Forestry Recommendations: Street Right-of-Way and Yard Tree Inventory

City of Roeland Park, Kansas

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Introduction

The City of Roeland Park completed a tree inventory that identified 3,773 street right-of-way and front yard trees. The inventory as conducted in June 2022 by Wiregrass Ecological Associates, Bainbridge, Georgia. For this project, all trees located within the city ROW and trees located behind the ROW to the front face of each home that were 6" in diameter or larger were included. This inventory is intended to inform efforts the city is taking to implement a tree protection policy.

This tree inventory not only provides Roeland Park with data to make management decisions, but it also gives city staff and leadership data to understand the impacts of development and other factors that can cause a loss of trees and especially, large trees. There first needs to be the understanding that trees are infrastructure, an appreciating asset where contributions to the community increase as trees grow and mature. When this community asset is lost, the contributions trees provide to residents and visitors is lost. Contributions such as reduced energy costs and demand, reduced respiratory and cardiovascular incidents that require hospitalization or treatment, reduced mortality, and reduced loss of school and work days. When trees are properly cared for and can grow to their largest potential, the city and residents will realize increased property values where trees are present, increased home resale and rentals, and increased feelings of well-being in areas with high canopy coverage.

An analysis of inventory data provided by Donnie Scharff, Roeland Park Public Works Director, found approximately 81 species of trees included in the inventory. This is a good composition of tree species but even more can be planted as site and soil conditions allow. Dutch elm disease exposed the risks of monoculture and low diversity plantings as it killed millions of American elms in the United States. Pine wilt has hammered Austrian and Scotch pines and its ability to readily spread to other types of pines is unclear. The emerald ash borer has been detected in 12 Kansas counties, 36 states and 5 Canadian provinces, leaving millions of dead ash trees in its wake. In the Kansas City metropolitan area, oak wilt has been confirmed and other oak diseases lurk. Storms expose the weaknesses of fast-growing trees and those with significant defects and the climate in Kansas tests the ability of trees to endure moisture and temperature extremes. The Asian longhorned beetle has been found in four eastern states and a federal and state investigation was triggered when the spotted lanternfly was found in a Kansas State Fair entry. When insects and diseases are transported in firewood and other raw wood products or cling to multiple modes of transportation, a distant threat can quickly become very near. The list of biotic and abiotic threats to Kansas community forests is likely to increase over time.

