



# **Street Tree Management Plan**

## **February 2018**

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## **Executive Summary**

The City of Aberdeen, Forestry Division developed this plan with a focus on addressing short and long term maintenance needs for inventoried street trees. The Forestry Division completed a street tree inventory to gain an understanding of the needs of the existing urban forest and to project a recommended maintenance schedule for tree care. Analysis of inventory data and information about the city's existing program and vision for the urban forest was utilized to develop this management plan. A general description of the economic, environmental, and social benefits that trees provide to Aberdeen is presented as justification for investment in this resource.

## **State of the Existing Street Tree Population**

The summers of 2016 and 2017 inventory included trees, and planting sites along public street rights-of-way (ROW). A total of 16,550 sites were recorded during the inventory: 12,842 trees, and 3,708 planting sites. Analysis of the tree inventory data found:

- A majority of the inventoried street trees are rated at good to excellent condition.
- Two species, *Celtis occidentalis* (Common Hackberry) at 9% and the genus *Tilia* (Linden) at 8% of the population comprise the largest percentage (other than Ash) of the street ROW and are beginning to threaten biodiversity. The city has taken steps to ensure that these species proportion of the population will shrink over time. These steps include planting a more diverse selection of trees in the ROW and limiting the planting of both of these species.

- *Fraxinus pensylvanicus* (Green ash) as expected, was found in abundance on the street ROW (37%), which is a biodiversity concern of the city's streetscape, especially with the future threat of Emerald Ash Borer. This percentage should only decrease over time as the city and most nurseries have discontinued the planting of ash trees. The City is also selectively removing and thinning ash within the ROW.
- Overall, the diameter size class distribution of the inventoried tree population trended towards the ideal, with a greater number of young trees than established, maturing, and mature trees. This data is minimally skewed due to the fact that many young trees being planted in the ROW, are in new, expanding residential areas.

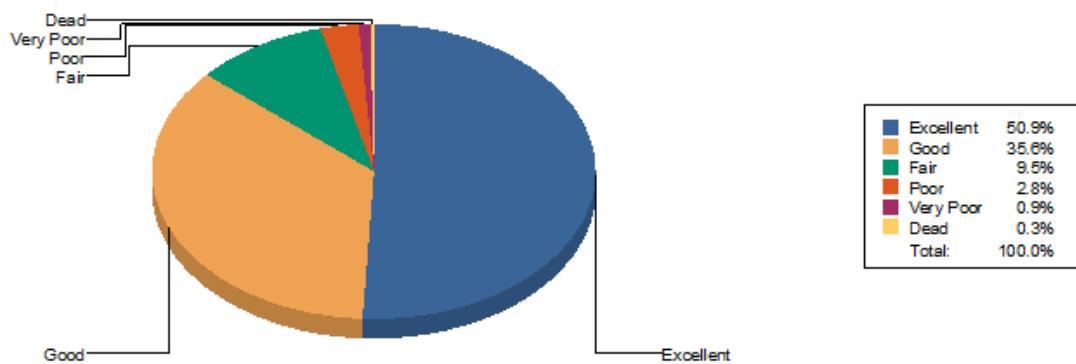
## **Quantifiable Benefits**

- The appraised value of Aberdeen's street tree population is estimated to be over \$48 million. This number is calculated in the tree inventory software, based on average tree size and condition.

## **Tree Maintenance and Planting Needs**

Trees in an urban area provide many environmental and economic benefits that justify the time and money for planting and maintenance. Maintenance should be prioritized by addressing trees with the highest safety risk first. The inventory noted about 2.8% (364 trees) in poor condition. These trees should be removed or pruned in the near future to promote public safety. Not all of these trees pose a threat as some are small diameter, younger trees. There were about 140 trees noted as

very poor or dead that would be included in removals. Again, many of these are young, small diameter trees that didn't survive their first few years of growth. Trees should be planted to mitigate removals and create canopy.



