



NYC AND LOS ANGELES: CLIMATE CHANGE & USING TREE DIVERSITY TO BUILD A SUSTAINABLE URBAN FOREST

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Urban Forester
City of Santa Monica

Presentation Outline



Urban Tree Canopy Loss

Climate Change

**Sustainable Forest
Management**

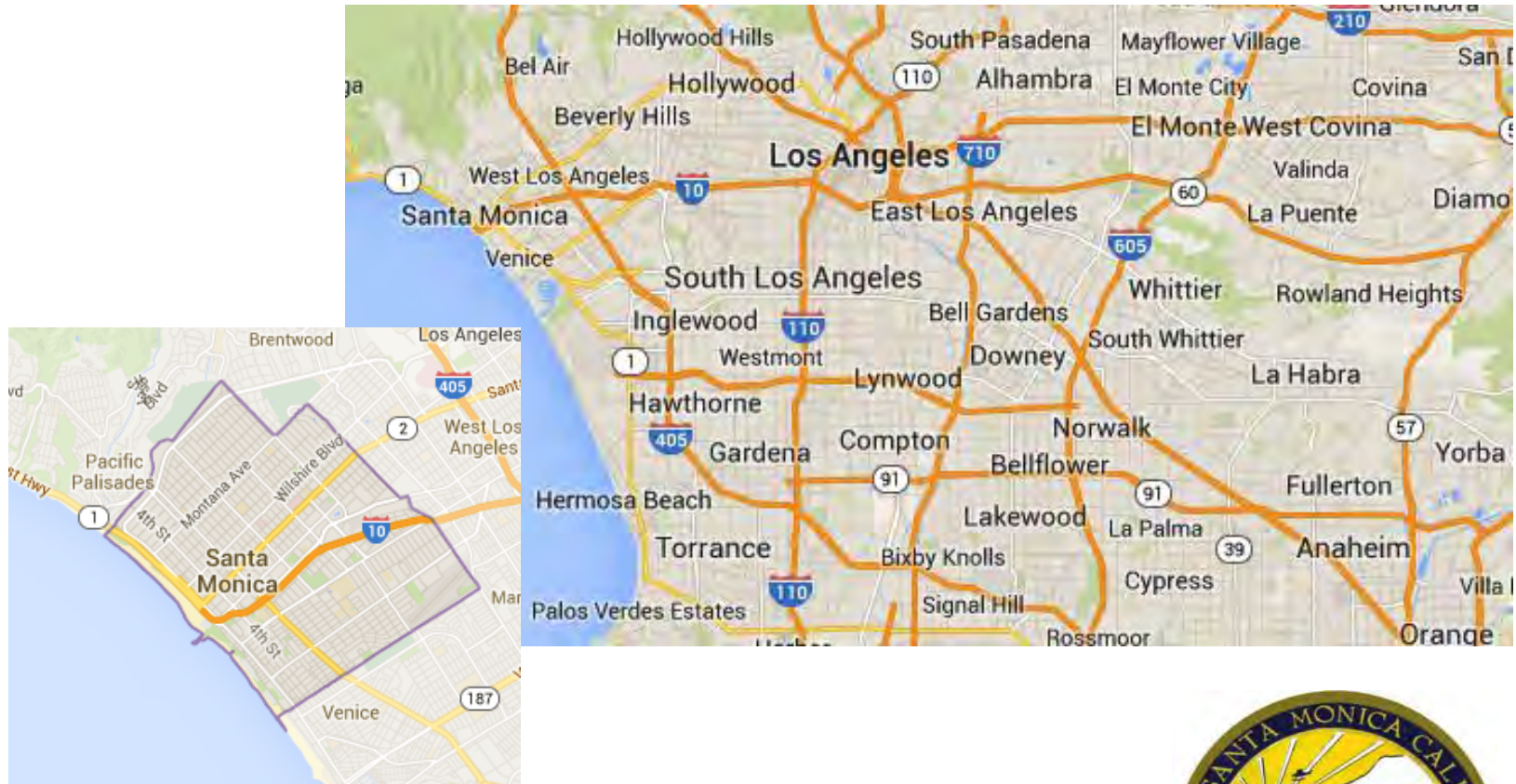
Urban Tree Diversity

Diversity Prioritization

New York and Los Angeles



City of Santa Monica & LA

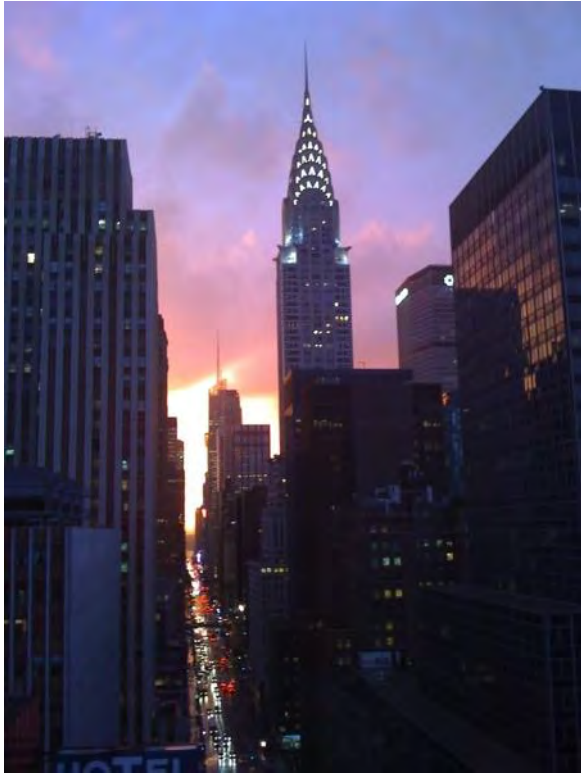


City of Santa Monica



acrossfit.com

Urban Forests by Numbers



**Estimated 2M
Park Trees**



**620,000
Street Trees**



**6,335
Park Trees**

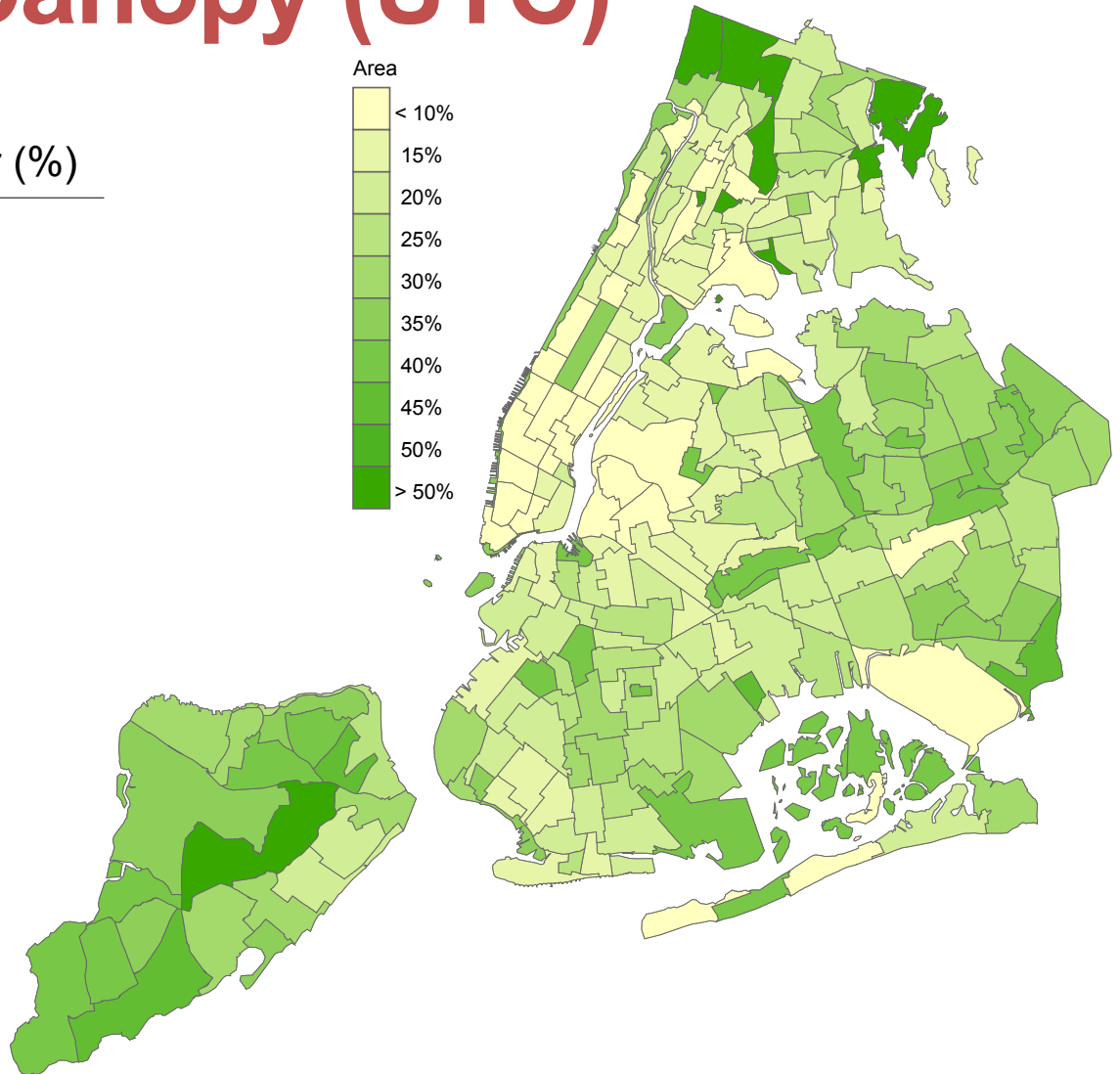
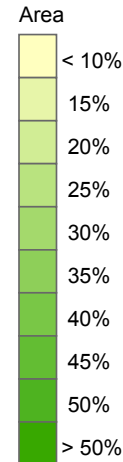
**26,813
Street Trees**

Urban Tree Canopy Loss



Urban Tree Canopy (UTC)

City	Tree Cover (%)
Atlanta, GA	37
Austin, TX	34
Boston, MA	29
Washington, DC	28
<i>US National Average</i>	<i>27</i>
Seattle, WA	25
<i>NYC & Los Angeles</i>	<i>21</i>
<i>London, UK</i>	<i>20</i>
<i>Santa Monica, CA</i>	<i>15</i>
Jersey City, NJ	12
Chicago, IL	11



Urban Tree Canopy Loss

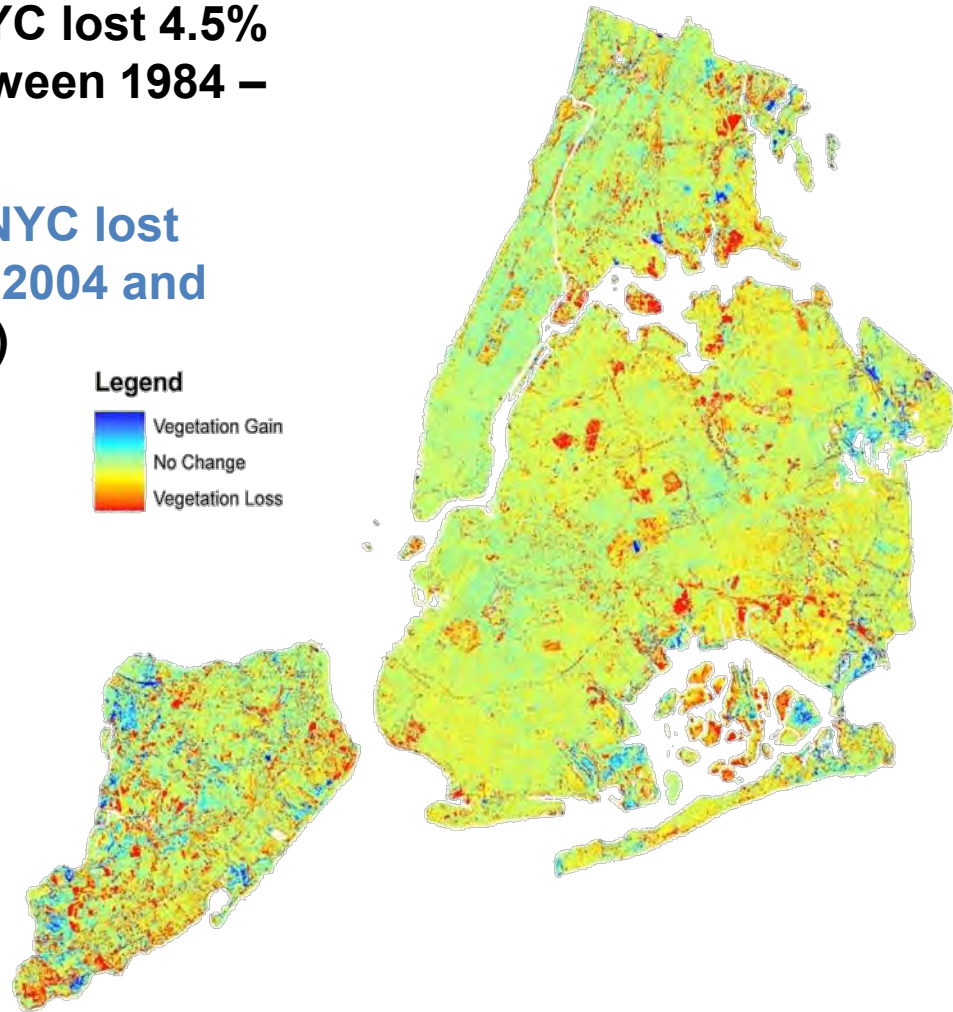
Columbia University found that NYC lost 4.5% vegetative cover (9,000 acres) between 1984 – 2002

A US Forest Service study found **NYC lost 1.2% area of tree canopy between 2004 and 2009** (Nowak and Greenfield, 2012)

6% Drop in total UTC in 5 Years

This same study discovered that **19 out of 20 US cities were losing urban tree canopy**

Legend



Urban Tree Canopy Loss







One of the biggest risks to the urban forest is, risk!

