



# Emergency Tree Risk Management in NYC

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Director of Tree Preservation

NYC Parks & Recreation

Parks

# New York City Population



Bronx: 1,392,002

Brooklyn: 2,532,645

Manhattan: 1,601,948

Queens: 2,247,848

Staten Island: 470,467

**Total: 8,244,910**

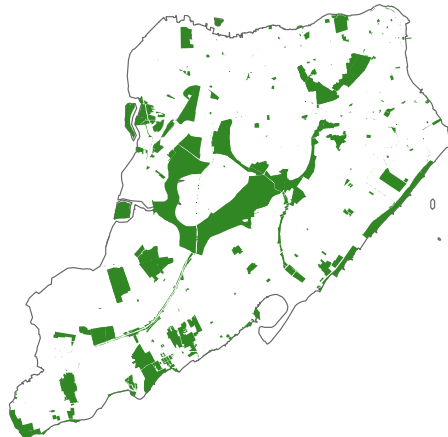
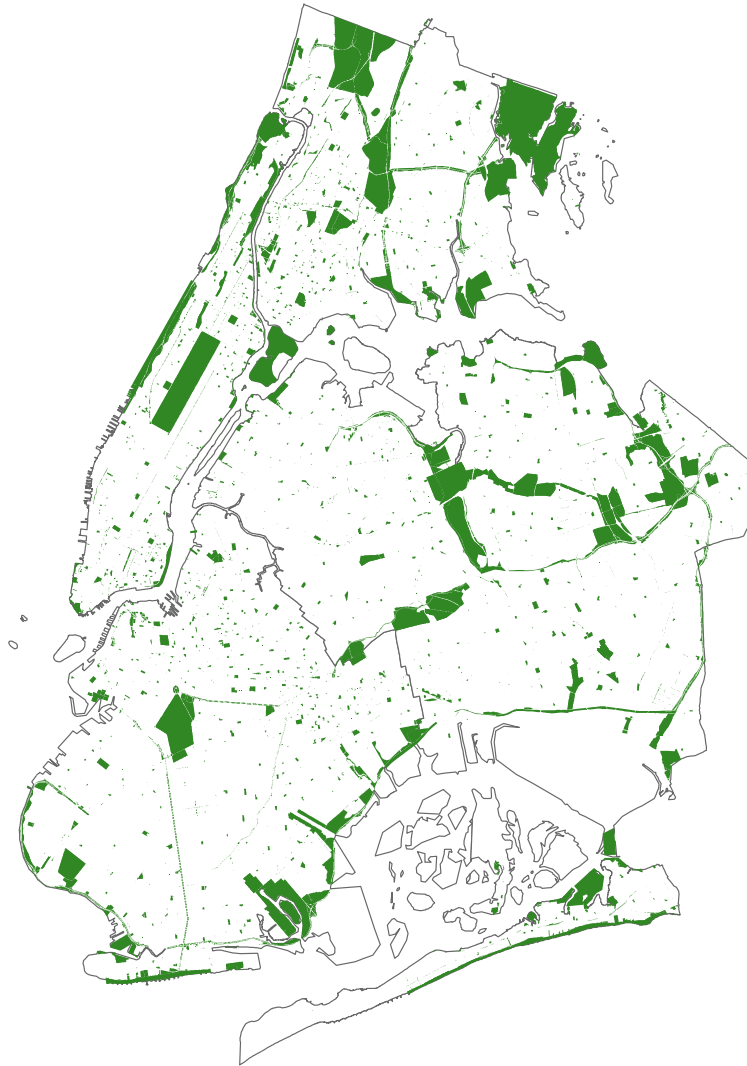
Source: <http://www.nyc.gov/html/dcp/html/census/popcur.shtml>



# The Urban Landscape

## NYC is 14% Parkland

- more than 5,000 individual properties
- 800 athletic fields
- nearly 1,000 playgrounds
- 550 tennis courts
- 66 public pools
- 48 recreational facilities
- 5 stadia
- 17 nature centers
- 13 golf courses
- 14 miles of beaches
- 1,200 monuments
- 22 historic house museums



# Estimated 2 Million Trees in Landscaped Parks & Natural Areas



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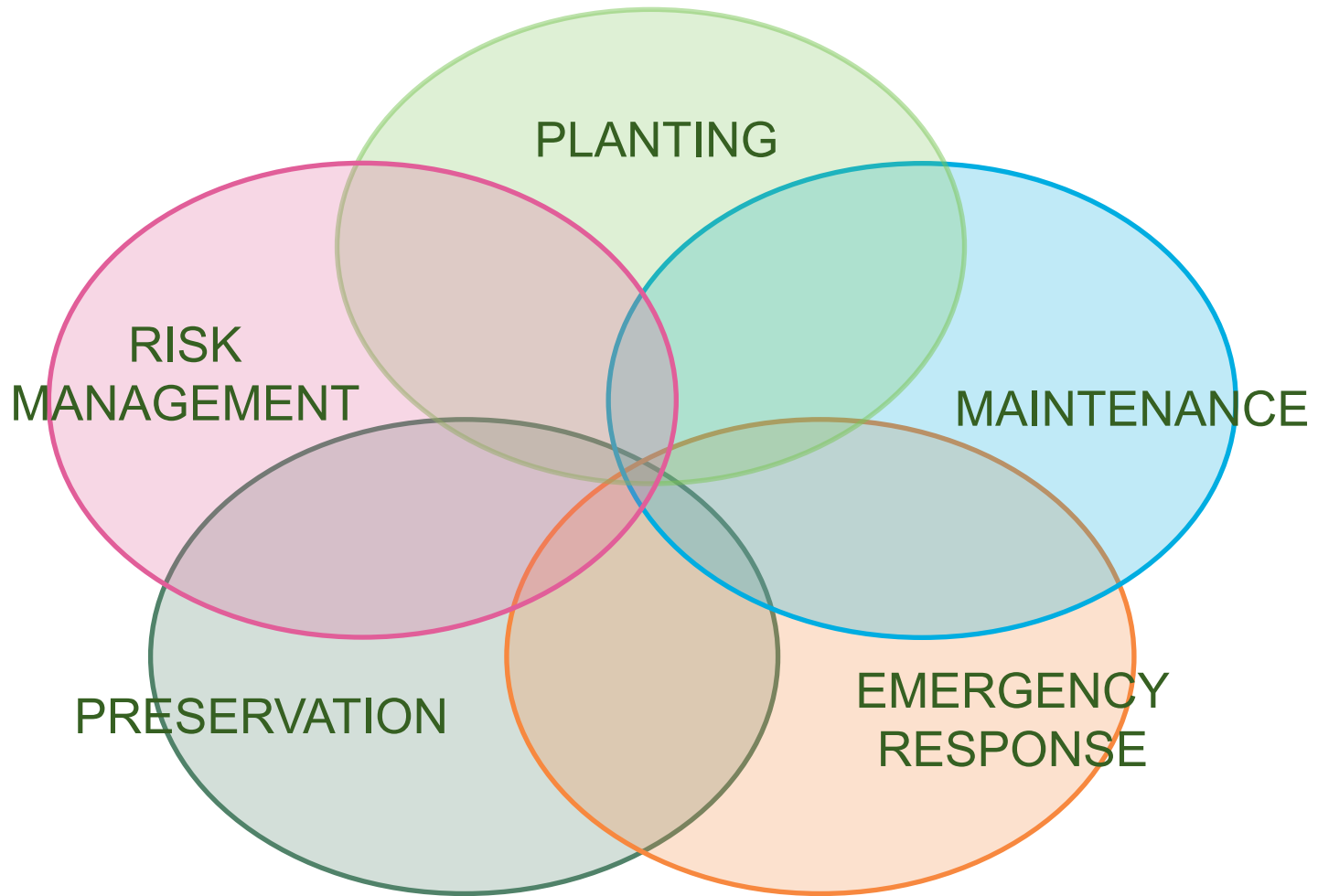


# 615,000 Street Trees

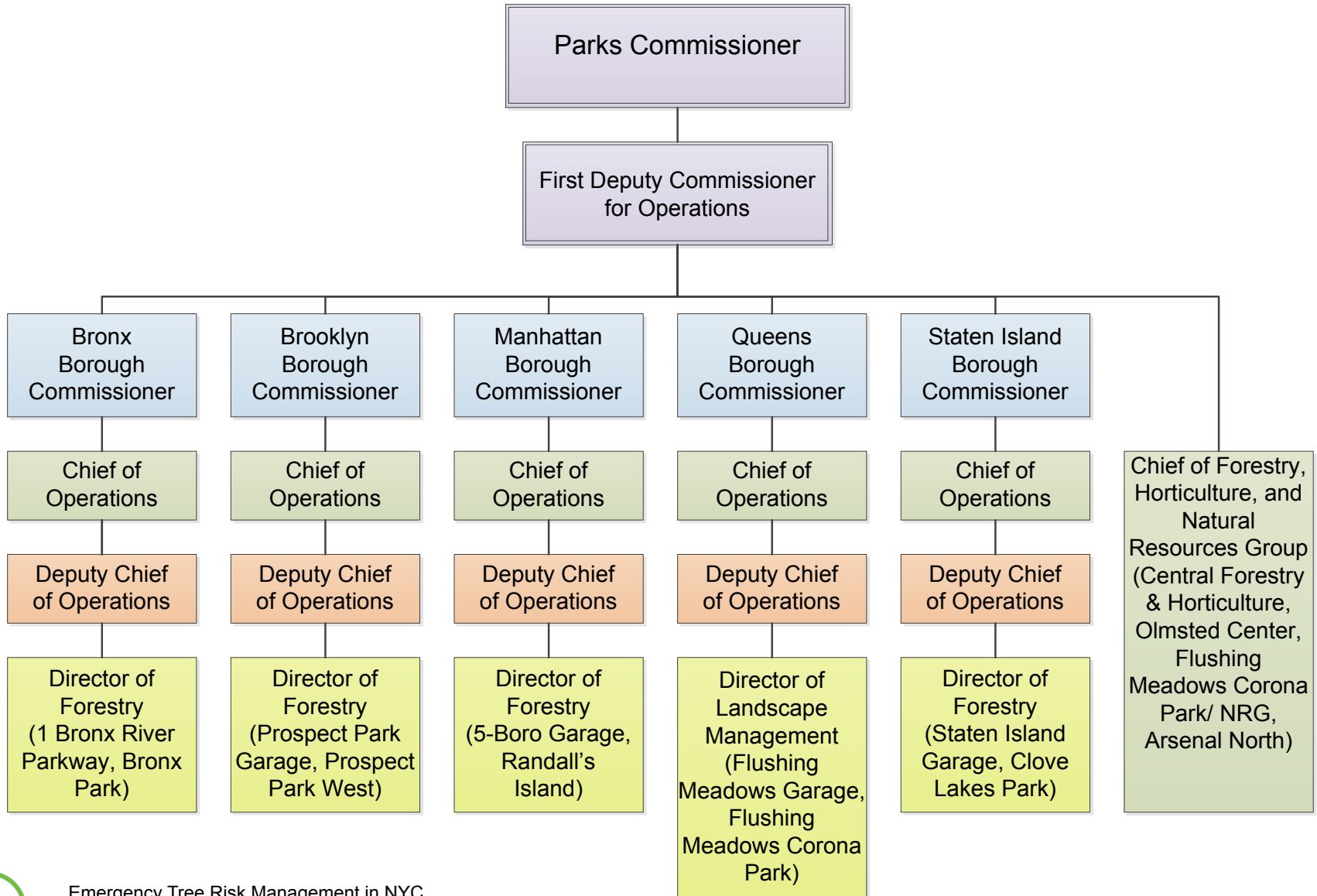


Emergency Tree Risk Management in NYC

# NYC Urban Forest Management



Emergency Tree Risk Management in NYC



# ForMS – Forestry Management System

Computerized inventory and work management database

2-way integration with **311** – public request comes in, forestry response comes out

During storms, the system may be limited to just tree-related emergencies





# Tree Risk Management

Application of policies, procedures, and practices used to identify, evaluate, mitigate, monitor, and communicate tree risk.

*Source : Companion Publication to the ANSI A300 Part 9: Tree, Shrub, and Other Woody Plant Management – Standard Practices (Tree Risk Assessment)*



# Emergency

An emergency is a situation that poses an immediate risk to health, life, property or environment.

Source : *UK Government Advice on Definition of an Emergency*



# Emergency Tree Risk Management



# Emergency Tree Risk Management





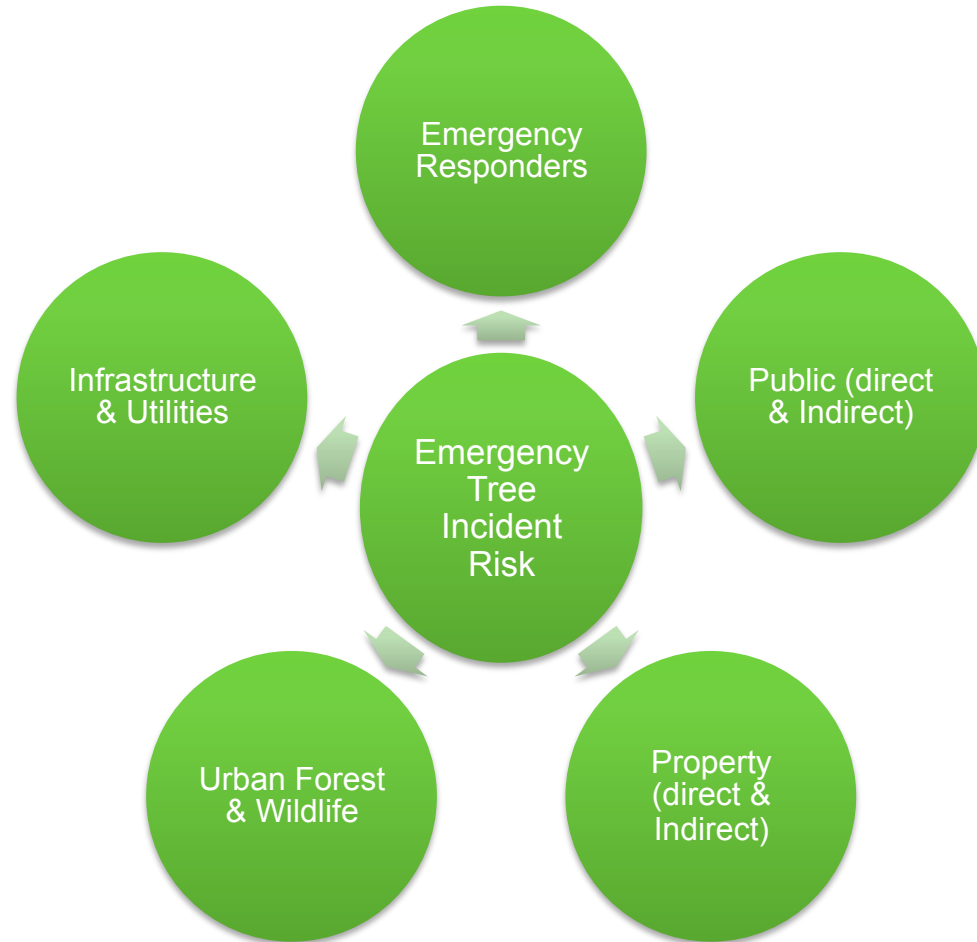
# Emergency Tree Risk Management



# Emergency Tree Risk Management



# The Risks of Emergency Tree Incidents



# Historical Emergency Tree Risk Management in NYC



NYC Parks

Emergency Tree Risk Management in NYC





SCENES WROUGHT BY THE RECENT TORNADO AT WOODHAVEN, LONG ISLAND.

1. View on Exchange street, showing Schaeffer's house, near which Mr. Peirce was killed.

2. Soliciting contributions for the Relief Fund.

3. Panoramic view, showing wrecked schoolhouse.

(From photographs by J. H. Hare, The Illustrated American Photographer.)

