2015 NYC Street Tree Census Report

By Aparna Akula

Introduction

Trees have grown continuously on the mainland and islands that now comprise New York City since the end of the Ice age. Trees have inhabited the lands in or around what is now New York City for over 300 million years, far before the existence of humanity. Humanity's impact of the trees in New York City greatly accelerated with European colonization of the Americas as the new settlers brought with them advanced metal tools and tree processing technologies paired with an appetite for lumber for domestic use and for export to others of the Thirteen Colonies and to the Old World. While the Native American population lived off and with the Northeastern coastal forests relatively symbiotically, the new European colonists, with their higher population density, sedentary housing needs, and agriculture techniques, diminished the need to harvest wild fruits from trees. The New World found itself rapidly deforested, New York City included.

Street tree data from the Trees Count! 2015 Street Tree Census, conducted by volunteers and staff organized by NYC Parks & Recreation and partner organizations. The main goal of the project is to conclude what are the common species present in the trees and which of these species are healthy.

New York City

Each census takes approximately two years to complete and involves the collection of spatial and morphological data for every street tree in NYC, and data about the condition of their planting spaces. According to a recent Nature Conservancy analysis, New York presently has about seven million trees, or less than one tree for each of its 8.8 million citizens. The streets are lined with over 650,000 trees; however, they are not properly spaced, much like the parks.

According to a New York Times article,

- The Trust for Public Land, a conservation organization that aids in the creation of public parks across the United States, discovered that inhabitants of predominantly white and affluent communities have much more open park space than low-income New Yorkers and people of color.
- An additional 250,000 trees might theoretically be added to the streetscape; the remaining trees would be planted in parks and other green areas under the management of local, state, and federal governments, or of private partners.
- “We lose hundreds of New Yorkers a year from extreme heat, far more than we lose from cold,” Mr. Levine said. “And the rate of death from heat among African-American New Yorkers is double the rate among white New Yorkers.”
- Trees provide shade in the summer, absorb carbon dioxide, and storm water, and have a quantifiable impact on the temperature of the air around them. According to figures from the city's health department, 350 more New Yorkers per year die from heat-related causes than in car accidents. With climate change, deaths from heat are only predicted to rise.
- It has also been demonstrated that being in nature lowers stress. The city's parks served as one of the few safe havens during the worst of the pandemic.
- “People are seeing how valuable our open space is and how valuable our tree canopy-covered streets are,” said Nelson Villarrubia, the executive director of Trees New York, a group that works to protect the urban forest. He said that since the pandemic, the organization has seen an uptick in interest in its classes for teaching volunteers how to care for city trees.

Motivation

Every day, our street trees provide benefits that directly enhance our quality of life. Trees minimize stormwater runoff, filter, and chill the air, and save energy. They raise property prices, enhance community aesthetics, and enhance the health and wellbeing of people. It was quite challenging to place a monetary number on these advantages until recently. But now, researchers with the U.S. Forest Service have created a method for evaluating the financial impact of many but not all the advantages of urban trees.

Trees are the basis of sustaining life on earth. They absorb carbon dioxide and release oxygen by Photosynthesis. They also help in reducing soil erosion by binding the soil to their roots. They absorb carbon from the atmosphere and store it in their wood and bark, thus slowing the rate of global warming. Forests help in flourishing wildlife and providing shelter for thousands of species

including humans. They are also the main source of raw material for timber and paper industries which helps in boosting the economy. Trees provide fruits, a source of food for birds, animals, and humans.

Respiration and transpiration, the biological processes by which trees breathe and take in water from their surroundings, are what provide trees their environmental advantages. The advantages rise as trees get bigger because these processes entail interactions between a tree's leaves, the surroundings, and the atmosphere.

A tree census observes the health of the trees and if stress factors are observed, it should be reported to the authorities concerned. The data will help in understanding the various species of trees, their population. A tree census will also help in restoring lost green cover and calculating the carbon sink capacity.

It will also help in knowing the condition of the trees, check the growth of invasive species or help remove the ones that are infected or lean precariously towards compound walls or the roads. For promoting awareness of the importance of the urban forest and support municipal urban forest management. It is possible to analyze and address root or trunk problems by looking into how they arise.

Question Definition

What questions are we trying to solve with visualizations of your data?

- What are the top species of the tree?
- What is the status of the trees and their corresponding tree health?
- What are the top 10 species with good health?
- What are the major problem of the trees?
- Is a big tree placed on curb is still healthy?
- Does stewardship help in taking of the problems?
- Which Borough has the highest number of trees?
- How are the trees distributed across New York City?

Methodology

The owner of the data is NYC open data. This data is provided by Department of Parks and Recreation. Street tree data from the Trees Count! User collected data in the 2015 census. 2015 Street Tree Census, conducted by volunteers and staff organized by NYC Parks & Recreation and partner organizations. Tree data collected includes tree species, diameter, and perception of health. Accompanying blockface data is available indicating status of data collection and data release citywide. The data is collected once in 10 years. The dataset contains 684K rows and 45 columns and each row is a tree.

