolor* | Pinaceae | E | E |
| 65 | White Mullberry | *Morus alba* | Moraceae | E | D |
| 66 | White Poplar | *Populus alba* | Salicaceae | E | D |
| 67 | Willow | *Salix sp.* | Salicaceae | E | D |

A special thank you to Luc Moisan, Ben Schwamb, and Earl Kinnaird for their interest and enthusiasm for learning about Grinnell's trees and their countless hours of field data collection and data entry.

We thank Imagine Grinnell, a private donor, and the City of Grinnell for contributing funding and partnering to make this project possible.

# Street Tree Species and Locations: **NW** and **NE** Grinnell

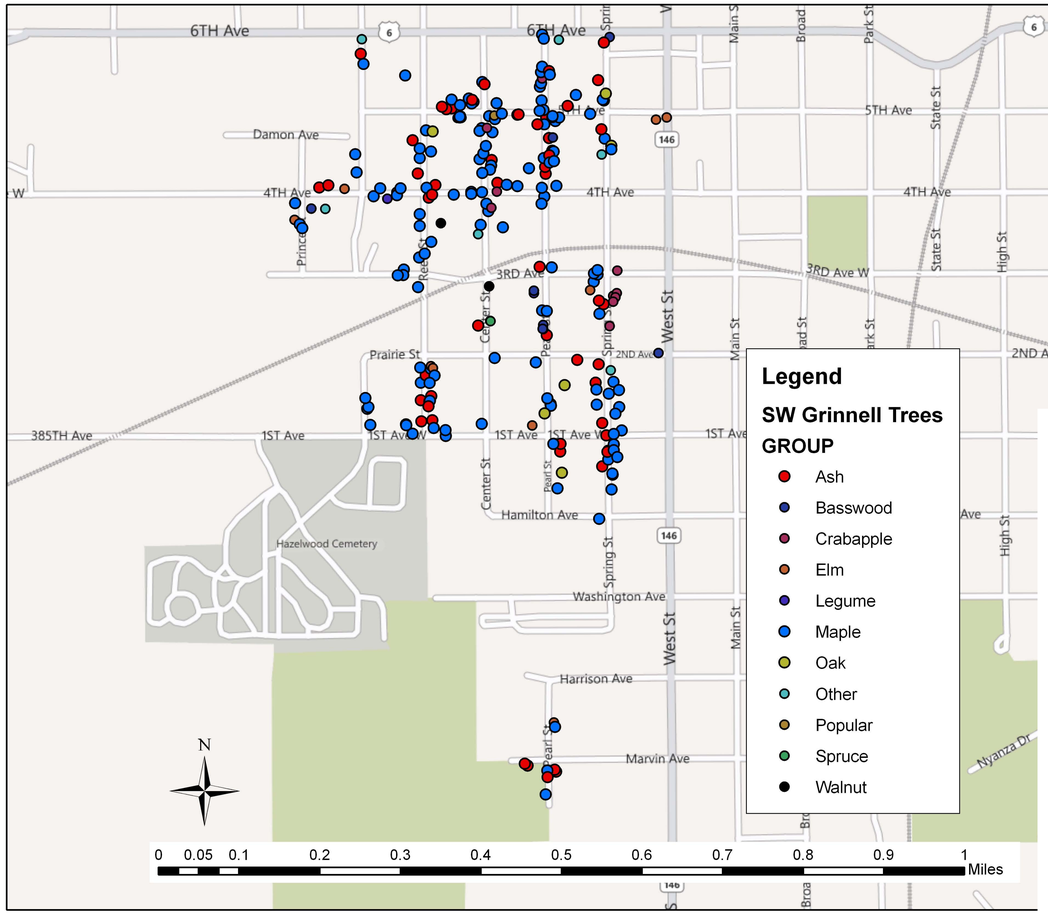



## Can you identify these trees by their leaves and fruit?

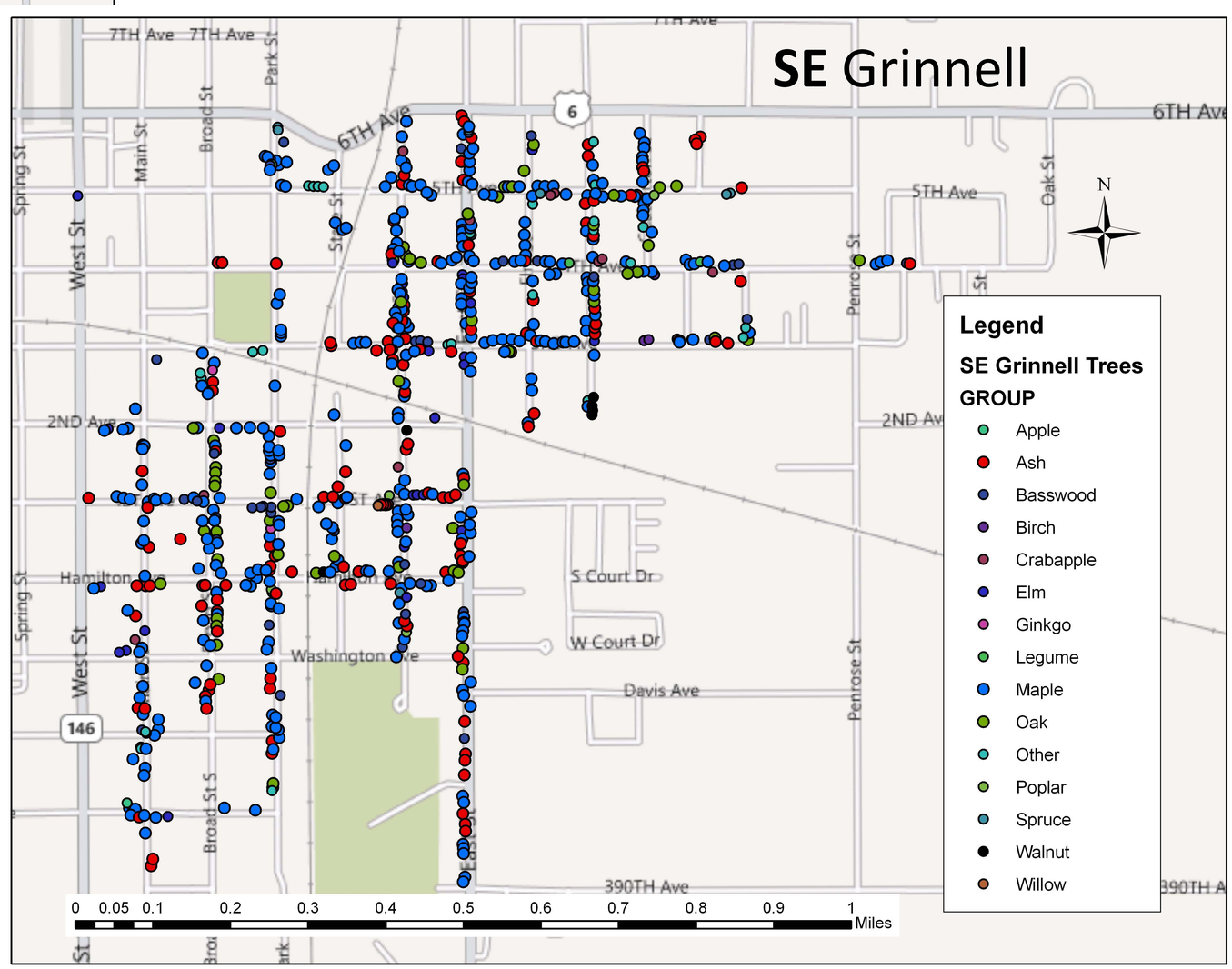
# Street Tree Species and Locations: **SW** and **SE** Grinnell