Wells, 2015



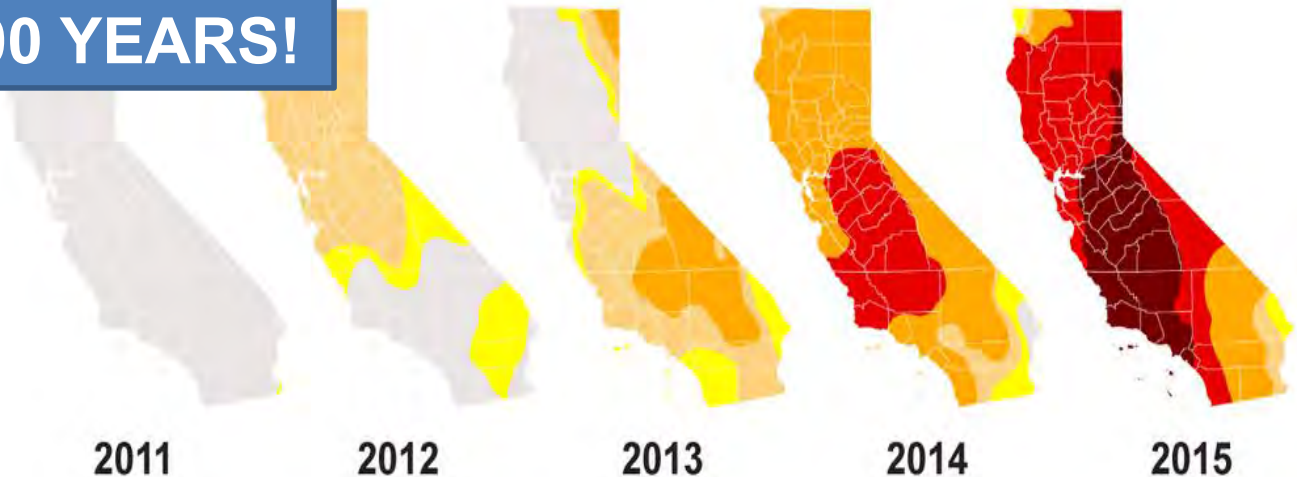
Urban Tree Canopy Loss

Climate Change: Drought

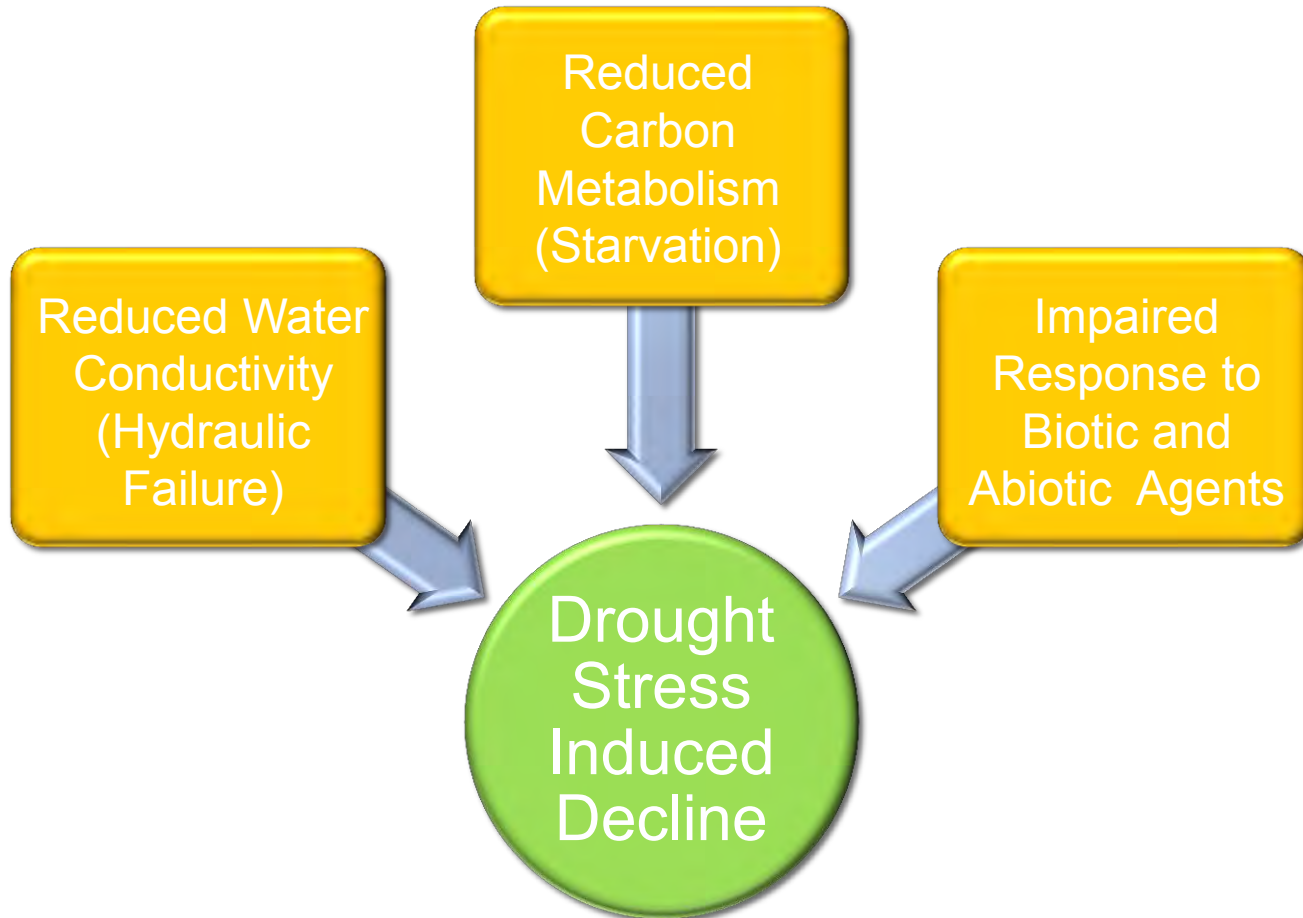
California's drought level at first week of January

Abnormally Dry Moderate Drought Severe Drought Extreme Drought Exceptional Drought

WORST IN 500 YEARS!



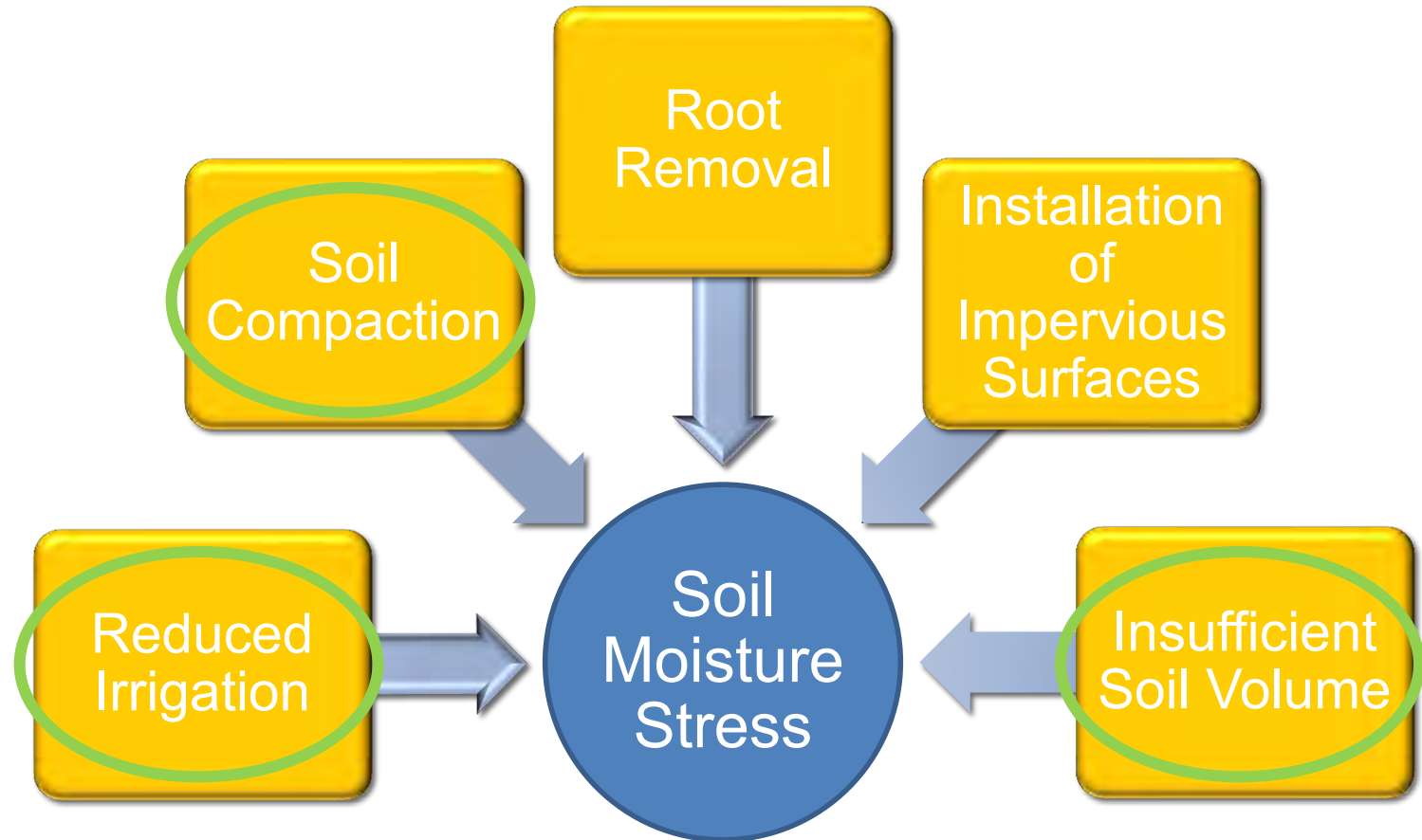
Drought: Threat to Urban Forest



A Summary of the Physiological Impacts of Drought Stress in Trees

(McDowell et al., 2013; McDowell, 2011)

Drought Stress: Contributing Factors



(Modified from Connella, 2008)

Drought Stress



Los Angeles Times



Source: LA Times

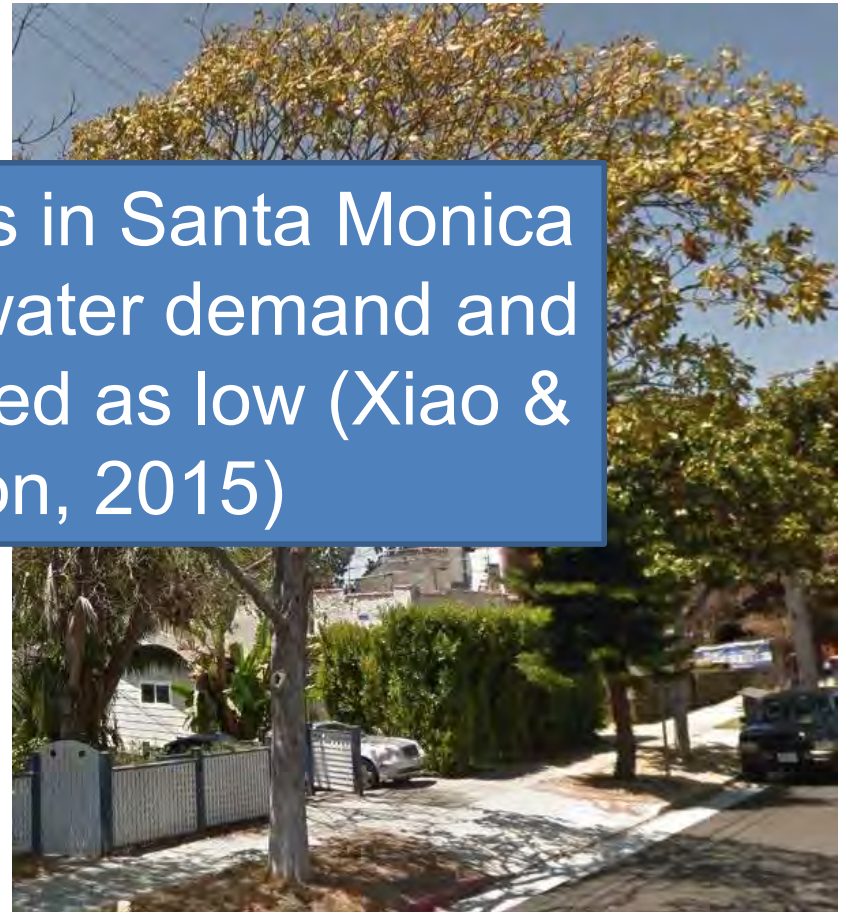
**April 2015: 14,000 dead park trees
reported in last year due to drought**

Drought Stress – Reduced Irrigation

June 2011



August 2014



55% of public trees in Santa Monica have a moderate water demand and 44% are categorized as low (Xiao & McPherson, 2015)

