Calculating Tree Benefits
for New York City

City of New York
Parks & Recreation
Michael R. Bloomberg, Mayor
Adrian Benepe, Commissioner

TREES COUNT!

Our street trees work for us every day, providing benefits that directly improve our quality of life. Trees purify and cool the air, reduce stormwater runoff, and conserve energy. They increase property values, beautify neighborhoods, and improve human health and well-being. Until re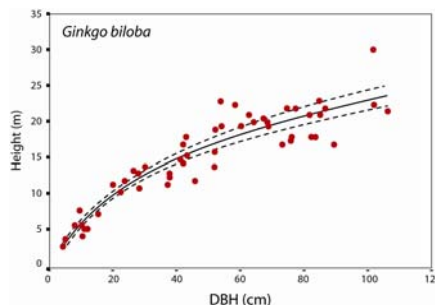cently, it was very difficult to put a dollar value on these benefits. But now scientists with the U. S. Forest Service have developed a way to assess the bottom line impact of many—but not all—benefits of urban trees.

Benefits are directly linked to tree size. The environmental benefits of trees arise from respiration and transpiration – the biological processes by which trees breathe and absorb water from the environment. Because these processes involve interactions between a tree's leaves, the environment, and the atmosphere, the benefits increase as trees grow in size. In general, the larger a tree, the more canopy cover and leaf surface area (the total area of the leaf spread) it has.

How do we take tree measurements? Measuring the canopy size, leaf surface area and total organic matter (biomass) for every tree would be impossible. Instead, scientists designed a method to sample a small number of trees that would provide data that could be extrapolated to the entire tree population.

Modeling tree growth to predict benefits. The U.S. Forest Service can model tree growth by individual species according to different climate regions. When information about tree size and species is fed into the growth model, it yields an estimate of canopy size, leaf area and biomass for every street

tree in that region. Tree benefits can then be calculated using local data including hourly climate and air pollution concentrations, local energy costs, power plant fuel types and emissions, and building construction information. The benefits are detailed below.

- **Air Quality Improvement.** Leaves absorb gaseous pollutants (carbon dioxide, nitrogen dioxide, and sulfur dioxide), and capture air-borne particles including dirt, dust and soot. Trees also prevent the release of many airborne pollutants by reducing energy

generation. Ground level ozone, a contributor to greenhouse gas formation, is reduced through the tree's ability to lower air temperatures.

ANNUAL BENEFIT VALUE: TO NYC: $5.3 MILLION

- **Energy Savings.** Trees provide shade, reducing the demand for electricity for cooling in the summer. Trees also reduce wind speeds, slowing the loss of heat from interior spaces during the winter. Trees cool the air through the process of transpiration, where moisture is converted to water vapor. An estimate for energy usage for every building in NYC was derived from data on building age, tree shading effects, and local climate. This estimate was drawn with two scenarios—with and without street trees—in order to show the difference in the resulting energy use. Local energy prices were then used to calculate the value of the impact of trees on building energy use.

ANNUAL BENEFIT VALUE TO NYC: $27.8 MILLION

- **Carbon Dioxide (CO_2).** Trees indirectly reduce emissions of CO_2 from power plants by reducing building energy use. Also as trees grow, they remove CO_2 from the atmosphere and store it in woody plant tissue. At the same time, trees release CO_2 as they decompose. These releases are subtracted from the total amount of CO_2 avoided from power generation and absorbed by tree growth to calculate the net CO_2 benefit.

ANNUAL BENEFIT VALUE TO NYC: $754,947

- **Reducing Stormwater Runoff.** Trees help reduce flooding and improve water quality, as runoff flowing over impervious surfaces picks up contaminants including oil and metals. Trees intercept rain on their leaf, branch and stem surfaces and by absorbing water through their roots. The water that trees intercept in NYC each year was calculated using local rainfall data.

ANNUAL BENEFIT VALUE TO NYC: $36 MILLION

- **Property Value and Other Benefits.** Research has shown that homes with a tree in front sell for almost 1 percent more than similar homes without trees. The difference in sale price indirectly reflects the value buyers place on trees and their more intangible benefits, such as aesthetics.

This difference was applied to the median New York City home resale price ($537,300) to calculate the total value.

ANNUAL BENEFIT VALUE TO NYC: $52 MILLION

TOTAL ANNUAL BENEFIT VALUE TO NYC: $122 MILLION

Did you know?

- A large, healthy tree removes almost 70 times more air pollution each year than a small, newly planted tree.

- London planetrees remove more than 77 tons of air pollution each year, over one-quarter of all pollutant removal by NYC's trees.

- Each year 272 tons—the equivalent of 40 adult elephants—of air pollution are intercepted or absorbed by trees in NYC

- Average electricity and natural gas cost savings in NYC are $47 per street tree

- Each year 313 tons of air pollution are avoided because of energy savings resulting from reduced emissions

- The average street tree in NYC intercepts 1,432 gallons of stormwater each year; all our street trees capture 890 million gallons per year

City of New York Parks & Recreation
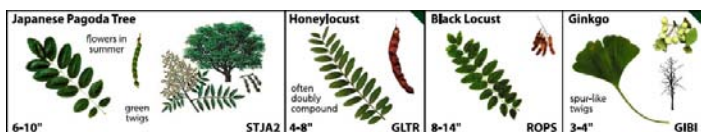Michael R. Bloomberg, Mayor
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To achieve our management, education, research, and planning goals, Parks carefully identified the relevant information to collect for each tree. Parks collected three times the amount of data during the 2005-2006 effort than it did in the 1995-1996 census, tracking over 15 million pieces of information.

Location. So Parks could find its way back to a tree that was surveyed, fully one-third of the volunteer training session focused on how to use an address to assign trees to the nearest building.

Species. We developed a Leaf Key to identify trees. Volunteers were trained to identify both genus and species, given a photo guide of 54 species and an additional choice of 72 species online (see below).

Size. Using a measuring tape specifically designed to calculate tree diameter from a circumference measurement, census workers measured the tree at a standard 4.5 feet from the ground (or breast height).

Condition. Staff developed a simple assessment system using leaf health, branch structure, and trunk condition geared toward an amateur workforce. Condition ratings were broad—excellent, good, poor, and dead—and comparable to those used in the 1995-1996 census.

Site Type. We recorded whether a tree was growing in a lawn area, an individual sidewalk pit, or a shared sidewalk cutout (see below).

Soil Level. We asked if the soil level is at least one inch below the sidewalk grade, if the soil is piled around the base of the trunk, or if the soil is level with the sidewalk.

Sidewalk Condition. Assessing the sidewalk directly adjacent to the tree opening, surveyors noted cracks and raised paving.

Vertical Treatment. Census takers noted fencing around the perimeter of a tree pit, those close to the tree, and solid walls built around the trees.

Horizontal Treatment. We looked for granite, concrete, or other blocks installed in tree pits at sidewalk grade and identified metal grating as well as decorative planting.