Condition	Percent	Count
Excellent	50.9%	6,551
Good	35.6%	4,576
Fair	9.5%	1,218
Poor	2.8%	364
Very Poor	0.9%	113
Dead	0.3%	40
<i>Total</i>		12,862

Aberdeen's urban forest, street tree population does benefit from the once in 7 years' tree training and routine pruning cycle. Ideally, we would like to shorten this cycle up, but we would need additional trained arborists to accomplish this. This cycle follows the city's Public Works Department chip seal schedule. The trees benefit from the trimming of lower branches which lessens the amount of interfering branches. The Public Works Department also loans us several employees through the winter months to assist with chipping branches

and cleanup efforts. If time allows, Forestry crews will structurally trim young trees that were planted 2-3 years ago. This allows us to train younger trees twice over a 7-year period instead of just once.

Proactive pruning cycles improve the overall health of the tree population and may eventually reduce maintenance costs. In most cases, pruning cycles will correct defects in trees before they worsen, which will avoid costly problems.



Planting trees is necessary to maintain canopy cover and to replace trees that have been removed or lost to natural mortality or other threats (for example, construction, invasive pests, weather impacts or vehicle/tree accidents).

Citywide tree planting should focus on creating canopy in areas that promote economic growth, in parking lots and near buildings with insufficient shade, and where there are gaps in the existing canopy. Trees of varied species should be planted. The city's existing planting list offers smart choices for species selection and past performance can provide further guidance for species selection.



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## **Introduction**

The City of Aberdeen is home to more than 27,000 full time residents who enjoy the beauty and benefits of their street trees and urban forest. The city's forestry program manages trees on the public property – along the street public right-of-way (ROW), in the parks and in other public spaces. The city's Forestry Division has 4 full time positions and 4-5 seasonal positions to manage urban forestry needs.

Funding for Aberdeen's urban forestry program comes from the Parks, Recreation and Forestry Departments operations budget. The City of Aberdeen has a tree care ordinance (Exhibit A) and, is able to meet the \$2 per capita for tree- related expenses, which helps us remain a Tree City USA. The city officially celebrates Arbor Day and has been a Tree City USA member for 37 years.

## **Approach to Tree Management**

The best approach to managing an urban forest is to develop an organized, proactive program using tools (such as a tree inventory) to set goals and measure progress. These tools can be utilized to draft cost-effective budgets based on projected needs, establish tree care priorities, generate planting location plans, and ultimately minimize the need for costly, reactive solutions to crises or urgent hazards.

In the summers of 2015 and 2016, the Aberdeen City Forester worked with summer interns to complete an inventory of all boulevard trees. The following information was collected during the inventory:

- Inventory of trees, stumps, and planting sites within the street ROW (boulevards)
- Analysis of tree inventory data

## **Tree Inventory Analysis**

The information gathered from this inventory will aid the City Forestry Division in the planning of future tree planting, recommended tree maintenance, and summarize the economic, environmental, and social benefits that trees provide to Aberdeen.

The summers of 2016 and 2017 inventory included trees, and planting sites along public street rights-of-way (ROW). A total of 16,550 sites were recorded during the inventory: 12,842 trees, and 3,708 planting sites.

The City of Aberdeen utilized a software program called TreeWorks. The information was gathered using Garmin hand-held GIS computers. Data gathered on these units was completed by trained personnel to ensure high accuracy. At each site, the following data fields were collected:

- Aboveground utilities
- Canopy size
- Clearance requirements
- Tree condition
- Grow space size
- Location
- Species
- Tree height
- Tree size
- Crown issues
- Available planting area

## **Assessment of Tree Inventory Data**

Data analysis and professional judgement are used to make generalizations about the state of the inventoried tree population. Recognizing trends in the data can help guide short and long-term management planning. In this plan, the following criteria and indicators of the inventoried tree population were assessed:

- Species Diversity: The variety of species in a specific population; affects the population's ability to withstand threats from invasive pests and diseases; impacts tree maintenance needs and costs, tree planting goals, and canopy continuity.
- Diameter Size Class Distribution: Statistical distribution of a given tree populations' trunk-size class; affects the valuation of tree-related benefits as well as the estimation of maintenance needs and costs, planting goals, and canopy continuity; the diameter size class distribution can be used to indicate the relative age of a tree population.
- Condition: The general health of a tree population; indicates how well trees are performing given their site-specific conditions; general health affects both short and long-term maintenance needs and costs as well as canopy continuity.
- Street ROW Stocking Level: The portion of existing street ROW trees compared to the total number of potential street ROW trees (number of inventoried trees plus the number of potential planting spaces); stocking level can help determine tree planting needs and budgets.
- Infrastructure Conflicts: Inventory data analysis that provides insight into how well the tree population has been integrated with other city infrastructure and suggestions for how to improve that integration in the future.