## **SW** Grinnell



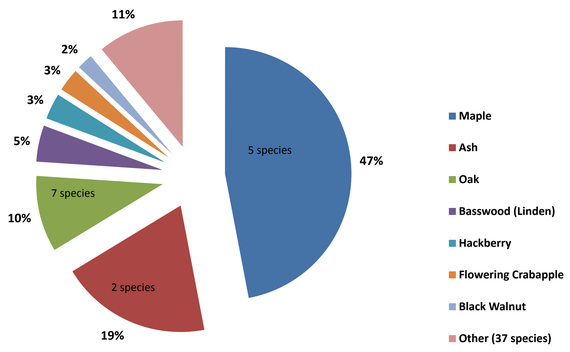
## Can you identify these trees by their bark?

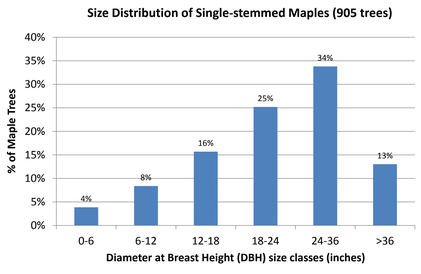
## **SE** Grinnell

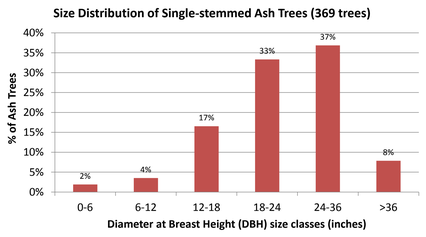


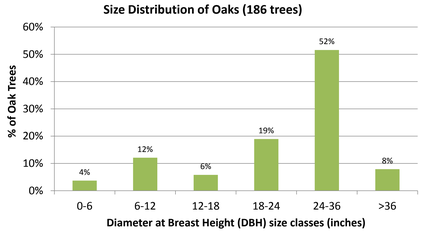
# Grinnell's Street Trees

## Species Composition

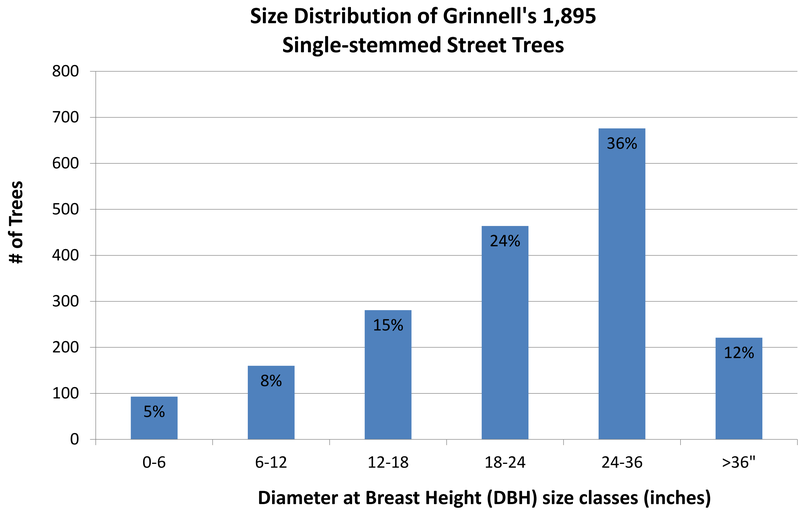


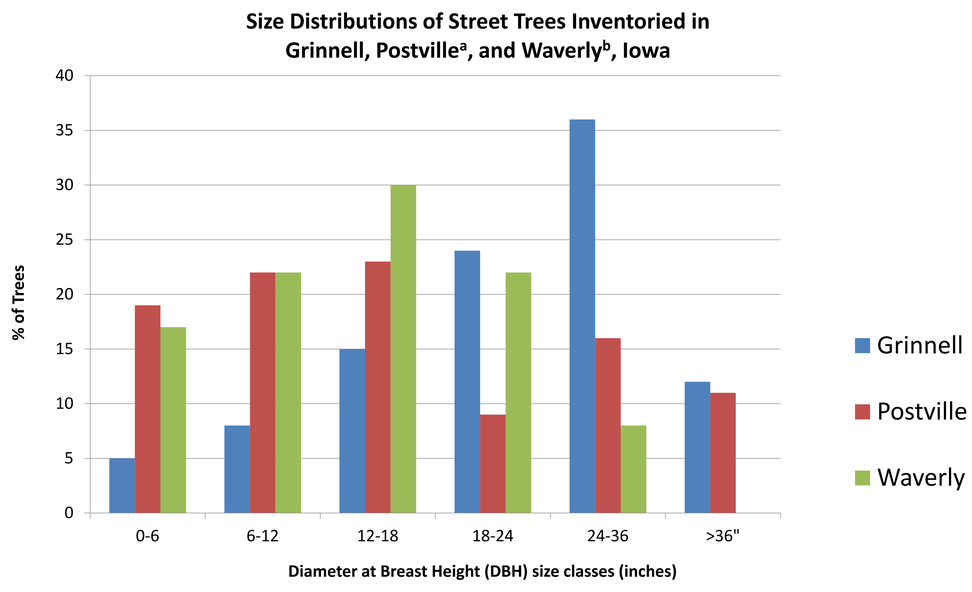







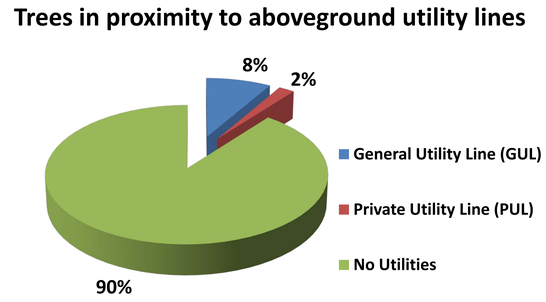
## Size Distribution

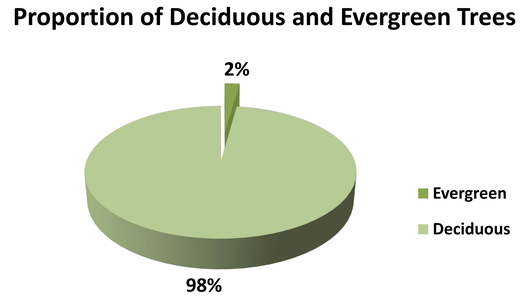


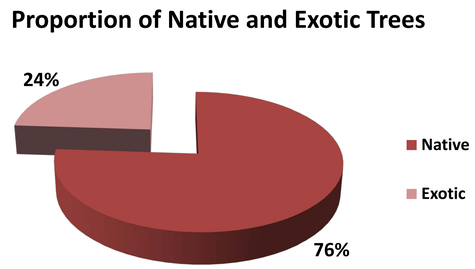




[a]The inventory for Postville, IA was completed by the Iowa DNR in 2009. It included 813 street and park trees.
[b]The inventory for Waverly, IA (pop.9,400) was completed by Brice Kelso and Jeff Hartwig, students in an Iowa State University Forestry class in 2009. It included a sample of about 60% of the city's street trees (1,197 trees).