Overhead Wires. Beyond redcording their existence, volunteers identified the type of overhead utility wires—primary, secondary, or house tap—to help guide our pruning and planting work.

Infrastructure Conflicts. We documented anything harming or restricting the growth of the tree including canopy debris, choking wires, close paving, choking tree guards and grates, tightly wrapped tree lights, electric outlets, and sneakers.

Trunk Damage. Census takers recorded the presence of torn bark, trunk wounds, and cavities.

Tree Pit Status. The census looked at more than just living trees. We included dead trees, shafts (standing dead trees with branches removed), stumps (trees cut to the ground) and empty tree pits.

Did you know?

- Over 15 million pieces of data were collected, entered, and analyzed as a result of the census effort.

- Parks divided the city into 1,649 zones, and used these units to track our progress in recruiting volunteers, and collecting and entering data.

Then and Now...

- The 1995-1996 census used over eight fields of data while the latest effort included 27 pieces of data. Many new fields were required to do the environmental benefits analysis (STRATUM), and inform management decisions.

Technology was a hallmark of the 2005-2006 street tree census. Parks used computer mapping, email, the internet, and handheld computers to recruit volunteers, report our progress and anaylze results, while only ten years ago we relied 100% on paper, copy machines and highlighters.

Computer Mapping. In 1998, Parks used Geographic Information Systems (GIS) to map the 1995-1996 census results. We used that information to organize the 2005-2006 effort, creating zones of approximately 300 trees each. These zones served as the organizing unit for the census. Each volunteer was asked to commit to one zone, we customized our recruitment efforts by mapping assigned zones and we provided a custom designed GIS zone map for each volunteer.
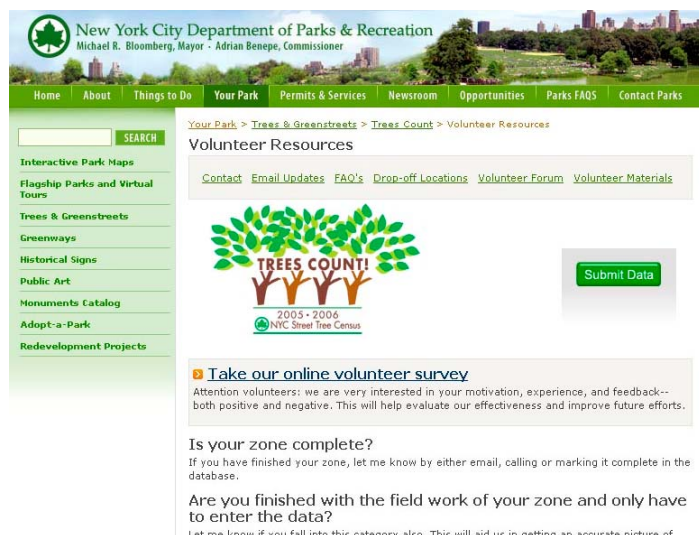
1995 Zone Map

2005 Zone Map

Zone 2133, Bronx

Using the most up to date New York City Department of Planning's GeoSupport application, the census data was mapped providing a basis for borough and neighborhood scale *spatial* analysis in ArcGIS. For example, the mapped census data will allow us to estimate how many additional trees could be planted on every block in all five boroughs.

Email. While email is a vital part of any business transaction or public program today, it was still in its infancy during the last census effort. Staff used email extensively to recruit volunteers and communicate with them through weekly updates and other notices.

Trees Count Website

Website. Parks designed a completely interactive census website where volunteers could:

- View a training calendar and register for classes;
- Access resources including the training manual, data collection, forms, and the leaf key;
- View weekly census updates;
- Communicate with other volunteers through a facilitated bulletin board;
- Enter tree census data into an online form; and
- Participate in a volunteer survey.

Handheld computers. Hewlett Packard donated 40 handheld computers. The Davey Resource Group's professional staff designed a customized database to put on the handhelds that matched the paper data forms so their data could be easily imported into Parks' online database. This bypassed the data-entry phase and saved paper and trees.

Forestry Management System (FoRMS). This fall, Parks will roll out a GIS-based application for tracking our tree inventory and work orders. Using a map-based application for everyday operations will revolutionize how Parks manages our urban forest. By tracking our inventory and work orders within a map of our city, Parks will be able to manage every tree in relation to other trees and infrastructure such as roads, highways and buildings. FoRMS will also allow people to submit and track requests on the Parks website.

FoRMS Sample Web Interface

Did You Know?

- 20% of the census was collected on handheld computers.
- The new online forestry management tool will allow users to see individual trees in their neighborhoods, and track requests related to them.
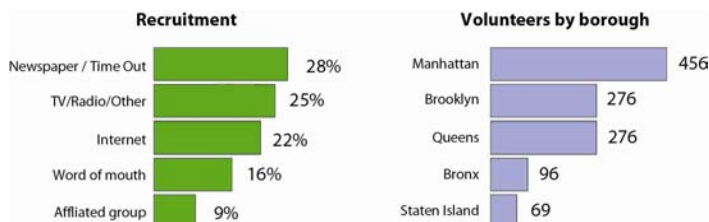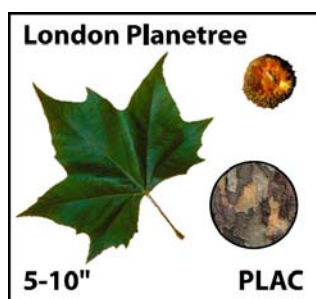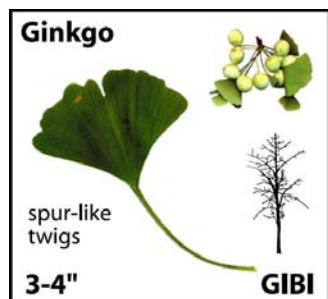
The 2005-2006 census effort mobilized an unprecedented number of volunteers. Over 1,100 volunteers participated, logging 30,000 volunteer hours.

Recruitment. Parks cast a wide net to recruit census volunteers in all five boroughs. Most of the volunteers found the tree census through newspapers, the internet, word-of-mouth, and Parks-affiliated groups. The typical volunteer was female, aged 41-60, employed full time, with a college or advanced degree, and has lived in New York City for at least twenty years. *

Recruitment

Newspaper / Time Out	28%
TV/Radio/Other	25%
Internet	22%
Word of mouth	16%
Affiliated group	9%

Volunteers by borough

Manhattan	456
Brooklyn	276
Queens	276
Bronx	96
Staten Island	69

Training. All volunteers were required to attend one 3-hour indoor training session and had an option to attend an outdoor session as well. We offered 111 training classes in all five boroughs on evenings and weekends. Volunteers received a 123-page training manual, clipboard, data collection forms, diameter measuring tape, a zone map, and a Trees Count t-shirt (see example below).