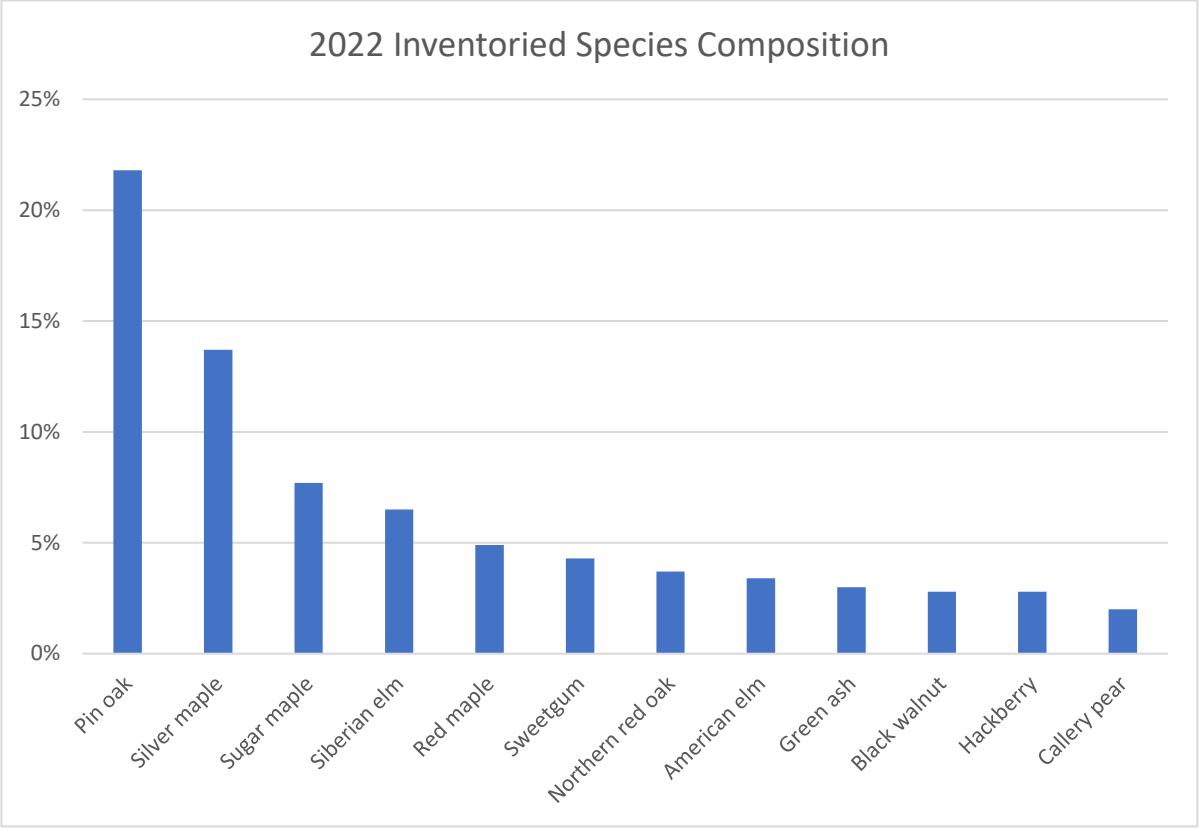
Tree condition is also a measure of forest health. Six condition categories were identified in the data. Six trees were counted as dead for 0% of the total. Twenty-three (23) trees were identified for removal (1%), 51 trees rated as poor (1%), 204 trees as fair (5%), 398 as good (11%) and 3,091 trees as excellent or 82% of the total. The city should familiarize themselves with the condition definitions and follow up in the near future on the trees rated for removal and poor.

Tree size is an indicator of the age of the forest. Trees included in the inventory were found to be 10" in diameter at the smallest and 65" at the largest. Utilizing diameter categories in increments of 4" found the highest number of trees in the size range of 12"-15.99" (871), followed by 521 trees in the diameter range of 20"-23.99". The fact that there are no 6" diameter trees in the inventory begs the question if trees are being planted in these locations. If not or not enough, they should be to ensure a continual growth of canopy coverage in the community. The lack of young trees to replace the overmature trees in these areas can expose the city and its residents to lost canopy coverage and years of heat islands, where energy costs and air pollution are higher, health incidences increase and lower resale value of homes.

Diversity Analysis

Overpopulation by a single species can make a community vulnerable to losing a large number of trees to a single insect, disease, climate impact or storm event. Dutch elm disease in American elms and the emerald ash borer in ash are examples. Pin oak dominates with nearly 22% of the total population (823 trees) with silver maple at 14% (517 trees). Sugar maple follows at 8% (291) and Siberian elm at 6.5% (244) of the population. A long-time rule of thumb for species diversity has been that no more than 10% of a species, no more than 20% of a genus, and no more than 30% of a family comprise the population. With continued threats by the same and new insects and diseases and climate extremes and damaging storm events, it is now suggested that stocking levels should be much lower. Some tree insects and pests don't attack an entire genera or family, but as emerald ash borer has shown, all *Fraxinus* in this country are vulnerable, as might be other members of the Olive family. Asian longhorned beetle favors maple, buckeye, willow, and elm plus numerous other tree species that are good or occasional hosts. These and other threats lead some to recommend a 5-10-15 rule of thumb or even lower thresholds.