44th July 1875

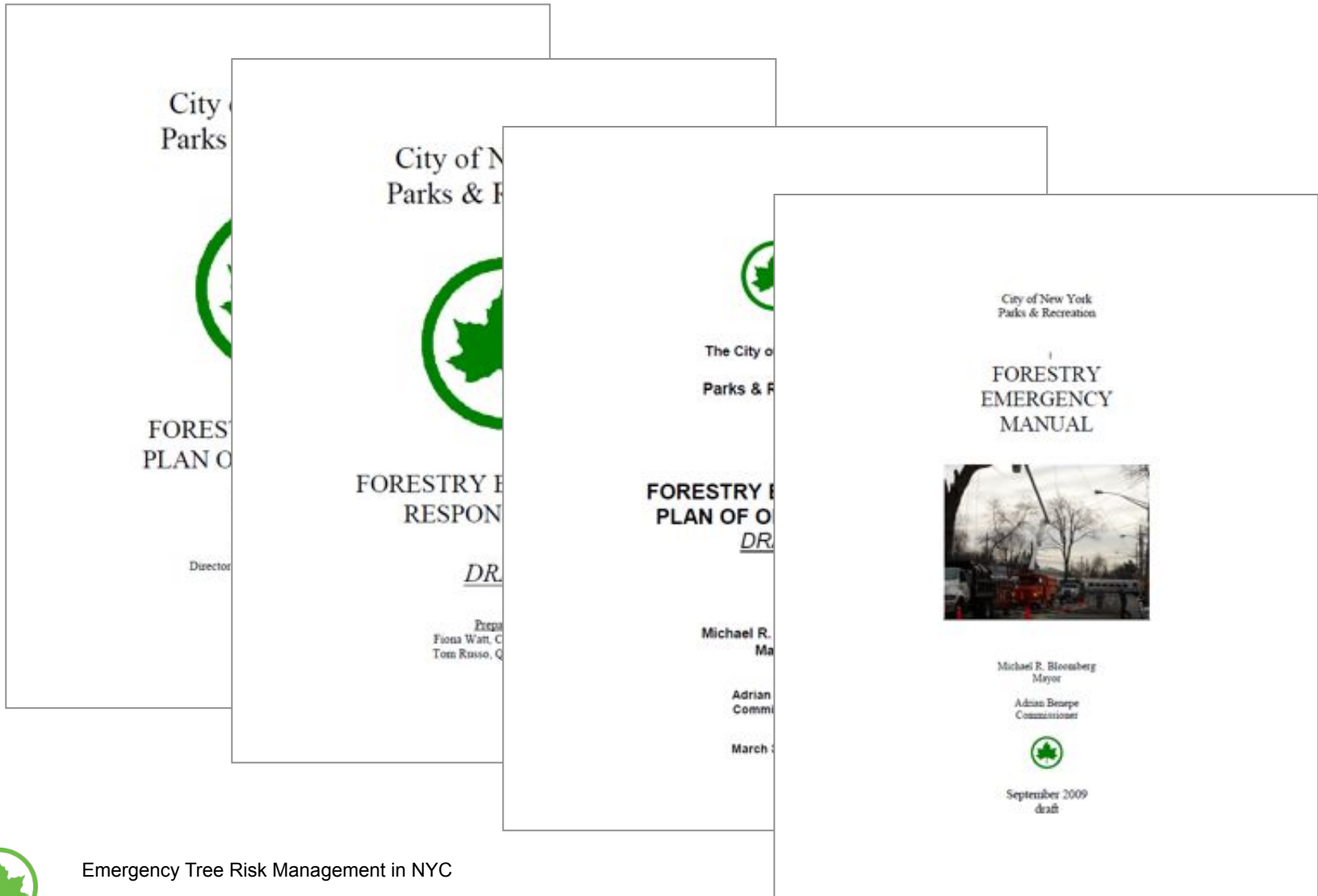
E. J. MURPHY LITHO  
NEW YORK



NYC Parks

From photographs by J.H. Hare, The Illustrated American Photographer.