Ginkgo
spur-like twigs
3-4"
GIBI

London Planetree
5-10"
PLAC

Support. After the mandatory training session, volunteers received ongoing support and encouragement. Parks sent weekly email or snail mail updates. We established a dedicated email account and telephone number, along with a website where volunteers could download training information and participate in an on-line bulletin board (see example below) that received 521 postings. One volunteer posted the following observation: "Lots of people ask me what I am doing. I tell them I'm counting the trees, and they look at me very strangely and walk away quickly!" One volunteer, dubbed "Treewright", helped to answer many of the questions posted by others.

All volunteers who submitted data were automatically entered into monthly raffles offering free tickets and entry to events and gardens throughout the city. Parks feted volunteers at a series of thank you parties held in each borough.

Beyond Volunteers. While volunteers provided the core of the census workforce, Parks turned to its Americorps initiative (the Green Apple Corps), an urban forestry consulting group, and Parks own staff to complete the effort. Volunteers completed 42% of the census.

* Based on the results of a post-census volunteer survey with over 400 respondents.

Did you know?

- Volunteers contributed 30,000 hours of their own time to the census. At an hourly rate of $8, the value of their work would have been $240,000.

- There was a 57% increase in volunteer participation from the 1995-1996 census, increasing from 700 to 1,100.

- 85% of the census volunteers were new to the Parks Department.*

- 95% of the volunteers said they would volunteer again.*

- The volunteer contributing the most to the tree count recorded 4,891 sites.

- The volunteer entering the most trees into the database logged 9,369 entries.

From our volunteers:

"Good experience. I loved learning tree types and 'meeting' the trees in my zone. I would be pleased to know I contributed to the city investing in more trees."

"I am so happy I had the chance to do this. It was a wonderful opportunity to learn more about trees - better than going to school for botany!!"

"I really had a great time. I also encountered some amazing streets right next to each other. Some were monocultures and some had a wide variety of trees. The reaction from homeowners and pedestrians was also very positive and rewarding. With the very large diameter trees I asked pedestrians for help in measuring and it was always interesting to see New Yorkers offer assistance. Hope to be able to help in 10 years for the next one."

new topic | post reply | Treescount Volunteer Forum Forum Index -> Tree Identification

View previous topic :: View next topic

Author	Message
raincloud	Posted: Tue Aug 30, 2005 11:13 am Post subject: tree id: Zelkova serrata? quote
Joined: 22 Jun 2005 Posts: 41 Location: Brooklyn	I have a tree with leaves that look identical to Zelkova serrata (I compared to one I was sure about down the street), but the bark is red-brown, with lenticels, similar to bark on some cherries I've seen. The park service put a tag on it labeling it as Zelkova serrata, but I thought the bark should be grey. What is it?
Back to top	profile pm
Mr. Tree	Posted: Tue Aug 30, 2005 11:25 am Post subject: Zelkova Bark quote

Citywide Results

City of New York
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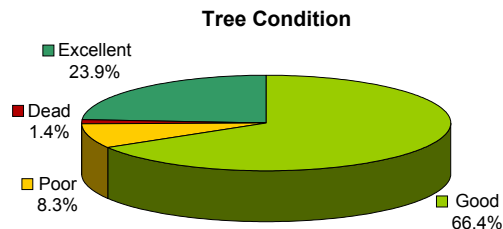
498,470

592,130

1995-1996

2005-2006

The results of the 2005-2006 census allow us to characterize the street tree population according to species, size, condition, and a host of other factors. In all, surveyors counted 592,130 trees--93,660 more than in 1995-1996, a 19% increase.

Species. The most common street tree in New York City is the London planetree. This venerable urban tree, *platanus x acerifolia*, has been a mainstay of the urban environment for almost a century. Although the London planetree just edges out the second most numerous street tree, the Norway maple, its canopy covers more than double the land area than its closest rival.
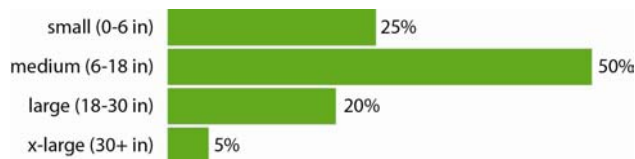
Importance Value. Importance value is a measure of a species' dominance within a population. It is an average of overall size, leaf area, and canopy cover. London planetree is twice as significant as Norway maple in our current street tree population. Pin oak, which has fewer trees than callery pear, has a higher importance value due to its larger stature and leaf size. An importance value greater than 25 indicates too much reliance on a species, which can subject a population to sudden catastrophe in the face of insects and disease.

Top Five Species	% Total Trees	% Canopy Cover	Importance Value
Planetree, London	15.3	29.1	24.49
Maple, Norway	14.1	13.9	13.44
Pear, callery	10.9	4.9	6.87
Honeylocust	8.9	8.2	8.24
Oak, pin	7.5	10.9	9.89

Condition. Just over 90% of the trees were rated in good to excellent condition.

Tree Condition

- Excellent 23.9%
- Dead 1.4%
- Poor 8.3%
- Good 66.4%

Size. Census takers measured the girth of each tree at chest height. One-quarter of all street trees citywide are small, with Manhattan having the highest percentage of small trees (35%). Five percent of trees are extra large (over 30 inches wide), with Queens having the highest percentage of extra large trees (6.3%).

- small (0-6 in) 25%
- medium (6-18 in) 50%
- large (18-30 in) 20%
- x-large (30+ in) 5%

Most (70%) of the City's largest street trees are comprised of just three species: London planetree, pin oak, and silver maple. By contrast, there is much greater species diversity in the small tree population (14 species in the first 70%).

Damage. Street trees are located on the busy interface between humans and nature, and as such are vulnerable to environmental and physical damage. Signs of damage include torn bark, wounds or cavities on the trunk and branches. Causes of such damage can include vehicles, vandals, or animals. Over 15% of our street trees have trunk wounds (89,211), with 6.6% having torn bark (39,524) and 5.3% with cavities of some type (31,103).

Conflicts. Overhead wires are the predominant urban infrastructure that conflict with trees in all neighborhoods in New York City with the exception of Manhattan. More than 35% of the City's street trees are growing under wires. Other urban conflicts common to street trees are listed below.

Urban Conflicts	# trees	% total
Overhead wires	209,171	35.8%
Raised sidewalks	100,829	13.9%
Cracked sidewalks	65,299	9.0%
Close Paving	43,409	6.8%
Choking wires	13,865	2.2%
Canopy debris	7,341	1.2%
Choking Guard/Grate	3,918	0.6%
Tree Lights	2,526	0.4%
Electric Outlet	1,875	0.3%
Sneakers	437	0.0%

Preliminary Management Observations. With the data from the census, there are a few key insights that have begun to emerge that will help us as we go forward:

- London planetree is our most important species and should always have some representation in our tree population;

- Almost 31% of our street tree species are susceptible to the Asian Longhorned beetle and our planting practices need to continue to strive for increased diversity, and reduced susceptibility to pests and diseases; and

- Large, canopy trees confer the most benefits and we need to continue to focus on planting large tree species that will successfully mature.