The number of species, genera and family members represented in the community forest is one measure of forest health and resilience. The inventory data is analyzed and ranked to identify the abundance of the top 12 species of trees growing on Roeland Park's ROW and front yards.



Species	Number Trees	% of Total	Species	Number Trees	% of Total
Pin oak (*Quercus)*	823	21.8%	Northern red oak *(Quercus)*	138	3.7%
Silver maple (*Acer)*	517	13.7%	American elm *(Ulmus)*	128	3.4%
Sugar maple *(Acer)*	291	7.7%	Green ash *(Fraxinus)*	113	3%
Siberian elm *(Ulmus)*	244	6.5%	Black walnut *(Juglans)*	107	2.8%
Red maple *(Acer)*	184	4.9%	Hackberry *(Celtis)*	105	2.8%
Sweetgum *(Liquidambar)*	161	4.3%	Callery pear *(Pyrus)*	76	2%

Miscellaneous: (Tree species representing less than 2% of the inventoried population):
Trident, hedge, black, Norway maple; boxelder; Ohio and red buckeye; Tree of Heaven, river birch; water, bitternut, black, mockernut, pignut, shagbark hickory; pecan, American hornbeam, northern catalpa, eastern redbud, katsuratree, flowering dogwood, white ash, Ginkgo, honeylocust, Kentucky coffeetree, eastern redcedar, goldenraintree, tuliptree, apple spp.; southern, saucer, star magnolia; Osage-orange, paradise apple, white mulberry, sourwood; Norway, white, Colorado blue spruce; Austrian, eastern white, limber, Scotch pine; London planetree, American sycamore, white poplar, eastern cottonwood; sweet, black, Japanese flowering cherry; common chokecherry, pear spp.; sawtooth, white, shingle, bur, chinkapin, willow, shumard, post and black oak; black locust, willow spp., baldcypress; American and littleleaf linden; American, lacebark (Chinese), red (slippery) elm; and Japanese zelkova.

Stocking Levels

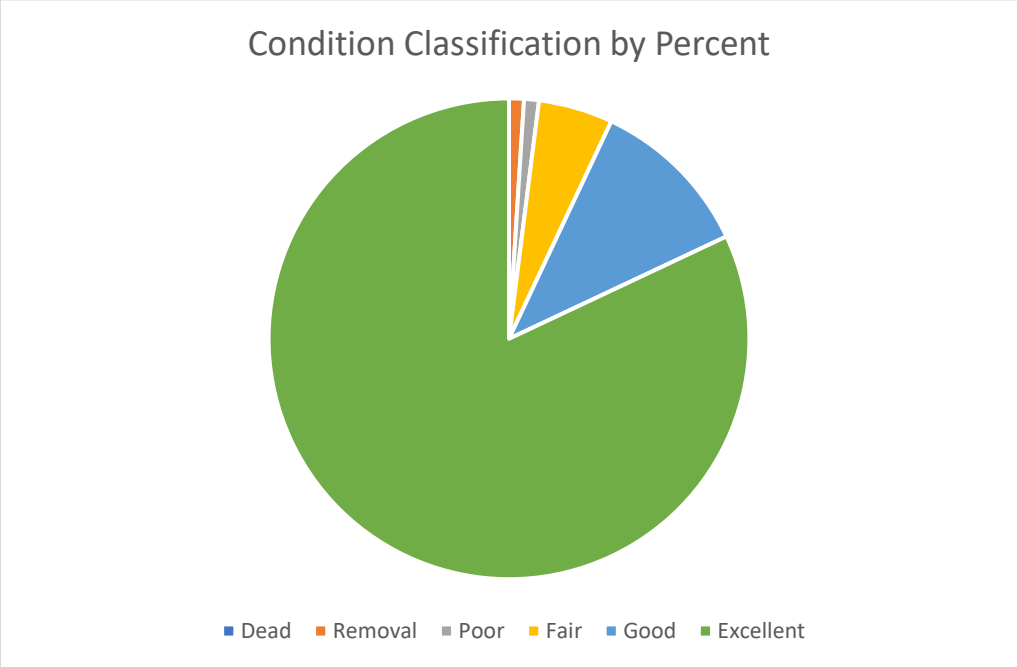
Many communities have followed the guidance for forest diversity proposed by Frank Santamour, Jr. His recommendation was dubbed the 10-20-30 Rule. With the known threats to forest health from biotic and abiotic factors, and awareness that more is likely on the horizon, that guidance is now being questioned and lower thresholds proposed. The loss of native trees to exotic insects or diseases or of native insects and diseases attacking non-native species is a driving factor to recommendations for dramatically lower stocking levels for species, genera and tree families.