## Other Characteristics



# Estimated Total Annual Benefits per Species

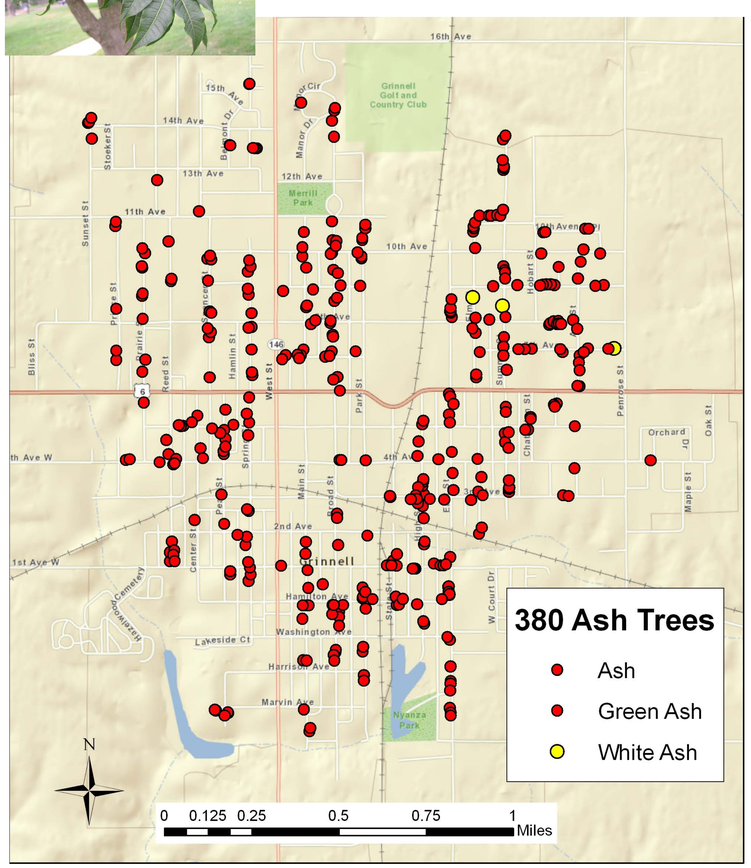
**Grinnell**

**Total Annual Benefits of Public Trees by Species ($)**

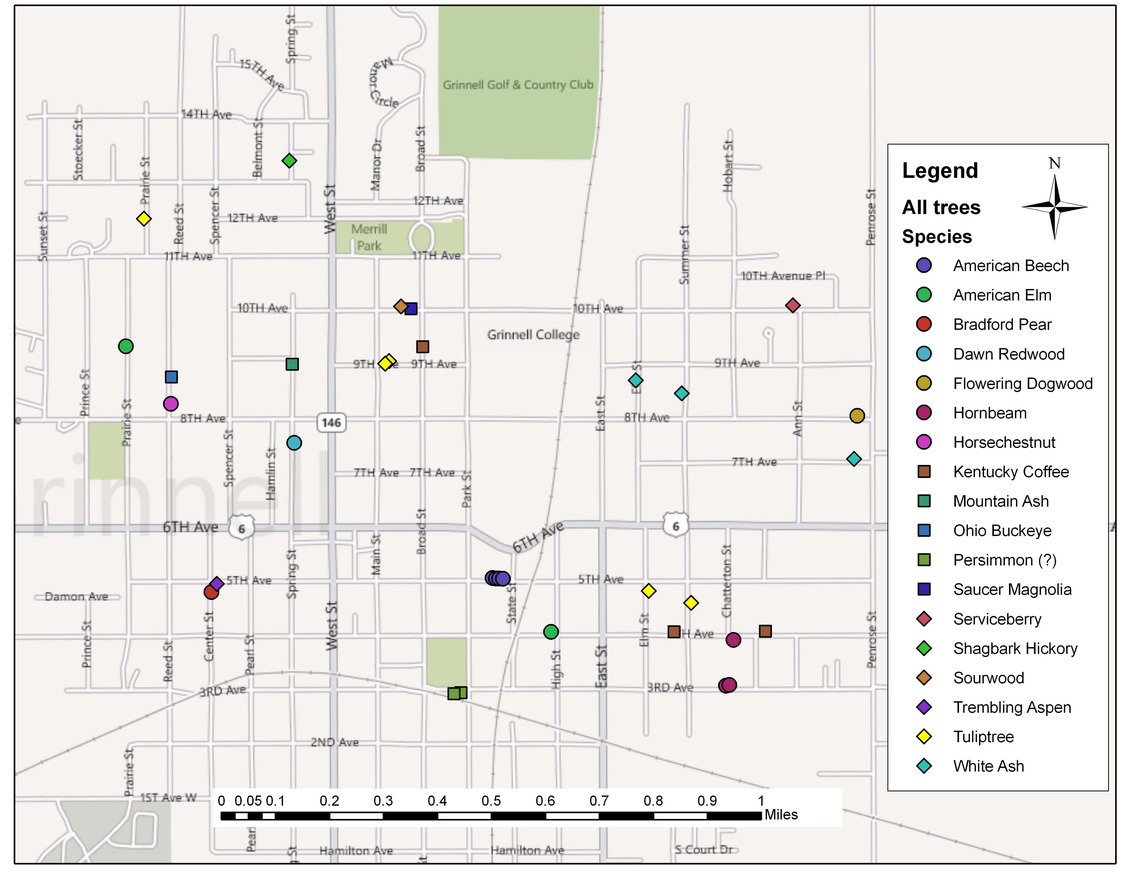
11/15/201

| Species | Energy | $CO_2$ | Air Quality | Stormwater | Aesthetic/Other | Total ($) | Standard Error | % of Total $ |
|---|---|---|---|---|---|---|---|---|
| Silver maple | 41,915 | 8,576 | 7,800 | 80,723 | 66,933 | 205,947 | (±0) | 24.4 |
| Norway maple | 33,173 | 3,359 | 5,900 | 38,645 | 20,412 | 101,489 | (±0) | 12.0 |
| Ash | 34,623 | 3,183 | 6,295 | 43,316 | 17,358 | 104,774 | (±0) | 12.4 |
| Sugar maple | 21,621 | 2,951 | 3,492 | 33,227 | 24,896 | 86,187 | (±0) | 10.2 |
| Pin oak | 14,591 | 3,183 | 1,874 | 21,232 | 25,078 | 65,958 | (±0) | 7.8 |
| Red maple | 8,728 | 925 | 1,595 | 9,777 | 7,623 | 28,649 | (±0) | 3.4 |
| American basswood | 9,348 | 1,482 | 1,434 | 12,622 | 9,835 | 34,721 | (±0) | 4.1 |
| Green ash | 10,107 | 1,327 | 1,857 | 15,879 | 8,578 | 37,748 | (±0) | 4.5 |
| Northern hackberry | 10,285 | 1,039 | 1,938 | 14,473 | 8,034 | 35,769 | (±0) | 4.2 |
| Apple | 1,962 | 188 | 327 | 1,056 | 657 | 4,189 | (±0) | 0.5 |
| Black walnut | 3,884 | 514 | 689 | 5,517 | 3,633 | 14,237 | (±0) | 1.7 |
| Northern pin oak | 2,867 | 243 | 511 | 3,498 | 1,338 | 8,457 | (±0) | 1.0 |
| Honeylocust | 3,727 | 665 | 639 | 5,950 | 15,374 | 26,354 | (±0) | 3.1 |
| American sycamore | 4,071 | 499 | 815 | 7,785 | 2,862 | 16,032 | (±0) | 1.9 |
| Bur oak | 2,510 | 337 | 446 | 3,733 | 2,347 | 9,373 | (±0) | 1.1 |
| OTHER STREET TREI | 18,094 | 2,036 | 3,003 | 26,987 | 13,630 | 63,750 | (±0) | 7.6 |
| Citywide Total | 221,503 | 30,507 | 38,614 | 324,420 | 228,589 | 843,633 | (±0) | 100.0 |

# Ash Tree Locations



# Rare and Interesting Trees



# Estimated Annual Energy Benefits

**Grinnell**

**Annual Energy Benefits of Public Trees By Species**

11/15/2011

| Species | Total Electricity (MWh) | Electricity ($) | Total Natural Gas (Therms) | Natural Gas ($) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|---|---|---|
| Silver maple | 204.5 | 15,524 | 26,929.4 | 26,391 | 41,915 | (N/A) | 16.8 | 18.9 | 65.49 |
| Norway maple | 152.7 | 11,587 | 22,026.9 | 21,586 | 33,173 | (N/A) | 15.9 | 15.0 | 54.74 |
| Ash | 158.1 | 12,000 | 23,084.4 | 22,623 | 34,623 | (N/A) | 15.3 | 15.6 | 59.49 |
| Sugar maple | 103.6 | 7,866 | 14,035.5 | 13,755 | 21,621 | (N/A) | 9.4 | 9.8 | 60.39 |