Then & Now

- In the 1995-1996 census, Norway maple comprised almost 23% of the street tree population and was the most populous species. It has now dropped to 14% of the population. The explanation? Over the past decade this species has made up more than 60% of all dead tree removals due to poor health.

- In the 1995-1996 census, over 2% of the population was dead at the time of the inventory (13,154 trees). This time, despite counting almost one-fifth more trees, only 1.4% (8,113) were found to be dead. What changed? Parks instituted a new dead tree removal service commitment, whereby dead trees are removed within 30 days of request. Parks meets this commitment 95% of the time.

Did you know?

- A 31 inch wide sweetgum in Queens is 134 years old. Though not the oldest or the largest street tree in the City, it is the oldest of those that we have measured by counting tree rings.

Citywide, the 2005-2006 census showed that our tree population grew by almost 19% since the last count. A breakdown by borough gives greater detail on the distribution, composition, and condition of our street trees.

Borough	1995-1996	2005-2006	% Increase
Bronx	47,995	60,004	25%
Brooklyn	112,400	142,747	27%
Manhattan	45,793	49,858	9%
Queens	217,111	239,882	10%
Staten Island	75,171	99,639	33%
Citywide total	498,470	592,130	19%

Condition of Street Trees by Borough

Bronx (% of population)

Honeylocust	13
Norway maple	12
London planetree	11
Pin oak	9
Callery pear	8

Brooklyn

London planetree	24
Norway maple	11
Honeylocust	9
Pin oak	7
Callery pear	7

Manhattan

Honeylocust	23
Callery pear	16
Ginkgo	10
London planetree	8
Littleleaf linden	6

Queens

Norway maple	18
London planetree	14
Pin oak	8
Callery pear	7
Honeylocust	7

Staten Island

Callery pear	25
London planetree	10
Red maple	9
Norway maple	8
Pin oak	7

The borough with the largest increase in trees counted between the two census efforts is Staten Island (32.5%), followed by Brooklyn (27%) and the Bronx (25%).

Species. London planetree may be the most common species citywide, but it is number one only in Brooklyn (23.6%). In the Bronx and Manhattan, honeylocust is the most plentiful street tree (12.9% and 23.3% respectively), while in Queens the honor still goes to the Norway maple (18.3%). The top five street tree species in each borough are shown in the charts to the left.

Diversity. The more species comprise a population, the less impact pests and diseases can have on the health and vitality of the whole population. A population that lacks species diversity is termed a monoculture. A general rule of thumb when measuring diversity is to assemble a population with no greater than 10% of any species. Another measure of diversity is the extent to which a single species dominates a population. In general, no one species should exceed 25% of a population. By this measure, Brooklyn (London planetree), Manhattan (honeylocust), and Staten Island (Callery pear) show significant dominance by the most plentiful species.
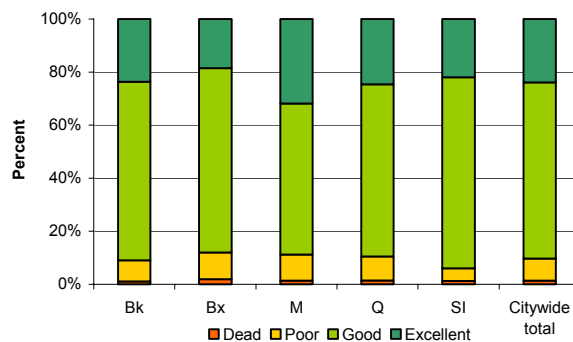
Condition. Just over 90% of the trees were rated in good to excellent condition, with the remaining trees judged to be in poor condition (8.3%) or dead (1.4%). Staten Island has the highest number of trees in good and excellent condition (94%), with Brooklyn (91%) and Queens (90%) close behind. The Bronx had the highest number of trees in poor and dead categories (12%), followed by Manhattan (11.3%) and Queens (10%).

Urban Conflicts. Overhead wires are the predominant urban infrastructure that conflict with trees in all neighborhoods in New York City with the exception of Manhattan. More than 35% of the City's street trees are growing under wires. Almost half of the trees growing under wir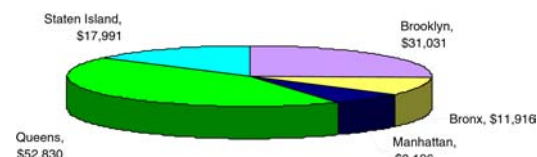es are in Queens (48%), followed by Staten Island (23%), Brooklyn (17%) and the Bronx (12%). Other urban conflicts are shown in the chart (above right).

Borough	Damaged Sidewalks	Canopy debris	Choking wires	Close Paving	Choking Grate	Tree Lights	Electric Outlet
Bronx	8,867	879	1,858	2,232	270	203	353
Brooklyn	28,424	2,625	3,632	17,436	1,070	554	172
Manhattan	2,984	1,451	772	1,373	1,193	771	929
Queens	49,245	2,034	6,161	18,258	813	702	324
Staten Island	11,309	352	1,442	4,110	572	296	97
Citywide total	100,829	7,341	13,865	43,409	3,918	2,526	1,875

Tree Benefits. The value of the street trees in each borough can be quantified in terms of the amount of air pollution removed, emissions avoided, stormwater runoff intercepted, and energy saved. In addition, street trees increase property values. The dollar value of the trees in each borough are shown below (in 000s).

Tree Benefit Details (in 000s)

Borough	Energy	CO2	Air Quality	Stormwater	Property Values	Total
Bx	$2,699	$73	$505	$3,300	$5,339	$11,916
BK	$7,352	$195	$1,378	$9,409	$12,697	$31,031
M	$1,646	$42	$293	$1,804	$4,411	$8,196
Q	$12,308	$342	$2,375	$16,238	$21,567	$52,830
SI	$3,814	$103	$719	$4,877	$8,478	$17,991
Total	$27,818	$755	$5,270	$35,628	$52,492	$121,964

PlaNYC

Mayor Bloomberg's vision for a greener, greater New York City includes the following programs to enhance our urban forest infrastructure:

- $40 million in total funding to fix over 20,000 sidewalks that are severely damaged by tree roots in a way that promotes tree and sidewalk longevity;

- $2 million each year to remove stumps as part of the new tree planting process.

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The 2005-2006 census showed that the Bronx tree population grew by almost 25% since the last count, from 47,995 to 60,004 trees. A breakdown by Community Board gives greater detail on the distribution, composition, and condition of our street trees.

The Community Board (CB) with the largest increase in trees counted between the two census efforts is CB 2 (424%), followed by CB 6 (106%) and CB 1 (52%). The overall tree canopy, which includes public and private trees, in the Bronx is 24%. For a breakdown of urban forestry facts by Community Board, see chart below.