Data cleaning is done on the dataset and all the unwanted columns are removed. The resulting data contains 651K rows and 30 columns. The following are the columns that are used for the project,

- tree_id - Unique identification number for each tree point.
- created_at - The date tree points were collected in the census software.
- tree_dbh - Diameter of the tree, measured at approximately 54" / 137cm above the ground. Data was collected for both living and dead trees.
- stump_diam - Diameter of stump measured through the center, rounded to the nearest inch. Only applies to records where "status" is "Stump."
- curb_loc - Location of tree bed in relationship to the curb; trees are either along the curb (OnCurb) or offset from the curb (OffsetFromCurb)
- status - Indicates whether the tree is alive, standing dead, or a stump.
- Health - Indicates the user's perception of tree health. Field left blank if the tree is dead or stump.
- spc_common - Common name for species, e.g., "red maple"
- steward - Indicates the number of unique signs of stewardship observed for this tree. No t recorded for stumps or dead trees. The values are 0, 1, 3 and 4
- guards - Indicates whether a guard is present, and if the user felt it was a helpful or harm ful guard. Not recorded for dead trees and stumps. Values Harmful, Helpful, and Unsure

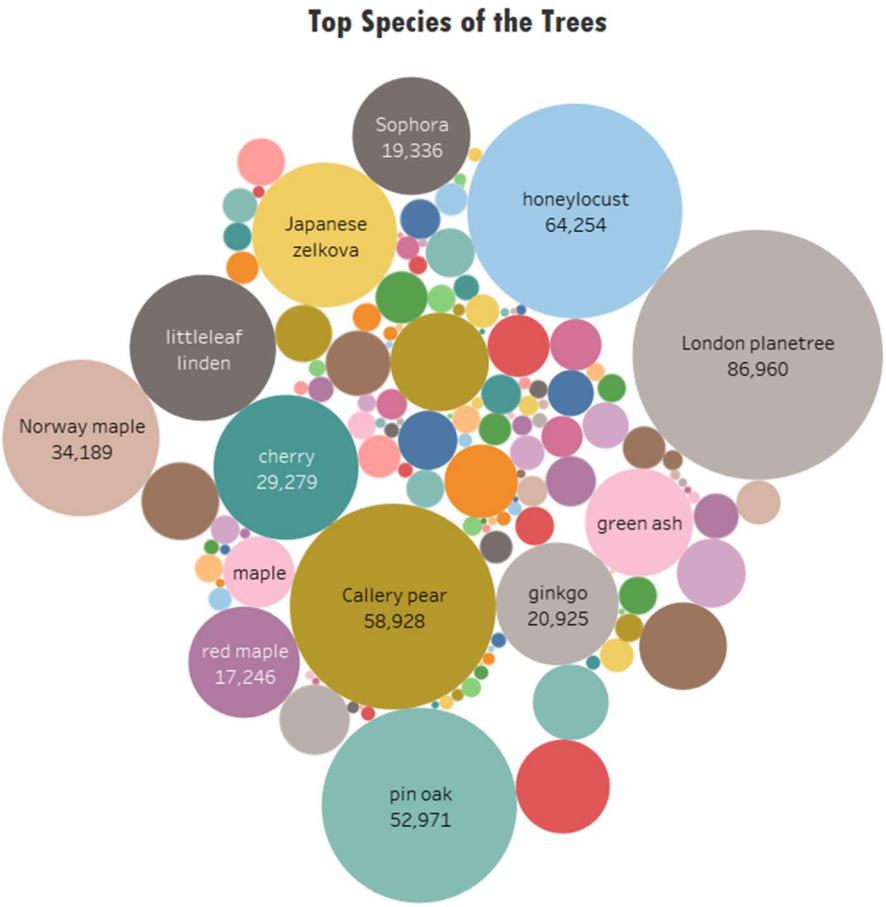
all indicate that a tree guard is present. A tree guard is considered 'helpful' if it doesn't i mpede water getting to the tree and does not raise the soil level or trap debris in the pit

- sidewalk - Indicates whether one of the sidewalk flags immediately adjacent to the tree was damaged, cracked, or lifted. Not recorded for dead trees and stumps. The domain v alues are Damage and NoDamage.
- user_type - This field describes the category of user who collected this tree point's data. The domain values are Volunteer, TreesCount Staff and NYC Parks Staff.
- problems – Indicates how the problems are caused.
- root_stone - Indicates the presence of a root problem caused by paving stones in tree bed.
- root_grate - Indicates the presence of a root problem caused by metal grates in tree bed.
- root_other - Indicates the presence of other root problems.
- trunk_wire - Indicates the presence of a trunk problem caused by wires or rope wrapped around the trunk.
- trnk_light - Indicates the presence of a trunk problem caused by lighting installed on the tree.
- trnk_other - Indicates the presence of other trunk problems.
- brch_light - Indicates the presence of a branch problem caused by lights, usually string light or wires in the branches.
- brch_shoe - Indicates the presence of a branch problem caused by sneakers in the branches.
- brch_other - Indicates the presence of other branch problems.
- borocode - Code for borough in which tree point is located. The integer domain values are 1-Manhattan, 2-Bronx, 3-Brooklyn, 4-Queens, and 5-Staten Island.
- Borough - Name of borough in which tree point is located. The values are Manhattan, Bronx, Brooklyn, Queens, and Staten Island.