| Pin oak | 70.1 | 5,324 | 9,456.7 | 9,268 | 14,591 | (N/A) | 5.6 | 6.6 | 68.83 |
| Red maple | 41.9 | 3,178 | 5,662.4 | 5,549 | 8,728 | (N/A) | 4.9 | 3.9 | 46.92 |
| American basswood | 43.2 | 3,283 | 6,188.7 | 6,065 | 9,348 | (N/A) | 4.2 | 4.2 | 59.16 |
| Green ash | 48.1 | 3,651 | 6,587.7 | 6,456 | 10,107 | (N/A) | 3.9 | 4.6 | 67.38 |
| Northern hackberry | 47.9 | 3,638 | 6,781.8 | 6,646 | 10,285 | (N/A) | 3.2 | 4.6 | 84.30 |
| Apple | 8.7 | 657 | 1,331.6 | 1,305 | 1,962 | (N/A) | 2.9 | 0.9 | 17.84 |
| Black walnut | 18.6 | 1,408 | 2,526.2 | 2,476 | 3,884 | (N/A) | 2.1 | 1.8 | 48.55 |
| Northern pin oak | 12.9 | 977 | 1,928.7 | 1,890 | 2,867 | (N/A) | 1.6 | 1.3 | 46.24 |
| Honeylocust | 18.3 | 1,388 | 2,386.3 | 2,339 | 3,727 | (N/A) | 1.4 | 1.7 | 71.66 |
| American sycamore | 19.4 | 1,473 | 2,650.6 | 2,598 | 4,071 | (N/A) | 1.3 | 1.8 | 81.41 |
| Bur oak | 11.8 | 894 | 1,648.5 | 1,615 | 2,510 | (N/A) | 1.3 | 1.1 | 52.29 |
| OTHER STREET TREES | 86.6 | 6,570 | 11,758.9 | 11,524 | 18,094 | (N/A) | 10.3 | 8.2 | 45.92 |
| Citywide total | 1,046.4 | 79,418 | 144,984.2 | 142,085 | 221,503 | (N/A) | 100.0 | 100.0 | 58.14 |

# Estimated Annual Stormwater Benefits

**Grinnell**

**Annual Stormwater Benefits of Public Trees by Species**

11/15/2011

| Species | Total rainfall interception (Gal) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|
| Silver maple | 2,978,493 | 80,723 | (N/A) | 16.8 | 24.9 | 126.13 |
| Norway maple | 1,425,913 | 38,645 | (N/A) | 15.9 | 11.9 | 63.77 |
| Ash | 1,598,256 | 43,316 | (N/A) | 15.3 | 13.4 | 74.43 |
| Sugar maple | 1,226,021 | 33,227 | (N/A) | 9.4 | 10.2 | 92.81 |
| Pin oak | 783,409 | 21,232 | (N/A) | 5.6 | 6.5 | 100.15 |
| Red maple | 360,764 | 9,777 | (N/A) | 4.9 | 3.0 | 52.57 |
| American basswood | 465,736 | 12,622 | (N/A) | 4.2 | 3.9 | 79.89 |
| Green ash | 585,907 | 15,879 | (N/A) | 3.9 | 4.9 | 105.86 |
| Northern hackberry | 534,029 | 14,473 | (N/A) | 3.2 | 4.5 | 118.63 |
| Apple | 38,970 | 1,056 | (N/A) | 2.9 | 0.3 | 9.60 |
| Black walnut | 203,548 | 5,517 | (N/A) | 2.1 | 1.7 | 68.96 |
| Northern pin oak | 129,055 | 3,498 | (N/A) | 1.6 | 1.1 | 56.41 |
| Honeylocust | 219,542 | 5,950 | (N/A) | 1.4 | 1.8 | 114.42 |
| American sycamore | 287,259 | 7,785 | (N/A) | 1.3 | 2.4 | 155.71 |
| Bur oak | 137,736 | 3,733 | (N/A) | 1.3 | 1.2 | 77.77 |
| OTHER STREET TREES | 995,756 | 26,987 | (N/A) | 10.3 | 8.3 | 68.49 |
| Citywide total | 11,970,393 | 324,420 | (N/A) | 100.0 | 100.0 | 85.15 |