## **Species Diversity**

Species diversity affects canopy continuity, maintenance costs, planting goals, and the forestry divisions ability to respond to threats from invasive pests or diseases. Low species diversity (large number of trees of the same species) can lead to severe losses in the event of species specific epidemics such as Dutch Elm disease. Because of the introduction and spread of Dutch Elm disease in the 1930's, combined with its prevalence today, massive numbers of American elm, a popular street tree in Midwestern communities, have perished. Many communities replanted to replace the lost elm trees. Ash and maple trees were popular replacements for American elm in the wake of Dutch Elm disease. Unfortunately, some of the replacement species for elm trees are now overabundant, which is a concern for biodiversity. Emerald ash borer are non-native insect pests that attack some of the most prevalent urban shade trees and many agricultural trees throughout the country.



The composition of a tree population should follow the standard 10-20-30 rule for species diversity in an urban tree population: a single species should represent no more than 10% of the urban forest, a single genera no more than 20% and a single family no more than 30%.

Figure 1 compares the percentages of the most common species identified during the inventory to the 10% rule. Green ash (37%) far exceeds the recommended 10% maximum for a single species in a population.

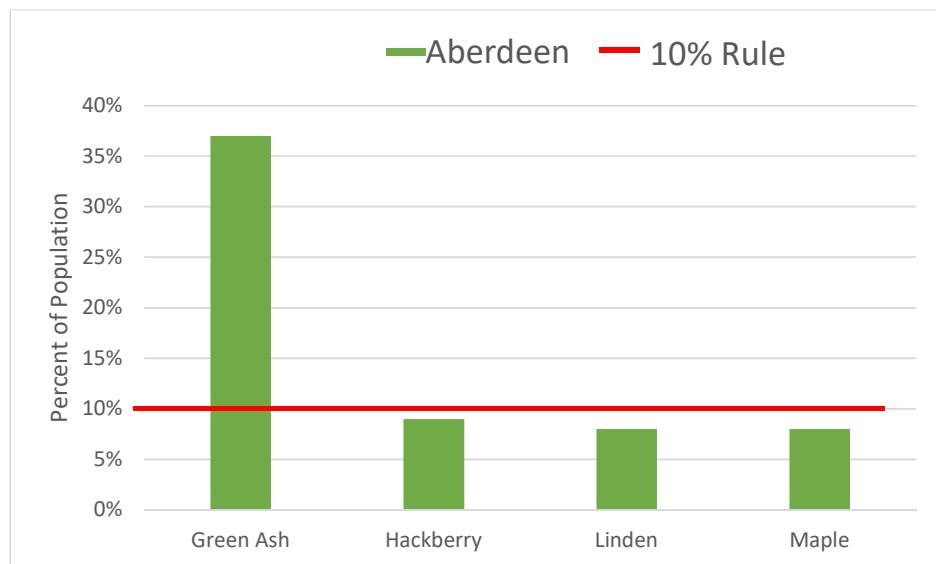


Figure 1. Four most abundant species of boulevard trees

Considering the large quantity of ash already present in the population, combined with its susceptibility to the future effects of Emerald ash borer, the planting of ash has been eliminated from the list of trees the city plants in the boulevard areas. (Exhibit B)

The city will continue to monitor the levels of other species in the future to try and reduce the chances of other species going over the 10% rule.

## Diameter Size Class Distribution

Analyzing the diameter size class distribution provides an estimate of the relative age of a tree population and insight into maintenance practices and needs.