An analysis of the data reveals the following stocking levels as it pertains to genera and family associations:

Species (81)	Genera (38)	Family (25)	Count	% of Total (3,773)
Oak	*Quercus*	*Fagaceae*	1,109	29.4%
Maple	*Acer*	*Aceraceae*	1,063	28%
Elm	*Ulmus*	*Ulmaceae*	378	10%
Sweetgum	*Liquidambar*	*Hamamelidaceae*	161	4.3%
Pines	*Pinus*	*Pinaceae*	144	3.8%
Ash	*Fraxinus*	*Oleaceae*	122	3.2%
Walnut	*Juglans*	*Juglandaceae*	107	2.8%
Hackberry	*Celtis*	*Ulmaceae*	105	2.8%
Sycamore	*Platanus*	*Platanaceae*	67	1.8%

Condition Analysis

The condition and health of the species is an important consideration. At the time of the inventory, the summarized field data shows that 82% (3,091) of all trees are reported to be in excellent condition, followed by 11% (398) in good, 5% (204) in fair, 1% (51) as poor, 1% (23) to be removed, and 0% (6 trees) dead. Dead trees and those identified for removal should be high priorities of management. The 51 trees rated poor should be monitored for a decline in condition. Definitions of condition categories should be requested from the inventory contractor and referred to.



Age Analysis

Understanding the age of the inventoried resource will help plan for the budgeting of future removal and maintenance needs. It should also guide tree planting programs in the community. Trees in the diameter ranges between 6 and 10 inches is zero and the abundance of trees 0 to 4 inches is unknown. However, if there is not an equal or higher number of young trees established in advance of the loss of mature trees, the community will experience more heat and negative economic impacts from the reduction of canopy coverage. Eight hundred forty-seven (847) trees were found in the diameter categories between 36 and 68 inches. These trees are at higher risk to storm damage and impacts from climate extremes. There were 2,926 trees less than 36" in diameter and this is a positive trend. The following table is a breakdown of the diameter categories in increments of 4 inches.

Number	Diameter Range	Number	Diameter Range	Number	Diameter Range
0	0-3.99	417	24-27.99	137	48-51.99
0	4-7.99	429	28-31.99	86	52-55.99
1	8-11.99	343	32-35.99	16	56-59.99
871	12-15.99	196	36-39.99	16	60-63.99
344	16-19.99	237	40-43.99	7	64-67.99
521	20-23.99	152	44-47.99		

Emerging Threats

The causal agent of Sudden Oak Death (SOD), *Phytophthora ramorum*, was detected in rhododendrons shipped to multiple locations in Kansas from an Oklahoma nursery in 2019. The pathogen affects a wide variety of trees, shrubs and plants and there is no known cure. SOD has killed millions of tanoak and coast live oak trees along the central California coast into southern Oregon. Oaks in the white oak category may not be as susceptible to the disease but those in the red oak category are likely to be substantially affected. There has been no confirmation that sudden oak death has established in the state. However, with the causal agent detected in the state, it should be noted that the 29% of oaks could be at risk if the disease were ever to develop and spread. Oak wilt, *Ceratocystis fagacearum*, is known to be in Johnson County cities not far from Roeland Park. This disease can attack all oaks but those in the red oak category die more quickly than species in the white oak group. This means that all 1,109 oak trees are at risk to infection, with a more rapid death expected for the 1,015 red oaks.