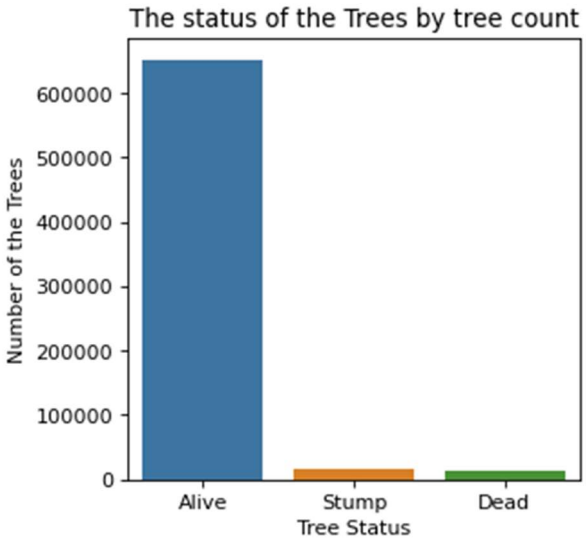
Outline :-

Both Tableau and the python seaborn are used to tell the story through visuals. The features Species, Tree health, Major Problems of the trees, Curb location, how the problems are caused to the root, the number of trees as per borough, how the problem are caused to the branches, the contribution b y each user type, how the problems are caused to the trunk and Guards are used to narrate the story. The status of the tree, health of the tree, problems caused to the tree and how are they caused, top species of the trees and how the trees are distributed in boroughs id determined.

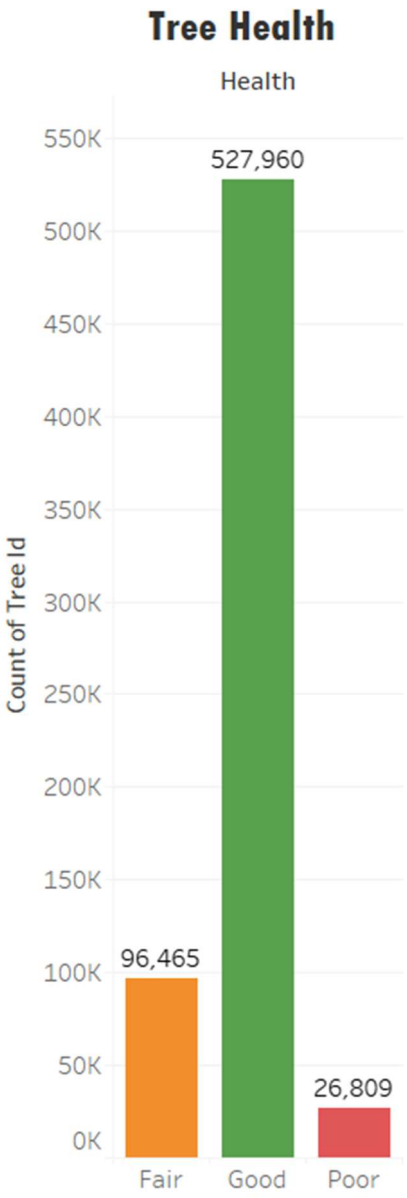
Findings



The packed bubbles determine the top species of the tree. It is calculated by the count of the trees present in each species. So, the top 10 species of tree across New York city are London planetree, Honeylocust, Callery pear, Pink oak, Norway maple, Littleleaf linden, Cherry, Japanese zelkova, Ginkgo, Sophora, Red maple and Green ash.