The inventoried trees were categorized into the following diameter size classes: young (1-6 inches DBH), established (7- 18 inches DBH), maturing (19-30 inches DBH), and mature trees (>30 inches DBH). Some studies suggest that the largest fraction of trees (approximately 40% of the population) should be young (<7 inches DBH), while a smaller fraction of trees (approximately 10%) should be in the mature size class (>30 inches DBH). A tree population with an ideal distribution would have an abundance of newly planted and young trees, and lower numbers of established, maturing, and mature trees.

Figure 2 compares Aberdeen's tree diameter class distribution of the inventoried tree population to an ideal proposed situation. Aberdeen's distribution skews to young and established trees. The red line represents the ideal percentage for each class.



Figure 2. Comparison of diameter class distribution for inventoried trees to an ideal distribution.

## **Discussion**

Even though it may appear that Aberdeen has too many young trees, this is not the case. Aberdeen actually has too few mature trees (>30") and thus, the distribution is skewed. The high proportion of established trees is reflective of an extremely strong planting program over the past 15 years.

The low proportion of mature trees is reflective of a time when either too little planting was done or when a high proportion of trees experienced mortality (Dutch elm disease). This could even become more disproportional when Emerald ash borer arrives.

One of Aberdeen's objectives is to establish age diversity in the street tree population. The Forestry Division's efforts on street tree planting and ongoing maintenance efforts will ensure that young, healthy trees are in place to fill in gaps in tree canopy and provide for gradual succession of older trees. The city must continue to promote tree preservation, enforce existing tree ordinances and planting codes. Tree planting and tree care will allow the distribution to normalize over time.

## **Condition**

The City Forestry Division assessed the condition of individual trees based on methods defined by the International Society of Arboriculture (ISA). Several factors were considered for each tree, including root characteristics, branch structure, trunk, canopy, foliage condition and the presence of pests. The condition of each inventoried tree was rated Excellent, Good, Fair, Poor, Very Poor or Dead.

In this plan, the general health of the inventoried tree population was characterized by the most commonly assigned condition during the inventory.

Comparing the condition of the inventoried tree population with relative tree age can provide insight into the stability of the population. In this plan, relative age was based on Diameter Breast Height (DBH). Since tree species have different lifespans and mature at different diameters, heights, and crown spreads; actual tree age cannot be determined from diameter size class alone. However, general classifications of size can be extrapolated into relative age classes. The following categories are used to describe the relative age of a tree: young (1-6 inches DBH), established (7- 18 inches DBH), maturing (19-30 inches DBH), and mature trees (>30 inches DBH).