# Emergency Manual for NYC Parks



Emergency Tree Risk Management in NYC

# Standard Emergency Response in NYC



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

– Mike Tyson





# September 16<sup>th</sup> 2010 Tornadoes



# September 16<sup>th</sup> 2010 Tornadoes



# Office of Emergency Management's Emergency Operations Center



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# Situational Awareness



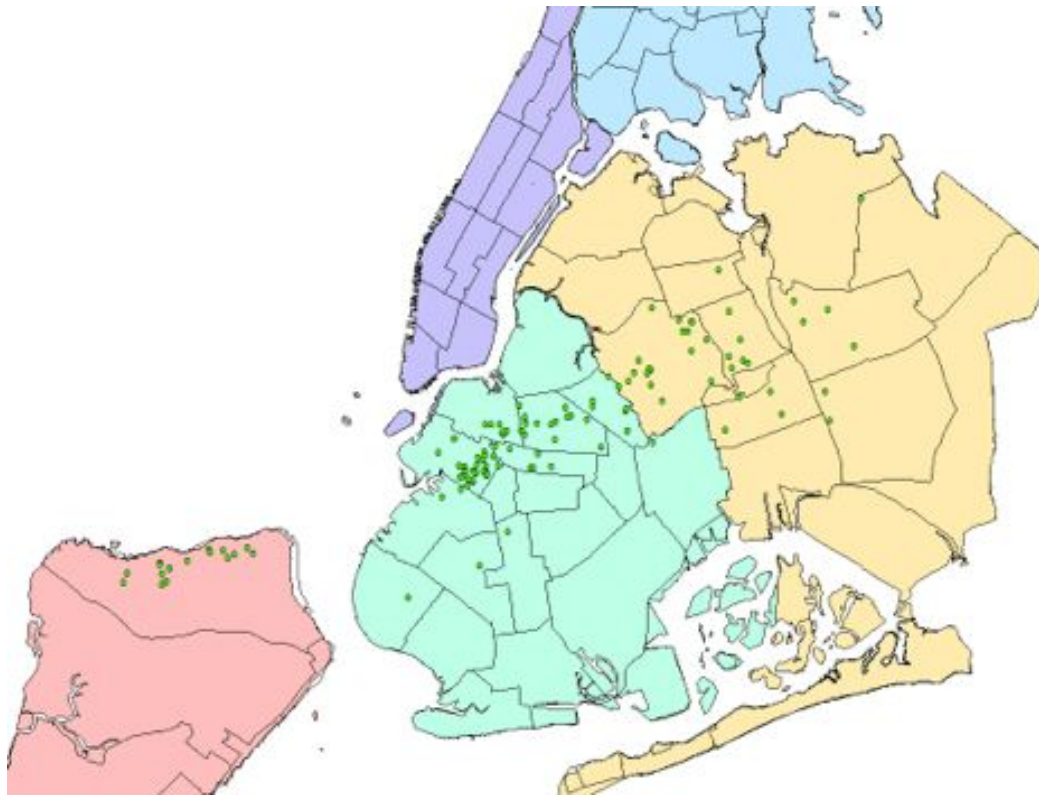


# Situational Awareness



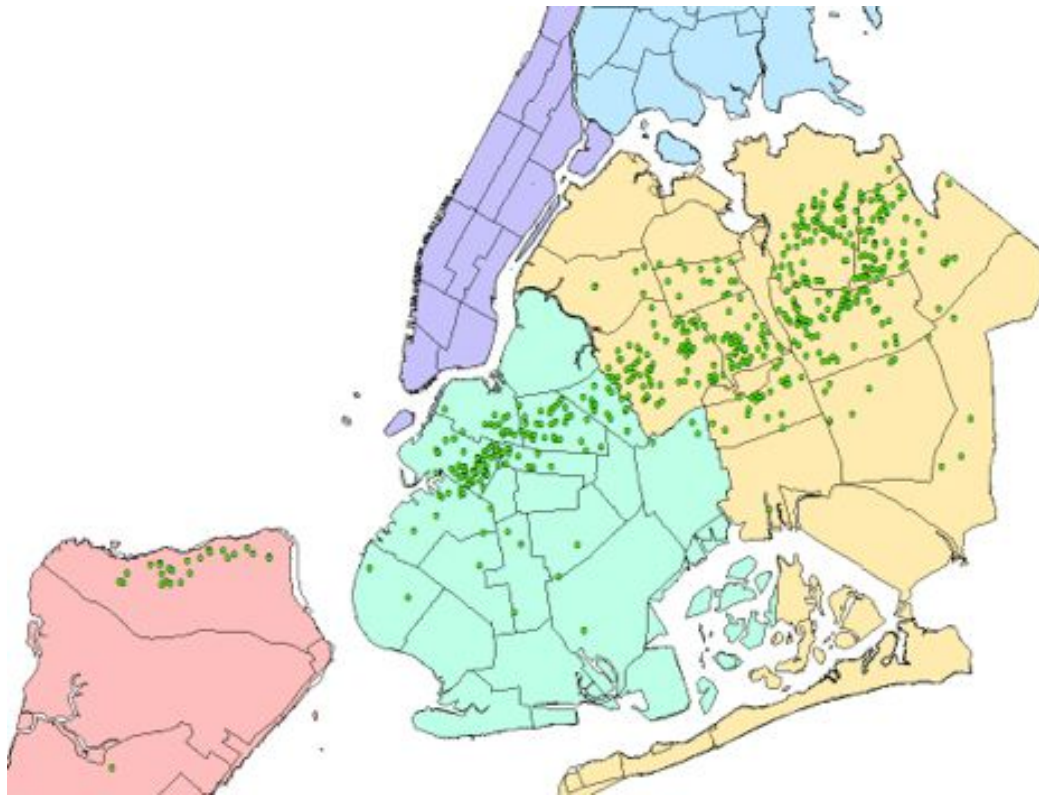
Emergency Tree Risk Management in NYC

# 9/16 18:00 134 Service Requests



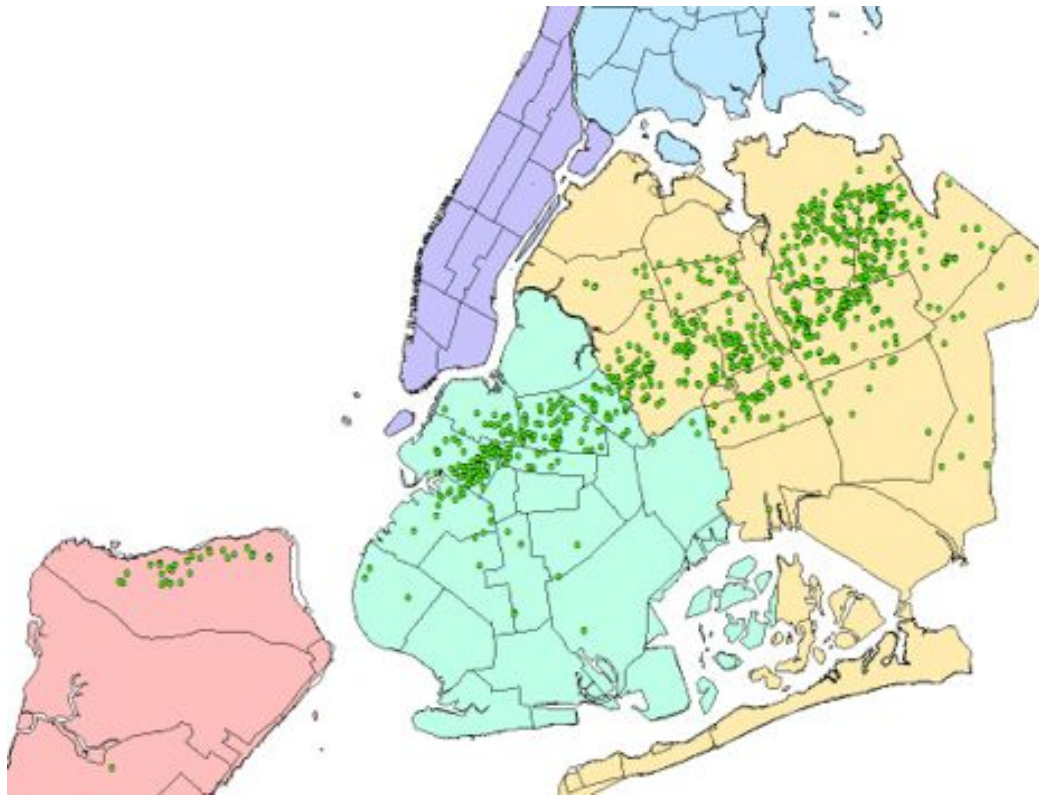
Emergency Tree Risk Management in NYC

# 9/16 19:00 589 Service Requests



Emergency Tree Risk Management in NYC

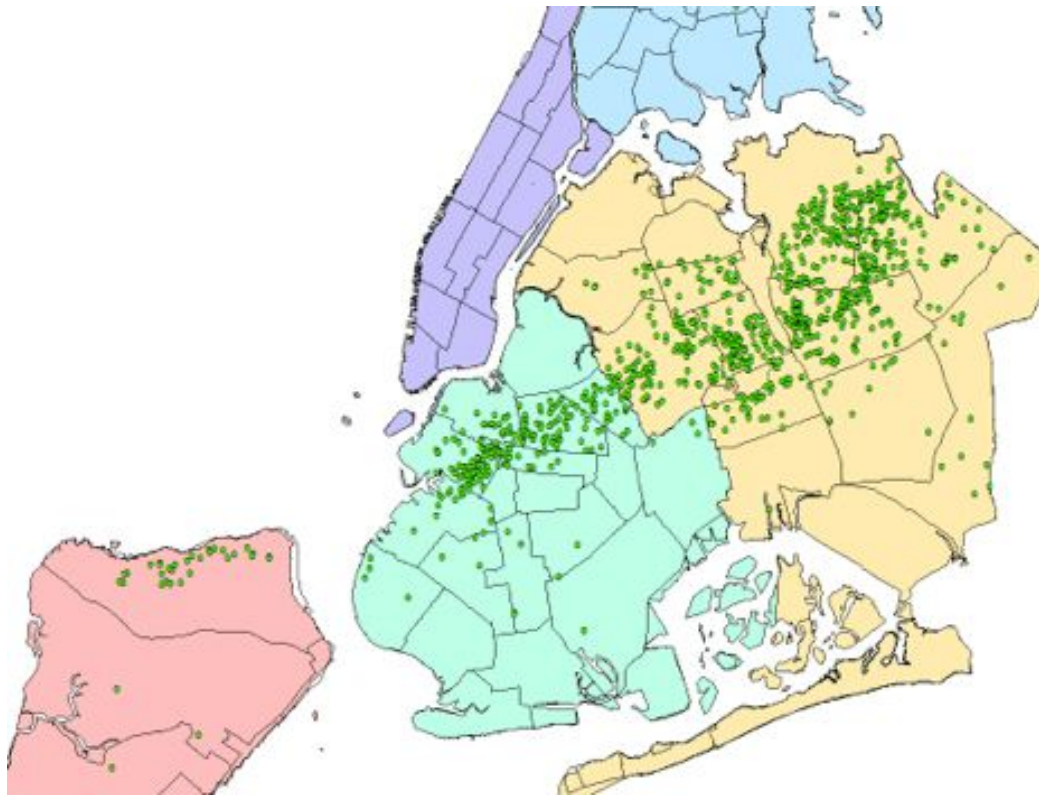
# 9/16 20:00 872 Service Requests



Emergency Tree Risk Management in NYC

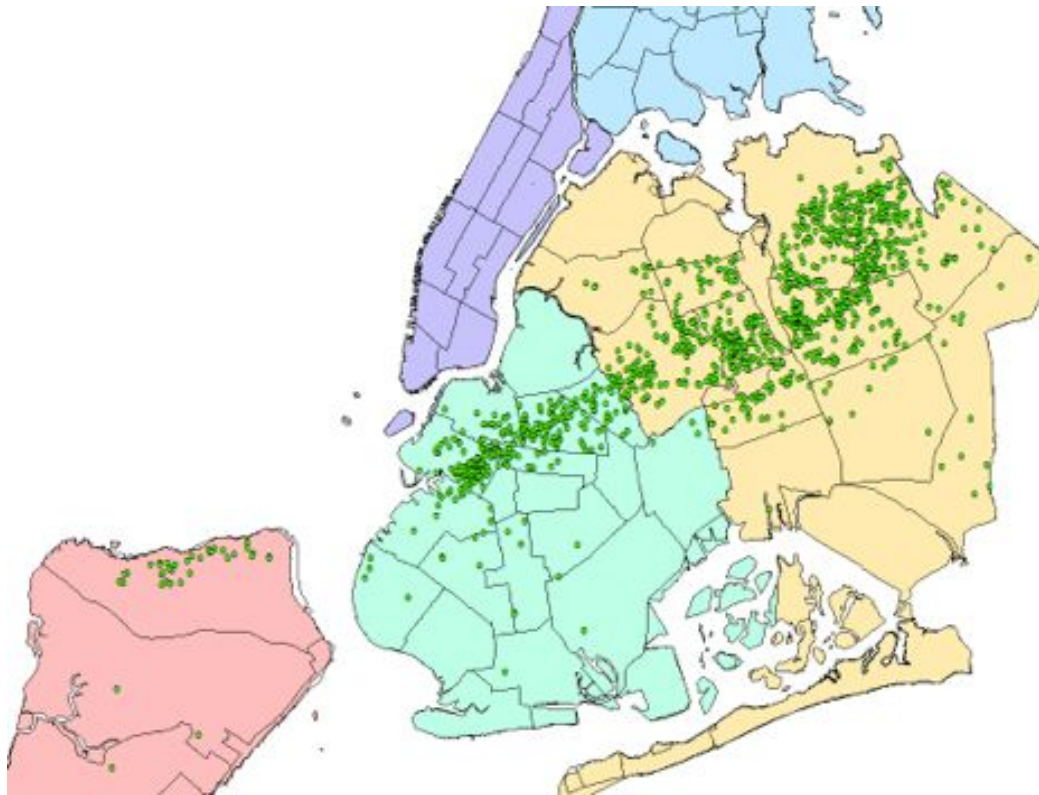


# 9/16 21:00 1,105 Service Requests



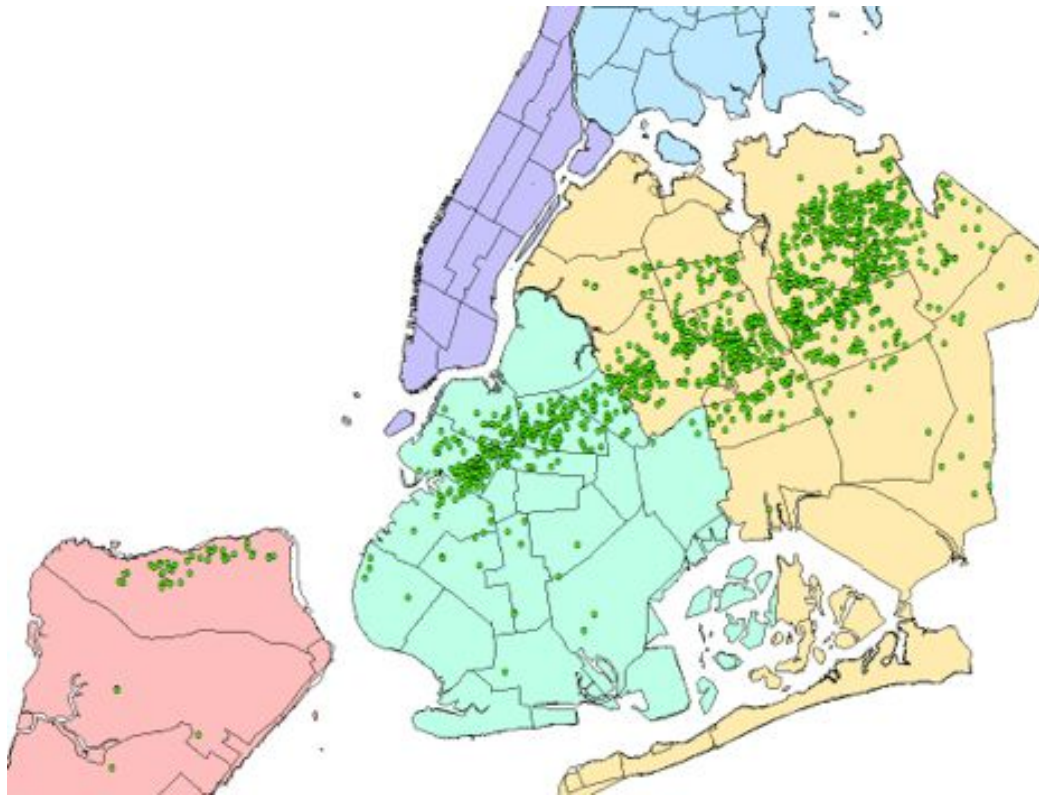
Emergency Tree Risk Management in NYC

# 9/16 22:00 1,344 Service Requests



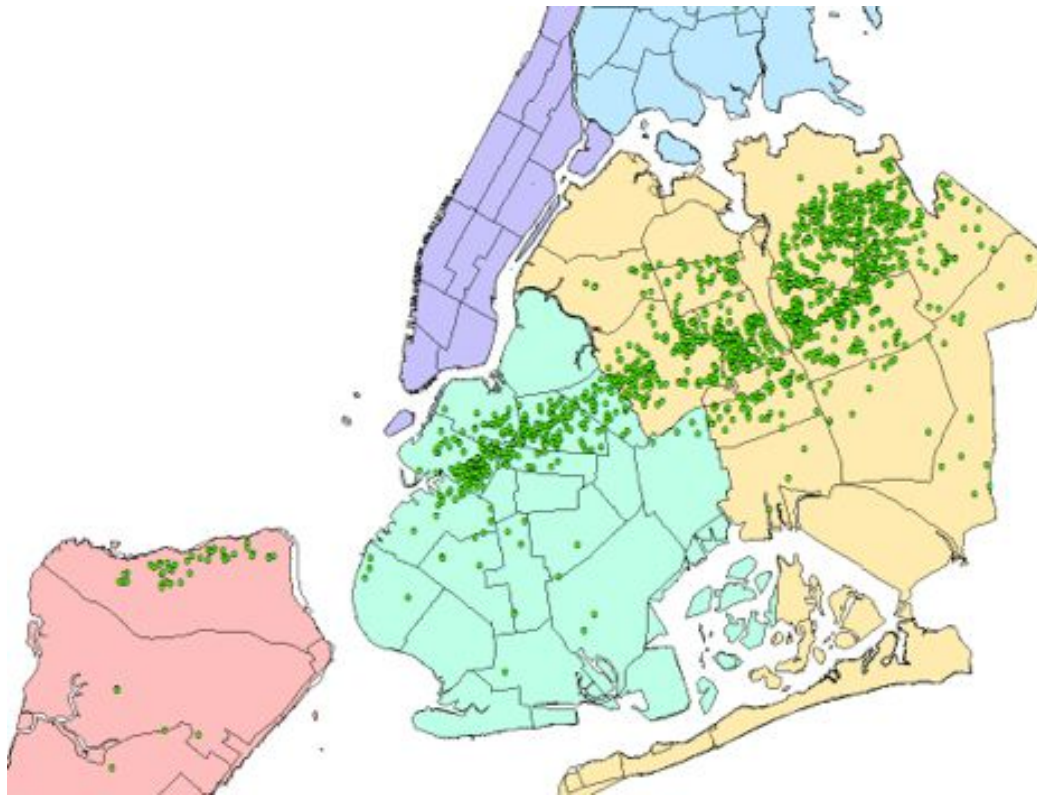
Emergency Tree Risk Management in NYC

# 9/16 23:00 1,530 Service Requests



Emergency Tree Risk Management in NYC

# 9/16 24:00 1,612 Service Requests

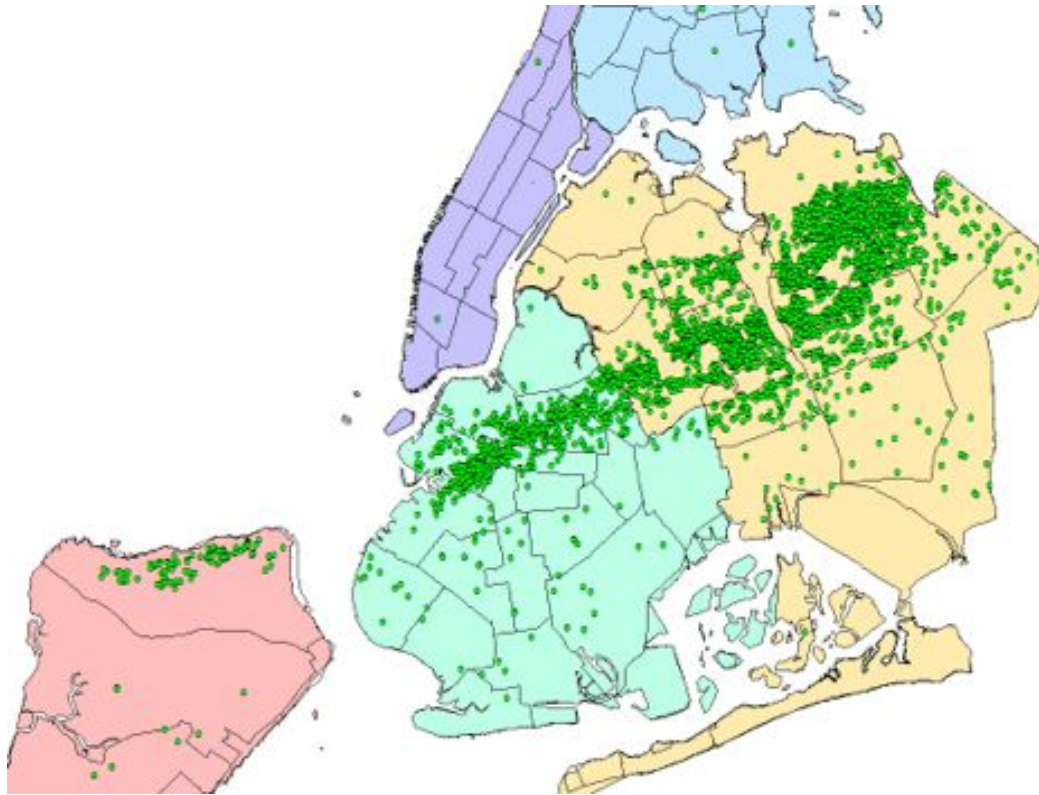


Emergency Tree Risk Management in NYC



# Day 2 - 9/17 19:00

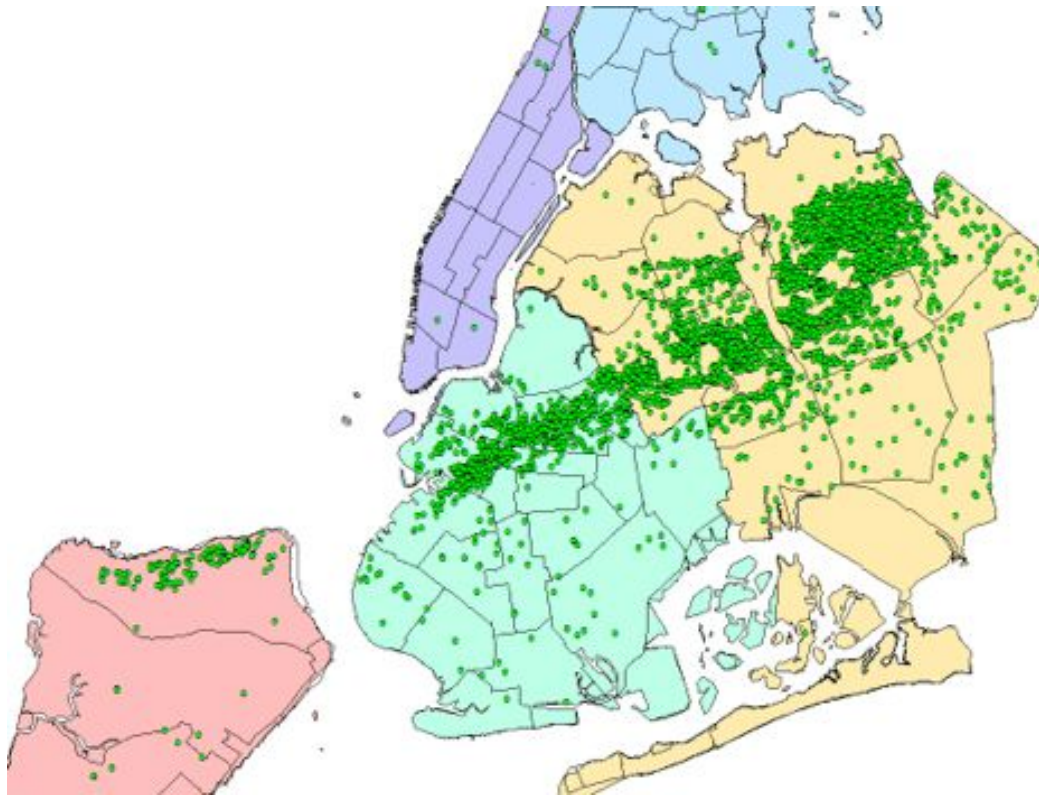
## 4,406 Service Requests



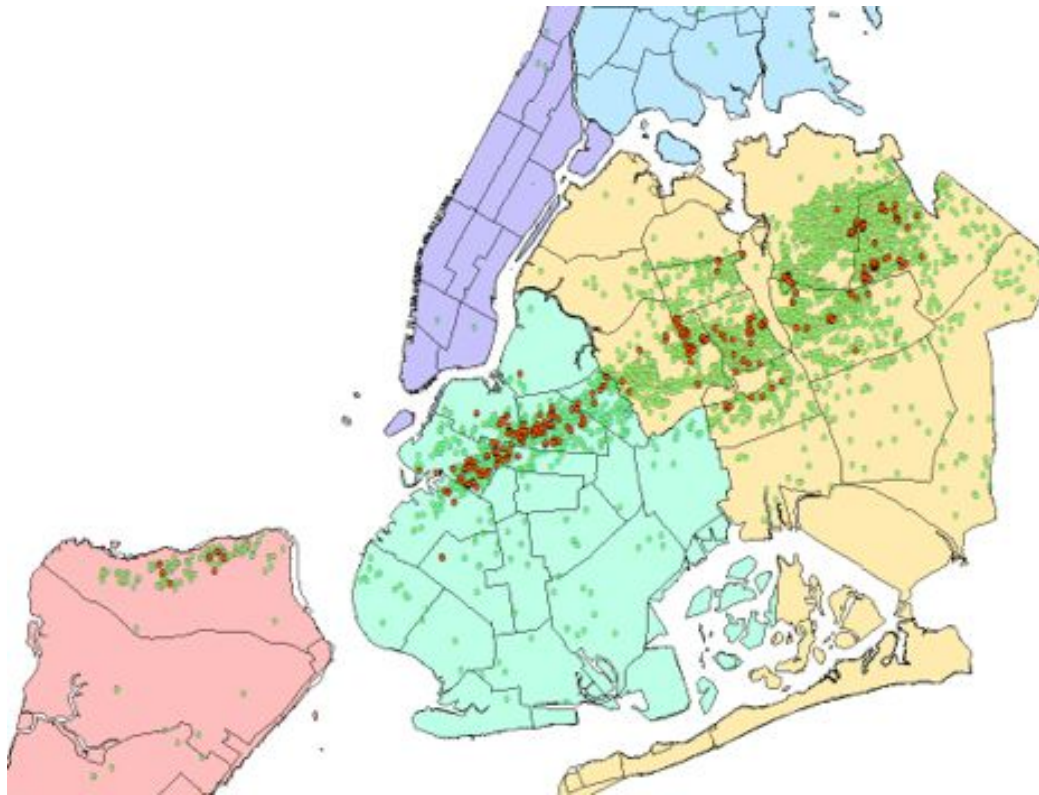
Emergency Tree Risk Management in NYC

# Day 3 -9/18 19:00

## 5,506 Service Requests

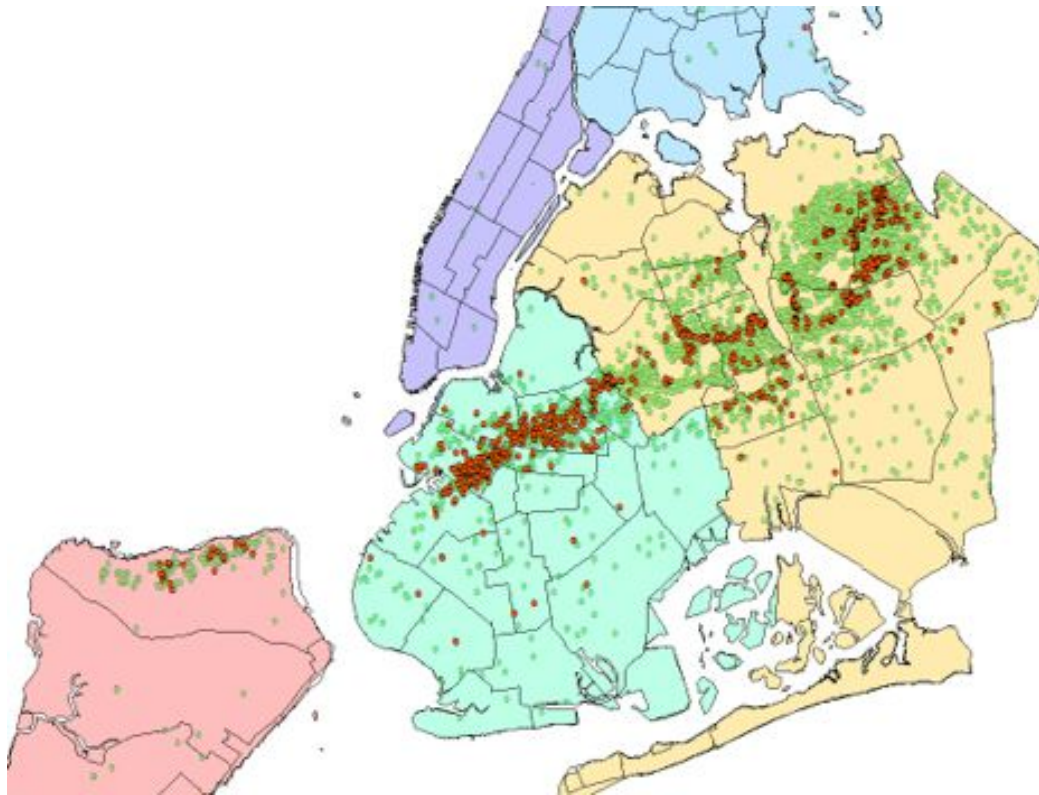


# Day 2 (9/17 19:00) 239 Work Orders Closed



Emergency Tree Risk Management in NYC

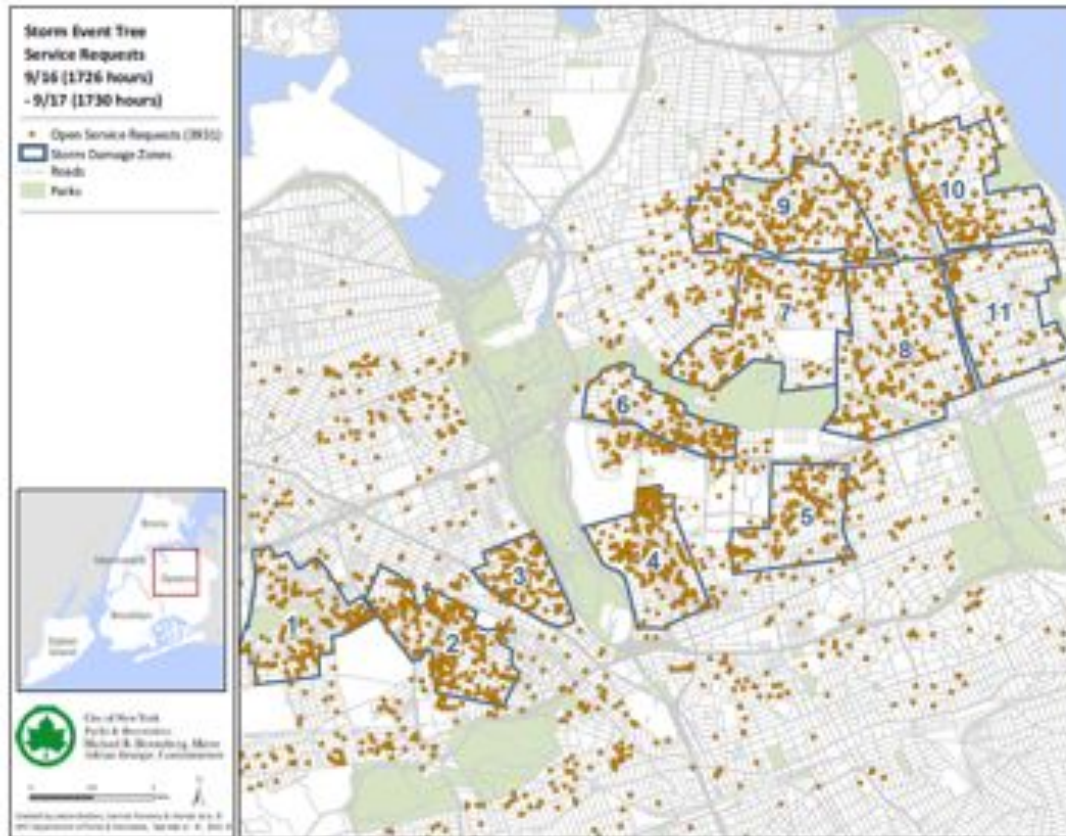
# Day 3 (9/18 19:00) 536 Work Orders Closed