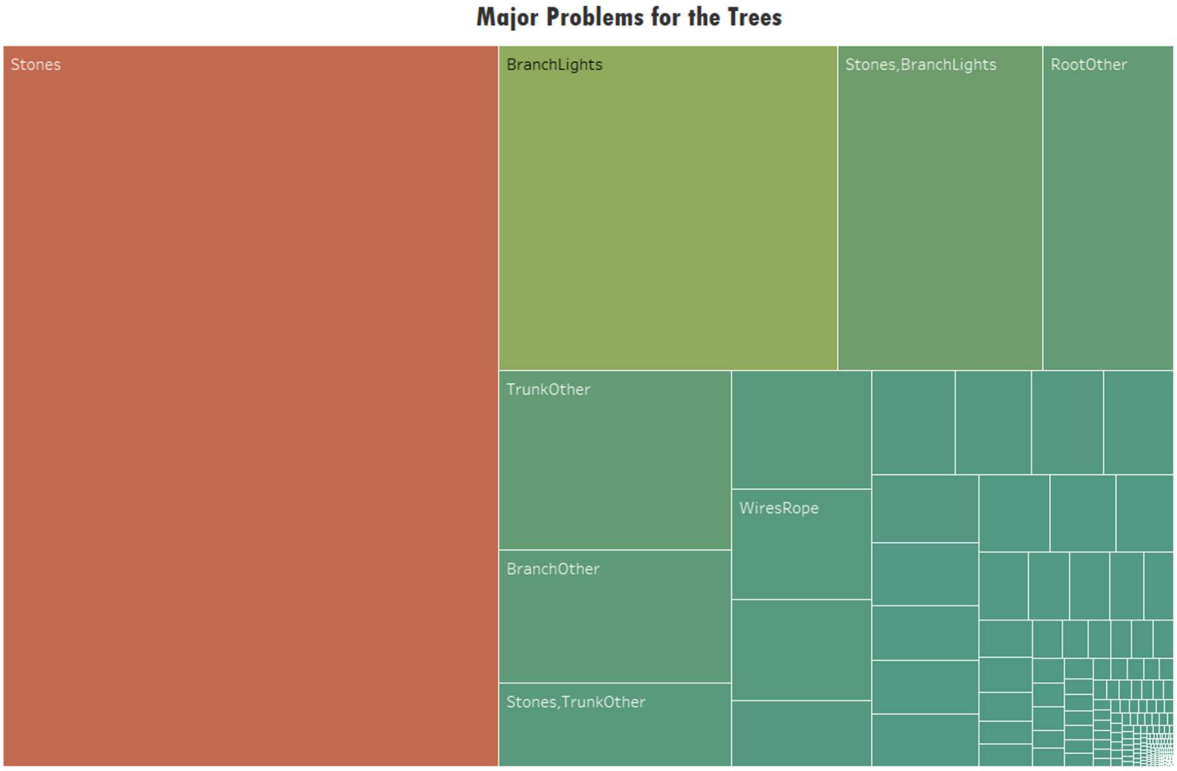
From the vertical bars, it can be derived that, nearly 652k of the 684k trees are living, 17654 are just stumps, and 13961 are standing dead out of the total. Nearly 528k of the living trees are in good health, 96.5k are in fair health, and 26.8k are in bad health.



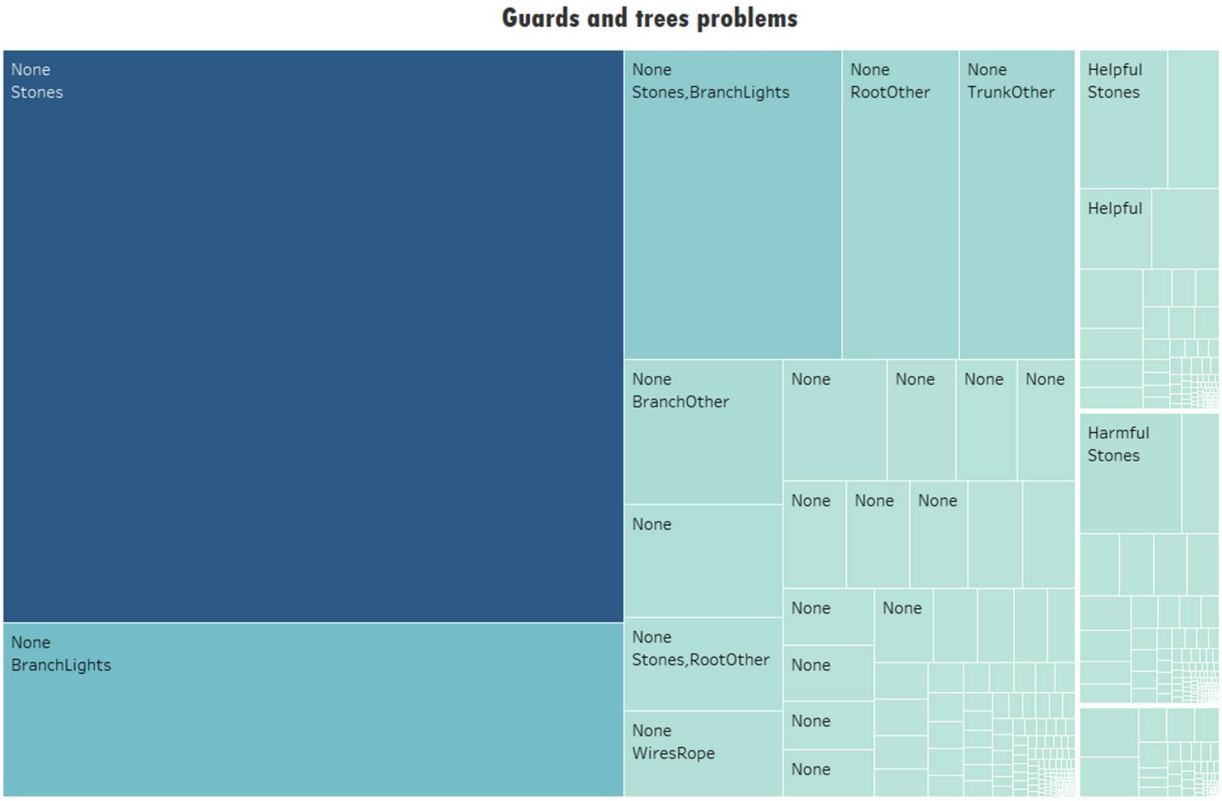
Top 10 species with good health

	Health		
Spc Common	Good	Fair	Poor
pitch pine	100.00%		
arborvitae	92.99%	5.18%	1.83%
false cypress	89.81%	8.33%	1.85%
Osage-orange	89.66%	10.34%	
red pine	89.62%	9.43%	0.94%
Atlas cedar	88.51%	10.34%	1.15%
sawtooth oak	87.66%	10.20%	2.14%
Chinese fringetree	86.75%	10.68%	2.56%
Chinese chestnut	86.71%	12.14%	1.16%
Japanese zelkova	86.42%	10.91%	2.67%