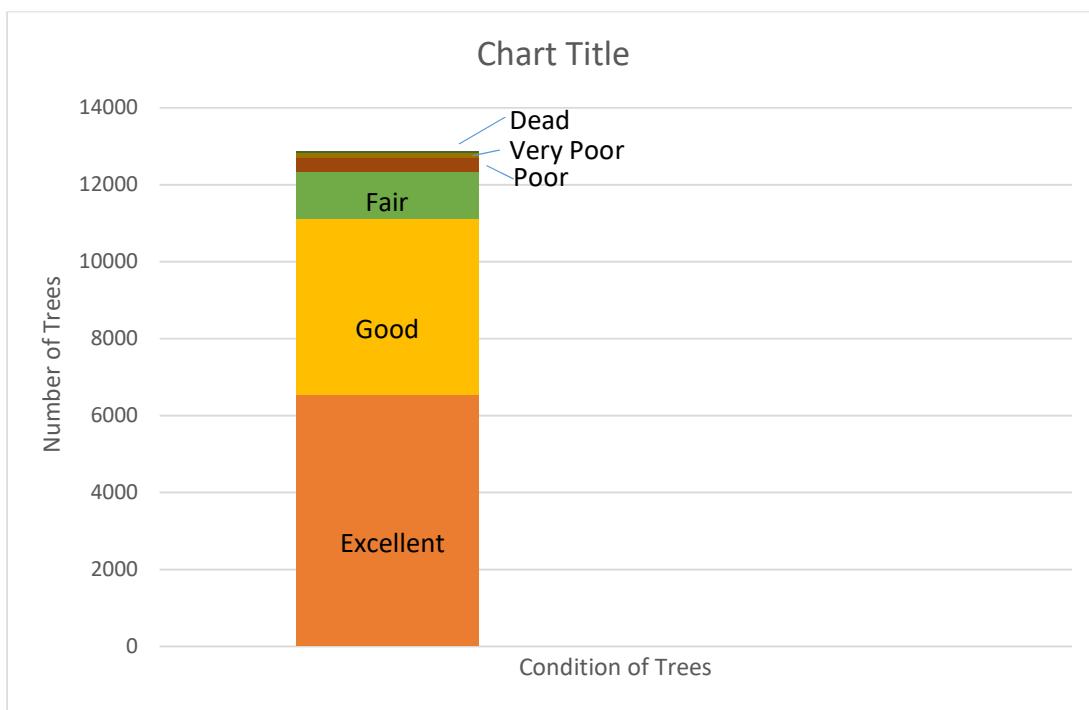


Figure 3. Tree condition of all inventoried trees.

## Boulevard Stocking Level

Stocking is a traditional forestry term used to measure the density and distribution of trees. In urban forestry, stocking level can be used to describe how close a street tree population is to achieving its full potential in regards to street tree density. A well-stocked street tree population will have trees growing in the most appropriate streetscape locations. The City of Aberdeen is aiming to increase stocking levels to increase the benefits accrued by the street tree portion of the urban forest.

Stocking potential is a unique measurement, as there are many municipality-specific factors that affect how many street trees can be supported. Stocking level is the ratio of street ROW spaces occupied by trees to the total street ROW spaces suitable for trees. For example, a

street ROW tree inventory of 1,000 total sites with 750 existing trees and 250 vacant planting sites would have a stocking level of 75%.

For an urban area, it is recommended that the street ROW stocking level be at least 90% so that no more than 10% of the potential planting sites along the street ROW are vacant.

Our inventory found 3,650 vacant planting spaces. Based on the data gathered during this inventory, Aberdeen's current street ROW tree stocking level is 78%. This basically tells us that we have much potential to fill in many of the 3,650 locations void of trees.

## **Conclusions**

Every hour of every day, public trees in Aberdeen are supporting and improving the quality of life. When properly maintained, trees provide abundant environmental, economic and social benefits far in excess of the time and money invested in planting, pruning, protection, and removal.

Managing trees in urban areas is often complicated. Navigating the needs of residents, concerns of public safety and liability, physical aspects of trees, forces of nature and expectation that these issues are resolved all at once is a challenge.

Aberdeen will continue to improve and maintain its urban forest, and will use this management plan to successfully implement, the health and safety of trees for the enjoyment of all for years to come.

(EXHIBIT A)

ARTICLE III. - STREET TREES

Sec. 56-71. - Permit.

- (a) No person shall trim, spray, preserve or remove trees in public places without first filing an application and procuring a permit from the city forester. The application for permit shall be accompanied by the permit fee set forth in the city fee schedule on file in the office of the finance director.
- (b) The application required in subsection (a) of this section shall state the number and kind of trees to be trimmed, sprayed, preserved or removed; the kind of treatment to be administered; the kind and condition of nearest trees upon the adjoining property; and such other information as the city forester shall find reasonably necessary to a fair determination of whether a permit should issue under this section.
- (c) The city forester shall issue the permit provided for in this section when he or she finds that the proposed plantings conform as to species and location to the policies set forth by the park and recreation board.
- (d) Upon receipt of an application for a permit to plant or set out in excess of five trees or plants, the city forester shall have the authority to require from the applicant a detailed declaration of intentions either in form of a planting plan or written statement in duplicate. All planting plans shall be drawn on tracing cloth in ink. One copy of each plan or statement of intention shall, when approved by the city forester, be returned to the applicant and the other copy be kept on file by the city forester. All statements filed in lieu of a planting plan shall contain the same information as required on the plan. All planting plans shall accurately show:
  - (1) The proposed street together with its subdivision of pavement, curb, gutter, parking strip and sidewalk areas to a definite indicated scale.
  - (2) The variety of each and every tree proposed to be planted and of those already existing within the proposed street lines, either indicated on the plans or referenced with a number to key list.
  - (3) The proposed location of each and every proposed tree together with the location of each existing tree within the proposed street line in scaled relation to other features of the plan.
  - (4) The distance between trees in any one row, in feet.
  - (5) The nature of the soil in the planting space, to a depth of three feet, and all existing and proposed surface or subsoil drainage system.