**Grinnell**

# Total Annual Benefits of Public Trees by Species ($)

11/15/201

| Species | Energy | $CO_2$ | Air Quality | Stormwater | Aesthetic/Other | Total ($) | Standard Error | % of Total $ |
|---|---|---|---|---|---|---|---|---|
| Silver maple | 41,915 | 8,576 | 7,800 | 80,723 | 66,933 | 205,947 | (±0) | 24.4 |
| Norway maple | 33,173 | 3,359 | 5,900 | 38,645 | 20,412 | 101,489 | (±0) | 12.0 |
| Ash | 34,623 | 3,183 | 6,295 | 43,316 | 17,358 | 104,774 | (±0) | 12.4 |
| Sugar maple | 21,621 | 2,951 | 3,492 | 33,227 | 24,896 | 86,187 | (±0) | 10.2 |
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| Red maple | 8,728 | 925 | 1,595 | 9,777 | 7,623 | 28,649 | (±0) | 3.4 |
| American basswood | 9,348 | 1,482 | 1,434 | 12,622 | 9,835 | 34,721 | (±0) | 4.1 |
| Green ash | 10,107 | 1,327 | 1,857 | 15,879 | 8,578 | 37,748 | (±0) | 4.5 |
| Northern hackberry | 10,285 | 1,039 | 1,938 | 14,473 | 8,034 | 35,769 | (±0) | 4.2 |
| Apple | 1,962 | 188 | 327 | 1,056 | 657 | 4,189 | (±0) | 0.5 |
| Black walnut | 3,884 | 514 | 689 | 5,517 | 3,633 | 14,237 | (±0) | 1.7 |
| Northern pin oak | 2,867 | 243 | 511 | 3,498 | 1,338 | 8,457 | (±0) | 1.0 |
| Honeylocust | 3,727 | 665 | 639 | 5,950 | 15,374 | 26,354 | (±0) | 3.1 |
| American sycamore | 4,071 | 499 | 815 | 7,785 | 2,862 | 16,032 | (±0) | 1.9 |
| Bur oak | 2,510 | 337 | 446 | 3,733 | 2,347 | 9,373 | (±0) | 1.1 |
| OTHER STREET TREI | 18,094 | 2,036 | 3,003 | 26,987 | 13,630 | 63,750 | (±0) | 7.6 |
| Citywide Total | 221,503 | 30,507 | 38,614 | 324,420 | 228,589 | 843,633 | (±0) | 100.0 |

**Grinnell**

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| Silver maple | 204.5 | 15,524 | 26,929.4 | 26,391 | 41,915 | (N/A) | 16.8 | 18.9 | 65.49 |
| Norway maple | 152.7 | 11,587 | 22,026.9 | 21,586 | 33,173 | (N/A) | 15.9 | 15.0 | 54.74 |
| Ash | 158.1 | 12,000 | 23,084.4 | 22,623 | 34,623 | (N/A) | 15.3 | 15.6 | 59.49 |
| Sugar maple | 103.6 | 7,866 | 14,035.5 | 13,755 | 21,621 | (N/A) | 9.4 | 9.8 | 60.39 |
| Pin oak | 70.1 | 5,324 | 9,456.7 | 9,268 | 14,591 | (N/A) | 5.6 | 6.6 | 68.83 |
| Red maple | 41.9 | 3,178 | 5,662.4 | 5,549 | 8,728 | (N/A) | 4.9 | 3.9 | 46.92 |
| American basswood | 43.2 | 3,283 | 6,188.7 | 6,065 | 9,348 | (N/A) | 4.2 | 4.2 | 59.16 |
| Green ash | 48.1 | 3,651 | 6,587.7 | 6,456 | 10,107 | (N/A) | 3.9 | 4.6 | 67.38 |
| Northern hackberry | 47.9 | 3,638 | 6,781.8 | 6,646 | 10,285 | (N/A) | 3.2 | 4.6 | 84.30 |
| Apple | 8.7 | 657 | 1,331.6 | 1,305 | 1,962 | (N/A) | 2.9 | 0.9 | 17.84 |
| Black walnut | 18.6 | 1,408 | 2,526.2 | 2,476 | 3,884 | (N/A) | 2.1 | 1.8 | 48.55 |
| Northern pin oak | 12.9 | 977 | 1,928.7 | 1,890 | 2,867 | (N/A) | 1.6 | 1.3 | 46.24 |
| Honeylocust | 18.3 | 1,388 | 2,386.3 | 2,339 | 3,727 | (N/A) | 1.4 | 1.7 | 71.66 |
| American sycamore | 19.4 | 1,473 | 2,650.6 | 2,598 | 4,071 | (N/A) | 1.3 | 1.8 | 81.41 |
| Bur oak | 11.8 | 894 | 1,648.5 | 1,615 | 2,510 | (N/A) | 1.3 | 1.1 | 52.29 |
| OTHER STREET TREES | 86.6 | 6,570 | 11,758.9 | 11,524 | 18,094 | (N/A) | 10.3 | 8.2 | 45.92 |
| Citywide total | 1,046.4 | 79,418 | 144,984.2 | 142,085 | 221,503 | (N/A) | 100.0 | 100.0 | 58.14 |

## Grinnell

# Annual Stormwater Benefits of Public Trees by Species

11/15/2011

| Species | Total rainfall interception (Gal) | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|---|
| Silver maple | 2,978,493 | 80,723 | (N/A) | 16.8 | 24.9 | 126.13 |
| Norway maple | 1,425,913 | 38,645 | (N/A) | 15.9 | 11.9 | 63.77 |
| Ash | 1,598,256 | 43,316 | (N/A) | 15.3 | 13.4 | 74.43 |
| Sugar maple | 1,226,021 | 33,227 | (N/A) | 9.4 | 10.2 | 92.81 |
| Pin oak | 783,409 | 21,232 | (N/A) | 5.6 | 6.5 | 100.15 |
| Red maple | 360,764 | 9,777 | (N/A) | 4.9 | 3.0 | 52.57 |
| American basswood | 465,736 | 12,622 | (N/A) | 4.2 | 3.9 | 79.89 |
| Green ash | 585,907 | 15,879 | (N/A) | 3.9 | 4.9 | 105.86 |
| Northern hackberry | 534,029 | 14,473 | (N/A) | 3.2 | 4.5 | 118.63 |
| Apple | 38,970 | 1,056 | (N/A) | 2.9 | 0.3 | 9.60 |
| Black walnut | 203,548 | 5,517 | (N/A) | 2.1 | 1.7 | 68.96 |
| Northern pin oak | 129,055 | 3,498 | (N/A) | 1.6 | 1.1 | 56.41 |
| Honeylocust | 219,542 | 5,950 | (N/A) | 1.4 | 1.8 | 114.42 |
| American sycamore | 287,259 | 7,785 | (N/A) | 1.3 | 2.4 | 155.71 |
| Bur oak | 137,736 | 3,733 | (N/A) | 1.3 | 1.2 | 77.77 |
| OTHER STREET TREES | 995,756 | 26,987 | (N/A) | 10.3 | 8.3 | 68.49 |
| Citywide total | 11,970,393 | 324,420 | (N/A) | 100.0 | 100.0 | 85.15 |