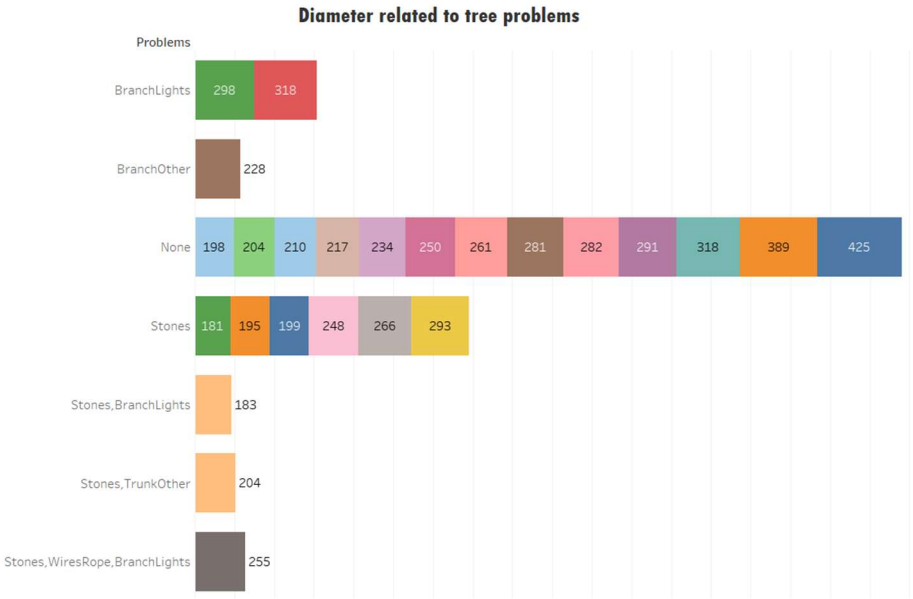
Pitch pine trees as a whole are all in good condition. The health of Arborvitae trees is approximately 92%. Nearly 89% of the trees in the species False cypress, Osage-orange, and Red pine are in good health. Atlas cedar has an 88% healthy tree percentage, compared to 87% for Sawtooth oak. About 86% of the trees in Chinese fringetree, Chinese chestnut, and Japanese zelkova are in good health.



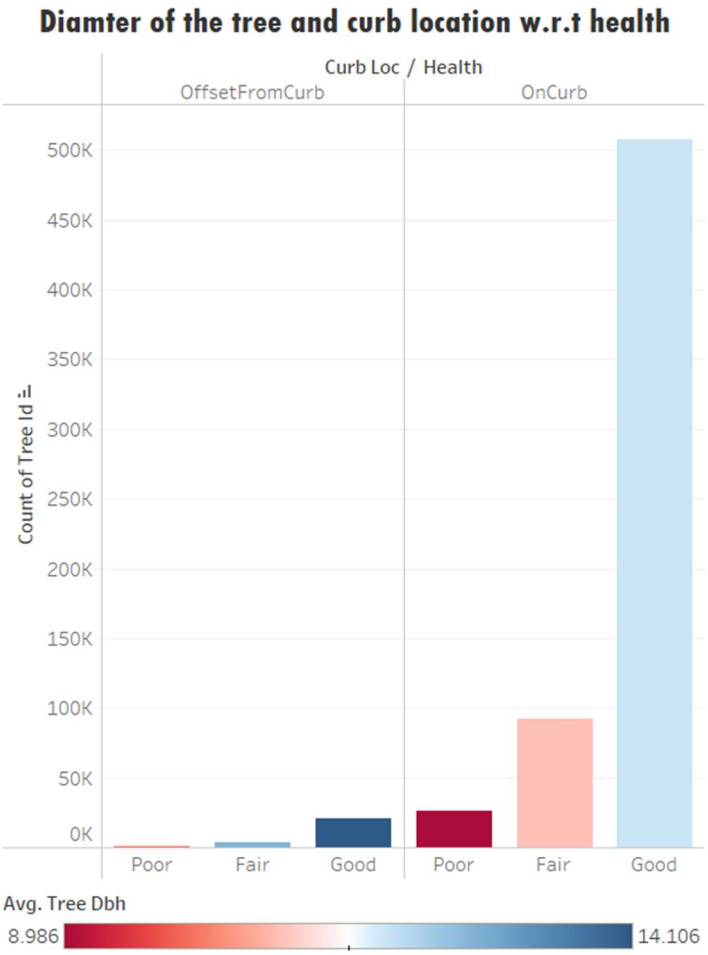
The tree maps reveal that most of the issues affecting the trees are brought on by Stones. The branch lights are the second significant issue. Both stones and branch lights have an effect on some of the trees. Other issues with the trees' roots, trunks, and branches also have an impact. Wires and ropes also harm trees.