(Code 1980, § 30-14(a)—(c); Code 2003, § 26-71)

Sec. 56-72. - Regulations for planting in a public place.

The following regulations are established for the planting, trimming and care of trees in public places:

- (1) Trees must not be less than 1½ inch in diameter of trunk one foot above the ground.
- (2) All trees from one to three inches in diameter of trunk one foot above the ground must be protected and supported by tree guards.
- (3) No tree shall be placed so as, in the opinion of the city forester, to cause a traffic hazard.
- (4) In felling trees, the trees must be removed with the root stump grubbed out when so required by the city forester.

- (5) The distance which trees shall be planted apart in the row will be in accordance with the recommendation of the city forester, and will depend upon species, purpose for planting, and cultural characteristics of the trees.
- (6) No tree shall be planted where the clear space between the curb and the sidewalk is less than three feet.
- (7) No tree shall be planted where the soil is too poor to ensure the growth of such tree unless the owner excavates a suitable hole of not less than 36 cubic feet and replaces the material removed with suitable loam, or soil stripped from pastureland.
- (8) No tree shall be planted nearer than two feet from the curbline or outer line of the sidewalk unless a special permit is granted by the city forester.
- (9) A permit and approval is required from the city forester before trees are planted within the public rights-of-way. Such trees shall be of a species selected from the list of approved trees maintained by the city forester.

(Code 1980, § 30-14(d); Code 2003, § 26-72; Ord. No. 08-01-08, 2-4-2008)

Sec. 56-73. - Regulations for construction around street trees.

- (a) *Generally.* The following regulations are to be established and a standard specification for augering, instead of trenching, the root zone of street trees shall be used. The trenching operation when allowed to be used in the root zone of a tree, causes damage to that tree's root system. Trenching through the tree's root zone will cause any or all of the following damage to occur to the street and remaining root system. Trenching damage causes slowing of the growth rate, die-back and decline of the tree's crown and or root system, deadwood formation, wind throw, invasion of wood-decaying fungi and or insects, or total tree mortality. The maintenance and protection responsibilities not only include the portion of the tree above ground, but also the root system of the tree. Augering specifications will be used by all individuals, partnerships, corporations, or governmental units to provide adequate protection for the roots of street trees.
- (b) *Specifications for augering.* The street tree root zone shall be protected by augering in the following manner:

Tree Diameter (DBH*) (in inches)	Auger Distance from Face of Tree
0 to 2	1 foot in all directions if trench is located within this radius.
3 to 4	2 feet in all directions if trench located within this radius.
5 to 9	5 feet in all directions if trench located within this radius.
10 to 14	10 feet in all directions if trench located within this radius.
15 to 19	12 feet in all directions if trench located within this radius.
19 and over	15 feet in all directions if trench located within this radius.

\*DBH = Diameter breast height, measured at 4.5 feet above ground.

- (c) *Minimum depth of auger within root zone; trenching.* The minimum depth of auger within the root zone, as described in subsection (b) of this section, shall be 24 inches below the soil surface. No trenching within the root zone of the tree as described, shall be permitted.
- (d) *When augering not required.* Augering shall not be required for installations that are in the street and more than five feet from the back of the curb.

(Code 1980, § 30-14(e); Code 2003, § 26-73)

Sec. 56-74. - Duties of private owner.