Emergency Tree Risk Management in NYC



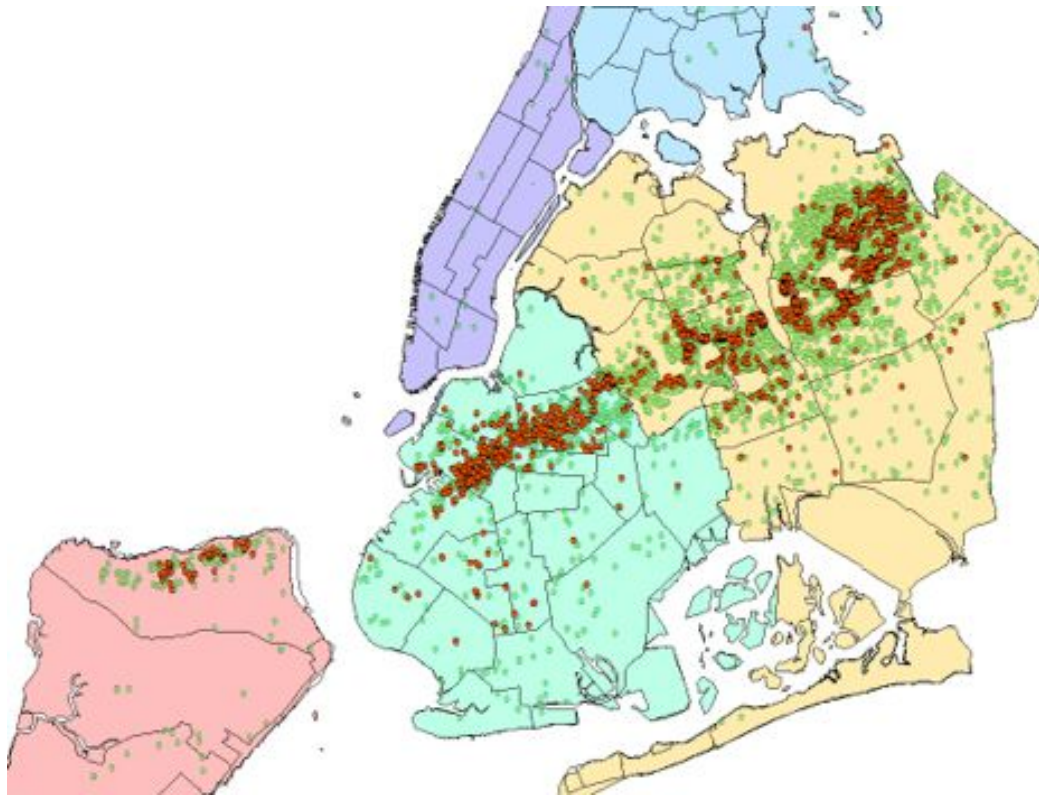
# Created Defined Storm Zones





# Day 7 - 9/23 19:00

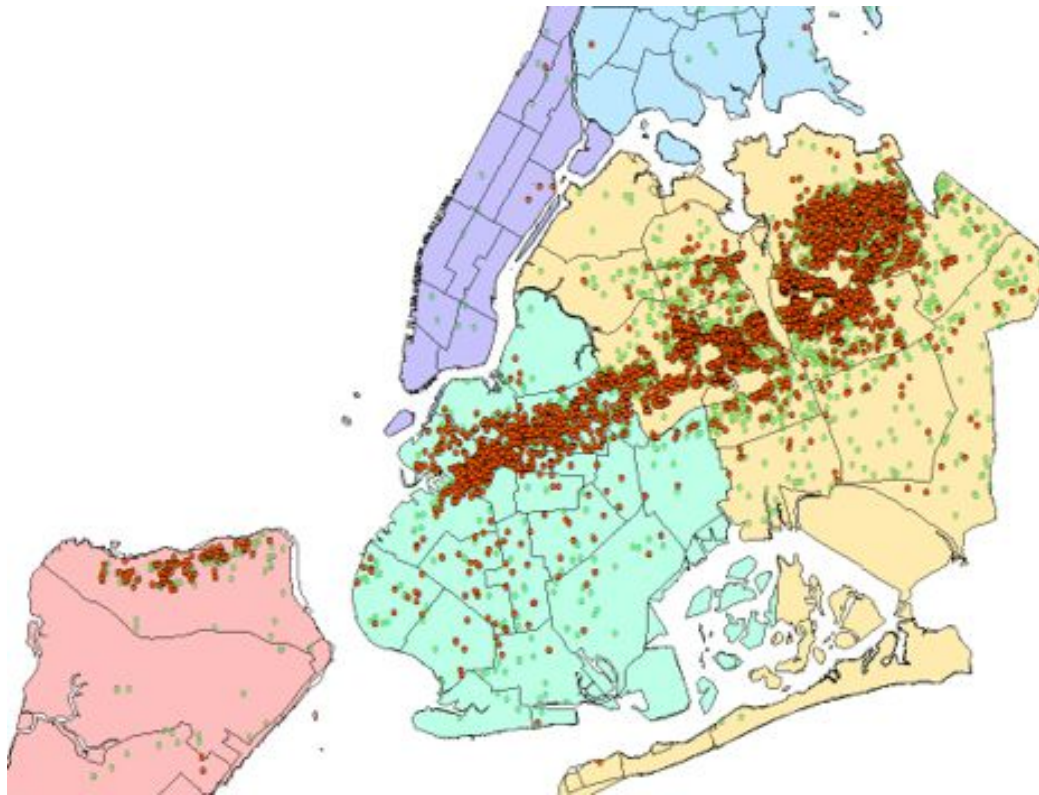
## 2,556 Work Orders Closed



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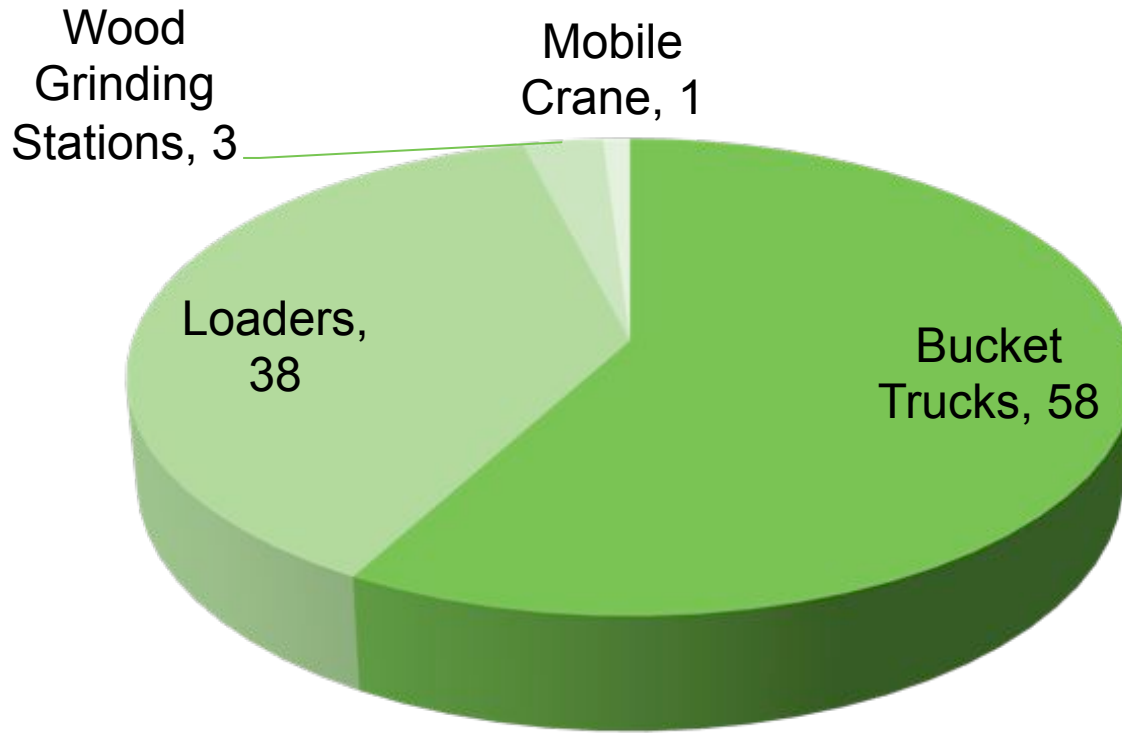
# Day 14 - 9/30 19:00

## 6,175 Work Orders Closed



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# Emergency Contractor Crews



# Emergency Contractor Crews





# Asian longhorned beetle

## *Anoplophora glabripennis*



**Origins** -- China; came to U.S. in solid wood-packing material

**First U.S. discovery** – 1996

**Earliest probable infestation** – 1980s

**Host species** – maple, horse chestnut, elm, birch, poplar, willow, ash, London plane (47% of NYC tree population)

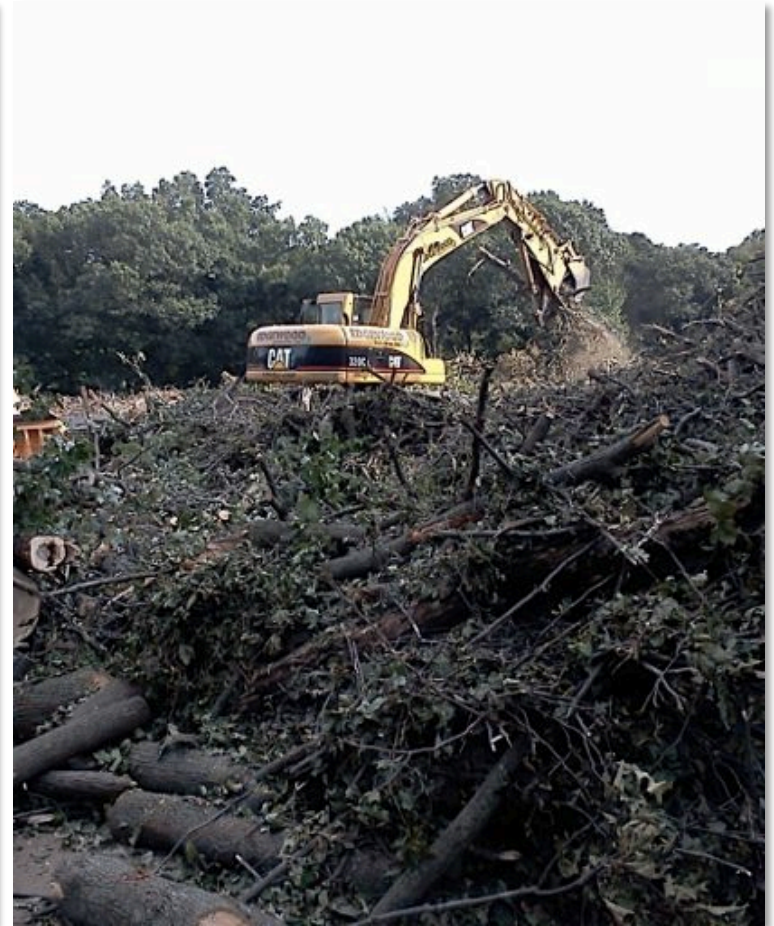
**Flight ability** -- 1,200 feet (1/5 mile)