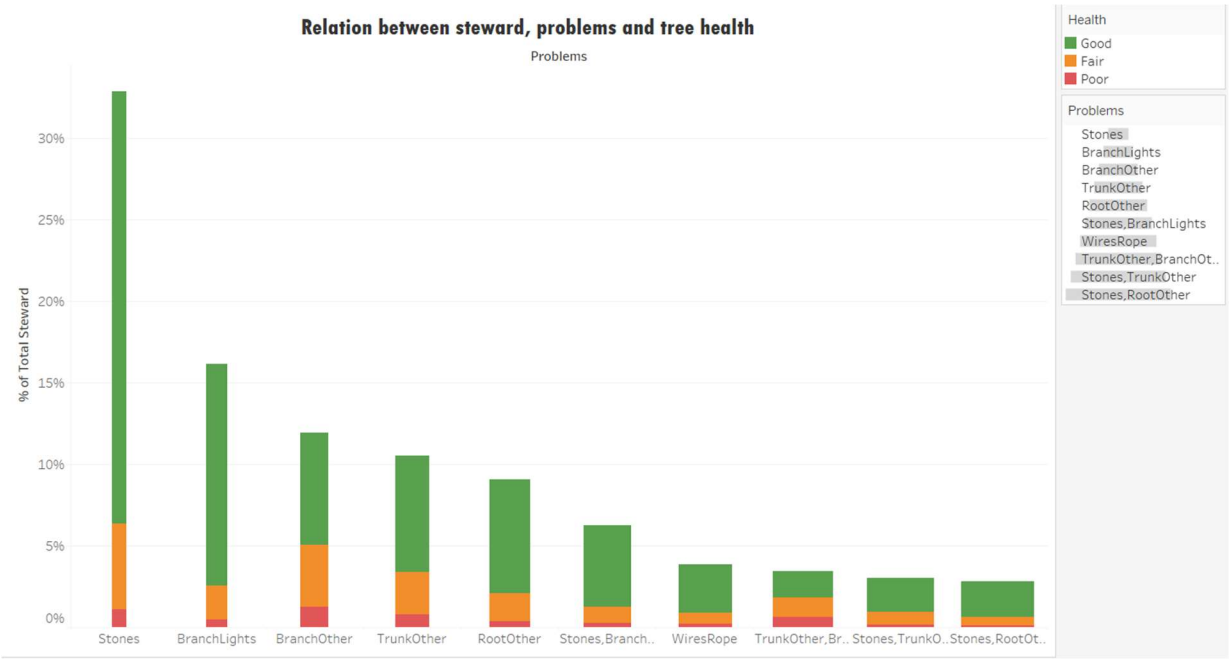
From the tree map shown above, it can be inferred that when guards are installed around trees, the difficulties with those trees are reduced. Despite the creation of guards, stones continue to harm trees since they do not retain water or offer nutrients. So, the guards can be helpful to some of the trees and not needed for some of the trees.



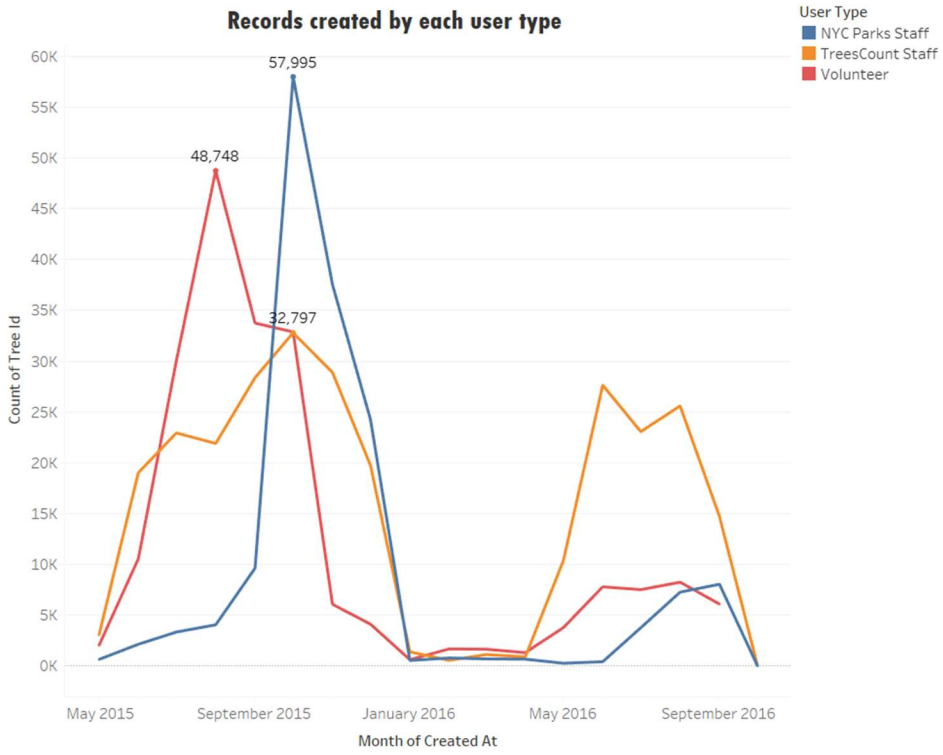
The diameter of the tree is not related to the problems of the tree. The trees which have different diameter also get affected by a variety of tree problems.