**Grinnell**

# Annual Aesthetic/Other Benefits of Public Trees by Species

11/15/2011

| Species | Total ($) | Standard Error | % of Total Trees | % of Total $ | Avg. $/tree |
|---|---|---|---|---|---|
| Silver maple | 66,933 | (N/A) | 16.8 | 29.3 | 104.58 |
| Norway maple | 20,412 | (N/A) | 15.9 | 8.9 | 33.68 |
| Ash | 17,358 | (N/A) | 15.3 | 7.6 | 29.82 |
| Sugar maple | 24,896 | (N/A) | 9.4 | 10.9 | 69.54 |
| Pin oak | 25,078 | (N/A) | 5.6 | 11.0 | 118.29 |
| Red maple | 7,623 | (N/A) | 4.9 | 3.3 | 40.98 |
| American basswood | 9,835 | (N/A) | 4.2 | 4.3 | 62.25 |
| Green ash | 8,578 | (N/A) | 3.9 | 3.8 | 57.19 |
| Northern hackberry | 8,034 | (N/A) | 3.2 | 3.5 | 65.85 |
| Apple | 657 | (N/A) | 2.9 | 0.3 | 5.97 |
| Black walnut | 3,633 | (N/A) | 2.1 | 1.6 | 45.42 |
| Northern pin oak | 1,338 | (N/A) | 1.6 | 0.6 | 21.58 |
| Honeylocust | 15,374 | (N/A) | 1.4 | 6.7 | 295.65 |
| American sycamore | 2,862 | (N/A) | 1.3 | 1.3 | 57.24 |
| Bur oak | 2,347 | (N/A) | 1.3 | 1.0 | 48.89 |
| OTHER STREET TREES | 13,630 | (N/A) | 10.3 | 6.0 | 34.59 |
| Citywide total | 228,589 | (N/A) | 100.0 | 100.0 | 60.00 |