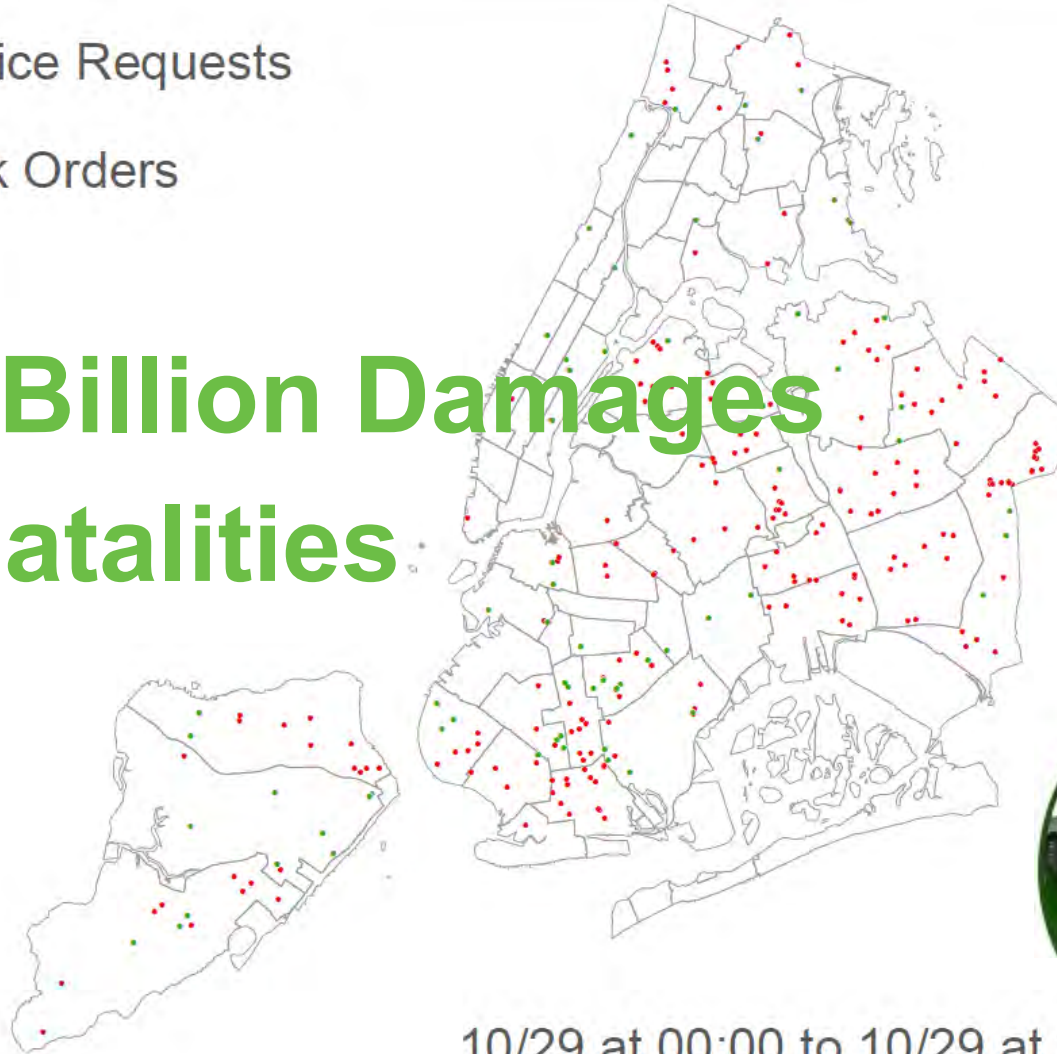
Urban Tree Canopy Loss

Climate Change: Extreme Weather



- Service Requests
- Work Orders

\$32 Billion Damages
53 Fatalities



10/29 at 00:00 to 10/29 at 12:00



Hurricane Sandy: 10/29/2012

- Service Requests
- Work Orders

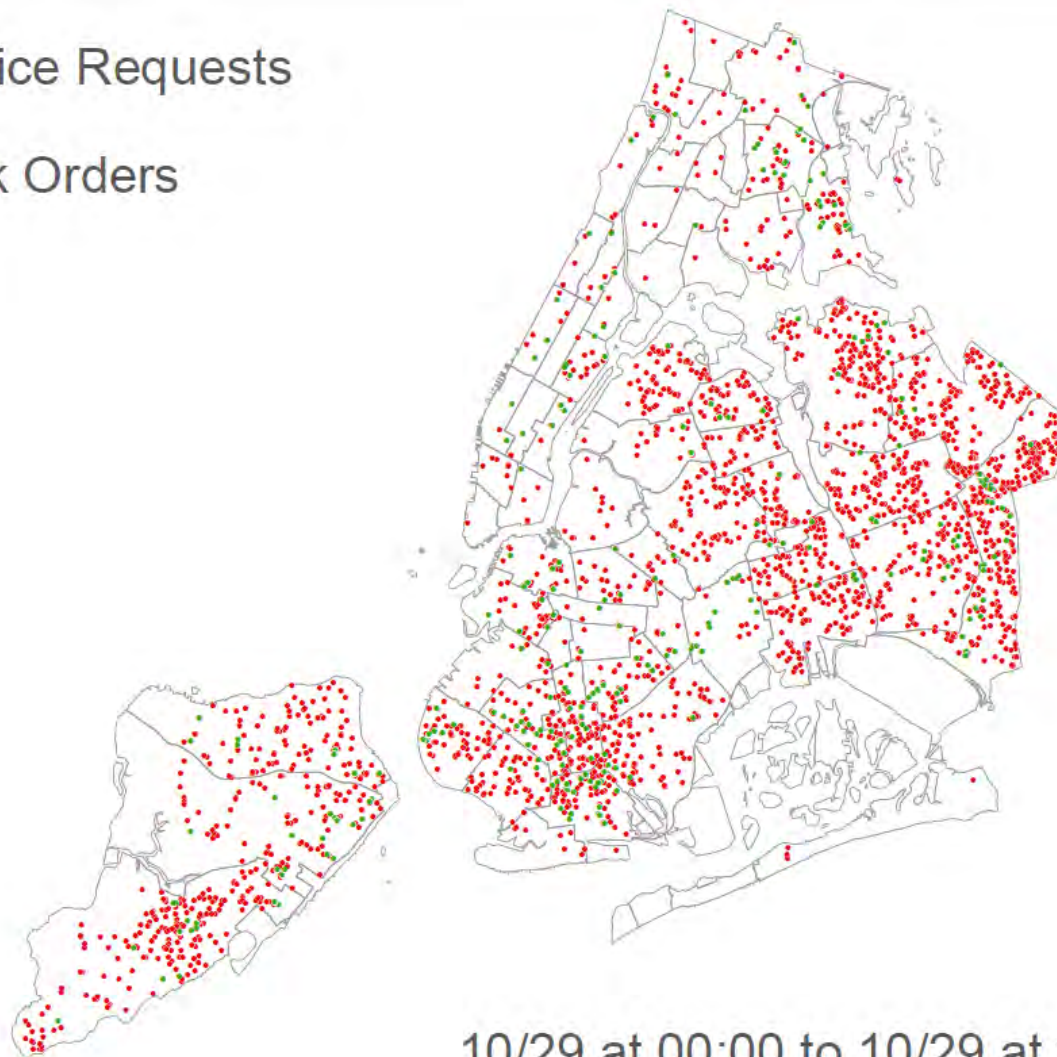


- Service Requests
- Work Orders



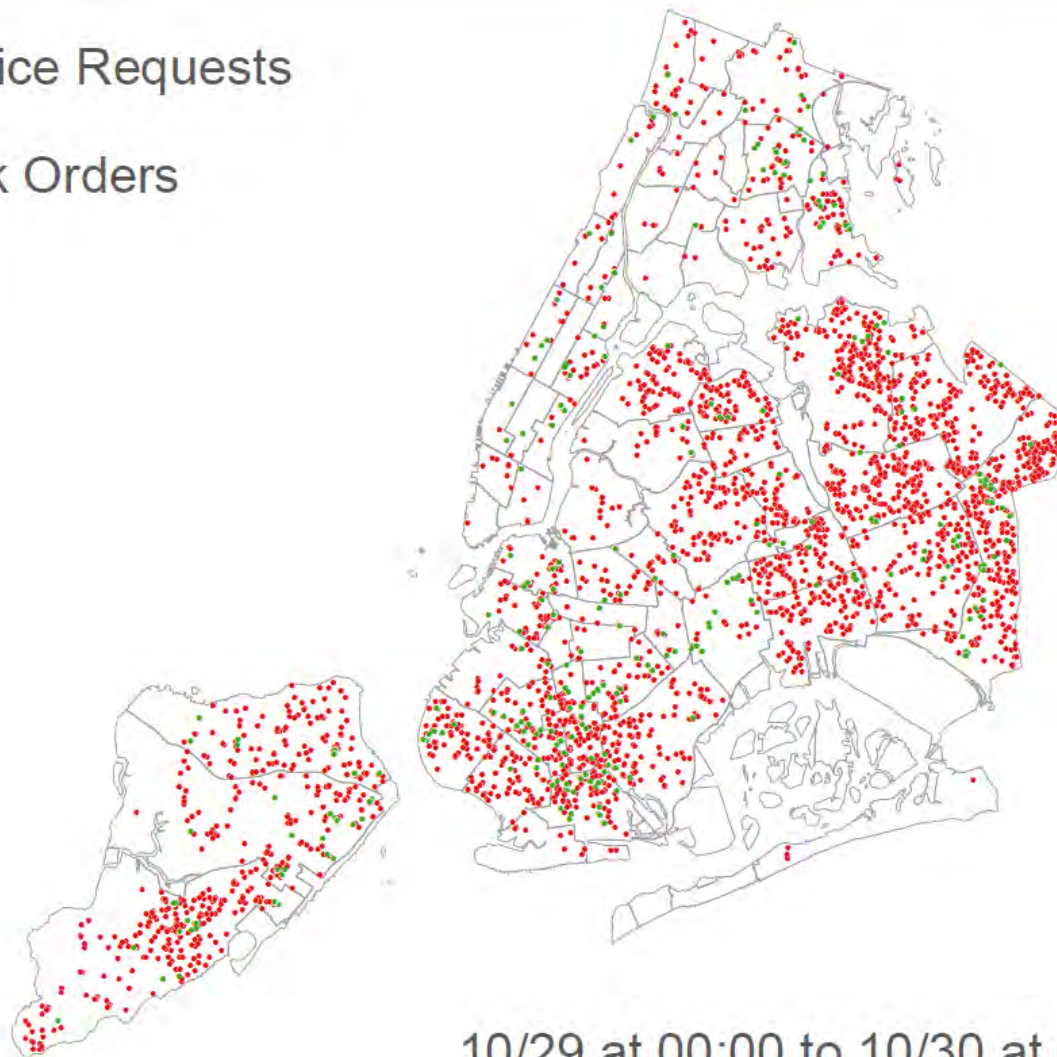
10/29 at 00:00 to 10/29 at 18:00

- Service Requests
- Work Orders



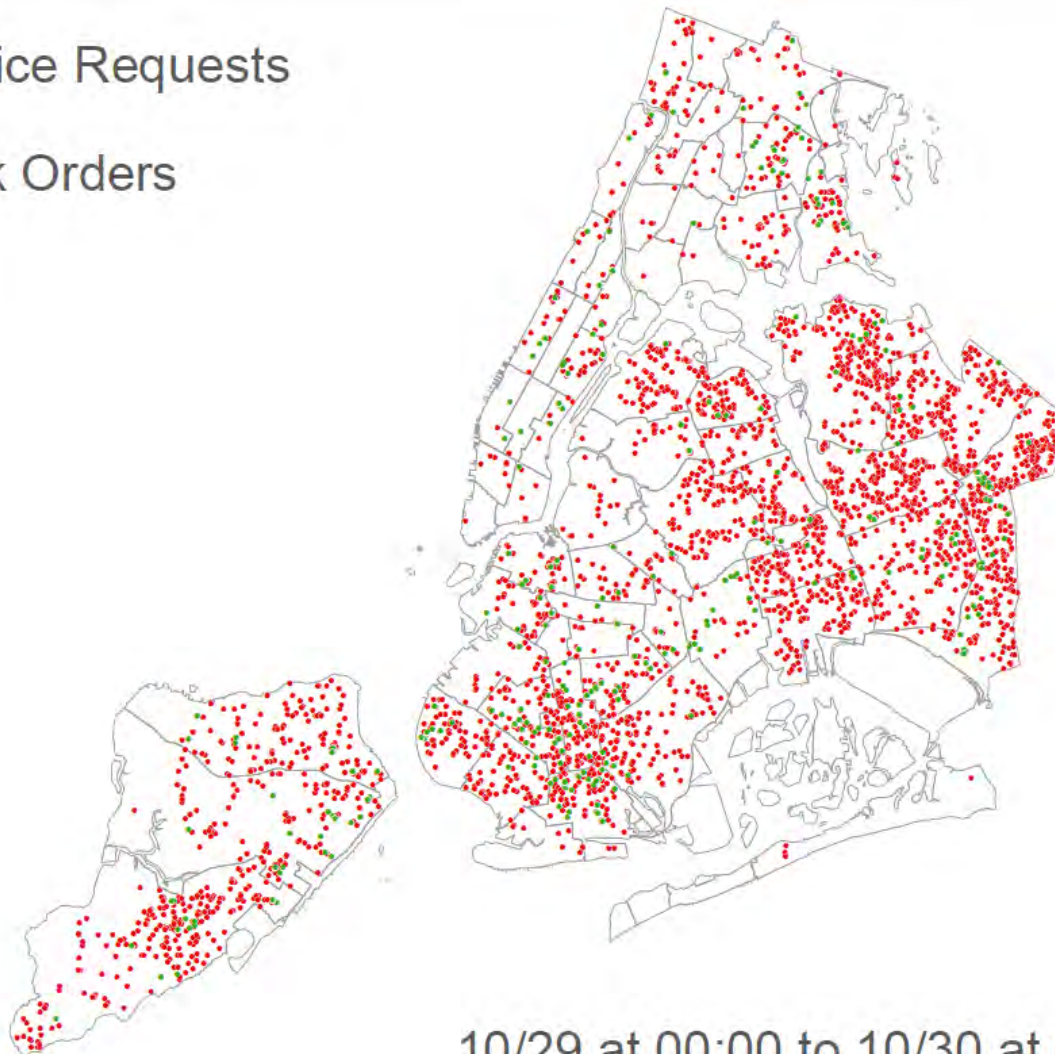
10/29 at 00:00 to 10/29 at 21:00

- Service Requests
- Work Orders



10/29 at 00:00 to 10/30 at 00:00

- Service Requests
- Work Orders



10/29 at 00:00 to 10/30 at 06:00

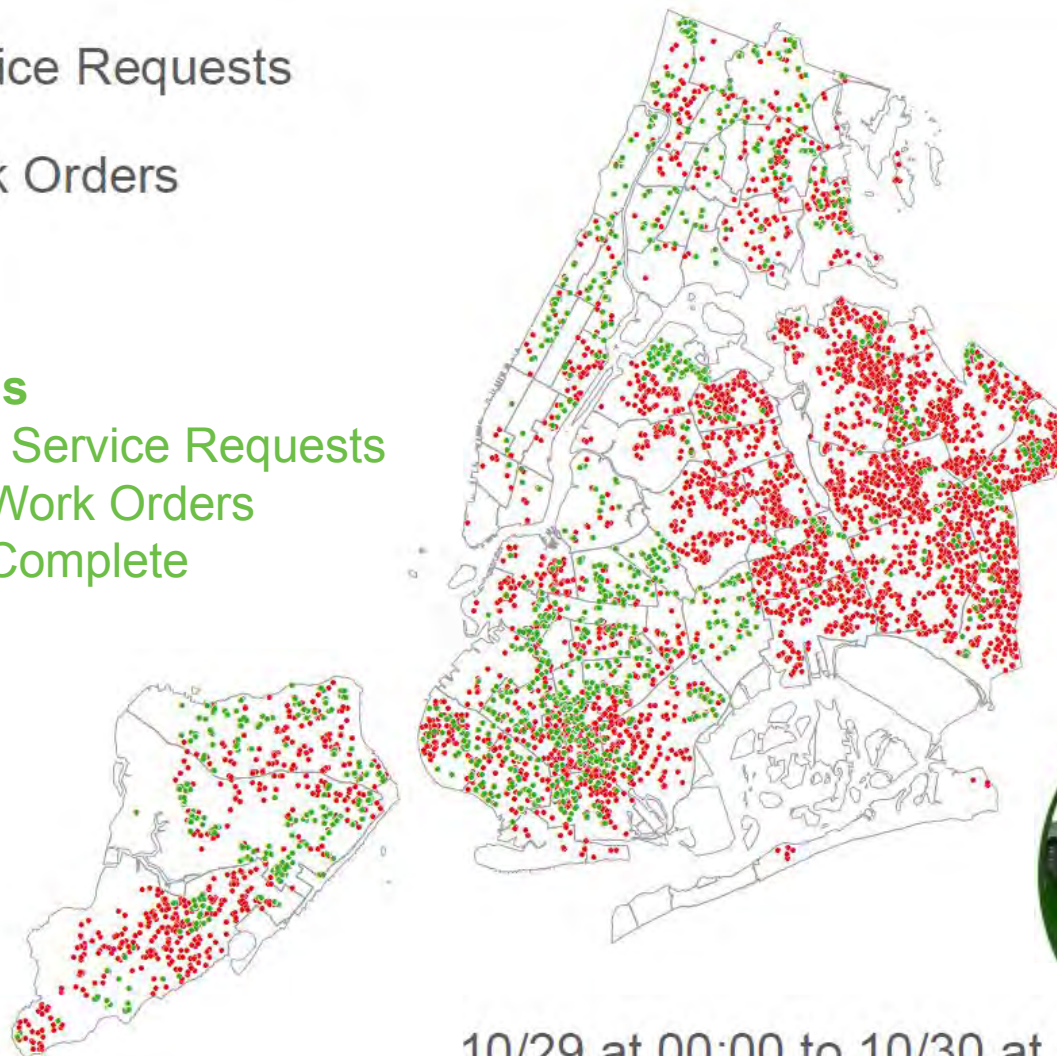
- Service Requests
- Work Orders