The Asian longhorned beetle has been detected in Massachusetts, New York, Ohio and South Carolina. A list of hosts include ash, birch, elm, buckeye, horsechestnut, goldenraintree, sycamore, London planetree, maple, mimosa, mountain ash, poplar, willow and katsuratree. A document from USDA-APHIS_PPQ Center for Plant Health Science and Technology indicates the genera of *Acer, Aesculus, Betula, Salix* and *Ulmus* as preferred hosts. Of the inventoried trees, 1,063 maple (*Acer*), 38 birch (*Betula*), 1 willow (*Salix)* and 378 elm (*Ulmus*) fall within that categorized risk. One hundred ninety-four (194) other trees are considered occasional to rare hosts. From that standpoint, 1,674 trees or 44% of the inventoried population could be at risk.

A few years ago, a spotted lanternfly was found in a forestry exhibit at the Kansas State Fair. An investigation did not locate any live insects in the community where the insect was reported to be found. Nonetheless, it reinforces that an insect or disease can be transported easily. Should a population of the insect ever become established in the state, the host range is much wider. According to USDA-APHIS-PPQ, the spotted lanternfly can be found on fruit, ornamental and woody trees, with Tree-of-Heaven (*Ailanthus*) one of the preferred hosts.

There are other common insect and disease problems that occur on trees in Kansas, such as:

Species	**Potential Problems**
Ash	Emerald ash borer, native ash borers, ash yellow disease, heart rot and decay
Eastern redcedar	Cedar apple rust, Kabatina tip blight, bagworms
Maples	Verticillium wilt, iron chlorosis in high pH soils, root and butt rots
Pines	Pine wilt, needle diseases, tip blight, pine needle scale
Oaks	Oak wilt, cankers, bur oak blight, scale, twig galls, root and butt rots
Elm	Cankers, Dutch elm disease, Verticillium wilt, European elm scale

The publication *Tree and Shrub Problems in Kansas: Diseases, Insects, and Environmental Stresses* details many problems of woody plants in Kansas. It can be found online at http://www.ksre.ksu.edu/bookstore/pubs/MF3132.pdf

Management Recommendations

The City of Roeland Park should be commended for this step to inventory trees that will influence the right-of-way areas and understand its green infrastructure. The following recommendations are offered to further the city's understanding of its public tree resource and inform future management decisions.

- Increase species diversity on inventoried and public properties from 81 to at least 90 in the next 5 to 10 years. The removal of ash and other poor condition trees represents opportunities to diversify. Avoid increasing species within genera already overrepresented.
- Increase the genera of trees on inventoried and public properties. Thirty-eight (38) genera were present at the time of inventory. Strive for at least 10 new genera in the next 5 to 10 years. Try to choose genera that also diversify the families of trees represented. See the linked resource and chart with trees classified by genus and family below.
- Forge partnerships with commercial entities to encourage their sale of diverse and desirable species of trees for planting in the community. Partner with civic organizations when those partnerships benefit the community and public tree resource.
- Undertake an educational program/campaign to promote the multiple benefits of trees to your residents and the community. Emphasize the necessity of planting a diverse array of trees to protect the community canopy from a high loss of trees due to biotic and abiotic threats. Encourage residents to establish a diverse array of trees on private properties to build resiliency throughout the community.