**Grinnell**

# Importance Values for Public Most Abundant Trees

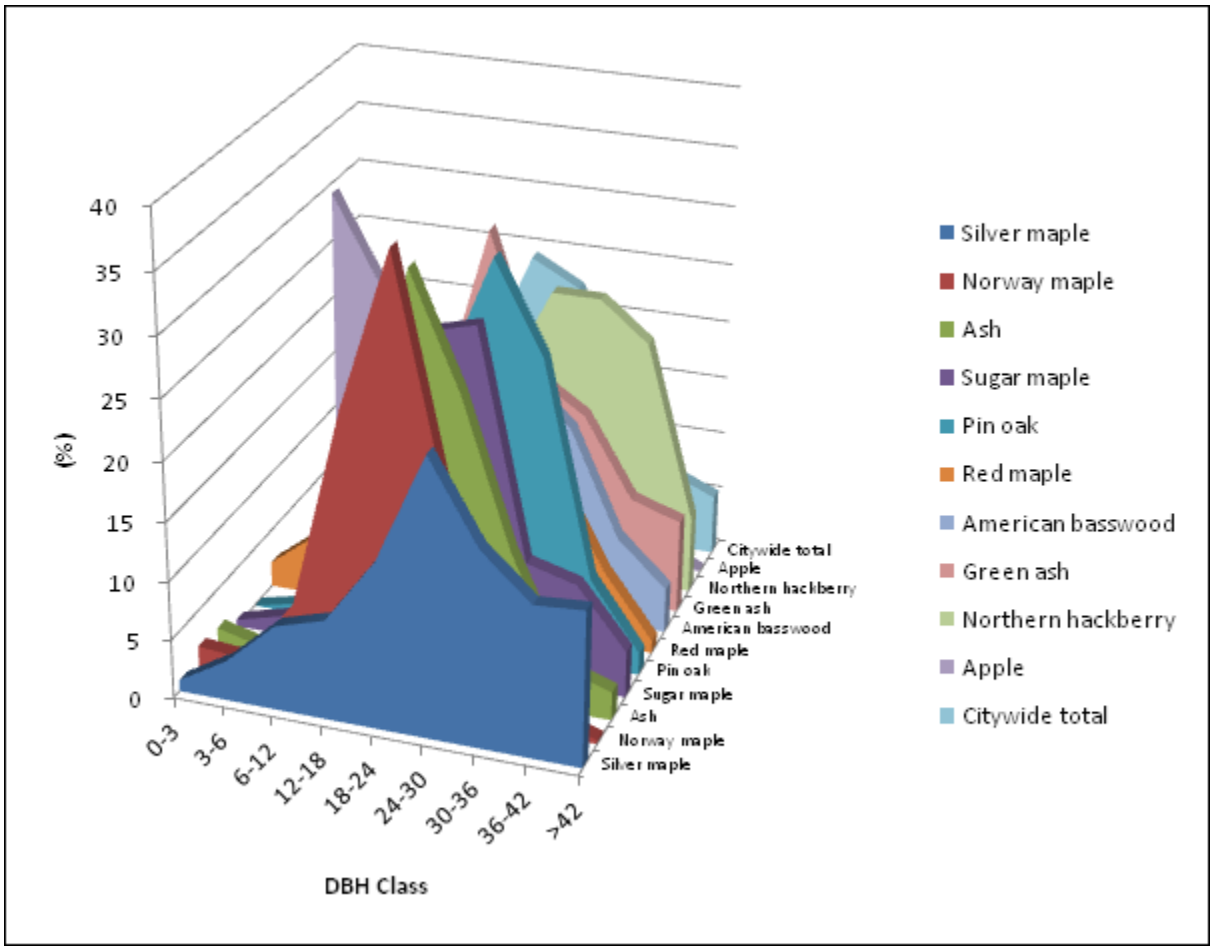
11/15/2011

| Species | Number of Trees | % of Total Trees | Leaf Area (ft² ) | % of Total Leaf Area | Canopy Cover (ft² ) | % of Total Canopy Cover | Importance Value |
|---|---|---|---|---|---|---|---|
| Silver maple | 640 | 16.8 | 4,771,021 | 23.4 | 1,192,543 | 22.4 | 20.9 |
| Norway maple | 606 | 15.9 | 2,153,165 | 10.6 | 682,460 | 12.8 | 13.1 |
| Ash | 582 | 15.3 | 2,480,717 | 12.2 | 736,502 | 13.8 | 13.8 |
| Sugar maple | 358 | 9.4 | 2,374,881 | 11.7 | 536,646 | 10.1 | 10.4 |
| Pin oak | 212 | 5.6 | 1,421,420 | 7.0 | 377,242 | 7.1 | 6.5 |
| Red maple | 186 | 4.9 | 564,587 | 2.8 | 194,218 | 3.6 | 3.8 |
| American basswood | 158 | 4.1 | 831,412 | 4.1 | 202,694 | 3.8 | 4.0 |
| Green ash | 150 | 3.9 | 1,058,539 | 5.2 | 248,986 | 4.7 | 4.6 |
| Northern hackberry | 122 | 3.2 | 958,115 | 4.7 | 272,169 | 5.1 | 4.3 |
| Apple | 110 | 2.9 | 48,829 | 0.2 | 37,315 | 0.7 | 1.3 |
| Black walnut | 80 | 2.1 | 356,092 | 1.7 | 90,826 | 1.7 | 1.9 |
| Northern pin oak | 62 | 1.6 | 199,403 | 1.0 | 60,331 | 1.1 | 1.2 |
| Honeylocust | 52 | 1.4 | 504,119 | 2.5 | 102,836 | 1.9 | 1.9 |
| American sycamore | 50 | 1.3 | 559,662 | 2.7 | 112,133 | 2.1 | 2.1 |
| Bur oak | 48 | 1.3 | 241,296 | 1.2 | 60,349 | 1.1 | 1.2 |
| OTHER TREES | 394 | 10.3 | 1,860,055 | 9.1 | 416,956 | 7.8 | 9.1 |
| Total | 3,810 | 100.0 | 20,383,314 | 100.0 | 5,324,208 | 100.0 | 100.0 |

**Grinnell**

# Relative Age Distribution of Top 10 Public Tree Species (%)

11/15/2011




| | DBH class (in) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Species | 0-3 | 3-6 | 6-12 | 12-18 | 18-24 | 24-30 | 30-36 | 36-42 | >42 |
| Silver maple | 0.94 | 3.44 | 7.19 | 8.44 | 14.06 | 23.44 | 16.56 | 12.81 | 13.13 |
| Norway maple | 1.98 | 1.65 | 7.26 | 24.09 | 37.29 | 19.14 | 6.60 | 1.65 | 0.33 |
| Ash | 1.72 | 0.69 | 4.12 | 15.12 | 34.36 | 25.09 | 12.71 | 3.78 | 2.41 |
| Sugar maple | 0.56 | 1.68 | 7.26 | 10.61 | 27.93 | 29.05 | 10.06 | 8.94 | 3.91 |
| Pin oak | 0.00 | 0.94 | 1.89 | 6.60 | 22.64 | 33.02 | 25.47 | 7.55 | 1.89 |
| Red maple | 2.15 | 5.38 | 19.35 | 22.58 | 18.28 | 10.75 | 13.98 | 6.45 | 1.08 |
| American basswood | 0.00 | 1.27 | 6.33 | 18.99 | 25.32 | 20.25 | 16.46 | 7.59 | 3.80 |
| Green ash | 0.00 | 0.00 | 1.33 | 16.00 | 30.67 | 18.67 | 16.00 | 9.33 | 8.00 |
| Northern hackberry | 0.00 | 0.00 | 4.92 | 1.64 | 16.39 | 24.59 | 24.59 | 21.31 | 6.56 |
| Apple | 29.09 | 21.82 | 18.18 | 14.55 | 7.27 | 7.27 | 0.00 | 1.82 | 0.00 |
| Citywide total | 2.67 | 2.78 | 8.33 | 14.57 | 24.32 | 22.17 | 13.21 | 6.81 | 5.14 |