Totals

6050 Service Requests

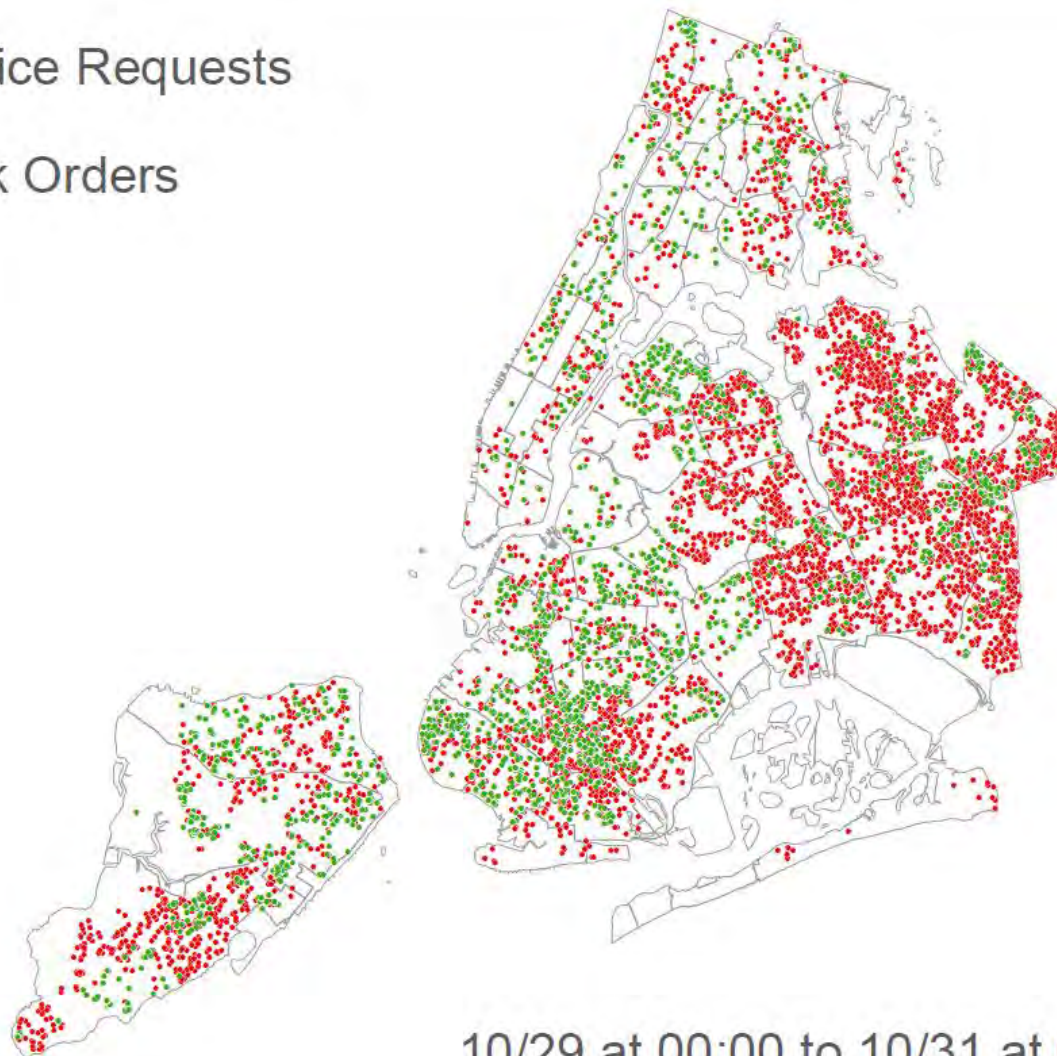
710 Work Orders

140 Complete



10/29 at 00:00 to 10/30 at 15:00

- Service Requests
- Work Orders



10/29 at 00:00 to 10/31 at 06:00

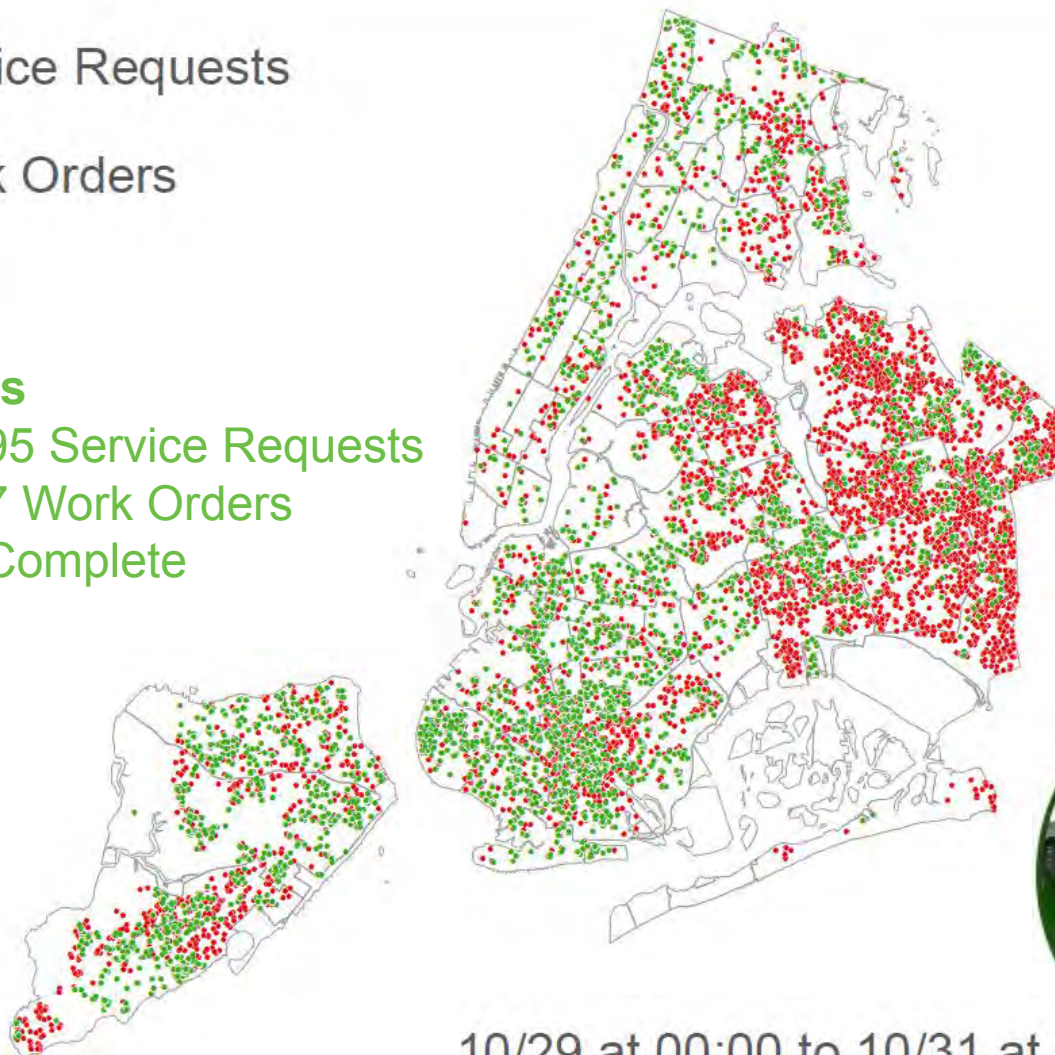
- Service Requests
- Work Orders

Totals

10,995 Service Requests

3,687 Work Orders

551 Complete



10/29 at 00:00 to 10/31 at 15:00

Climate Change: Extreme Weather



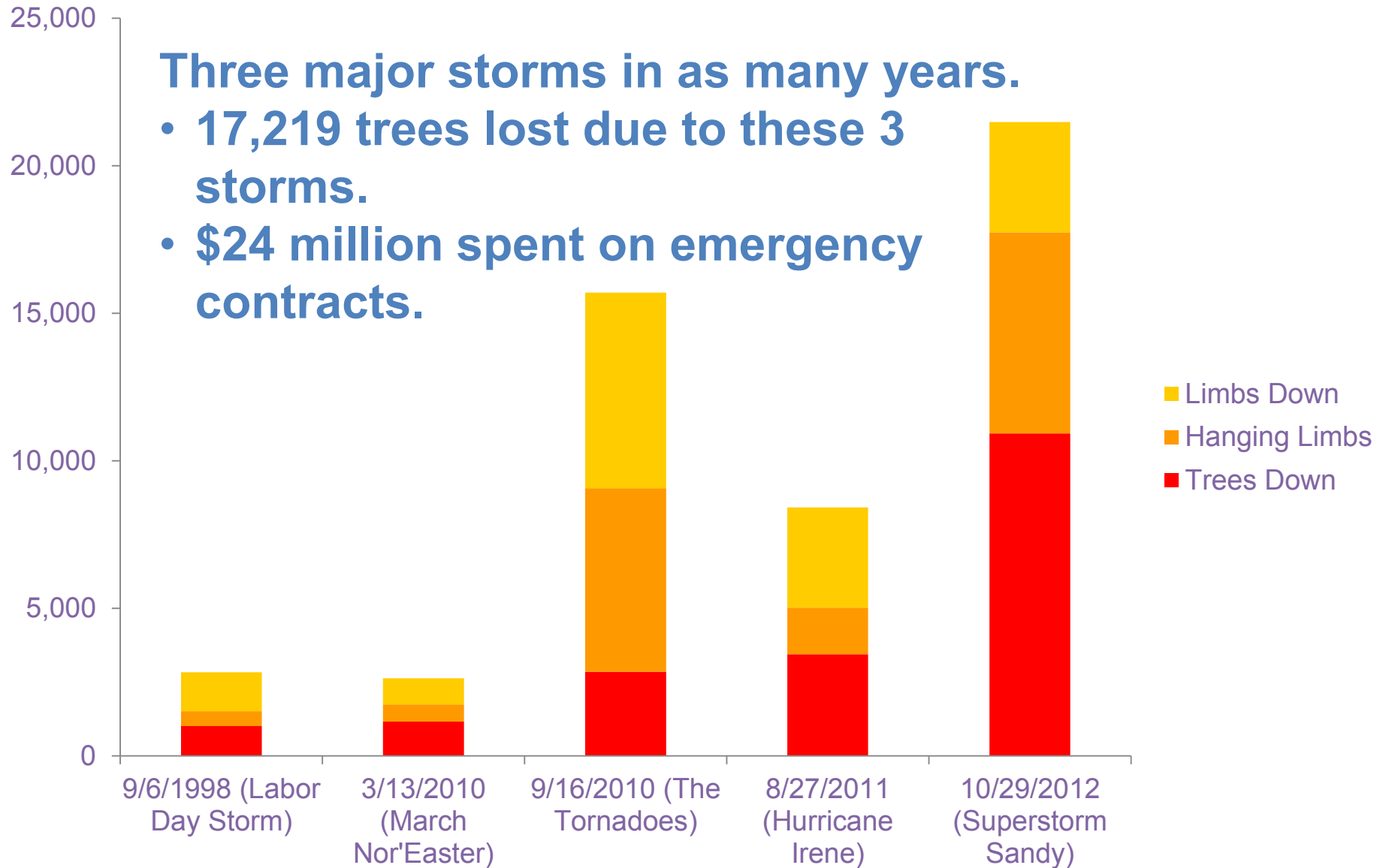
Climate Change: Extreme Weather



Climate Change: Extreme Weather

Three major storms in as many years.

- **17,219 trees lost due to these 3 storms.**
- **\$24 million spent on emergency contracts.**



- Hurricane Sandy created a 13-14ft Storm Surge
- 47,800 trees in the inundation zone