It shall be the duty of any person growing or maintaining or planting a tree within the parking strip or other public place or responsible for trees growing on property abutting on public places as follows:

- (1) *Trimming.* To keep all trees standing upon private property or upon the parking strip or boulevard adjoining such property so trimmed that no bough or branch thereof shall be lower than approximately 16 feet above the surface of the street, road, alley or any sidewalk thereon and shall keep all such trees so trimmed that no trunk, limb or branch thereof shall in any way, or at any time, come in contact with any street lighting.
- (2) *Treatment or removal.* To treat or remove any tree or plant so diseased or insect ridden as to constitute a hazard to trees or plants in public places, except in accordance with Dutch elm disease as defined in section 56-33.
- (3) *Prohibited species.* To remove and refrain from all planting of any of the following species:
  - a. All shrubs;
  - b. All species of the populus family;
  - c. All evergreens; and
  - d. Other species as may be determined by the city forester.
- (4) *Good arboriculture practices.* All trimming and treating and removals must be done according to good arboriculture practices as set forth by the city forester. Specific procedures will be made available by the city forester on a request basis.

(Code 1980, § 30-15; Code 2003, § 26-74)

Secs. 56-75—56-110. - Reserved.

# Acceptable Trees for Boulevards

**Tree List**

<b><u>Tree List</u></b>		<b><u>Comments</u></b>	<b><u>Size</u></b>
<b>Northern Catalpa</b>	(Catalpa speciosa)	Unique large heart shaped leaves	Height 55', Upright Oval
<b>Common Hackberry</b>	(Celtis occidentalis)	Native to S.D., Great, Clean Shade Tree	Height 65', Arching, Rounded
<b>Northern Acclaim Honeylocust</b>	(Gleditsia triacanthos 'Harve')	Provides light shade, Seedless, Hardier	Height 45', Upright, Symmetrical
<b>Shademaster Honeylocust</b>	(Gleditsia triacanthos 'Shademaster')	Provides light shade, Seedless	Height 55', Symmetrical
<b>Skyline Honeylocust</b>	(Gleditsia triacanthos 'Skycole')	Provides filtered shade, Seedless	Height 50', Pyramidal
<b>Kentucky Coffeetree 'Espresso'</b>	(Gymnocladus dioica 'Espresso')	Seedless, Insect & Disease Resistant	Height 50', Open, Broadly
<b>Kentucky Coffeetree</b>	(Gymnocladus dioica)	Insect & Disease Resistant	Height 50', Open, Broadly
<b>Northern Advance Sycamore</b>	(Platanus occidentalis 'Bismarck')	Northern hardy selection of Sycamore	Height 50', Upright
<b>Amur Corktree</b>	(Phellodendron amurense)	Pest free, decent fall color	Height 40', low spreading crown
<b>Shagbark Hickory</b>	(Carya ovata)	Attractive bark, potential fall color	Height 35', oval form
<b>Quaking Aspen</b>	(Populus tremuloides)	Attractive Leaves and Bark, Potential to Sucker	Height 65', Pyramidal to Rounded
<b>Bur Oak</b>	(Quercus macrocarpa)	Native, Moderately fast growth	Height 60', Open, Rounded
<b>American Linden (all varieties)</b>	(Tilia americana)	Not for boulevards less than 6 foot width	Height 70', Pyramidal to Rounded
<b>Accolade Elm</b>	(Ulmus carpinifolia 'Morton')	Requires Annual Pruning, Fast Growth	Height 65', Vase Shape
<b>Jefferson Elm</b>	(Ulmus americana 'Jefferson')	Disease Resistant, Fast Growth	Height 60', Upright Full Crown
<b>Danada Charm Elm</b>	(Ulmus 'Morton Red Tip')	Disease Resistant, Fast Growth	Height 65', Vase Shape
<b>Autumn Gold Gingko</b>	(Ginkgo biloba 'Autumn Gold')	Free of disease and pest problems, slow	Height 50', Pyramidal
<b>Amur Maackia</b>	(Maackia amurensis)	Ornamental type tree, late flowering	Height 25', upright form

\* An Approved Planting Permit is Required Before Purchasing Trees for the Boulevard \*

**TREES MUST BE A MINIMUM 1" inch - 1 1/4" inch CALIPER**

**Anything smaller than 1 inch caliper will not be allowed in the boulevard**

**\*\* For a boulevard planting permit or other questions, contact:**

**Aaron Kiesz - City Forester**  
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 605-626-7015  
[aaron.kiesz@aberdeen.sd.us](mailto:aaron.kiesz@aberdeen.sd.us)