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Resources:

Kansas Forest Service, Forest Health: https://www.kansasforests.org/forest_health

Kansas Department of Agriculture, Plant Protection and Weed Control:
https://agriculture.ks.gov/divisions-programs/plant-protect-weed-control

USDA APHIS

- Asian Longhorned Beetle:
  https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/asian-longhorned-beetle/asian-longhorned-beetle
- Spotted Lanternfly:
  https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/spotted-lanternfly/spotted-lanternfly

Johnson County Extension:
https://www.johnson.k-state.edu/lawn-garden/agent-articles/diseases/sudden-oak-death.html

National EAB website: http://www.emeraldashborer.info

Native North American Tree Families: http://www.treesforme.com/families.html

Classification by Family

Aceraceae	**Cupressaceae**	**Hippocastanaceae**	**Rosaceae**
Acer - Maple	*Calocedrus* - Incensecedar	*Aesculus* - Buckeye	*Amelanchier* - Serviceberry
	Cupressus - Cypress	Horsechestnut	*Crataegus* - Hawthorn
Adoxaceae	*Juniperus* - Juniper		*Malus* - Crabapple
Viburnum - Viburnum	Redcedar	**Juglandaceae**	*Prunus* - Cherry, Chokecherry,
	Metasequoia - Dawn Redwood	*Carya* - Hickory	Apricot, Almond, Peach, Plum
Anacardiaceae	*Taxodium* - Baldcypress	Pecan	*Pyrus* - Callery Pear
Cotinus - Smoketree	*Thuja* - Arborvitae	*Juglans* - Butternut	*Sorbus* - Mountainash
Pistacia - Chinese Pistache		Walnut	
	Ebenaceae		**Rutaceae**
Annonaceae	*Diospyros* - Persimmon	**Lauraceae**	*Tetradium* - Tetradium
Asimina - Pawpaw		*Sassafras* - Sassafras	*Phellodendron* - Corktree
	Ericaceae	*Liriodendron* - Tuliptree	*Ptelea* - Hoptree
Aquifoliaceae	*Oxydendrum* - Sourwood	*Magnolia* - Magnolia	
Ilex - Holly			**Salicaceae**
	Eucommiaceae	**Moraceae**	*Populus* - Poplar
Betulaceae	*Eucommia* - Hardy Rubber Tree	*Maclura* - Osage Orange	Cottonwood
Alnus - Alder		*Morus* - Mulberry	Aspen
Betula - Birch	**Fabaceae**		*Salix* - Willow
Carpinus - Hornbeam	*Cercis* - Redbud	**Nyssaceae**	
Corylus - Filbert	*Cladrastis* - Yellowwood	*Nyssa* - Tupelo	**Sapindaceae**
Ostrya - Hophornbeam	*Gleditsia* - Honeylocust		*Koelreuteria* - Goldenraintree
	Gymnocladus - Kentucky Coffeetree	**Oleaceae**	*Sapindus* - Western Soapberry
Bignoniaceae	*Maackia* - Amur Maackia	*Chionanthus* - Fringetree	
Catalpa - Catalpa	*Robinia* - Black Locust	*Fraxinus* - Ash	**Simaroubaceae**
	Sophora - Pagodatree	*Syringa* - Lilac	*Ailanthus* - Tree of Heaven
Celastraceae			
Euonymous - Euonymous	**Fagaceae**	**Pinaceae**	**Styracaceae**
	Castanea - Chestnut	*Abies* - Fir	*Halesia* - Silverbell
Cercidiphyllaceae	*Fagus* - Beech	*Picea* - Spruce	*Styrax* - Snowbell
Cercidiphyllum - Katsuratree	*Quercus* - Oak	*Pinus* - Pine	
		Pseudotsuga - Douglas Fir	**Tiliaceae**
Cornaceae	**Ginkgoaceae**	*Tsuga* - Hemlock	*Tilia* - Linden
Cornus - Dogwood	*Ginkgo* - Ginkgo	*Larix* - Larch	
			Ulmaceae
	Hamamelidaceae	**Platanaceae**	*Celtis* - Hackberry
	Corylopsis - Winterhazel	*Platanus* - London Planetree	Sugarberry
	Liquidambar - Sweetgum	Sycamore	*Ulmus* - Elm
	Parrotia - Persian Parrotia		*Zelkova* - Zelkova