# Grinnell

## Replacement Value for Public Trees by Species

11/15/2011

| Species | DBH Class (in) 0-3 | 3-6 | 6-12 | 12-18 | 18-24 | 24-30 | 30-36 | 36-42 | >42 | Total | Standard Error | % of Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Silver maple | 1,438 | 6,446 | 21,756 | 48,570 | 138,528 | 358,830 | 359,133 | 361,342 | 411,549 | 1,707,591 | (±0) | 19.06 |
| Norway maple | 3,178 | 3,230 | 22,849 | 143,746 | 380,238 | 303,110 | 148,117 | 48,105 | 10,696 | 1,063,268 | (±0) | 11.87 |
| Ash | 2,648 | 1,292 | 12,463 | 86,641 | 336,494 | 381,500 | 273,902 | 105,832 | 74,874 | 1,275,646 | (±0) | 14.24 |
| Sugar maple | 573 | 2,154 | 15,714 | 45,067 | 205,837 | 335,042 | 164,859 | 190,991 | 92,966 | 1,053,204 | (±0) | 11.75 |
| Pin oak | 0 | 712 | 2,334 | 15,731 | 92,820 | 210,969 | 231,496 | 89,033 | 24,754 | 667,849 | (±0) | 7.45 |
| Red maple | 1,045 | 3,291 | 20,090 | 46,237 | 65,114 | 60,015 | 110,833 | 66,774 | 12,383 | 385,781 | (±0) | 4.31 |
| American basswood | 0 | 658 | 5,581 | 33,026 | 76,604 | 96,024 | 111,213 | 66,774 | 37,150 | 427,030 | (±0) | 4.77 |
| Green ash | 0 | 0 | 915 | 20,490 | 66,599 | 62,717 | 76,272 | 57,546 | 54,816 | 339,354 | (±0) | 3.79 |
| Northern hackberry | 0 | 0 | 3,348 | 2,202 | 38,302 | 90,022 | 128,454 | 144,678 | 49,534 | 456,540 | (±0) | 5.09 |
| Apple | 9,163 | 8,617 | 12,088 | 18,976 | 16,467 | 25,772 | 0 | 11,937 | 0 | 103,020 | (±0) | 1.15 |
| Black walnut | 1,045 | 1,316 | 10,045 | 15,412 | 26,811 | 42,010 | 17,241 | 22,258 | 24,767 | 160,906 | (±0) | 1.80 |
| Northern pin oak | 0 | 1,436 | 15,714 | 2,372 | 4,117 | 45,102 | 64,033 | 0 | 0 | 132,774 | (±0) | 1.48 |
| Honeylocust | 0 | 0 | 0 | 1,708 | 14,478 | 76,156 | 12,643 | 8,221 | 0 | 113,205 | (±0) | 1.26 |
| American sycamore | 0 | 581 | 0 | 0 | 0 | 26,879 | 37,928 | 57,546 | 45,680 | 168,613 | (±0) | 1.88 |
| Bur oak | 0 | 1,475 | 8,001 | 2,746 | 24,323 | 30,757 | 54,867 | 0 | 15,992 | 138,160 | (±0) | 1.54 |
| Northern red oak | 573 | 718 | 0 | 2,372 | 20,584 | 25,772 | 27,443 | 35,811 | 0 | 113,272 | (±0) | 1.26 |
| Siberian elm | 0 | 581 | 7,323 | 11,953 | 2,896 | 0 | 0 | 0 | 0 | 22,753 | (±0) | 0.25 |
| Broadleaf Deciduous Lar | 1,929 | 0 | 915 | 5,123 | 8,687 | 4,480 | 12,643 | 0 | 0 | 33,776 | (±0) | 0.38 |
| Black locust | 0 | 0 | 0 | 3,232 | 8,138 | 29,226 | 5,875 | 7,628 | 0 | 54,100 | (±0) | 0.60 |
| Spruce | 0 | 0 | 1,532 | 5,900 | 10,154 | 7,913 | 0 | 0 | 0 | 25,500 | (±0) | 0.28 |
| Black maple | 0 | 0 | 0 | 4,744 | 4,117 | 6,443 | 45,738 | 0 | 26,562 | 87,603 | (±0) | 0.98 |
| Catalpa | 0 | 586 | 0 | 0 | 6,157 | 0 | 20,303 | 0 | 19,598 | 46,643 | (±0) | 0.52 |
| Eastern white pine | 0 | 0 | 766 | 0 | 10,154 | 11,870 | 0 | 0 | 0 | 22,790 | (±0) | 0.25 |
| Oak | 0 | 0 | 0 | 0 | 2,896 | 17,919 | 6,321 | 0 | 18,272 | 45,408 | (±0) | 0.51 |
| Ginkgo | 1,130 | 0 | 1,292 | 2,621 | 0 | 14,548 | 0 | 0 | 0 | 19,591 | (±0) | 0.22 |
| Cottonwood | 0 | 0 | 0 | 0 | 0 | 0 | 23,500 | 0 | 16,946 | 40,446 | (±0) | 0.45 |
| Littleleaf linden | 0 | 0 | 0 | 0 | 11,491 | 12,003 | 0 | 11,129 | 0 | 34,623 | (±0) | 0.39 |
| Conifer Evergreen Large | 1,135 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16,249 | 17,384 | (±0) | 0.19 |
| White ash | 0 | 0 | 0 | 9,846 | 0 | 0 | 0 | 0 | 0 | 9,846 | (±0) | 0.11 |
| Eastern cottonwood | 0 | 0 | 0 | 0 | 6,157 | 0 | 0 | 0 | 29,396 | 35,553 | (±0) | 0.40 |
| Northern white cedar | 719 | 0 | 0 | 1,439 | 2,486 | 3,882 | 0 | 0 | 0 | 8,525 | (±0) | 0.10 |
| Boxelder | 0 | 0 | 0 | 0 | 6,157 | 4,784 | 0 | 0 | 9,799 | 20,740 | (±0) | 0.23 |
| Eastern redbud | 592 | 686 | 0 | 1,749 | 2,870 | 0 | 0 | 0 | 0 | 5,897 | (±0) | 0.07 |
| Tulip tree | 0 | 0 | 0 | 0 | 5,791 | 4,480 | 6,321 | 0 | 0 | 16,592 | (±0) | 0.19 |
| Black cherry | 0 | 0 | 1,770 | 3,232 | 0 | 0 | 0 | 0 | 0 | 5,002 | (±0) | 0.06 |
| Elm | 0 | 0 | 0 | 1,708 | 2,896 | 0 | 0 | 8,221 | 9,136 | 21,960 | (±0) | 0.25 |

| Species | DBH Class (in) 0-3 | 3-6 | 6-12 | 12-18 | 18-24 | 24-30 | 30-36 | 36-42 | >42 | Total | Standard Error | % of Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kentucky coffeetree | 1,122 | 0 | 0 | 2,746 | 0 | 0 | 0 | 0 | 0 | 3,868 | (±0) | 0.04 |
| Black spruce | 0 | 0 | 766 | 2,950 | 0 | 0 | 0 | 0 | 0 | 3,716 | (±0) | 0.04 |
| White oak | 0 | 0 | 1,292 | 2,621 | 0 | 0 | 10,365 | 0 | 0 | 14,278 | (±0) | 0.16 |
| White mulberry | 0 | 0 | 0 | 2,372 | 4,117 | 0 | 0 | 0 | 0 | 6,489 | (±0) | 0.07 |
| Norway spruce | 0 | 0 | 0 | 3,106 | 0 | 0 | 0 | 0 | 0 | 3,106 | (±0) | 0.03 |
| Scotch pine | 0 | 0 | 722 | 1,342 | 0 | 0 | 0 | 0 | 0 | 2,064 | (±0) | 0.02 |
| American elm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,598 | 19,598 | (±0) | 0.22 |
| Ohio buckeye | 0 | 0 | 1,250 | 0 | 0 | 0 | 0 | 0 | 0 | 1,250 | (±0) | 0.01 |
| Broadleaf Deciduous Me | 0 | 646 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 646 | (±0) | 0.01 |
| Birch | 479 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 479 | (±0) | 0.01 |
| River birch | 0 | 0 | 0 | 1,799 | 0 | 0 | 0 | 0 | 0 | 1,799 | (±0) | 0.02 |
| Hickory | 0 | 0 | 915 | 0 | 0 | 0 | 0 | 0 | 0 | 915 | (±0) | 0.01 |
| Red pine | 0 | 0 | 0 | 0 | 2,539 | 0 | 0 | 0 | 0 | 2,539 | (±0) | 0.03 |
| Quaking aspen | 0 | 0 | 0 | 1,616 | 0 | 0 | 0 | 0 | 0 | 1,616 | (±0) | 0.02 |
| Pear | 0 | 718 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 718 | (±0) | 0.01 |
| Scarlet oak | 0 | 0 | 915 | 0 | 0 | 0 | 0 | 0 | 0 | 915 | (±0) | 0.01 |
| Willow | 0 | 0 | 0 | 0 | 0 | 0 | 7,390 | 0 | 0 | 7,390 | (±0) | 0.08 |
| Mountain ash | 0 | 0 | 0 | 2,372 | 0 | 0 | 0 | 0 | 0 | 2,372 | (±0) | 0.03 |
| Basswood | 0 | 0 | 0 | 0 | 0 | 6,001 | 0 | 0 | 0 | 6,001 | (±0) | 0.07 |
| Citywide total | 26,769 | 35,144 | 170,358 | 557,766 | 1,605,016 | 2,294,225 | 1,956,887 | 1,293,825 | 1,020,716 | 8,960,706 | (±0) | 100.00 |