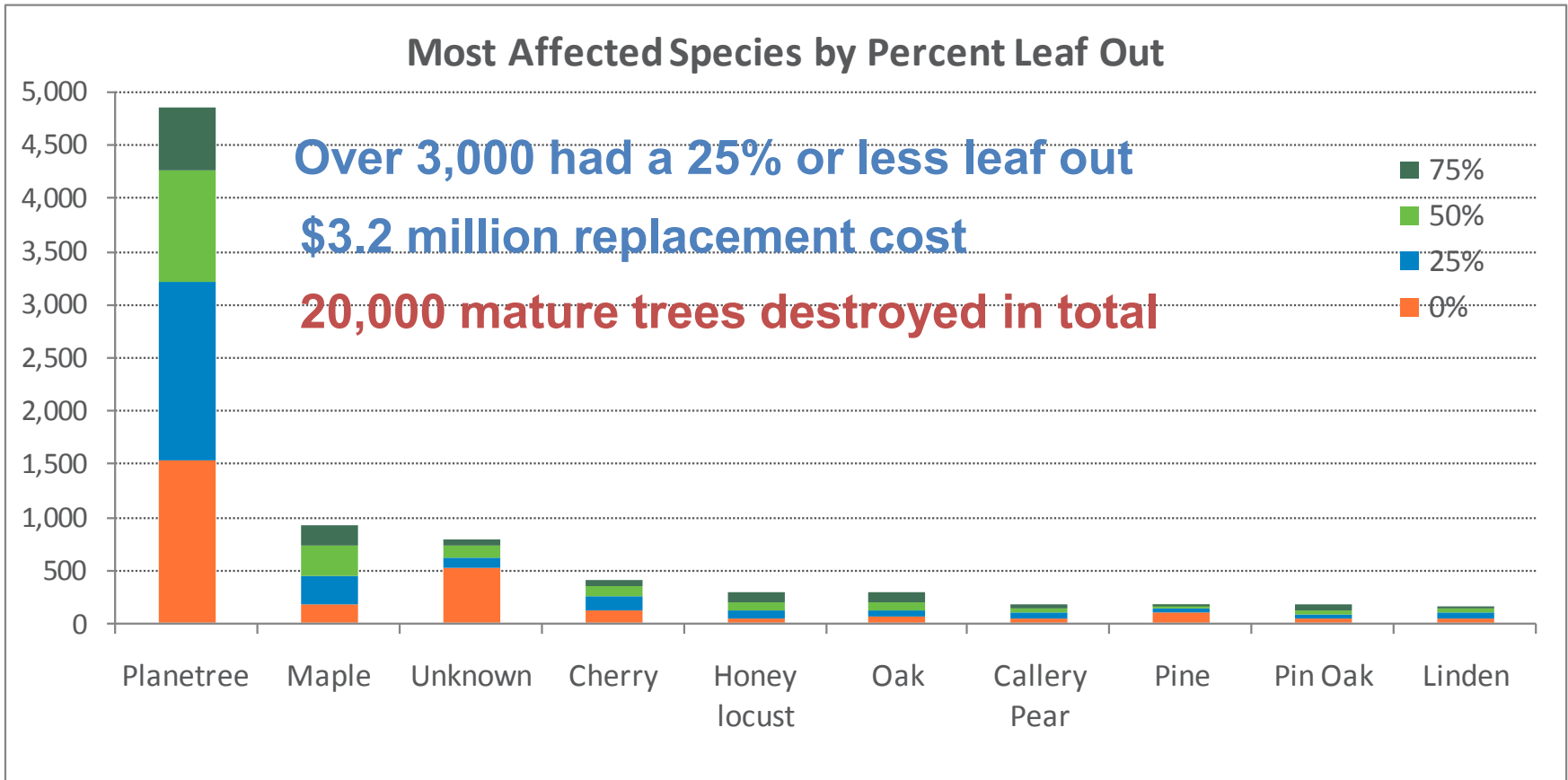
August 2011



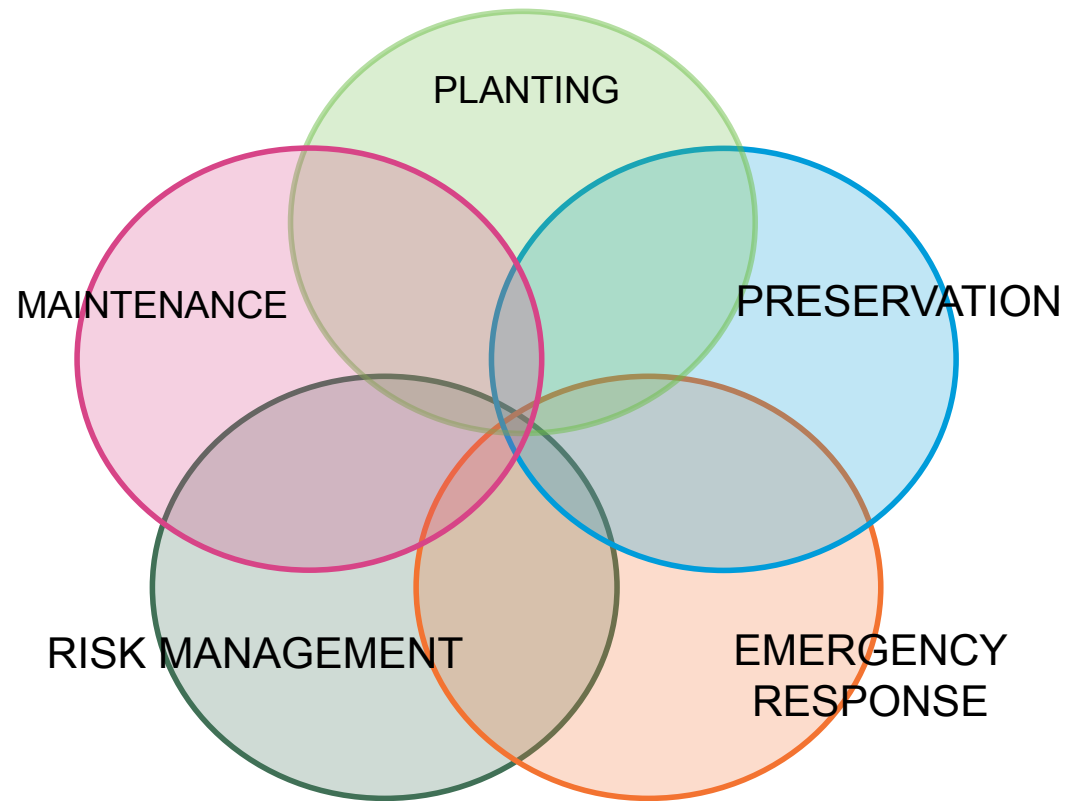
September 2013



Climate Change: Extreme Weather



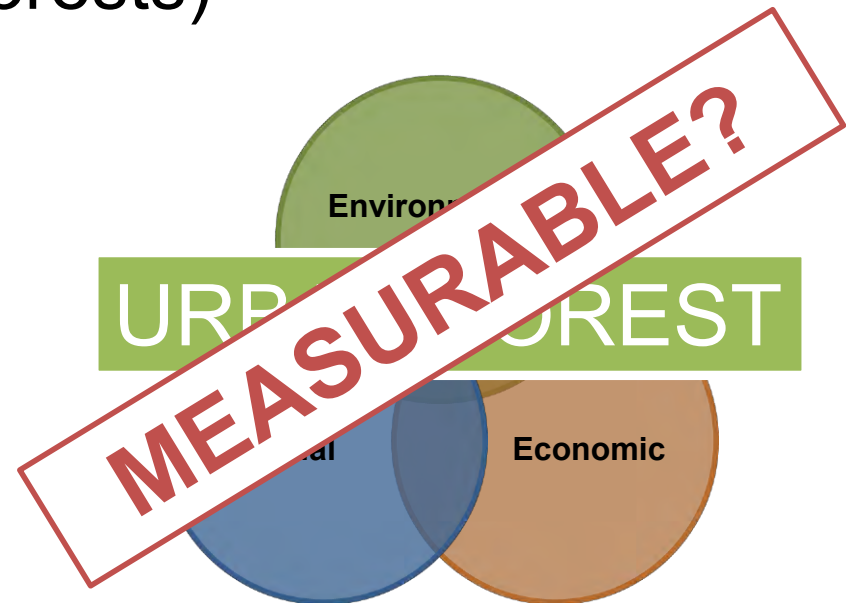
Sustainable Forest Management



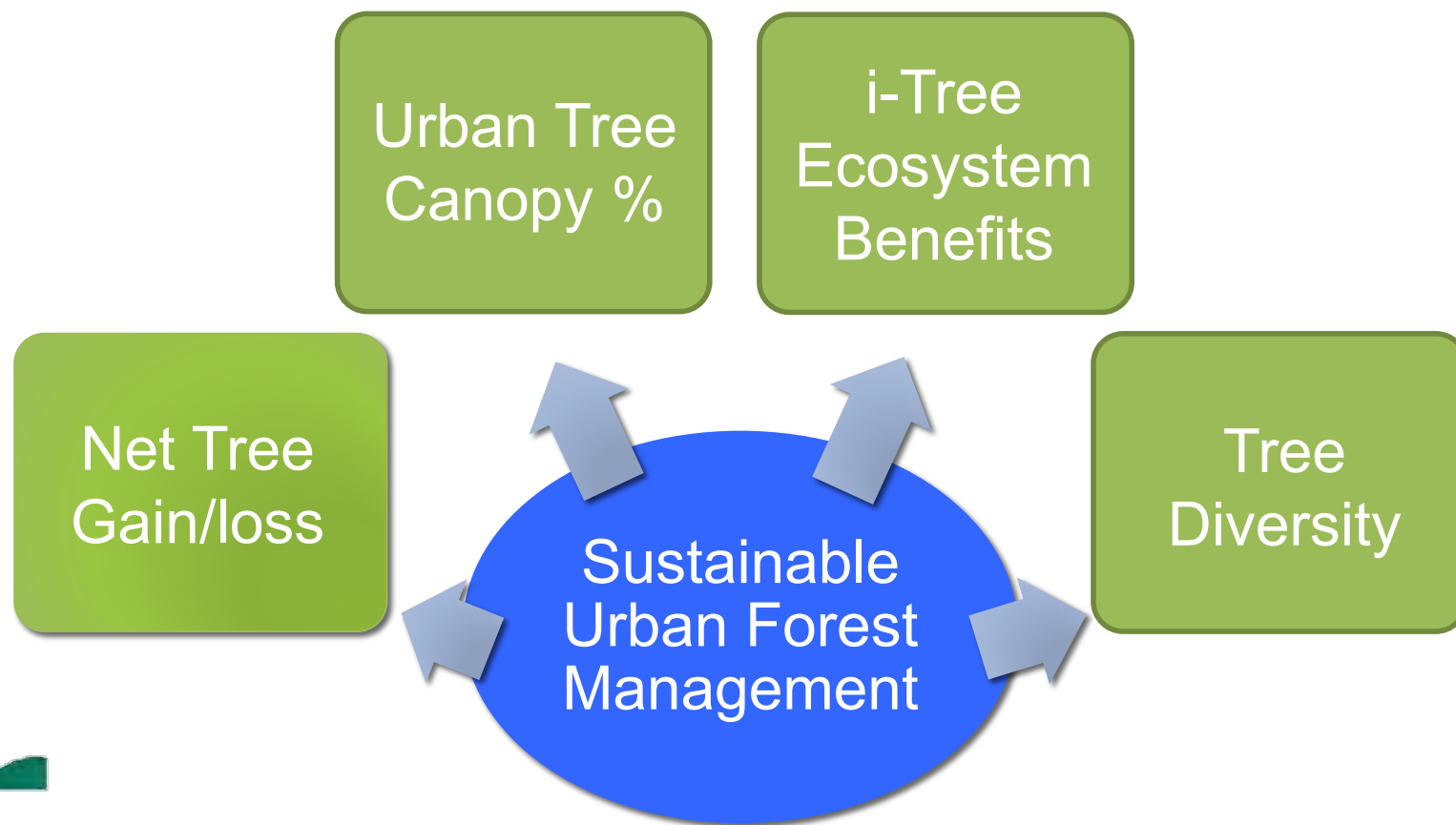
Source: Adapted from USDA Forest Service

Sustainable Forest Management

“a dynamic and evolving concept, aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations.”(United Nations Forum on Forests)



Urban Forest Sustainability Metrics



i-Tree: Ecosystem Benefits

2001 Benefit-Cost Analysis of Santa Monica's
Municipal Forest
TOTAL BENEFITS = \$2.3 MILLION

2015 City of Santa Monica Municipal Forest
Assessment
TOTAL BENEFITS = \$5.1 MILLION

Trees Need to be in Good Functional
Health to Deliver Benefits
(Rahman et al., 2011)

■ Energy ■ Carbon Dioxide ■ Air Quality ■ Stormwater ■ Aesthetics

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Urban Forest Sustainability Metrics:

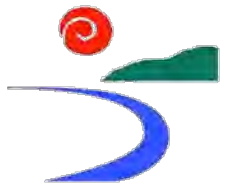
Urban Tree Diversity

Diversity

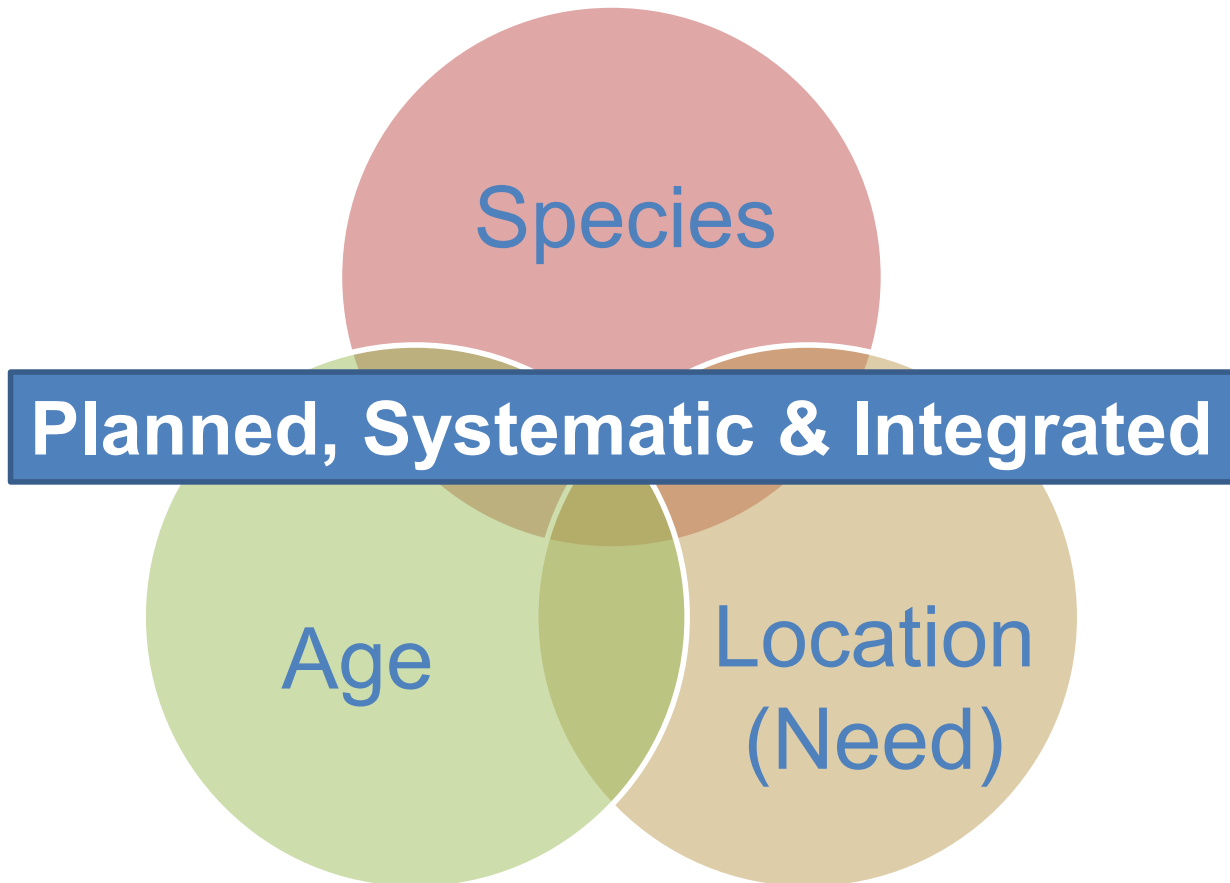
A range of many people or things that are **very different** from **each other** (Oxford Learner's Dictionary, 2014)

Resilience

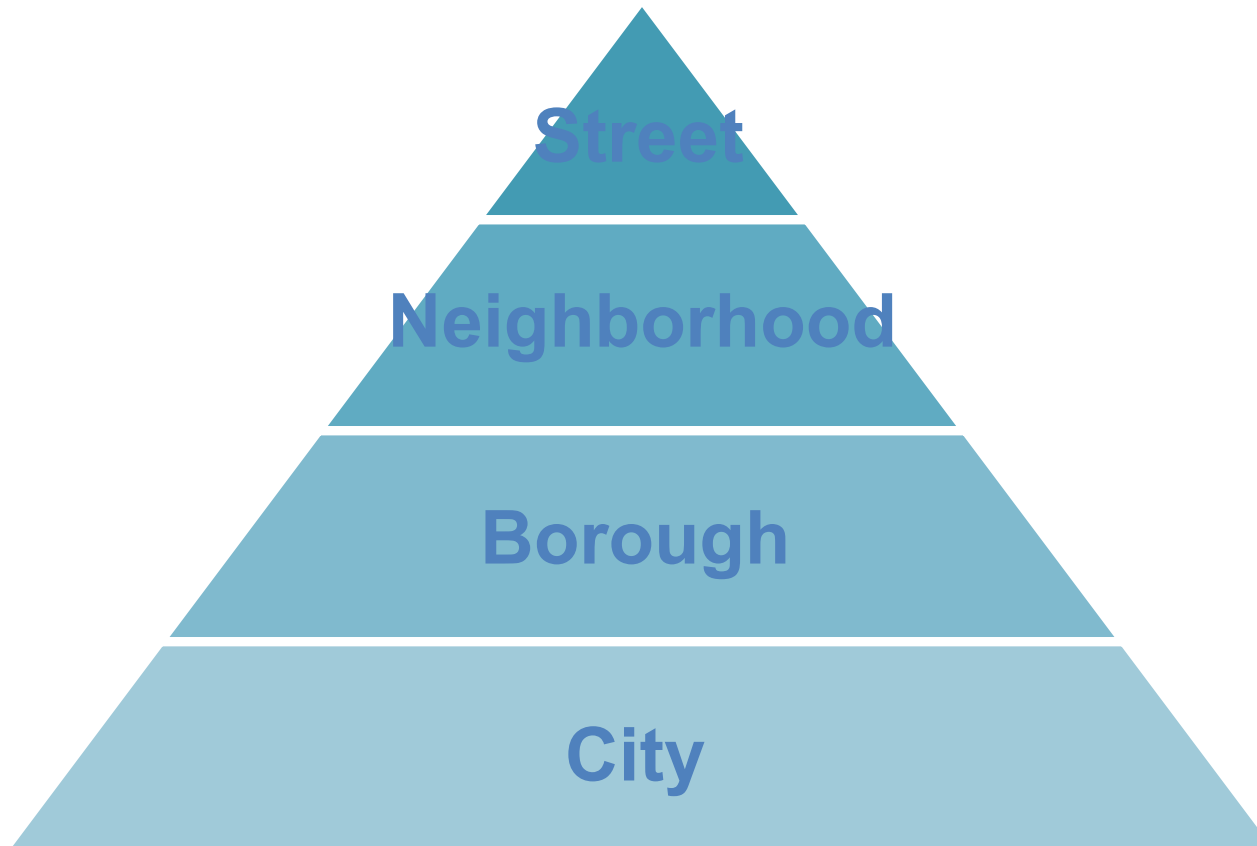
The **ability** to become **strong, healthy**, or successful again **after** something **bad happens** (Merriam-Webster, 2014)



Urban Tree Diversity

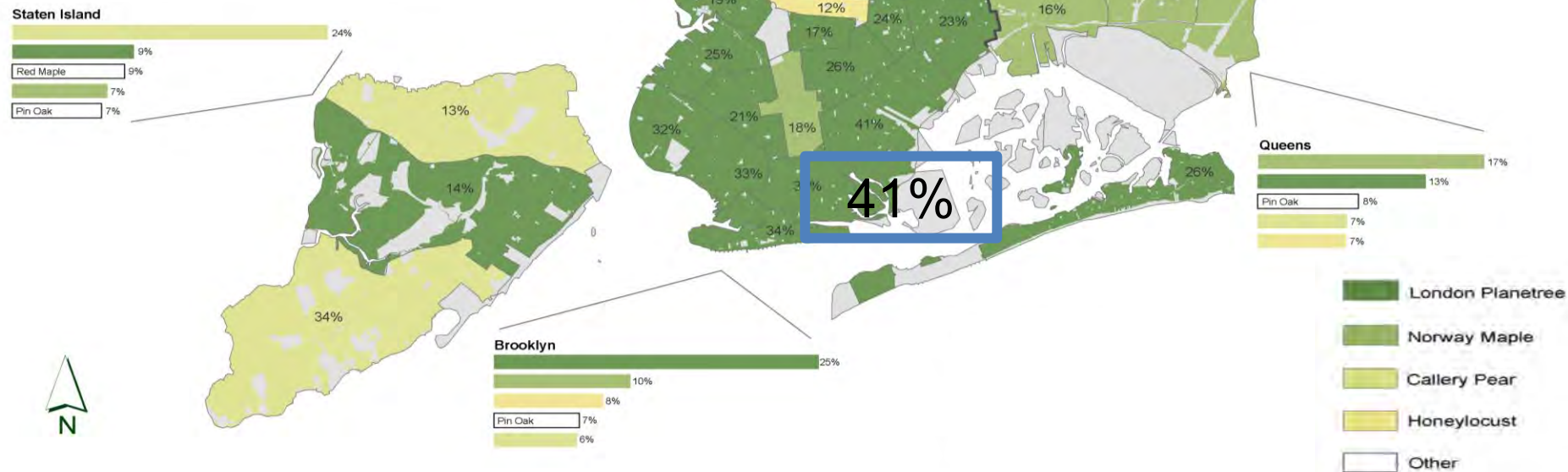


Urban Tree Diversity – What Level?



Urban Tree Diversity – What Level?