Species. Honeylocust is the most common species in the Bronx, and is the fourth most common tree in New York City. The top 10 species found in the Bronx are in the chart at right. There are 168 different species identified in the city and 119 of them in the Bronx.
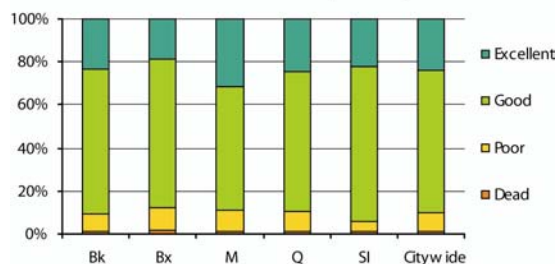
The percentages of honeylocust, Norway maple and London planetree are dominating the population: they are too high for healthy species diversity.

Condition. Over 87% of the trees in the Bronx were rated in good to excellent condition, with the remaining trees judged to be in poor condition (10.1%) or dead (2.0%). Fewer than 19% of Bronx trees have some category of a trunk wound and almost 25% have infrastructure conflicts, such as tree lights, choking wires and grates, and close paving.

Street Tree Species	
Honeylocust	12.9%
Norway maple	12.3%
London planetree	11.1%
Pin oak	8.7%
Callery pear	7.6%
Littleleaf linden	5.4%
Japanese zelcova	3.6%
Green ash	3.5%
Gingko	3.3%
Red maple	3.1%

Urban Forest Scorecard

CB	Tree Count Increase From 1995-1996	Overall Tree Canopy
1	52%	11%
2	424%	9%
3	46%	18%
4	32%	15%
5	51%	11%
6	106%	11%
7	24%	15%
8	35%	38%
9	27%	18%
10	36%	15%
11	35%	19%
12	24%	27%
Total	25%	24%

Tree lined Martin Luther King Blvd.

Condition of Street Trees by Borough

Legend: Excellent, Good, Poor, Dead
X-axis: Bk, Bx, M, Q, SI, Citywide

Street tree stocking level by neighborhood

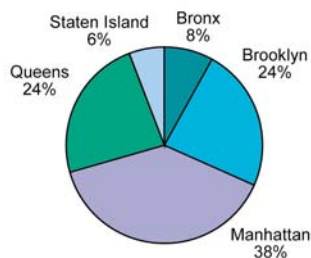- 0 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- Park/Open Space

Tree Benefits. The value of the street trees in each borough can be quantified in terms of the amount of air pollution removed, emissions avoided, stormwater runoff intercepted, and energy saved. In addition, street trees increase property values.

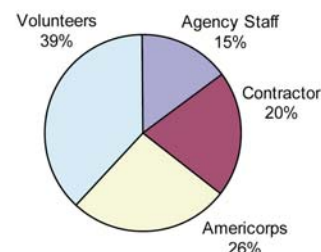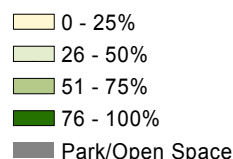| Benefits Type	Annual Value
Energy	$2,699,080
CO2	$73,001
Air Quality	$504,687
Stormwater	$3,299,869
Property Values	$5,339,339
Total	$11,915,976

In the Bronx, the total annual benefit from street trees is $11,915,976. The chart above quantifies the annual values by benefit type. The total annual benefit from all of New York City's street trees is $121,963,336.

Workforce. Almost 1200 people volunteered for the census in 2005-2006, 67% more compared to 1995-1996. All boroughs contributed to the volunteer workforce, and volunteers completed 41% of the census work. In the Bronx, 39% of the data was collected by volunteers.

Bronx Largest Trees

The three largest street trees measured in the Bronx are:

- London planetree measuring 52.2 inches DBH (5250 Fieldston Road)
- London planetree measuring 51 inches DBH (3035 Corlear Avenue)
- Northern red oak measuring 48 inches DBH (2115 Conner Street)

The largest street tree measured in New York City is a 76 inch diameter pin oak in Queens.

Volunteers by Borough

Staten Island 6%, Bronx 8%, Brooklyn 24%, Queens 24%, Manhattan 38%

Bronx Workforce

Volunteers 39%, Agency Staff 15%, Contractor 20%, Americorps 26%

The 2005-2006 census showed that the Brooklyn tree population grew by almost 27% since the last count, from 112,400 to 142,747 trees. A breakdown by Community Board gives greater detail on the distribution, composition, and condition of our street trees.

The Community Board (CB) with the largest increase in trees counted between the two census efforts is CB 1 (89%), followed by CB 4 (69%) and CB 13 (63%). The overall tree canopy, which includes public and private trees, in Brooklyn is 21%. For a breakdown of urban forestry facts by Community Board, see chart below.

Tree-lined street in Flatbush.

Urban Forest Scorecard

CB	Tree Count Increase From 1995-1996	Overall Tree Canopy
1	89%	7%
2	31%	14%
3	20%	16%
4	69%	16%
5	21%	18%
6	29%	16%
7	36%	28%
8	31%	21%
9	56%	21%
10	19%	25%
11	22%	12%
12	25%	20%
13	63%	17%
14	10%	28%
15	15%	19%
16	7%	15%
17	5%	22%
18	22%	26%
Total	**27%**	**21%**

Street tree stocking level by neighborhood

- 0 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- Park/Open Space

Species. London planetree is the most common species in Brooklyn, and is the most common tree in New York City. The top 10 species found in Brooklyn are in the chart at right. There are 168 different species identified in the city and 138 of them in Brooklyn.
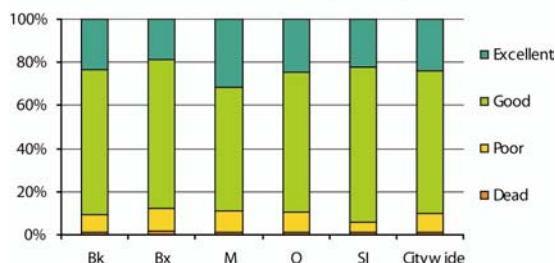
While London planetree still dominates Brooklyn's streets, their distribution has declined since 1995-1996 from 31.6% to 23.6%.

Condition. Over 90% of the trees in Brooklyn were rated in good to excellent condition, with the remaining trees judged to be in poor condition (8.0%) or dead (1.1%). Fewer than 17% of Brooklyn trees have some category of a trunk wound and almost 38% have infrastructure conflicts, such as tree lights, choking wires and grates, and close paving.

Street Tree Species

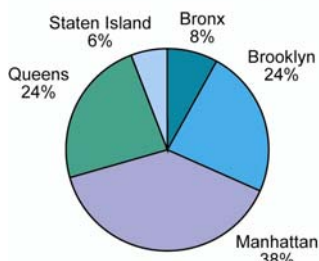|	
London planetree	23.6%
Norway maple	11.0%
Honeylocust	8.8%
Pin oak	6.9%
Callery pear	6.7%
Littleleaf linden	5.7%
Green ash	3.2%
Japanese zelkova	3.2%
Ginkgo	2.7%
Unknown	2.7%

Tree Benefits. The value of the street trees in each borough can be quantified in terms of the amount of air pollution removed, emissions avoided, stormwater runoff intercepted, and energy saved. In addition, street trees increase property values.