## Grinding Stations for Woody Debris





# Stump Removal & Sidewalk Repair



# The NYC Players

- OEM
- DSNY
- NYPD
- FDNY
- DDC
- DOT
- DEP



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# Additional Help

## Federal & State Agencies

### USFS

- 'Hot-Shot' crew
- APHIS
- FEMA
- National Guard



**FEMA**



## State Agencies

- NYSDAM
- Port Authority
- DOT
- NYSOEM



New York State  
Department of Transportation



NYC Parks

## Mutual Aid

- Nassau County
- Westchester County
- Suffolk County



Westchester  
gov.com



## Private Contract

- Lewis Tree Service





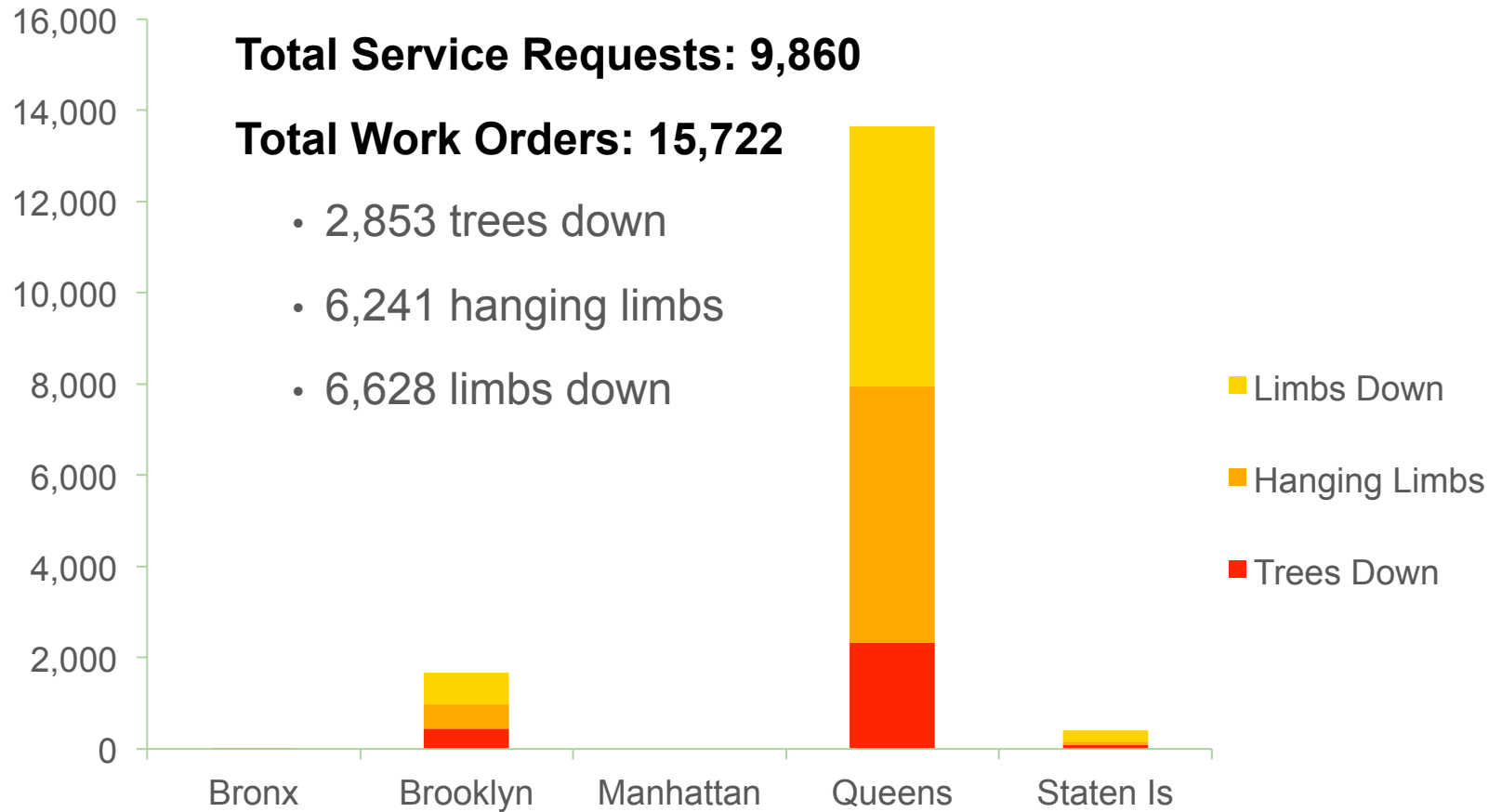
# September 2010 Tornadoes vs NYC Trees

**42 Days of Storm Activation**

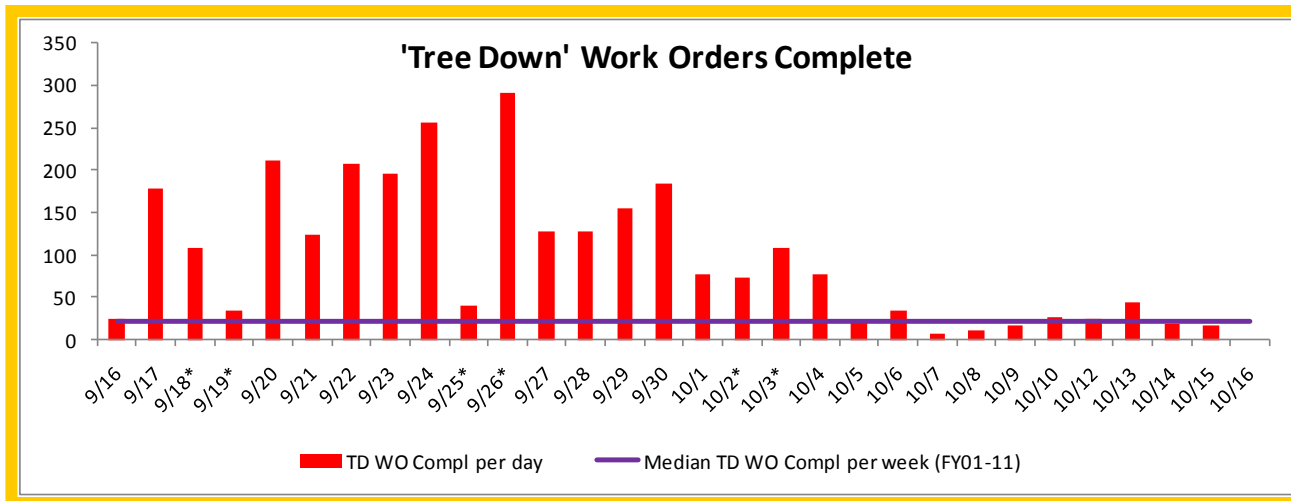
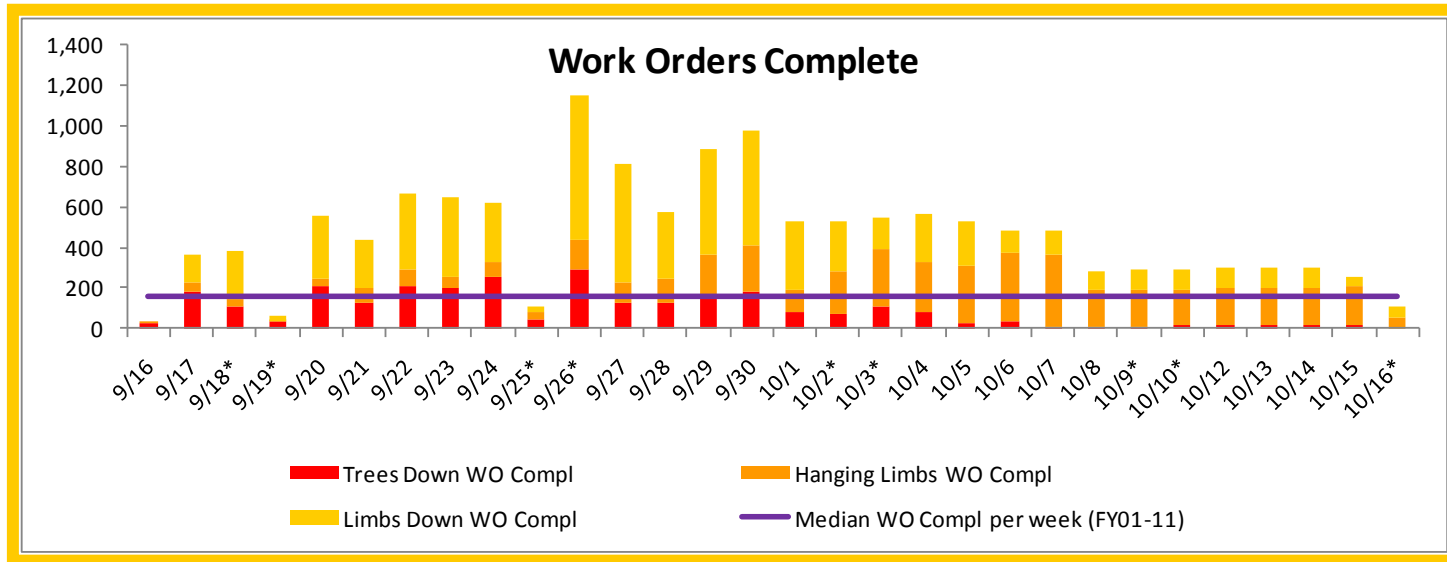
**Total Service Requests: 9,860**

**Total Work Orders: 15,722**

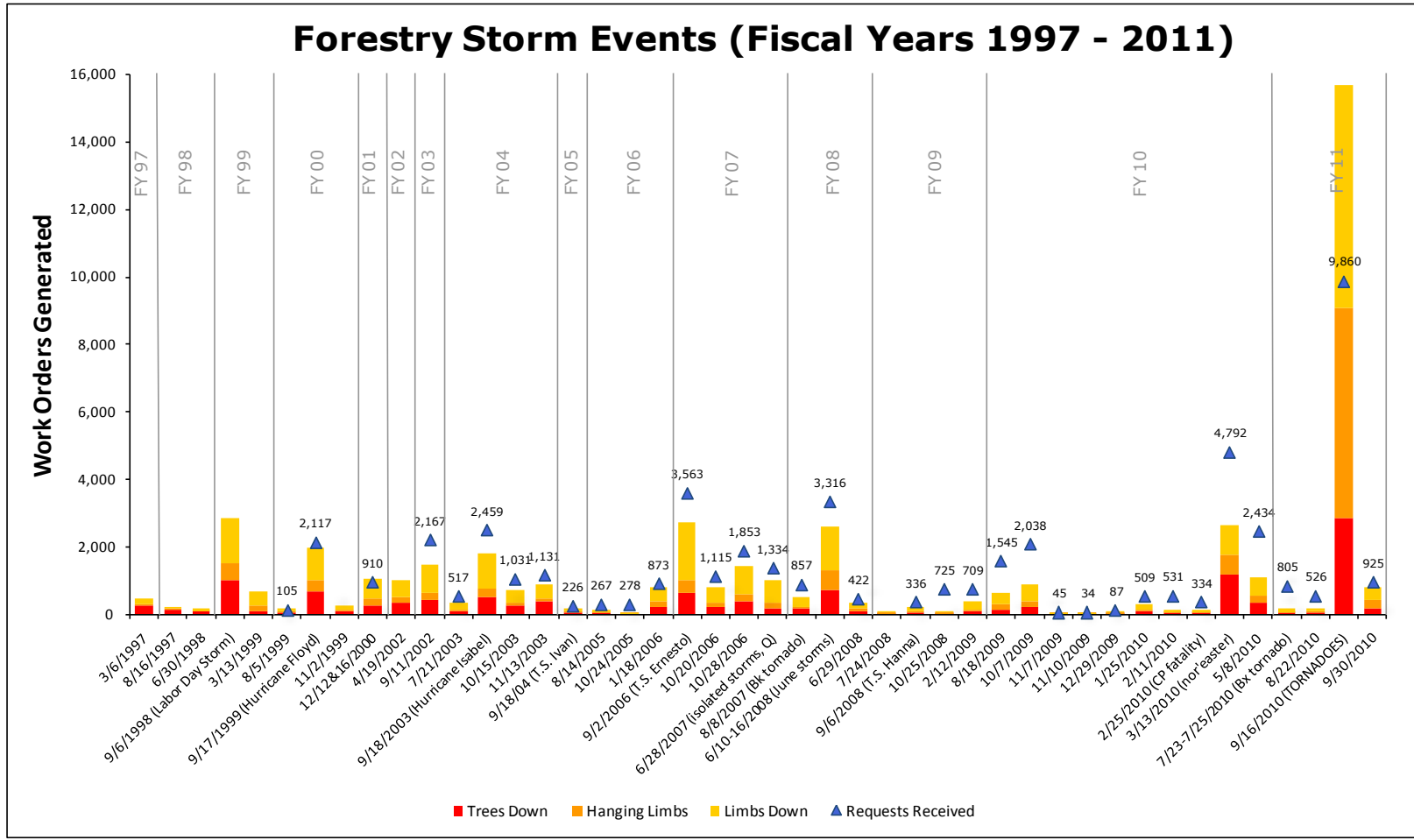
- 2,853 trees down
- 6,241 hanging limbs
- 6,628 limbs down



# Completed Work Orders



# How Does This Compare to Other Incidents?



# Lessons Learned



Update forestry emergency response protocol and train all staff accordingly



Increase size of emergency contracts and update the specifications to include larger equipment



Set clear priorities for inspections and work orders



Inspectors must be able to communicate near live from the field on progress



Be prepared to utilize help from fellow agencies and mutual aid

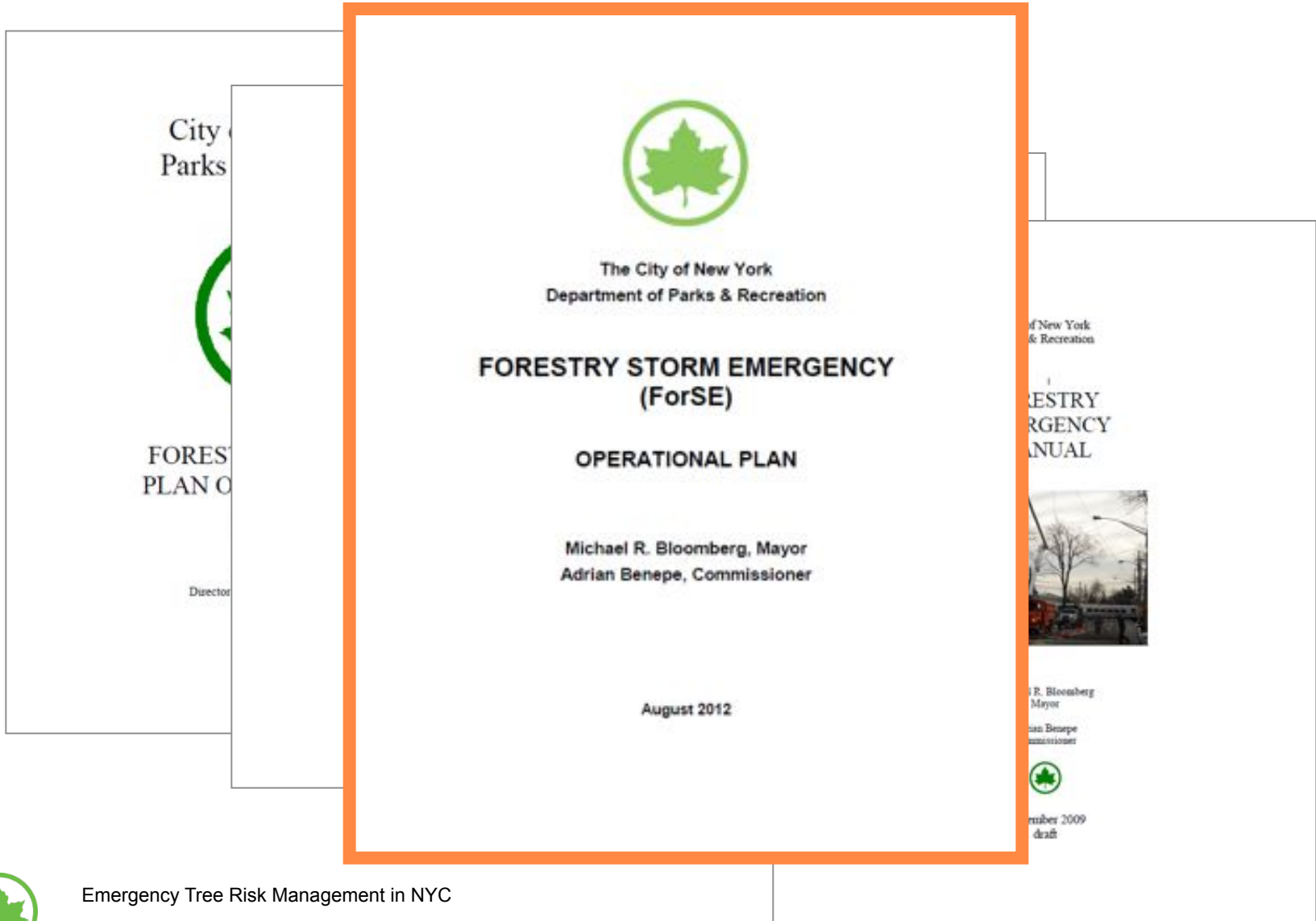


Forestry specialists needed at OEM Emergency Operation Center (EOC)





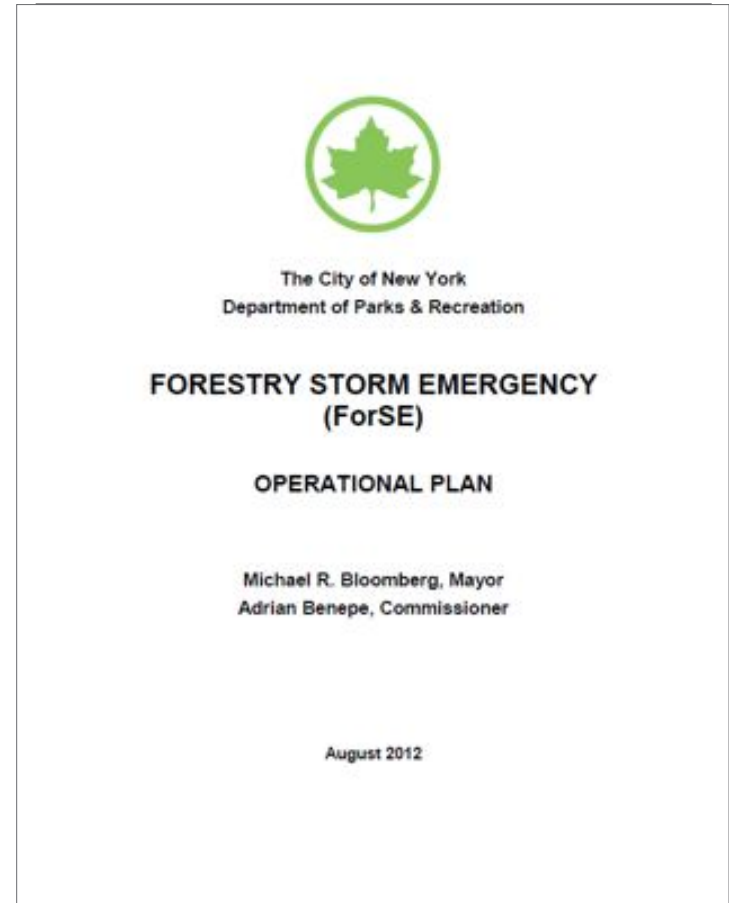
# Updated Emergency Tree Risk Management Manual