Top Five Species	% Total Trees
Planetree, London	15.3
Maple, Norway	14.1
Pear, callery	10.9
Honeylocust	8.9
Oak, pin	7.5



Urban Tree Diversity – Planning



“Everyone has a plan 'til they get punched in the mouth.”

Mike Tyson

Policies of 49 California municipalities were accessed 82% indicated that species diversity was an objective (Muller and Bornstein, 2010)

Only 48% had codified this objective in a management plan

Urban Tree Diversity - Species



Tree Diversity to Build a Sustainable Urban Forest: Matt Wells



Species Diversity Recommendations

Authors	Diversity Recommendations
Miller and Miller (1991); Smiley, Kielbaso and Proffer (1986)	No species shall exceed 10% of the population
Kielbaso (1989)	No species should exceed 5% and no genus should exceed 10%
Santamour (2002)	Plant no more than 10% of any species, no more than 20% of any genus and no more than 30% of any family

10 Genus and 20 Species



WEST PLAZA

OCEAN VIEW ELEMENTARY
SCHOOL
1000 OCEAN VIEW DRIVE
LOS ANGELES, CA 90015

milliontreesNYC™

A PLANYC INITIATIVE WITH NYC PARKS AND NEW YORK RESTORATION PROJECT

- Planting 20,000 street trees a year
- 10 year funding allowed for procurement contracts
- 3 nurseries contract grew for NYC Parks

Species Planted



“Once more unto the breach, dear friends, once more...”

William Shakespeare, *Henry V*



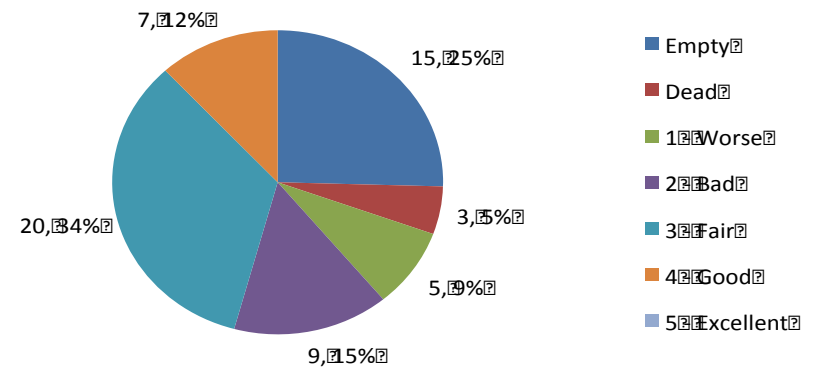
Urban Forest Managers
overly rely on ‘tried and
tested’ species
(Sjoman, 2012)

As growing conditions
become more
challenging, diversity
decreases
(Pauleit et al., 2002)

Introducing New Species



2ND STREET 259 Ginkgo Trees



2nd Street = 46% Successful Establishment

Baseline = 80% Successful Establishment

Introducing New Species



Bring Back the Old (Natives)

Quercus agrifolia (133)



Platanus racemosa (374)



Species Based Pruning Cycles



City of
Santa Monica®

Tree Diversity to Build a Sustainable Urban Forest: Matt Wells

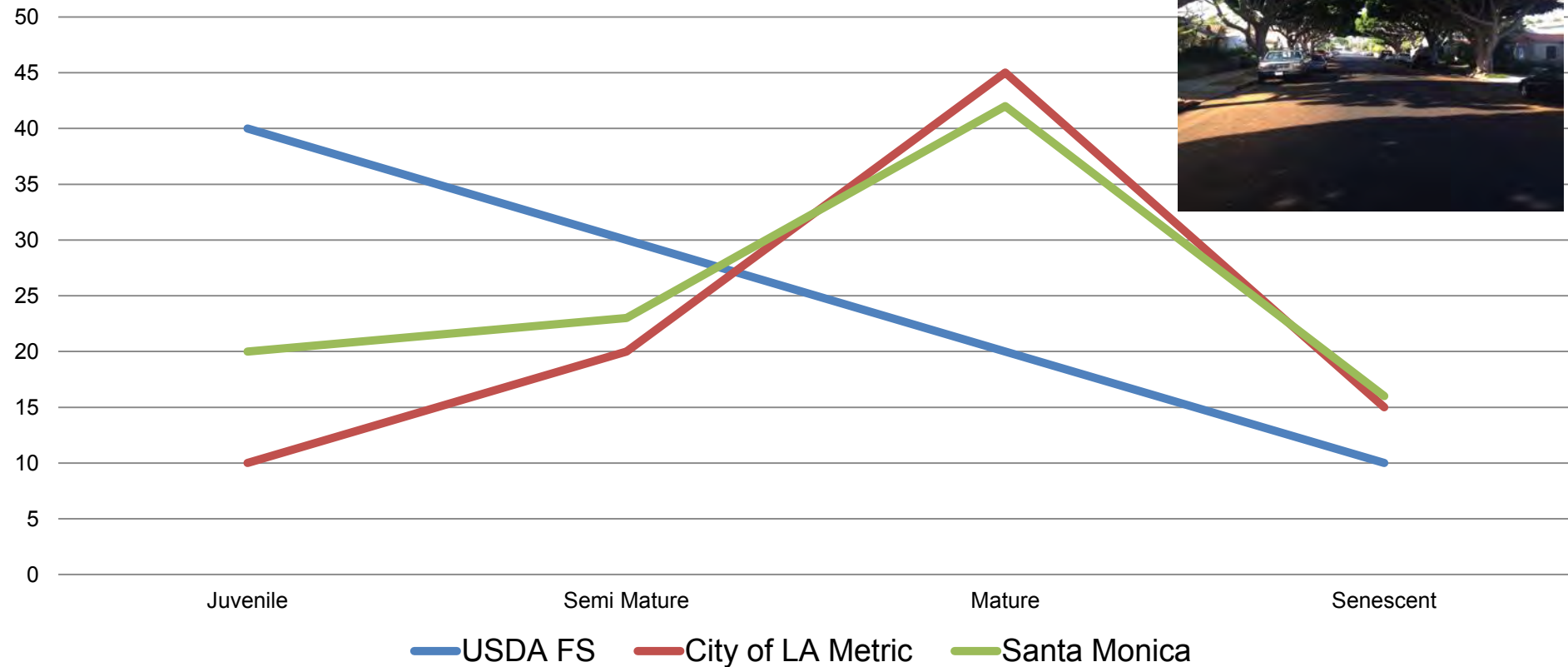
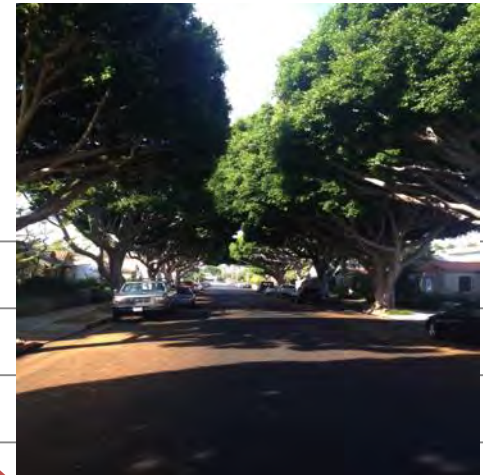
Urban Tree Diversity - Age



Tree Diversity to Build a Sustainable Urban Forest: Matt Wells

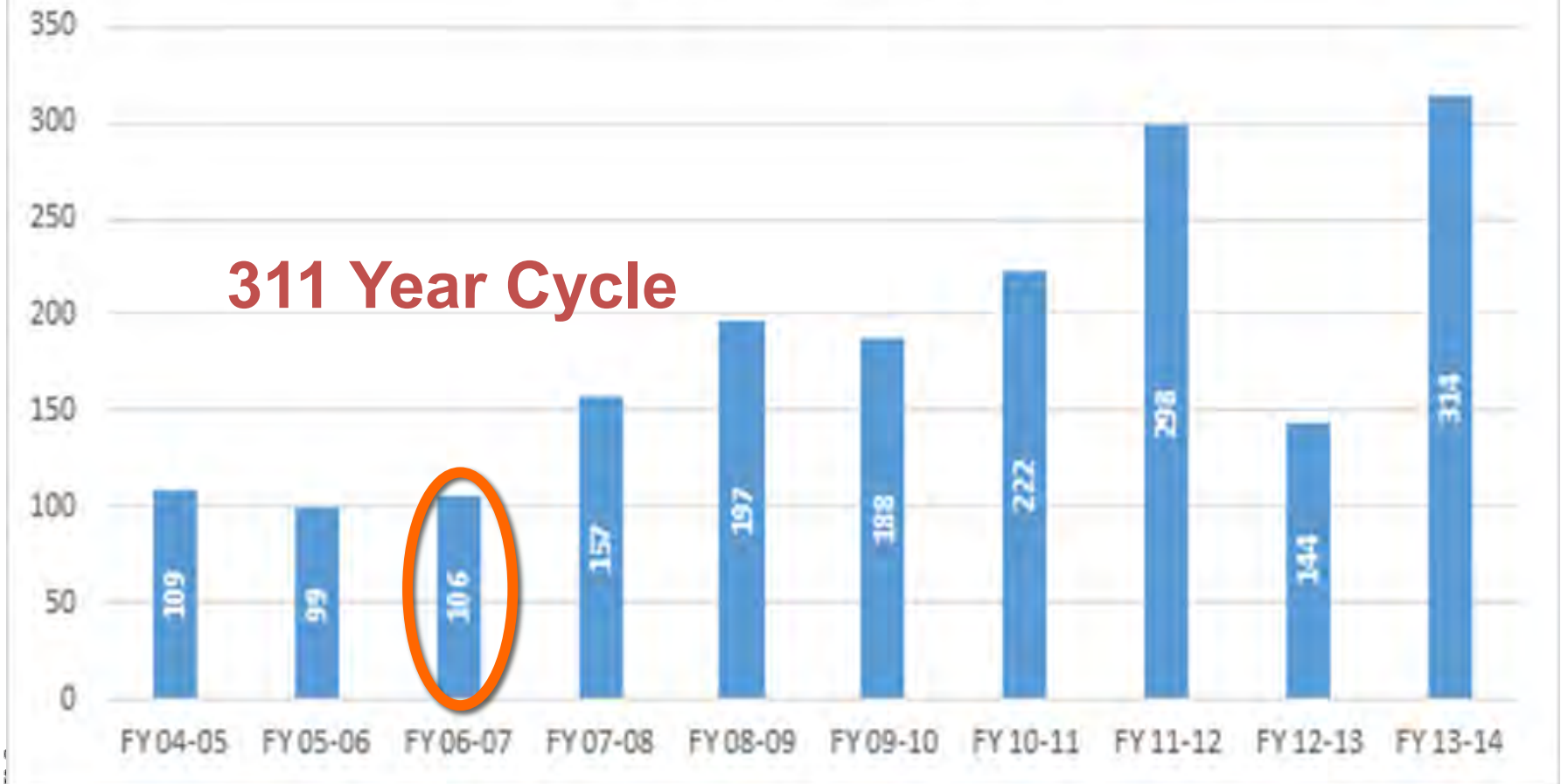


Urban Tree Diversity - Age



Diversify Through Removal

Tree Removals - Ten Years
Total Trees = 1,834



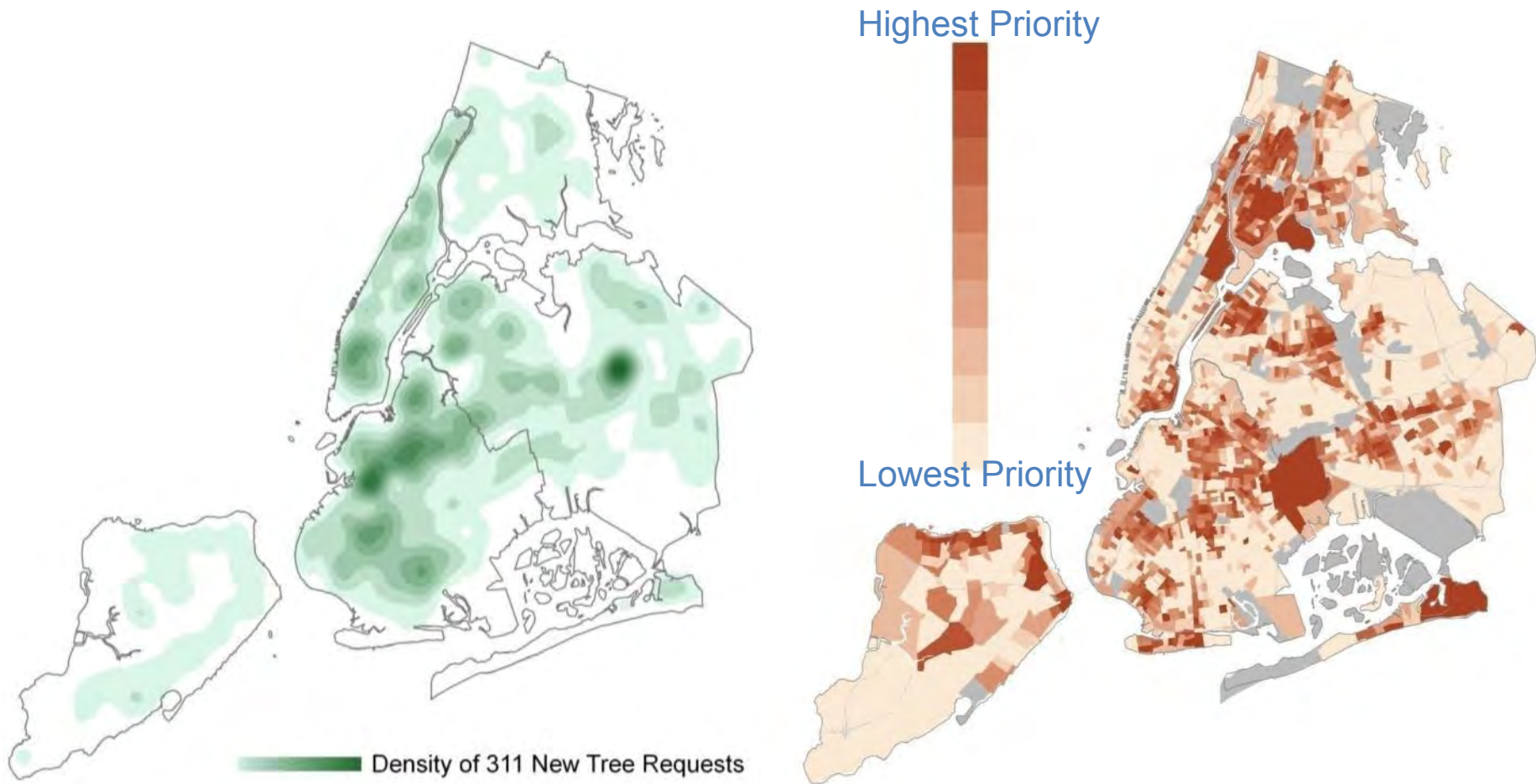
311 Year Cycle

Urban Tree Diversity – Location (Need)

Urban Tree Diversity – Location (Need)