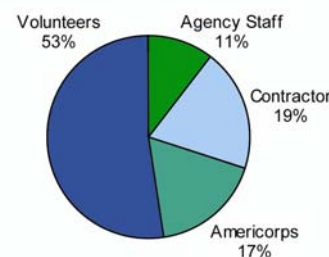| Benefits Type	Annual Value
Energy	$7,351,997
CO_2	$194,538
Air Quality	$1,377,899
Stormwater	$9,408,920
Property Values	$12,697,485
Total	**$31,030,839**

In Brooklyn, the total annual benefit from street trees is $31,030,839. The chart above quantifies the annual values by benefit type. The total citywide annual benefit from all of New York City's street trees is $121,963,336.

Workforce. Almost 1200 people volunteered for the census in 2005-2006, 67% more compared to 1995-1996. All boroughs contributed to the volunteer workforce, and volunteers completed 41% of the census work. In Brooklyn, 53% of the data was collected by volunteers.

Brooklyn Largest Trees

Volunteers measured the two largest street trees in Brooklyn. They are:

- American elm, measuring 60.5 inches in diameter (1015 66th Street)

- London planetree measuring 58.5 inches in diameter (440 Quentin Road)

The largest street tree measured in New York City is a 76 inch diameter pin oak in Queens.

City of New York Parks & Recreation
Michael R. Bloomberg, Mayor
Adrian Benepe, Commissioner

The 2005-2006 census showed that the Manhattan tree population grew by almost 9% since the last count, from 45,793 to 49,858 trees. A breakdown by Community Board gives greater detail on the distribution, composition, and condition of our street trees.
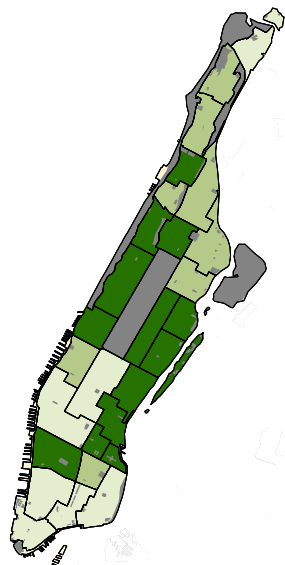
The Community Board (CB) with the largest increase in trees counted between the two census efforts is CB 10 (68%), followed by CB 1 (64%) and CB 11 (58%). Two CBs (CB 5 and 6) experienced decreases. The overall tree canopy, which includes public and private trees, in Manhattan is 13%. For a breakdown of urban forestry facts by Community Board, see chart below.
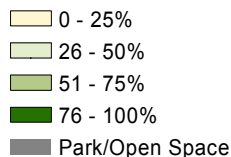
Urban Forest Scorecard

CB	Tree Count Increase From 1995-1996	Overall Tree Canopy
1	64%	6%
2	11%	6%
3	8%	12%
4	9%	5%
5	-10%	2%
6	-8%	8%
7	27%	9%
8	4%	8%
9	23%	15%
10	68%	11%
11	57%	14%
12	16%	22%
Total	**9%**	**13%**

2nd largest street tree in Manhattan.

Street tree stocking level by neighborhood

- ▢ 0 - 25%
- ▢ 26 - 50%
- ▢ 51 - 75%
- ▢ 76 - 100%
- ▢ Park/Open Space

Species. Honeylocust is the most common species in Manhattan, and is the fourth most common tree in New York City. The top 10 species found in Manhattan are in the chart at right. There are 168 different species identified in the city and 90 of them in Manhattan.
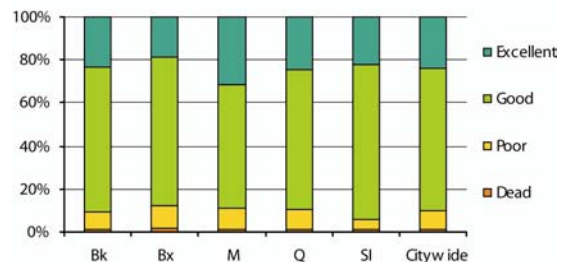
The percentages of honeylocust and callery pear are dominating the population: they are too high for healthy species diversity.

Street Tree Species

Honeylocust	23.3%
Callery pear	15.7%
Ginkgo	9.9%
London planetree	8.2%
Littleleaf linden	6.3%
Pin oak	5.4%
Japanese zelcova	4.1%
Japanese pagoda tree	3.3%
American elm	2.6%
Northern red oak	2.3%

Condition. Over 88% of the trees in Manhattan were rated in good to excellent condition, with the remaining trees judged to be in poor condition (9.9%) or dead (1.3%). Fewer than 20% of Manhattan trees have some category of a trunk wound and 19% have infrastructure conflicts, such as tree lights, choking wires and grates, and close paving.
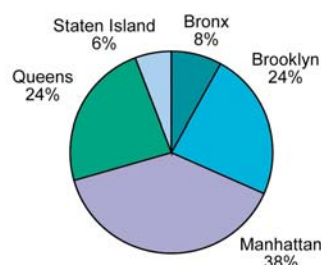

Tree Benefits. The value of the street trees in each borough can be quantified in terms of the amount of air pollution removed, emissions avoided, stormwater runoff intercepted, and energy saved. In addition, street trees increase property values.

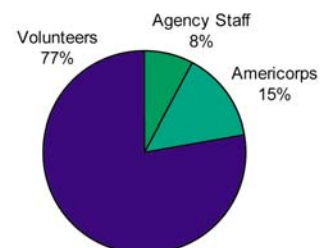| Benefits Type	Annual Value
Energy	$1,645,533
CO2	$41,944
Air Quality	$292,973
Stormwater	$1,804,352
Property Values	$4,410,538
Total	**$8,195,339**

In Manhattan, the total annual benefit from street trees is $8,195,339. The chart above quantifies the annual values by benefit type. The total annual benefit from all of New York City's street trees is $121,963,336.

Workforce. Almost 1200 people volunteered for the census in 2005-2006, 67% more compared to 1995-1996. All boroughs contributed to the volunteer workforce, and volunteers completed 41% of the census work. In Manhattan, 77% of the data was collected by volunteers.

Manhattan Largest Trees

Volunteers and agency staff measured the three largest street trees in Manhattan. They are:

- English elm, measuring 58 inches in diameter (1062 St. Nicholas Avenue)
- London planetree, measuring 49 inches in diameter (370 West 120th Street)
- American elm, measuring 44 inches in diameter (1136 5th Avenue)

The largest street tree measured in New York City is a 76 inch diameter pin oak in Queens.

The 2005-2006 census showed that the Staten Island tree population grew by almost 33% since the last count, from 75,171 to 99,639 trees. A breakdown by Community Board gives greater detail on the distribution, composition, and condition of our street trees.

The Community Board (CB) with the largest increase in trees counted between the two census efforts is CB 1 (41%), followed by CB 3 (40.6%) and CB 2 (33%). The overall tree canopy, which includes public and private trees, in Staten Island is 34%. For a breakdown of urban forestry facts by Community Board, see chart below.