It is evident from the bar chart that large trees are not planted close to the curb. Therefore, the average-diameter trees planted on the curb still have good health. The enormous trees that are off the curb are in good health condition.



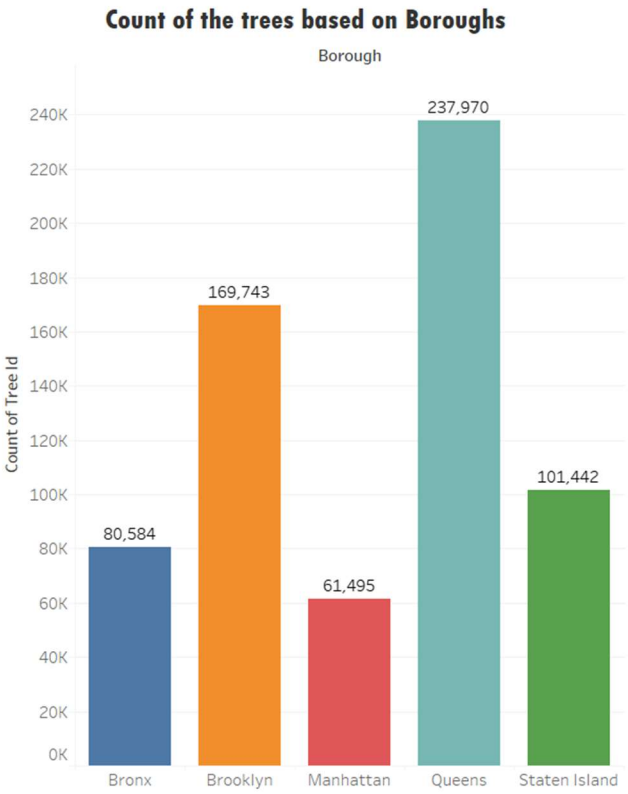
According to the vertical bars, as the number of stewards decreases, tree problems grow worse. Even though the concerns are present in the trees with excellent stewardship, they are few in number and are in good health.



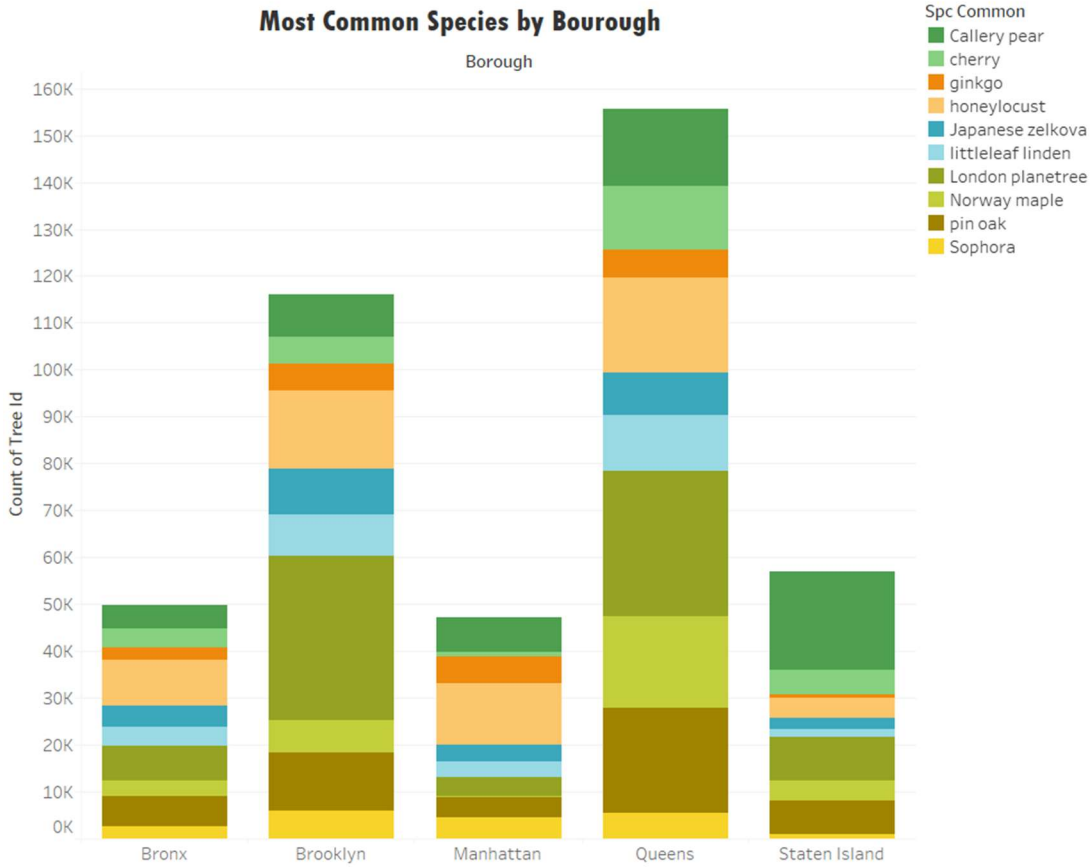
The line graph shows that in 2015, NYC parks employees collected the most data ever for the tree census. The volunteers came in second with the second-highest total, followed by the TreesCount staff.