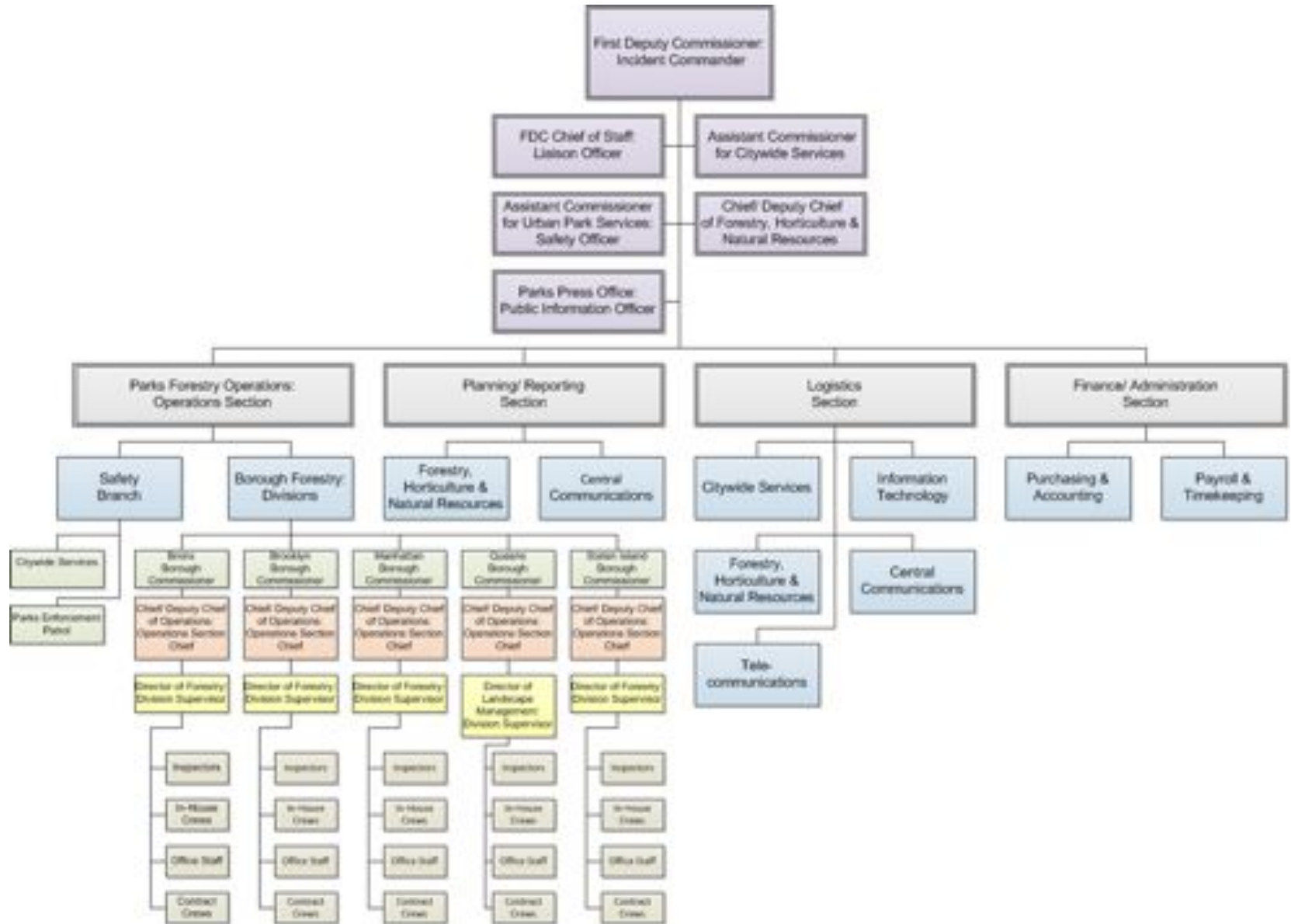
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# Forestry Storm Emergency (ForSE) – 2012

- **Incorporate ICS Framework**
  - **Defined Chain of Command**
- **Defined Incident Levels**
- **Defined Phases of Response**
- **Developed Strategic Response Tactics**
  - **Request Based**
  - **Storm Zone**
  - **Combined**
- **Defined Prioritization by Risk:**
  - **Life Safety**
  - **Property Preservation**
  - **Quality of Life**
  - **All other work**



# Incident Chain of Command Structure



# Incident Levels to Guide Level of Response

Incident Level	Intensity	Tree Down SRs (greater than or equal to)					Exceeds Weekly Average by
		BX	BK	M	Q	SI	
5	Low	10	15	5	40	10	~ 3 x
4		25	45	10	100	25	~ 8 x
3	Medium	70	110	30	250	60	~ 20 x
2		175	275	80	625	150	~ 50 x
1	High	350	550	170	1,250	300	~ 100 x

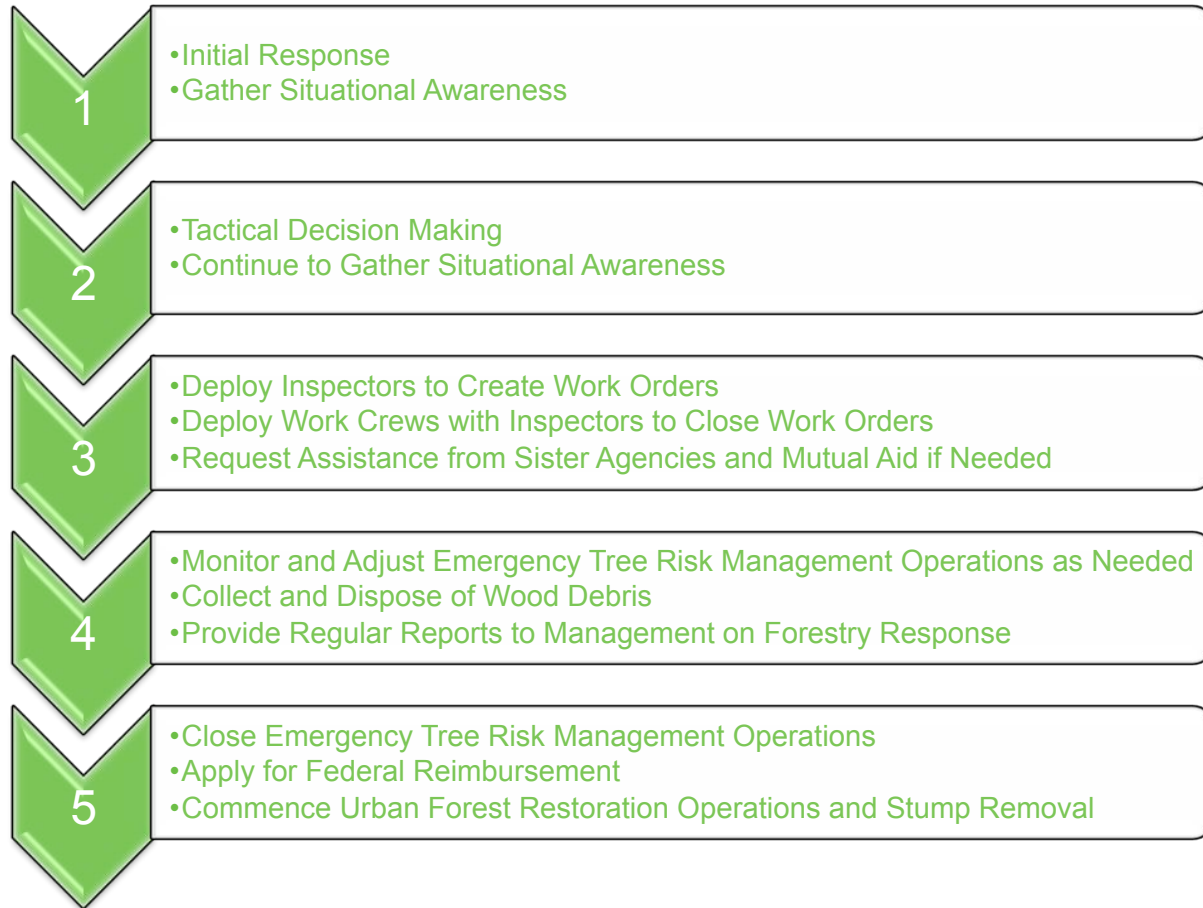
Shaded boxes indicate levels at which OEM may convene the Interagency Committee for Downed Trees Emergencies.

Incident levels are based on the number of Tree Down SRs received within 24 hours in any one borough.





# Phases of an Emergency Response



## Defined Initial Response

- Remove high priority downed trees.
- Ascertain the extent of the storm damage to gain situational awareness.
- Deploy resources including inspectors and debris removal crews based solely on Service Requests and field observations.



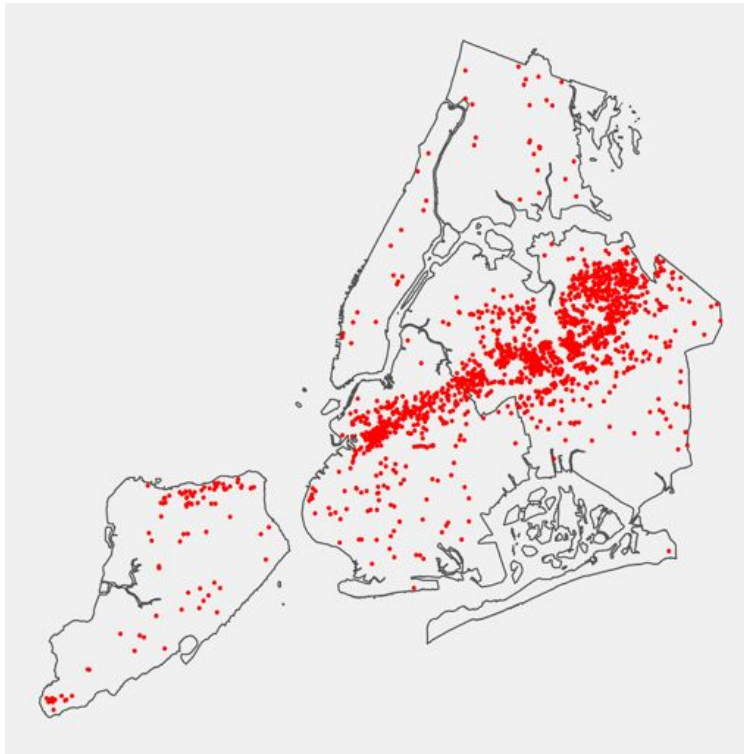
# Tactical Decision-Making

## Situational Awareness

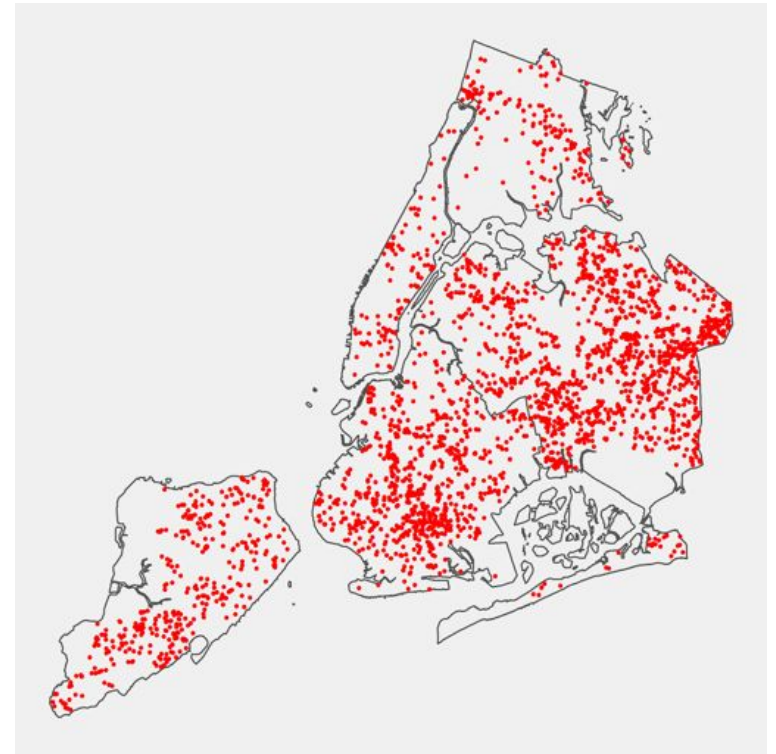
- Request-Based Response
- Storm Zone Response
- Combined Response



# Tactical Decision-Making



Tornados – September 16, 2010



Hurricane Irene – August 27, 2011





# Inspection & Work Order Prioritization

Incidents are prioritized in the following order:

1. Life safety and obstructed roadways
2. Property preservation
3. Quality of life
4. Sidewalk restoration and replanting





# Life Safety & Obstructed Roadways

Trees causing immediate danger to human health. FDNY or NYPD might have responded already.

Trees blocking emergency access routes. Clear primary roads then secondary roads and finally tertiary roads

Trees on electric wires

Large limbs hanging over public areas and in danger of falling



# Life Safety & Obstructed Roadways



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# Property Preservation

Trees down on houses, cars or other property but stabilized

Trees blocking access to homes





# Property Preservation



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# Quality of Life

Fallen trees and hanging limbs that are not interfering with traffic or endangering pedestrians.

Blocked sidewalks

Trees down in parks

Storm-related pruning





# Sidewalk Restoration & Replanting

DDC sidewalk repairs and replanting



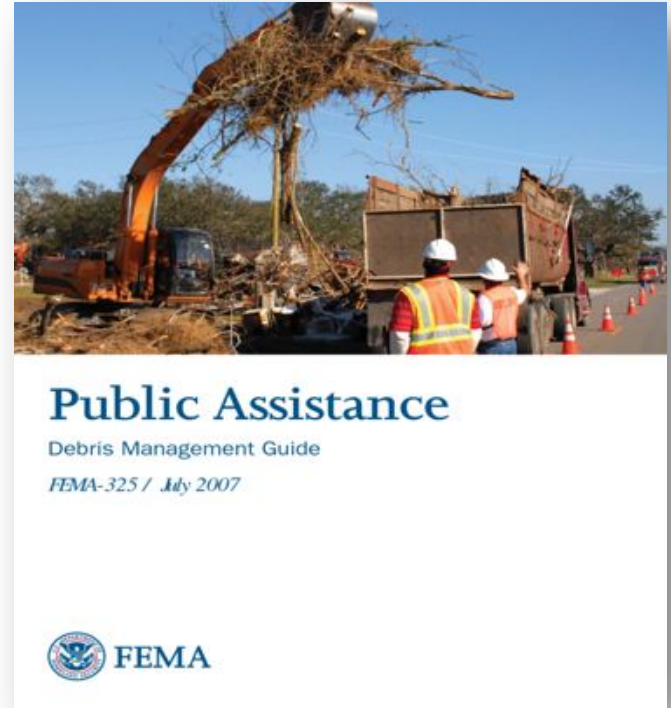
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# Wood Debris Reduction & Disposal

The approach to wood debris disposal will vary based on where the debris is located in relation to the Asian longhorned beetle (ALB) quarantine zones and the severity of the incident.



# Public Assistance Reimbursement



# Storm Mobile



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# Storm Mobile – StoMo



- Windows application optimized for tablet computers
- 2-way integration with 311
- GPS
- Utilizes citywide wireless network
- SRs & WOs are updated upon syncing
- Near real-time data updating





**Service Request**

Request ID: 366852

Address: 243 ELIZABETH STREET

Type: Tree Leaning

\* RA: **Work Order Created**

**Caller Comments**

\*\*Complaint Details: I AM REPORTING A TREE THAT IS LEANING AND LOOKS AS IF IT IS GOING TO FALL. IT IS NOT A BIG TREE AND I BELIEVE THAT THE ONLY THING THAT IS KEEPING FROM THE TREE UPROOTING A FALLING IS A DECORATIVE BOX. \*\*Location

**Other Requests on Street**

Type	Resolution	Created

**Work Order**

WO ID: [Assigned on Sync]  ASAP

\* House #: 243

\* Street: ELIZABETH STREET

\* WO Type: **Hanging Limb**

\* Status: **Open**

Tree #: 2

Location: **Across**

Equipment: **Bucket & Chipper**

\* Diameter: 13-16

Species: **ASTR - PAWPAW**

Work Date: 03/26/2013

**State of Site**

	Yes	No	N/A
Wire Hazard:	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Sidewalk Damage:	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Tree Uprooted:	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Wood Remains:	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Stump Remains:	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

WOs on Street	WO Notes	Parking
Hanging limb touching sidewalk.		