Species. Callery pear is the most common species in Staten Island, and is the third most common tree in New York City. The top 10 species found in Staten Island are in the chart at right. There are 168 different species identified in the city and 132 of them in Staten Island.
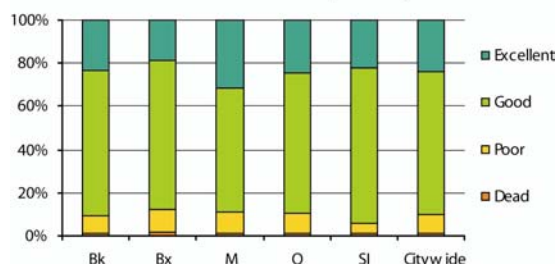
The percentage of callery pear is dominating the population: it is too high for healthy species diversity.

Condition. Almost 94 % of the trees in Staten Island were rated in good to excellent condition, with the remaining trees judged to be in poor condition (4.8%) or dead (1.3%). Fewer than 12% of Staten Island trees have some category of a trunk wound and 18% have infrastructure conflicts, such as tree lights, choking wires and grates, and close paving.

Street Tree Species

Callery pear	24.8%
London planetree	9.6%
Red maple	8.8%
Norway maple	7.5%
Pin oak	6.9%
Silver maple	5.6%
Sweetgum	5.0%
Green ash	3.7%
Honeylocust	3.5%
Littleleaf linden	1.9%

Tree lined Bay Street in Staten Island.

Urban Forest Scorecard

CB	Tree Count Increase From 1995-1996	Overall Tree Canopy
1	41%	31%
2	33%	34%
3	41%	35%
Total	**33%**	**34%**

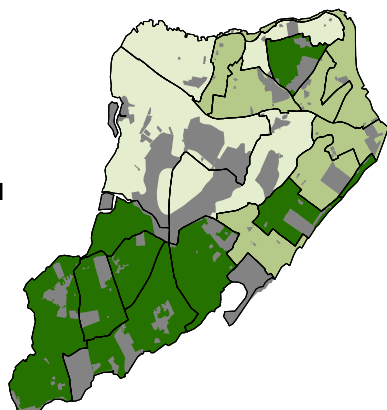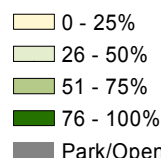Condition of Street Trees by Borough

Tree Benefits. The value of the street trees in each borough can be quantified in terms of the amount of air pollution removed, emissions avoided, stormwater runoff intercepted, and energy saved. In addition, street trees increase property values.

Benefits Type	Annual Value
Energy	$3,813,953
CO2	$103,394
Air Quality	$719,044
Stormwater	$4,877,092
Property Values	$8,478,342
Total	**$17,991,826**

In Staten Island, the total annual benefit from street trees is $17,991,826. The chart above quantifies the annual values by benefit type. The total annual benefit from all of New York City's street trees is $121,963,336.

Workforce. Almost 1200 people volunteered for the census in 2005-2006, 67% more compared to 1995-1996. All boroughs contributed to the volunteer workforce, and volunteers completed 41% of the census work. In Staten Island, 25% of the data was collected by volunteers.

Street tree stocking level by neighborhood

- 0 - 25%
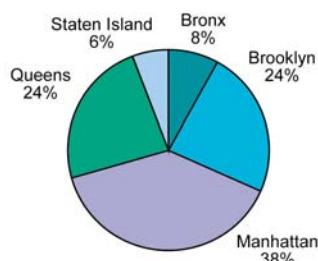- 26 - 50%
- 51 - 75%
- 76 - 100%
- Park/Open Space

Staten Island Largest Trees

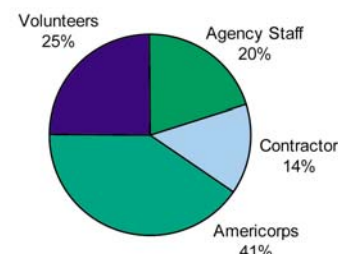Volunteers measured the three largest street trees in Staten Island. They are:

- London planetree, measuring 67 inches in diameter (326 Bryant Avenue)
- London planetree, measuring 64 inches in diameter (90 Walnut Street)
- Silver maple, measuring 64 inches in diameter (368 Colony Avenue)

The largest street tree measured in New York City is a 76 inch diameter pin oak in Queens.

Volunteers by Borough

Staten Island Workforce

Queens

City of New York
Parks & Recreation
Michael R. Bloomberg, Mayor
Adrian Benepe, Commissioner

TREES COUNT!

The 2005-2006 census showed that the Queens tree population grew by almost 10% since the last count, since 217,111 to 239,882 trees. A breakdown by Community Board gives greater detail on the distribution, composition, and condition of our street trees.

The Community Board (CB) with the largest increase in trees counted between the two census efforts is CB 14 (138%), followed by CB 2 (46%) and CB 11 (41%). One CB (CB 9) experienced a 9% decrease between the two tree counts. The overall tree canopy, which includes public and private trees, in Queens is 20%. For a breakdown of urban forestry facts by Community Board, see chart below.

Species. Norway maple is the most common species in Queens, and is the second most common tree in New York City. The top 10 species found in Queens are in the chart at right. There are 168 different species identified in the city and 155 of them in Queens.
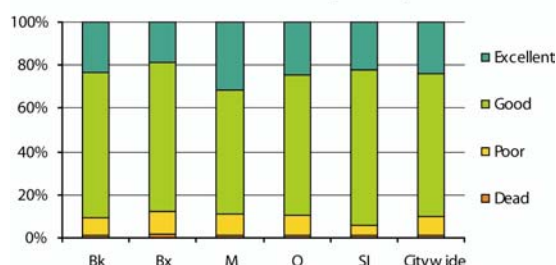
While Norway maple still dominates Queens' streets, their distribution has declined significantly since 1995-1996 from 33.3% to 18.3%.

Condition. Over 89% of the trees in Queens were rated in good to excellent condition, with the remaining trees judged to be in poor condition (9.1%) or dead (1.5). Fewer than 14% of Queens trees have some category of a trunk wound and 32% have infrastructure conflicts, such as tree lights, choking wires and grates, and close paving.

Street Tree Species	
Norway maple	18.3%
London planetree	13.7%
Pin oak	8.2%
Callery pear	7.4%
Honeylocust	7.2%
Littleleaf linden	4.9%
Silver maple	4.3%
Green ash	4.0%
Red maple	3.0%
Northern red oak	2.2%

Tree-lined street.