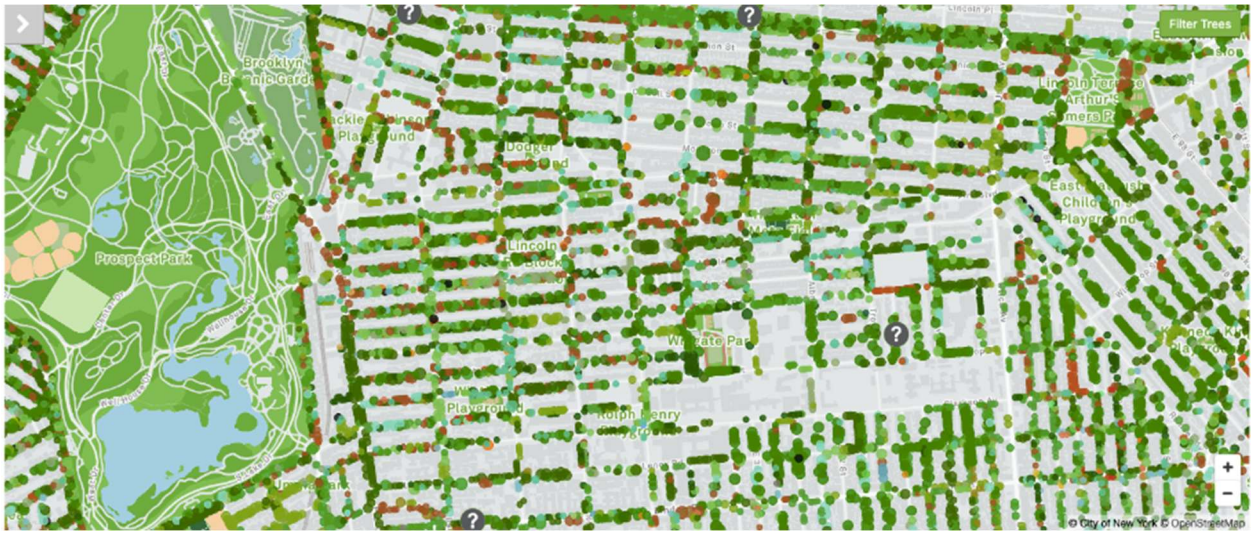
Staff from TreesCount performed the poll well in the subsequent year, followed by employees from NYC parks and volunteers.

However, the aggregate number of trees that the TreesCount Staff reported was higher.



It is clear from bar chart that Queens has the most trees, with Brooklyn coming in second. Starting from 100,000 trees, Staten Island, Bronx, and Manhattan differ by 20,000 trees apiece.





New York City tree map distribution

The trees with dark green color dots are considered to be in good health; those with light blue color dots are considered to be in fair health; and those with red color dots are considered to be in bad health.

Conclusion

About 4/5 of the living trees in New York City are in good health. The most powerful grower in New York City is London Planetree. With 14% of the total tree population, Honeylocust is the second most common species. All of the pitch pine trees are in good health. Healthiness of Arborvitae trees is 0.9%. Stones do not promote healthy soil or plant growth. In the summer, stones can also become hot and damage tree roots. It is dangerous for trees to grow too close to power lines. When their branches contact overhead power wires, they may result in power outages or brief power interruptions. A power line's electrical current won't directly harm neighboring trees. However, the tree may catch fire if its branches come into contact with electrical lines or if electricity arcs from a power line.

A tree may die before its time if its trunk is tied firmly. Every time you swing, the rope scuffs up against the branch, eventually removing bits of bark and leaving the tree exposed to disease or pests. When properly erected and removed, tree guards can solve a variety of problems for trees and those who care for them, including protection from solar damage, mechanical damage from weed eaters, deer rubbing, and rats eating tree bark. The curb's location affects the health of the tree. Stewardship of trees aids in maintaining the health of the trees, which will lead to fewer issues. Many tree records were gathered by the TreeCount team.

Trees are vital. The largest plants in the world, they provide humans with oxygen, store carbon, stabilize the soil, and support a variety of fauna around the globe. Trees support a robust economy and can offer a variety of resources to those in need. Therefore, for trees to benefit humans, humans must care for trees.

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