# Storm Mobile – Advantages for Forestry Inspectors

- Significant reduction of paperwork
- Receive service requests in the field from 311
- Rapid field inspection of SRs to create work orders that are sent directly to forestry
- Ability to quickly communicate where blocked streets are located
- Flag work orders that involve utility or sidewalk damage or require specialized equipment
- Ability to create field pick-up work orders
- Ability to handle duplicate SRs
- Ability to rapidly close out work orders



## Forestry Storm Report

April Showers - April 19, 2013

### Storm Response Summary

Total Service Requests Received:	302	Trees Down:	114	Storm Start:	4/19/2013 12:00 AM
Total Work Orders Created:	161	Trees Down:	16	Intake End:	Not Set
Total Work Orders Completed:	69	Trees Down:	6	Report Generated:	4/29/2013 10:09 AM

#### Emergency Totals

	Service Requests			Work Orders			Debris
	Received	Resolved	% Resolved	Created	Complete	% Complete	Pending
Bronx	23	5	22%	33	29	88%	0
Brooklyn	68	12	18%	46	12	26%	0
Manhattan	18	8	44%	2	0	0%	0
Queens	153	52	34%	67	21	31%	0
Staten Island	40	13	33%	13	7	54%	0
<b>Citywide</b>	<b>302</b>	<b>90</b>	<b>30%</b>	<b>161</b>	<b>69</b>	<b>43%</b>	<b>0</b>

#### Trees Down / Uprooted / Leaning / Split

	Service Requests			Work Orders		
	Received	Resolved	% Resolved	Created	Complete	% Complete
Bronx	9	4	44%	2	2	100%
Brooklyn	22	6	27%	6	1	17%
Manhattan	9	5	56%	0	0	
Queens	51	19	37%	6	1	17%
Staten Island	23	10	43%	2	2	100%
<b>Citywide</b>	<b>114</b>	<b>44</b>	<b>39%</b>	<b>16</b>	<b>6</b>	<b>38%</b>

#### Hanging Limbs

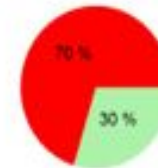
	Service Requests			Work Orders		
	Received	Resolved	% Resolved	Created	Complete	% Complete
Bronx	7	0	0%	31	27	87%
Brooklyn	28	3	11%	30	11	37%
Manhattan	5	1	20%	0	0	
Queens	53	15	28%	41	16	39%
Staten Island	11	2	18%	7	2	29%
<b>Citywide</b>	<b>104</b>	<b>21</b>	<b>15%</b>	<b>109</b>	<b>56</b>	<b>51%</b>

#### Limbs Down

	Service Requests			Work Orders		
	Received	Resolved	% Resolved	Created	Complete	% Complete
Bronx	7	1	14%	0	0	
Brooklyn	18	3	17%	10	0	0%
Manhattan	4	2	50%	2	0	0%
Queens	49	18	37%	20	4	20%
Staten Island	6	1	17%	4	3	75%
<b>Citywide</b>	<b>84</b>	<b>25</b>	<b>30%</b>	<b>36</b>	<b>7</b>	<b>19%</b>

#### Service Requests

■ Resolved    ■ Unresolved



#### Inspections

■ Inspected    ■ Not Inspected



#### Work Orders

■ Completed    ■ Remaining



# Storm Mobile – Command Center Advantages

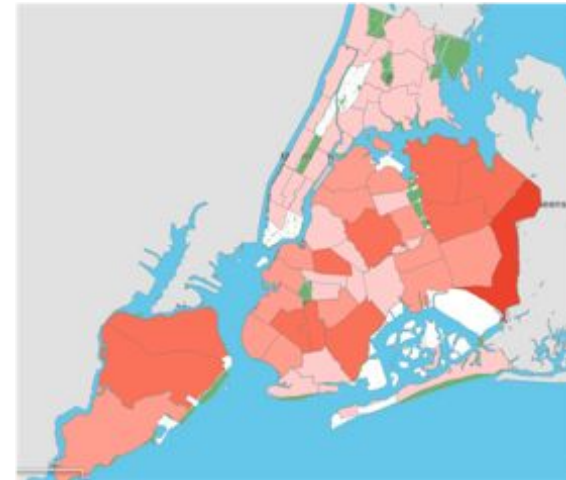
Command Center allows management staff to:

Rapidly understand the extent of the tree emergency from service requests

Receive near real time **situational awareness** from Forestry Inspectors and Forestry Crews

Quickly produce work listings with geographical coordinates, to be passed to assisting organizations and utility companies

Produce progress reports in near real time for distribution



“No plan survives contact  
with the enemy.”

– US Navy Seals





# Hurricane Irene August 28, 2011

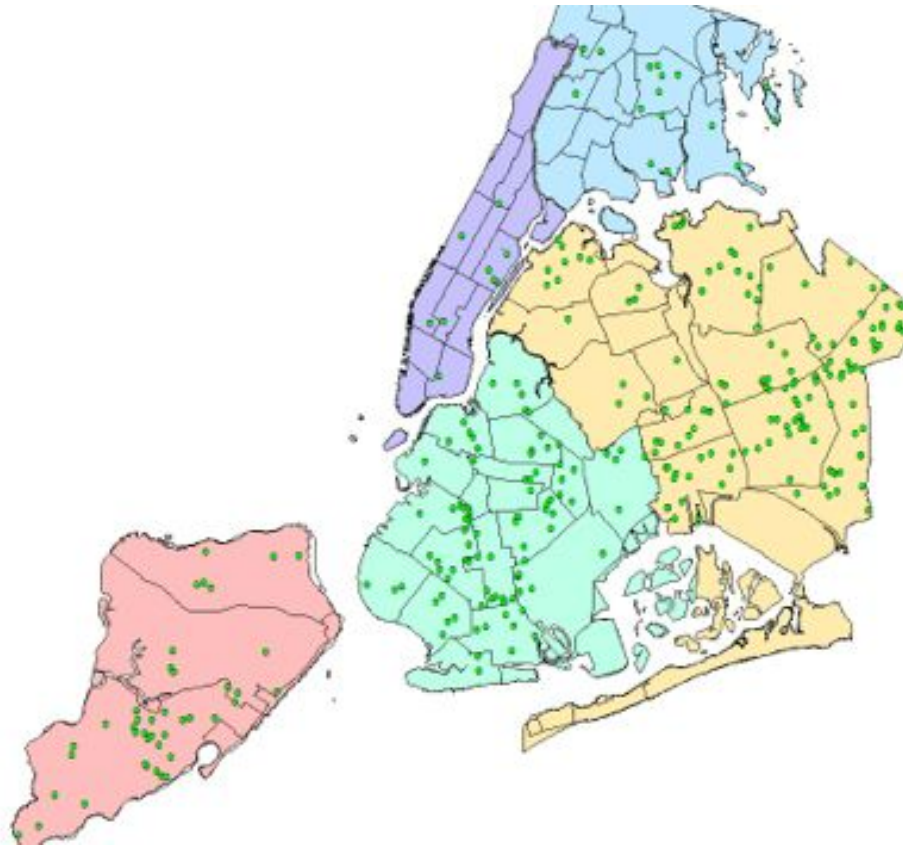


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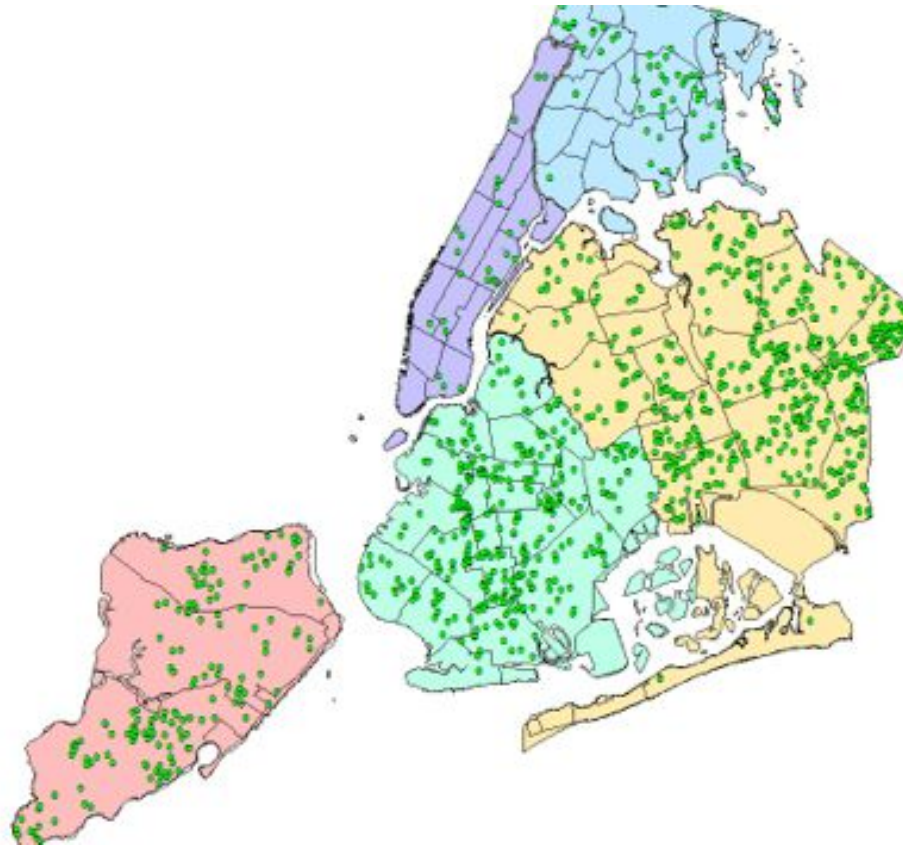
# 8/28 06:00

## 321 Service Requests



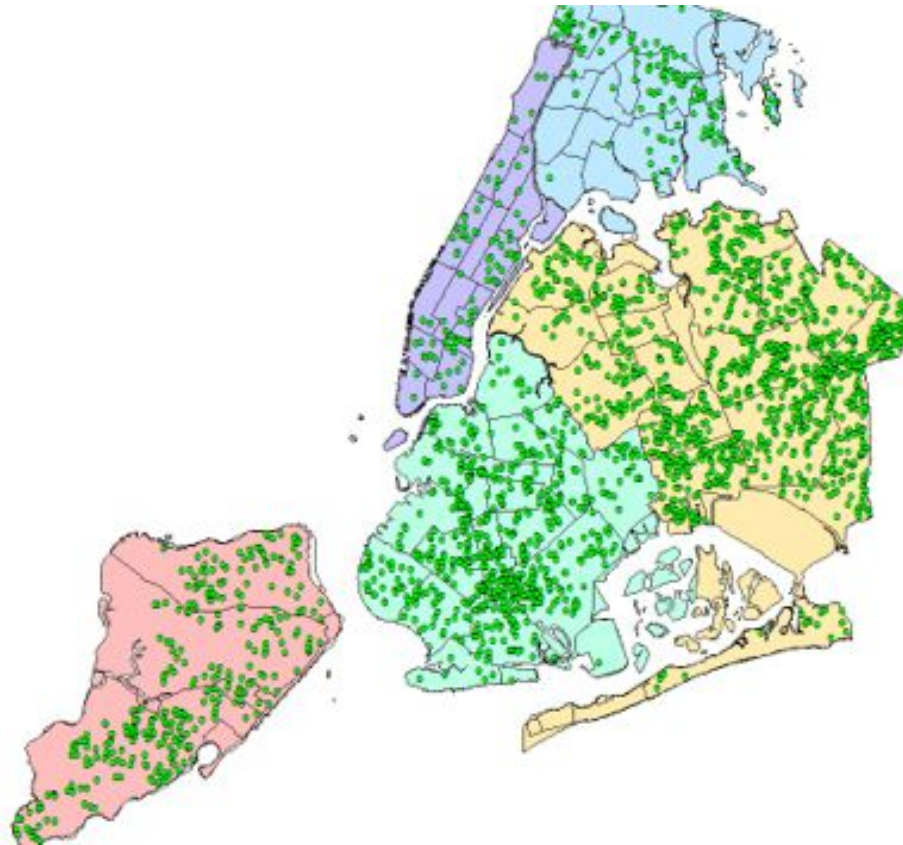
Emergency Tree Risk Management in NYC

# 8/28 12:00 noon 1,175 Service Requests



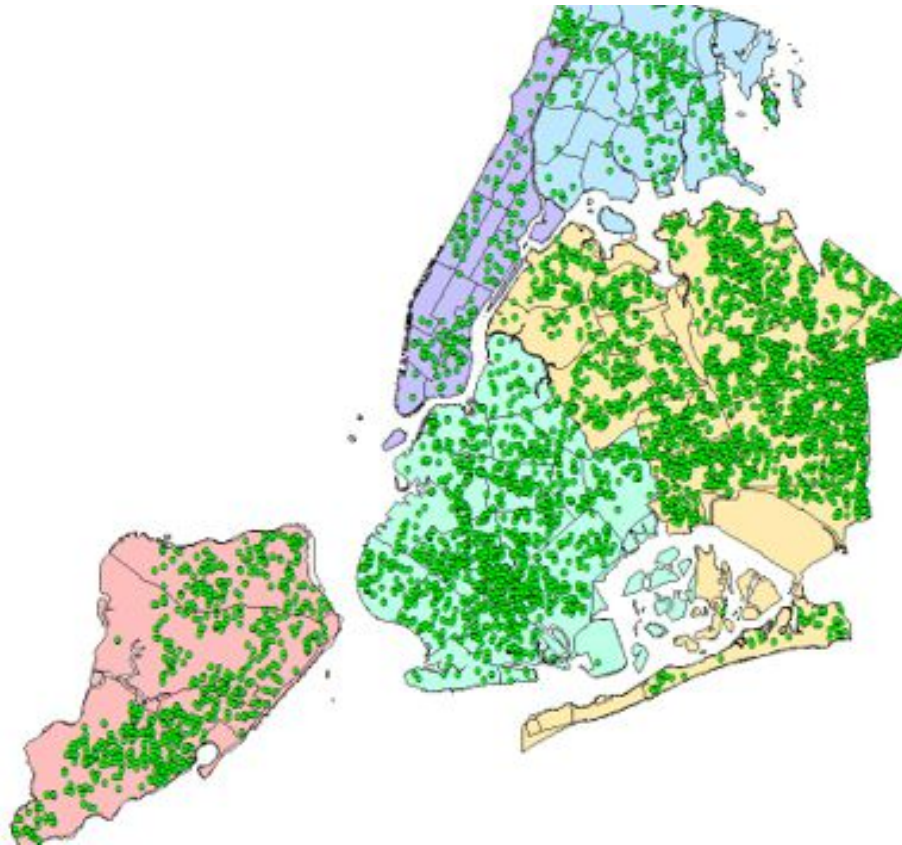
Emergency Tree Risk Management in NYC

# 8/28 22:00 2,462 Service Requests



8/29 22:00

5,394 Service Requests



Emergency Tree Risk Management in NYC



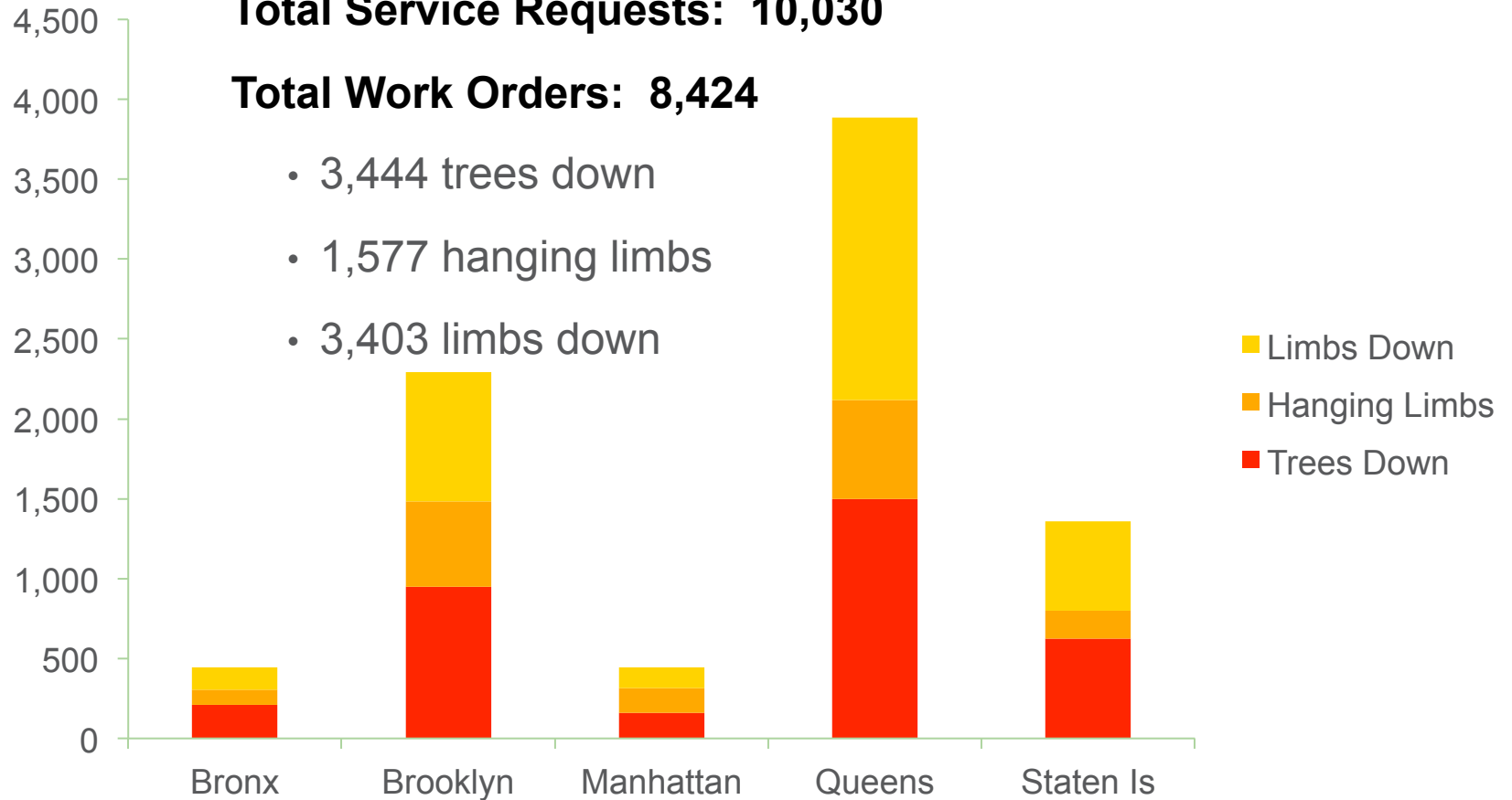
# Irene vs NYC Trees

## 21 Days of Activation

**Total Service Requests: 10,030**

**Total Work Orders: 8,424**

- 3,444 trees down
- 1,577 hanging limbs
- 3,403 limbs down



# Lessons Learned



Updated ForSE worked incredibly well!