Parks traditionally ran a request based street tree planting program

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Street Tree Block Planting

— Planted in Fall 2007 and previous seasons



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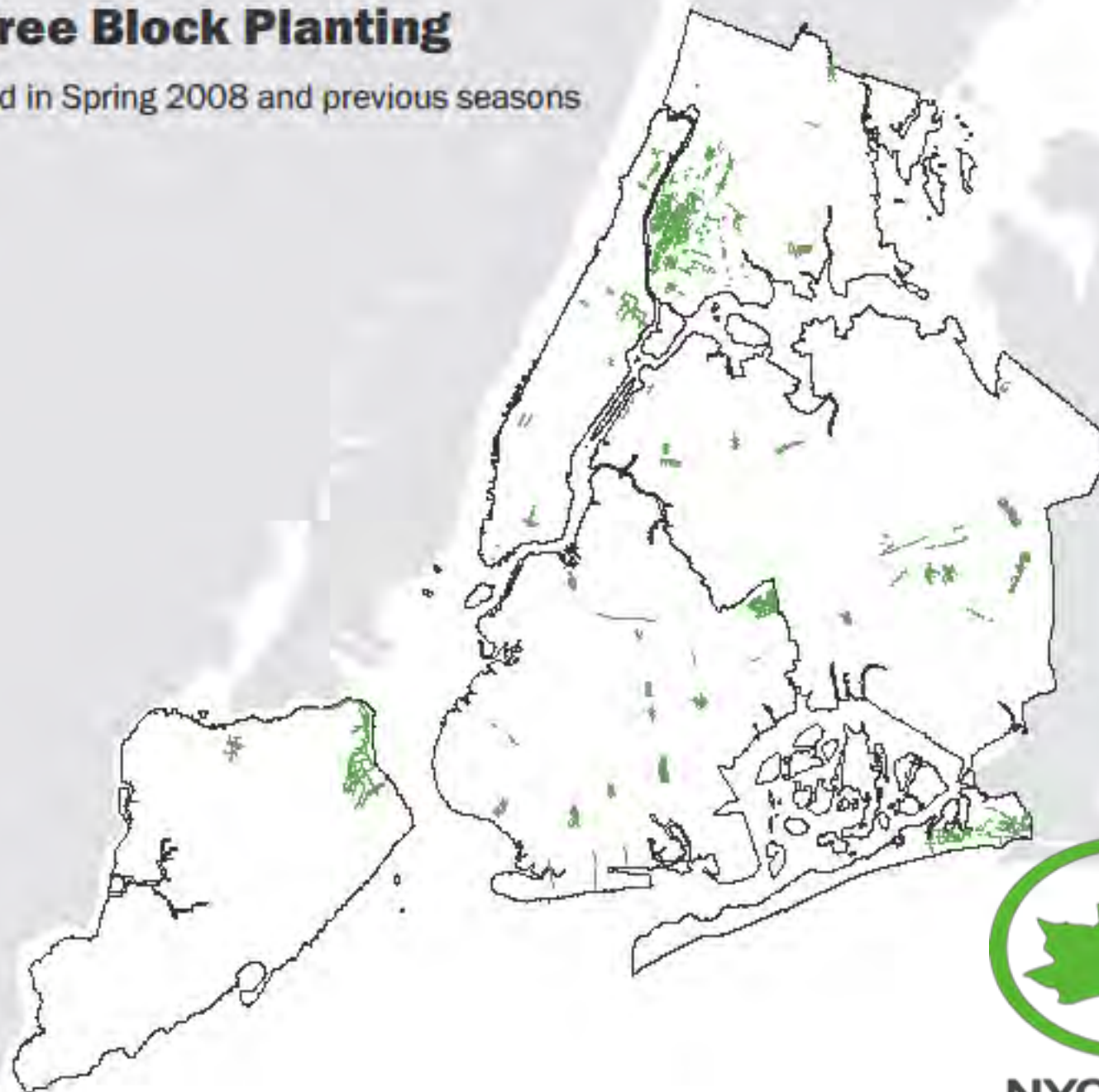
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NYC Parks

Street Tree Block Planting

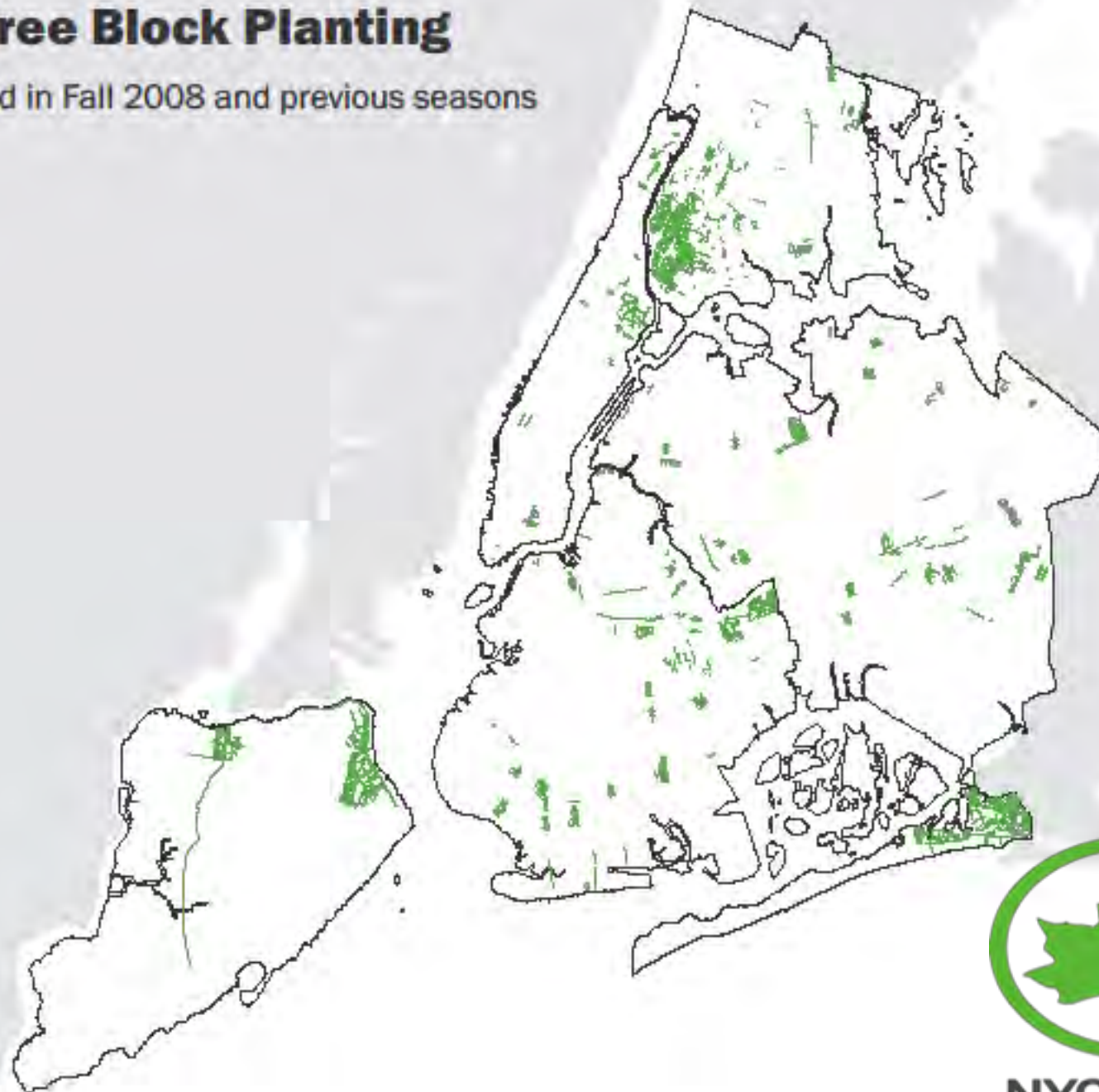
— Planted in Spring 2008 and previous seasons



NYC Parks

Street Tree Block Planting

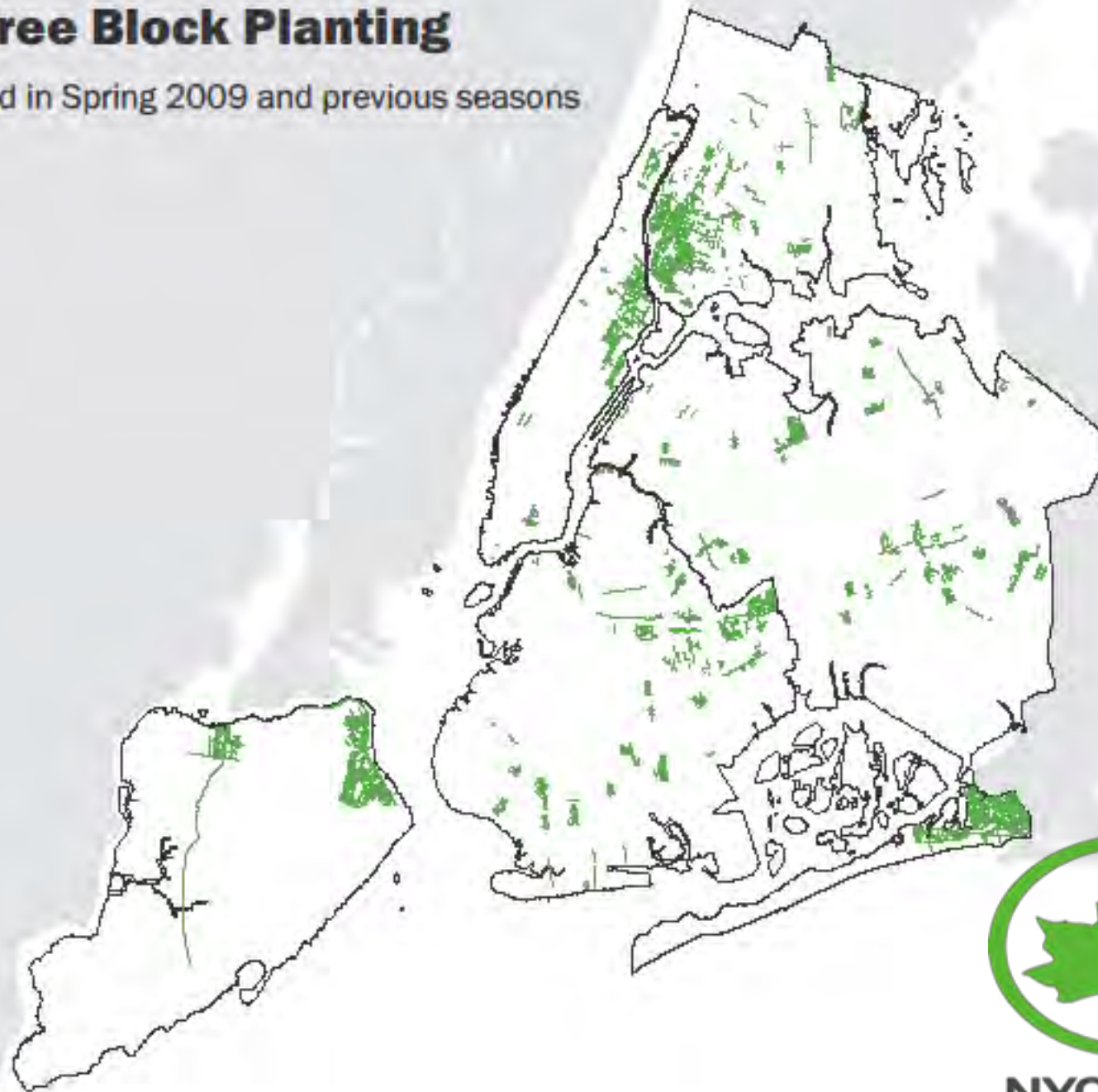
— Planted in Fall 2008 and previous seasons



NYC Parks

Street Tree Block Planting

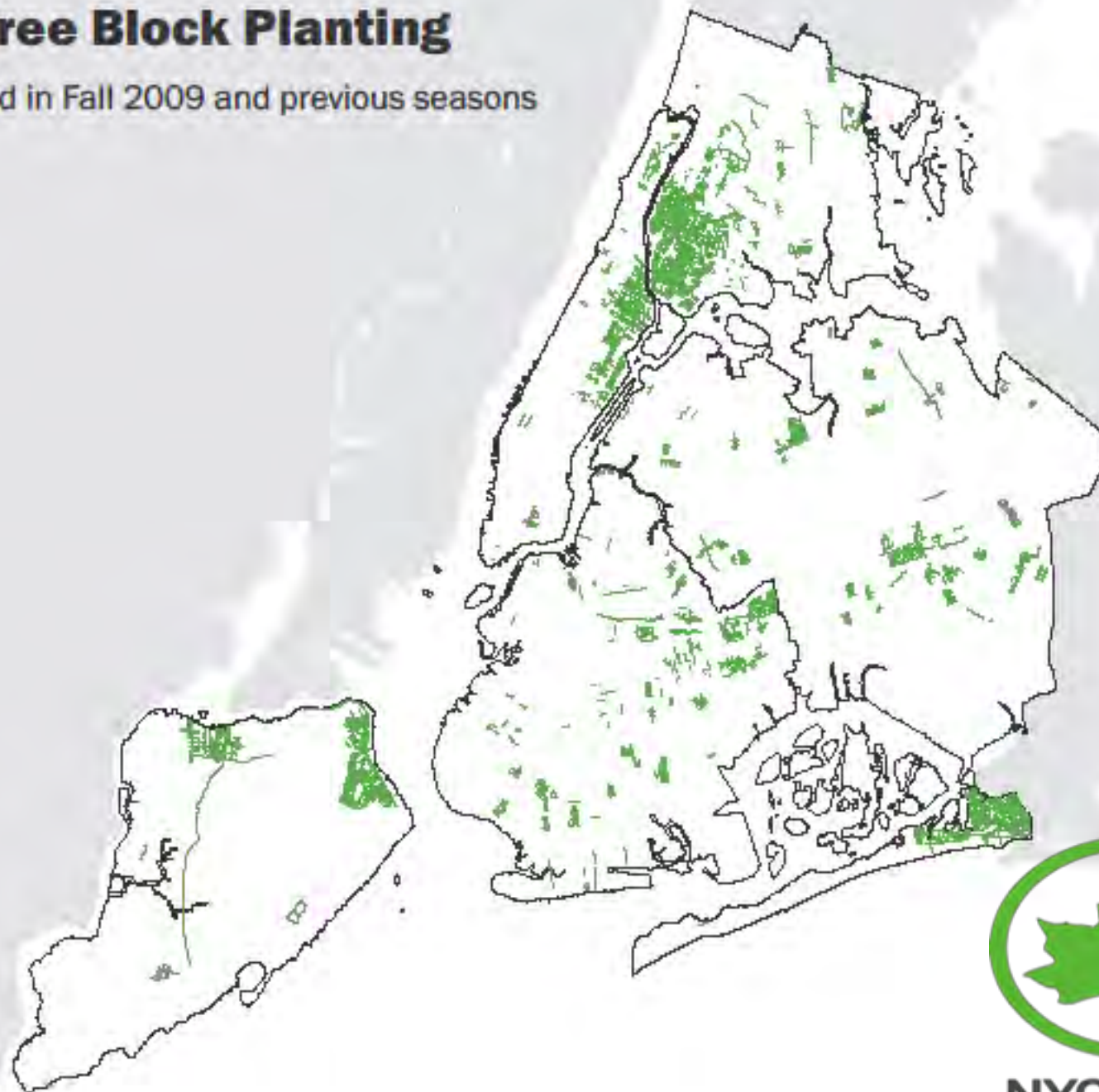
— Planted in Spring 2009 and previous seasons