Urban Forest Scorecard		
CB	**Tree Count Increase From 1995-1996**	**Overall Tree Canopy**
1	3%	13%
2	46%	12%
3	6%	18%
4	27%	14%
5	5%	19%
6	35%	26%
7	20%	24%
8	27%	33%
9	-9%	18%
10	12%	21%
11	41%	33%
12	1%	24%
13	11%	29%
14	138%	16%
Total	**10%**	**20%**

Street tree stocking level by neighborhood

- 0 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
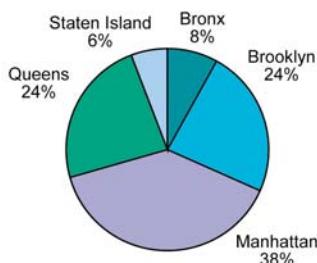- Park/Open Space

Condition of Street Trees by Borough

Tree Benefits. The value of the street trees in each borough can be quantified in terms of the amount of air pollution removed, emissions avoided, stormwater runoff intercepted, and energy saved. In addition, street trees increase property values.

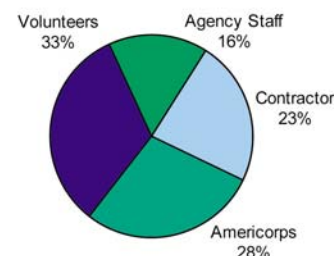| Benefits Type	Annual Value
Energy	$12,307,647
CO2	$342,069
Air Quality	$2,374,968
Stormwater	$16,237,987
Property Values	$21,566,690
Total	**$52,829,361**

In Queens, the total annual benefit from street trees is $52,829,361, 43.3% of the total citywide benefits received from all street trees. The chart above enumerates the annual values by benefit type. The total citywide annual benefit from all street trees is $121,963,336.

Workforce. Almost 1200 people volunteered for the census in 2005-2006, 67% more compared to 1995-1996. All boroughs contributed to the volunteer workforce, and volunteers completed 41% of the census work. In Queens, 33% of the data was collected by volunteers.

Volunteers by Borough

Queens Workforce

Queens Largest Trees

The three largest street trees in New York City were measured in Queens.

- Pin oak, measuring 76 inches in diameter (143-60 229th Street)
- Littleleaf linden, 73 inches in diameter (99-03 205th Place)
- Pin oak, measuring 72 inches in diameter (191-48 115th Avenue)

In 1995 New Yorkers joined together to count their trees, creating a baseline inventory of the City's street trees. Ten years later, on April 29, 2005, Parks Commissioner Adrian Benepe rallied the troops to once again enumerate the arboricultural assets that grace the streets and sidewalks of New York City. Equipped with maps, clipboards, tape measures, and tree identification keys, surveyors enumerated trees by species, size, location and condition in neighborhoods across New York City. With over a thousand volunteers logging a total of 30,000 hours, the effort represents the largest participatory urban forestry project in any city in the United States.

The tree census is an important scientific, technical, and educational effort. The results enable us to characterize our street tree population in terms of its structure, function, and value. This information is used in a variety of ways, including:

- **Management**. Enables daily and strategic decision-making based on the composition, condition, and distribution of street trees;

- **Education**. Educating the citizens of New York City about the importance of their street trees by making their communities cleaner, healthier, and better places to live and work;

- **Research**. Quantifying the benefits provided by New York City's street trees in terms of environmental services and property values;

- **Planning**. Tracking the changes that have occurred in the urban landscape over the past decade, as well as estimating future needs and overall trends.
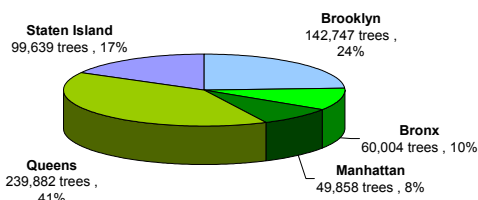
What is a street tree? The definition of a street tree for the 2006-2006 census is any tree growing within the public-right-of-way, or within 15 feet of the curb. Wooded areas within this proximity to the curb were not included. Trees within private or gated communities were not counted. Trees within public parks were not included, but trees in front of parks were counted.

How many are there? Surveyors counted a total of 592,130 trees. This is 93,000 more trees than were counted in 1995-1996, a 19 % increase.

What kind of trees? Census-takers identified 168 different species of trees growing along city streets. Just ten species comprise 74 % of the population.

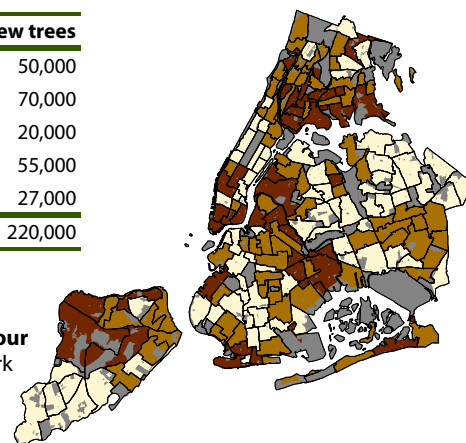| NYC's Top Ten Street Trees (%)			
London planetree	15.3	Littleleaf linden	4.7
Norway maple	14.1	Green ash	3.5
Callery pear	10.9	Red maple	3.5
Honeylocust	8.9	Silver maple	3.2
Pin oak	7.5	Ginkgo	2.8

Where are they? Queens remains the borough with the most trees, with just over 40% of the total population. Brooklyn has the second highest number of trees, with 24% of the population.

Which borough has the leafiest streets? This honor goes to Manhattan, with an average frequency of 49.4 trees per mile of sidewalk, with Queens a close second at 49.1, followed by Staten Island (48.6), Brooklyn (44.6) and the Bronx (37.4).

Where is there space for more trees? The streets of New York City are about 73% stocked, with space for approximately 220,000 additional street trees across the five boroughs. Neighborhoods targeted for new trees are shown below (dark brown indicate the most new trees).

Borough	New trees
Bronx	50,000
Brooklyn	70,000
Manhattan	20,000
Queens	55,000
Staten Island	27,000
Total	**220,000**

How valuable are our street trees? Trees work hard for us every day cleaning our air and water, providing shade and a cooler environment, and increasing property values. The results of the census were fed into a model created by the U.S. Forest Service that quantifies the annual benefits of street trees.

Annual Benefits	Total ($)	$/tree	$/capita
Energy	27,818,220	47.63	3.41
Air Quality	5,269,572	9.02	0.65
Stormwater	35,628,224	61	4.36
CO2	754,947	1.29	0.09
Aesthetic/Other	52,492,384	89.88	6.43
Total	**121,963,347**	**208.82**	**14.94**

PlaNYC

Mayor Bloomberg's vision for a greener, greater New York City will revolutionize our urban forestry program, including:

- Planting all the empty street tree sites with an estimated 220,000 trees by 2017 with over $200 million in funding;

- Doubling the current block pruning budget to meet the needs of 592,130 trees as well as increasing the frequency of the pruning cycle from 10 to 7 years

Did you know?

- There are approximately 5.2 million trees growing on public and private property in New York City.

- 24% of New York City's land area is covered with tree canopy, and street trees comprise one-quarter of this canopy.

- Standing trunk to trunk, our street trees would form a line 118 miles long—the distance from Manhattan to Hartford, CT.

- Spaced 25 feet apart single file, our street trees would stretch over 2,800 miles--all the way to Las Vegas, NV.