NYC Parks

Street Tree Block Planting

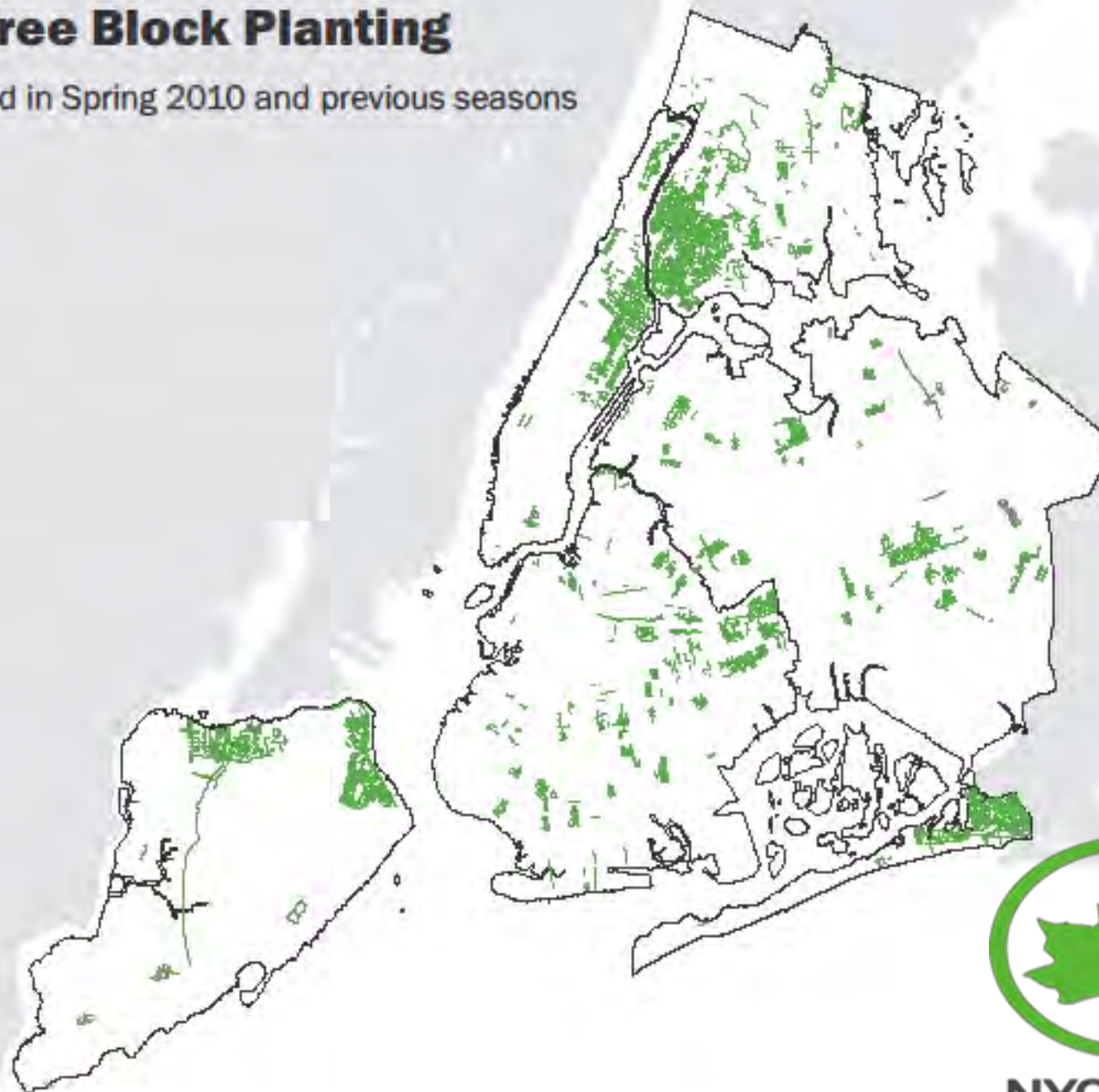
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NYC Parks

Street Tree Block Planting

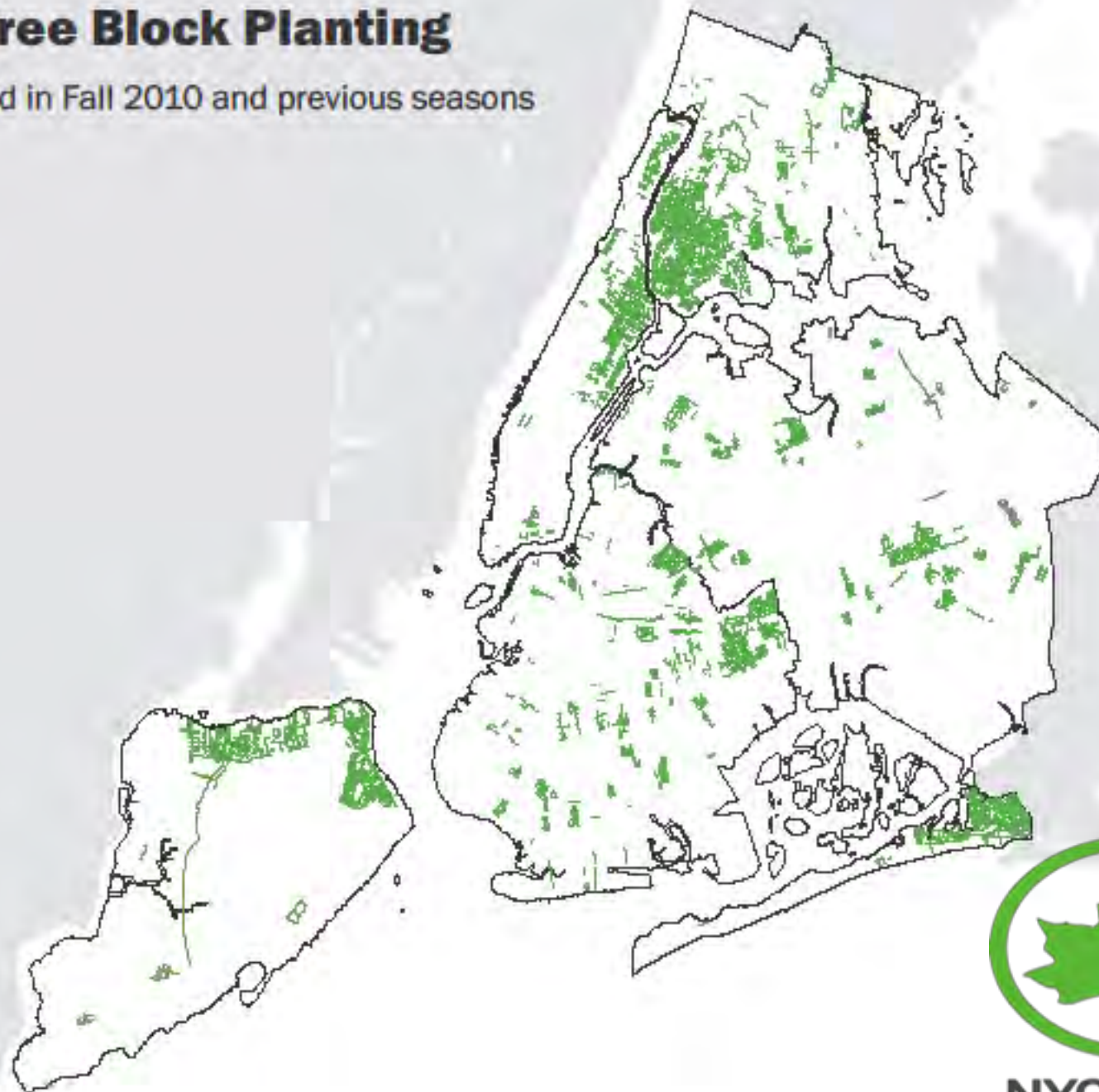
— Planted in Spring 2010 and previous seasons



NYC Parks

Street Tree Block Planting

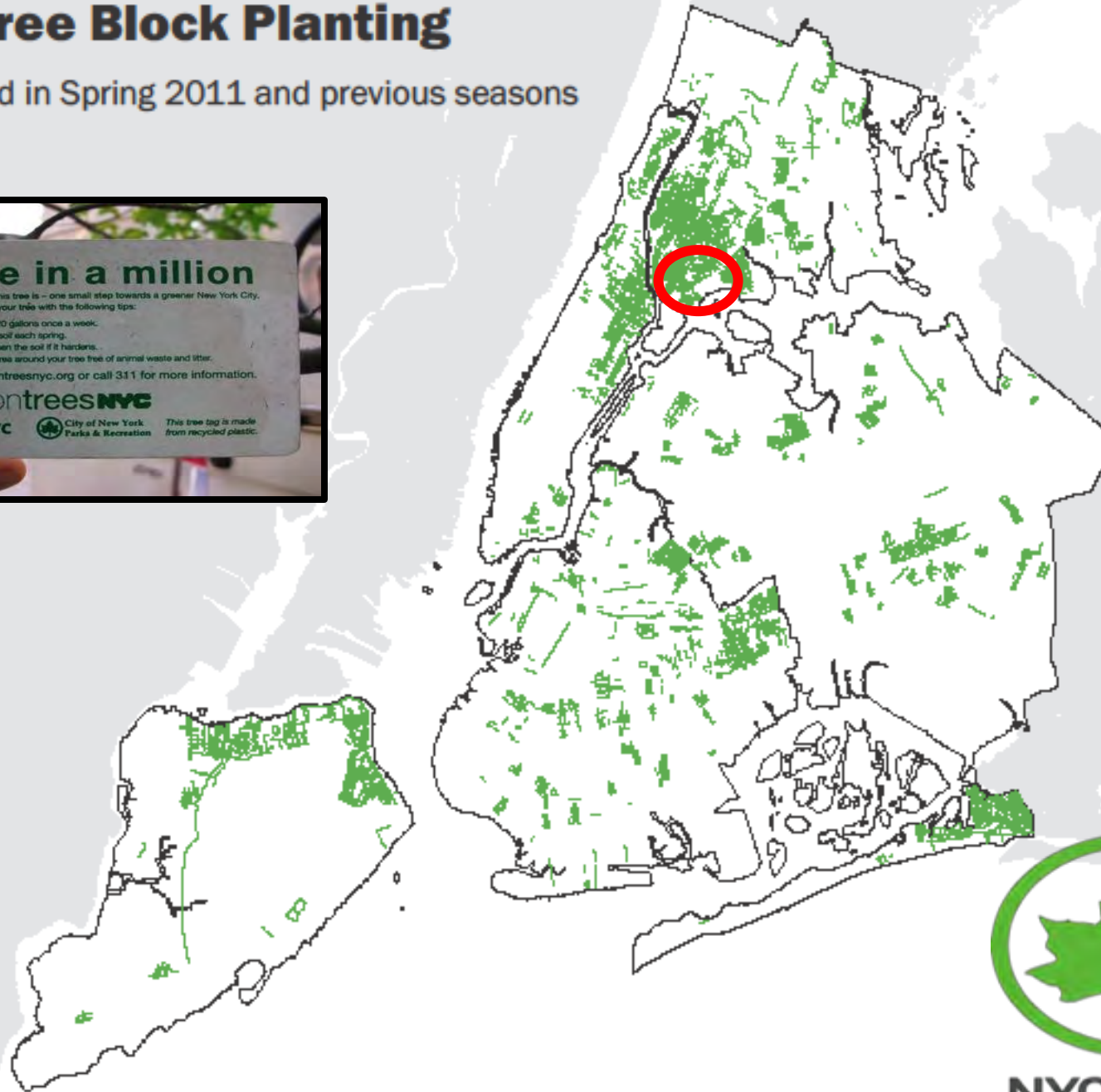
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NYC Parks

Street Tree Block Planting

— Planted in Spring 2011 and previous seasons



NYC Parks

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Tree Diversity to Build a Sustainable Urban Forest: Matt Wells

Tree Diversity Prioritization



Tree Diversity to Build a Sustainable Urban Forest: Matt Wells

Tree Diversity Prioritization

400 Management Units

Single Species per Unit

TOP 15 SPECIES KEY

- *Washingtonia robusta*
MEXICAN FAN PALM
- *Ficus microcarpa*
INDIAN LAUREL FIG
- *Magnolia grandiflora*
SOUTHERN MAGNOLIA
- *Phoenix canariensis*
CANARY ISLAND DATE PALM
- *Podocarpus macrophyllus*
YEWE PINE
- *Cinnamomum camphora*
CAMPHOR TREE
- *Pinus canariensis*
CANARY ISLAND PINE
- *Jacaranda mimosifolia*
JACARANDA
- *Cupaniopsis anacardioides*
CARROTWOOD
- *Liquidambar styraciflua*
AMERICAN SWEETGUM
- *Cedrus deodara*
DEODAR CEDAR
- *Metrosideros excelsior*
NEW ZEALAND CHRISTMAS TREE
- *Callistemon citrinus*
LEMON BOTTLEBRUSH
- *Melaleuca quinquenervia*
CAJUPUT TREE
- *Afrocarpus gracilior*
FERN PINE

TOP 15 SPECIES



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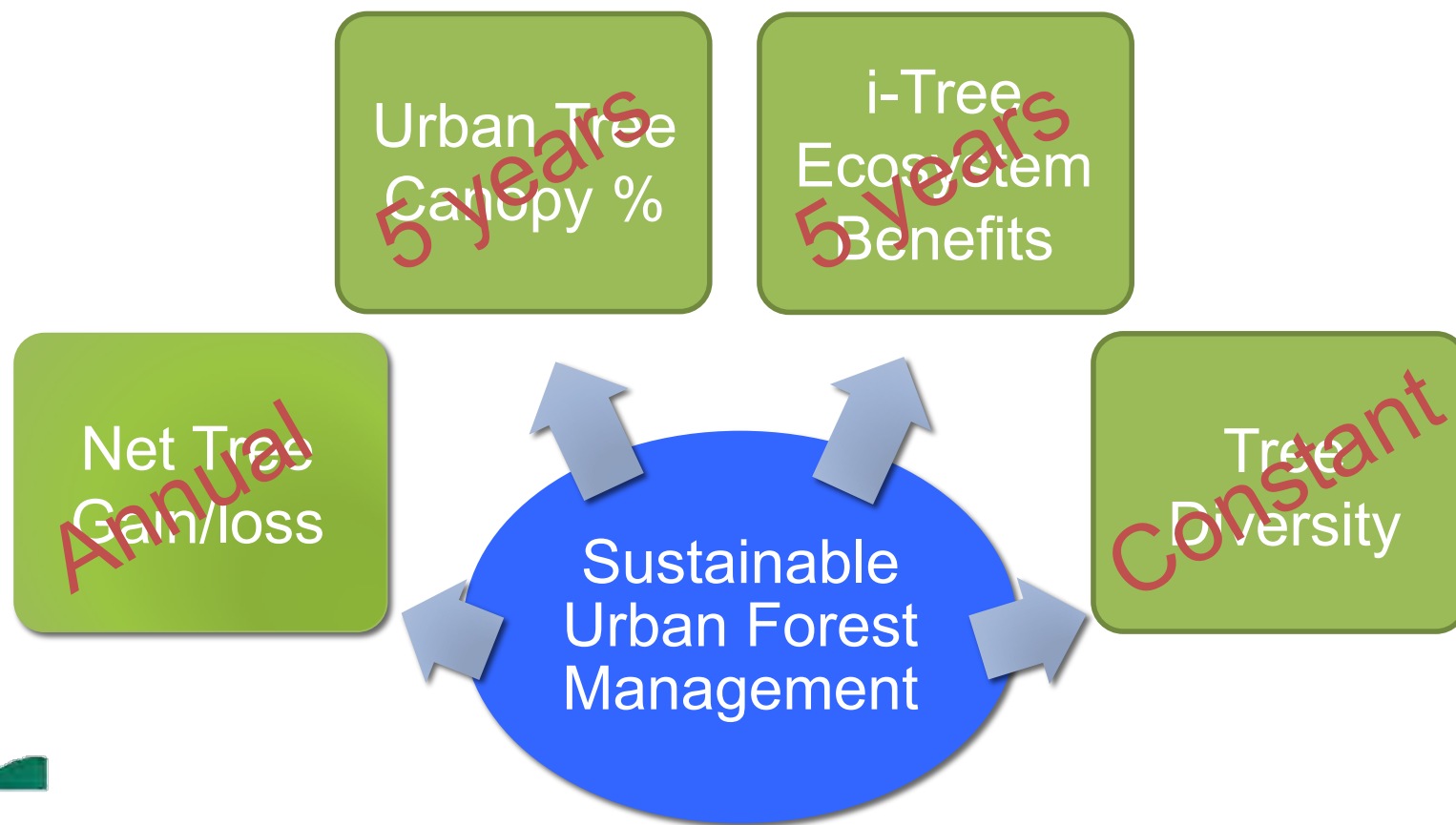


Tree Diversity Priority Model

Per Management
Unit



Urban Forest Sustainability Metrics



Use Research and Planning to Strive for a Sustainable Urban Forest







Thank You

Matthew P. Wells

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City of Santa Monica

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