Be ready for Storm Mobile challenges



Further improve debris management and record keeping protocols



Expedite the collection of situational awareness for blocked streets



Vital Inspectors are able to communicate near live from the field



Having Forestry staff at OEM was a very powerful tool



NYC Parks must be operational for 24hrs per day

# Superstorm Sandy

## October 29, 2012



NYC Parks

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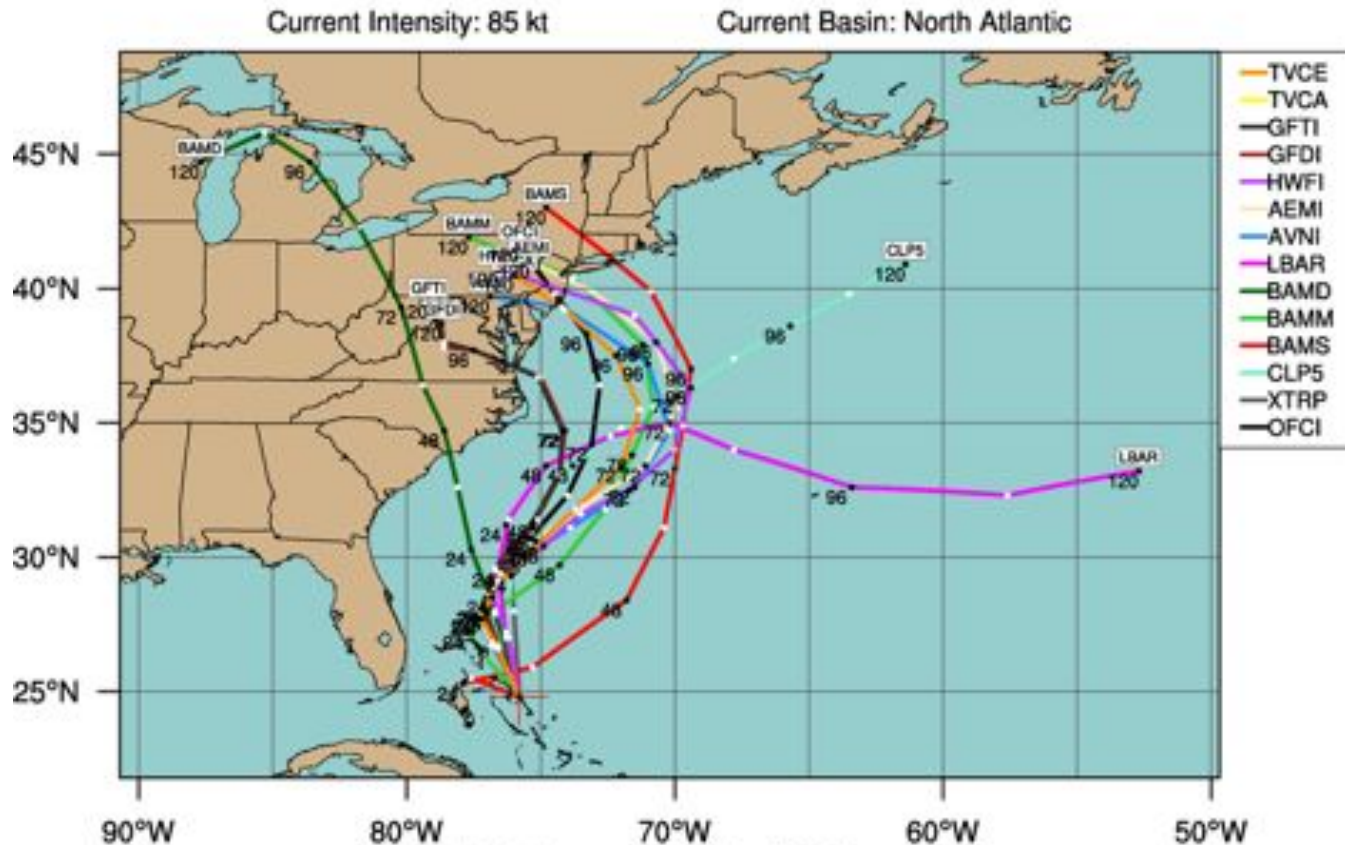
“Once more unto the breach,  
dear friends, once more...”

William Shakespeare, *Henry V*



# HURRICANE SANDY (AL18)

Early-cycle track guidance initialized at 0000 UTC, 26 October 2012



By using this plot, the user agrees to the UCAR Terms of Use which can be accessed at: <http://www2.ucar.edu/terms-of-use>

Plot generated at 0119 UTC 26 October 2012



NYC Parks

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# Superstorm Sandy & NYC

- Storm surge was 13-14 feet above Mean Low Water
- Massive power and transportation suspensions. 2 million New Yorkers without power immediately after the storm
- Caused NYC damage of an estimated \$19 billion dollars
- 911 received more than 20,000 calls per hour during the peak of the storm
- NYPD and FDNY rescued more than 2,200 people
- 4 dozen lives lost in NYC



# Hurricane Sandy – Far More Than Trees



Emergency Tree Risk Management in NYC

# Downed Tree Taskforce at OEM



Staffed by decision makers from agencies and utility companies involved in removing trees and debris, with OEM staff facilitating



• Service Requests

• Work Orders



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



• Service Requests

• Work Orders



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



NYC Parks

Emergency Tree Risk Management in NYC



• Service Requests

• Work Orders



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



NYC Parks

Emergency Tree Risk Management in NYC

• Service Requests

• Work Orders



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



NYC Parks

Emergency Tree Risk Management in NYC

• Service Requests

• Work Orders



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



NYC Parks

Emergency Tree Risk Management in NYC

• Service Requests

• Work Orders



10/29 at 00:00 to 10/30 at 03:00



NYC Parks

Emergency Tree Risk Management in NYC



• Service Requests

• Work Orders



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





• Service Requests

• Work Orders



10/29 at 00:00 to 10/30 at 09:00



NYC Parks

Emergency Tree Risk Management in NYC

• Service Requests

• Work Orders



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



• Service Requests

• Work Orders



10/29 at 00:00 to 10/30 at 18:00

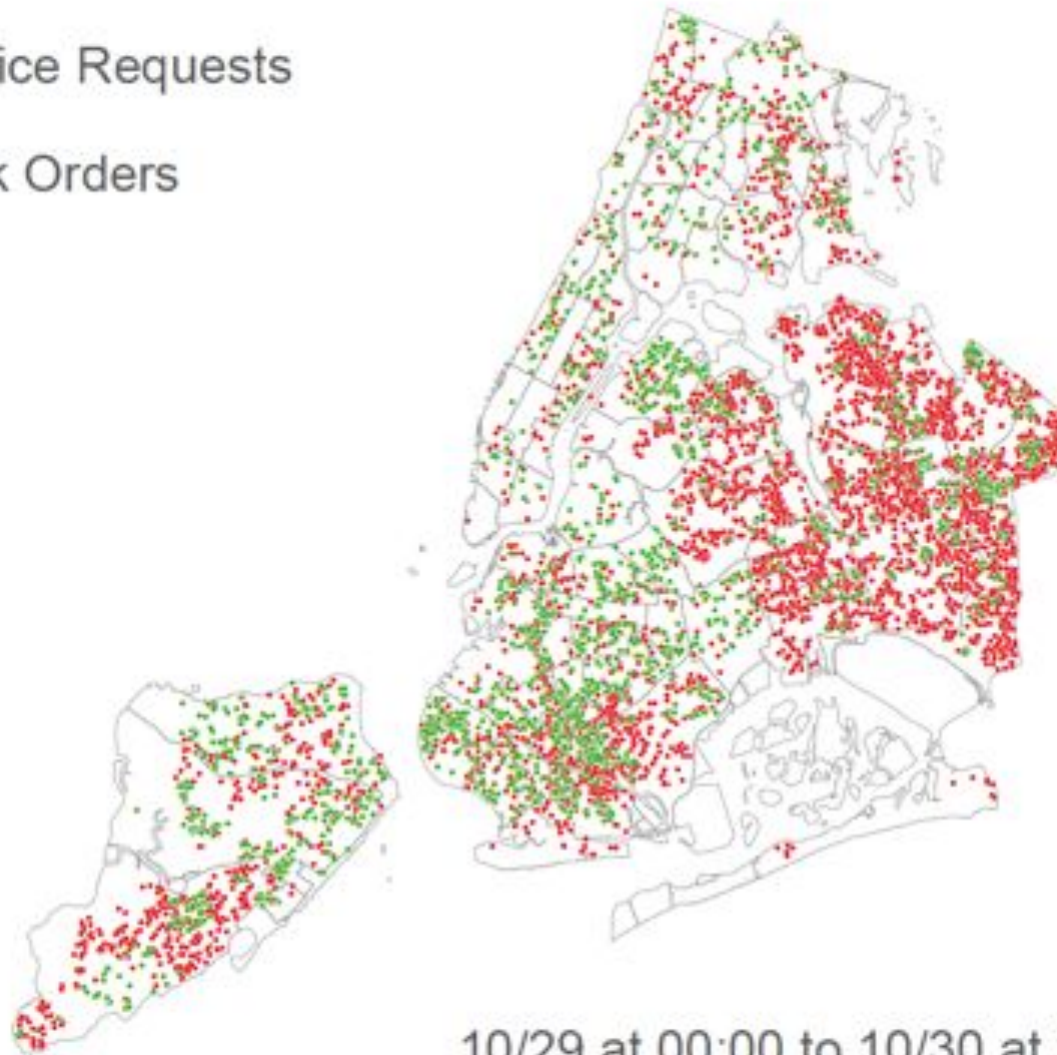


NYC Parks

Emergency Tree Risk Management in NYC

• Service Requests

• Work Orders



10/29 at 00:00 to 10/30 at 21:00



NYC Parks

Emergency Tree Risk Management in NYC



• Service Requests

• Work Orders



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



NYC Parks

Emergency Tree Risk Management in NYC



• Service Requests

• Work Orders



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

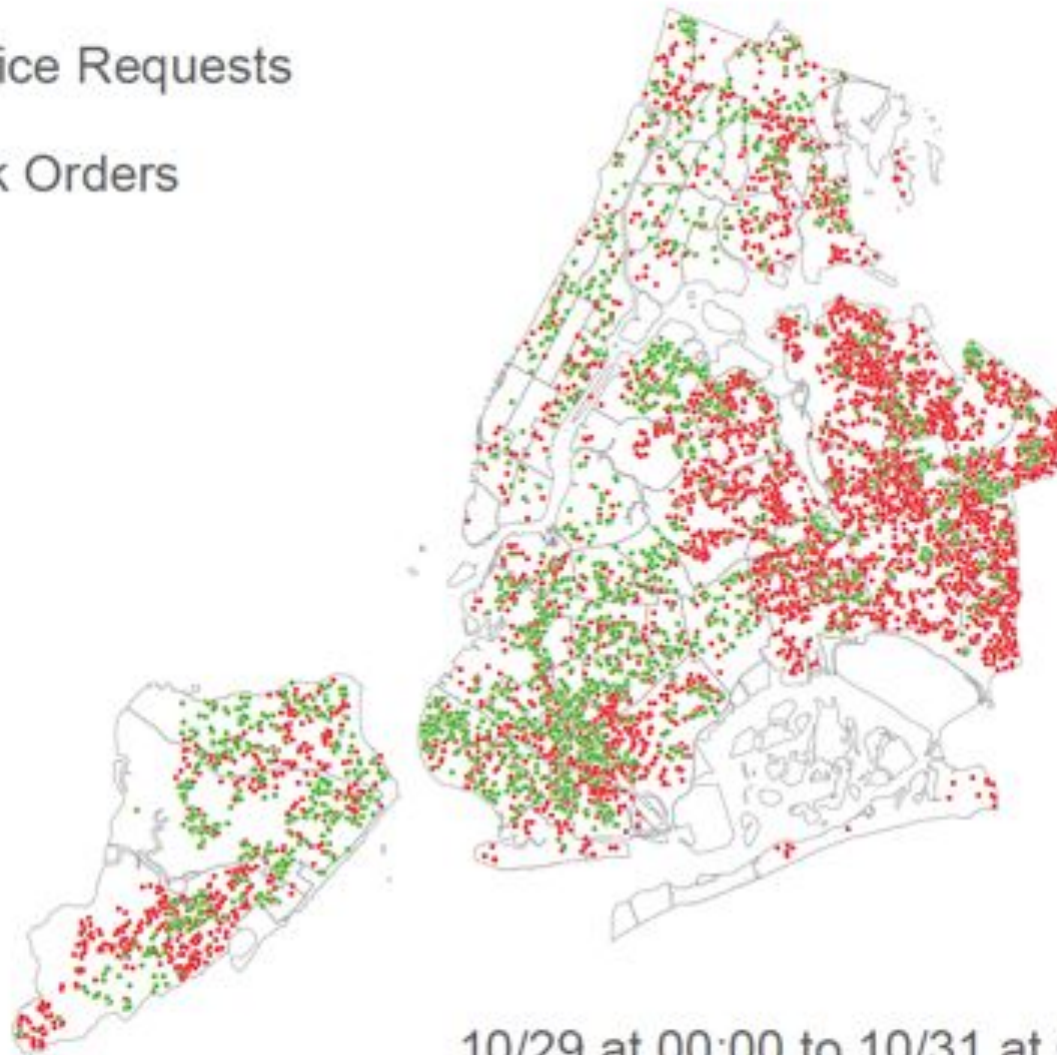


NYC Parks

Emergency Tree Risk Management in NYC

• Service Requests

• Work Orders



10/29 at 00:00 to 10/31 at 09:00



NYC Parks

Emergency Tree Risk Management in NYC

• Service Requests

• Work Orders



10/29 at 00:00 to 10/31 at 12:00



• Service Requests

• Work Orders



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





• Service Requests

• Work Orders



10/29 at 00:00 to 10/31 at 18:00





• Service Requests

• Work Orders

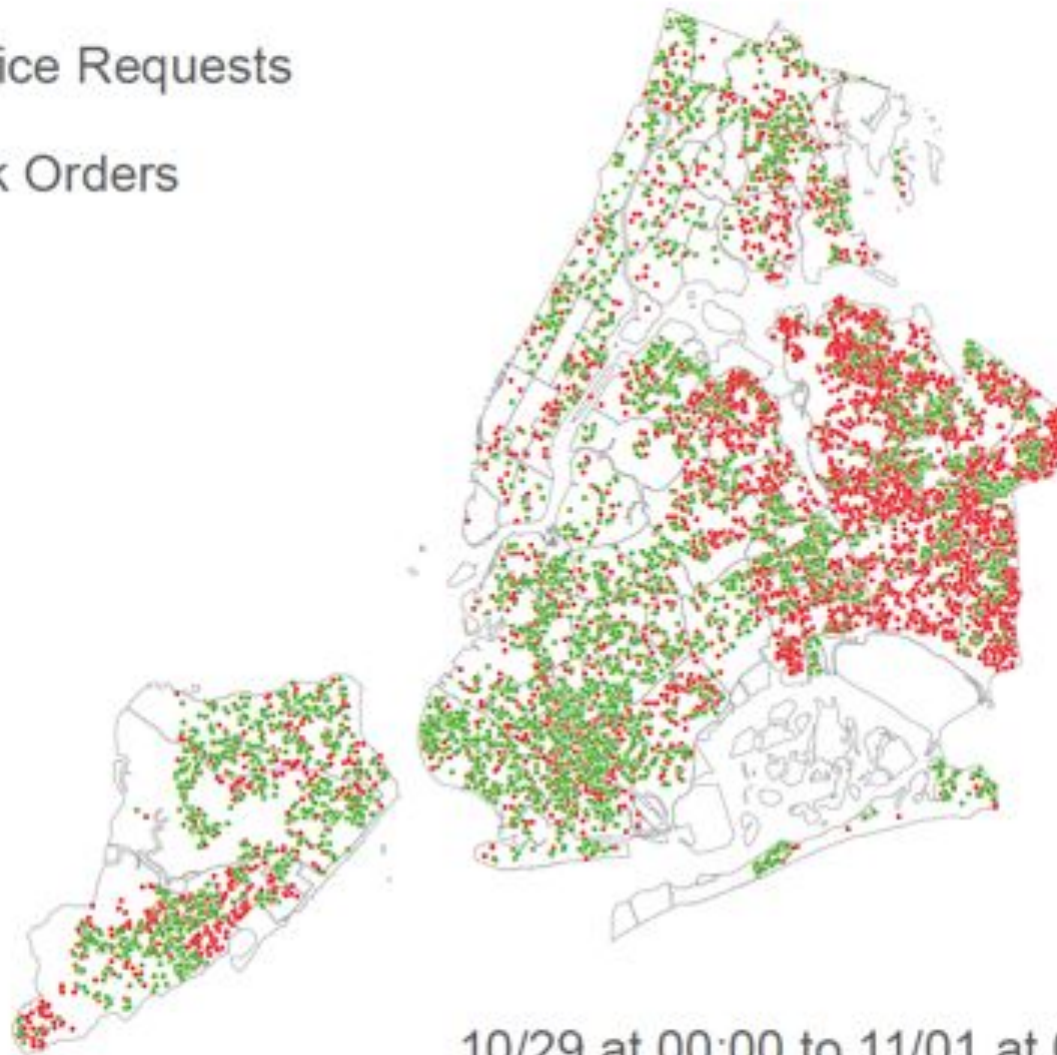


10/29 at 00:00 to 10/31 at 21:00



• Service Requests

• Work Orders



10/29 at 00:00 to 11/01 at 00:00

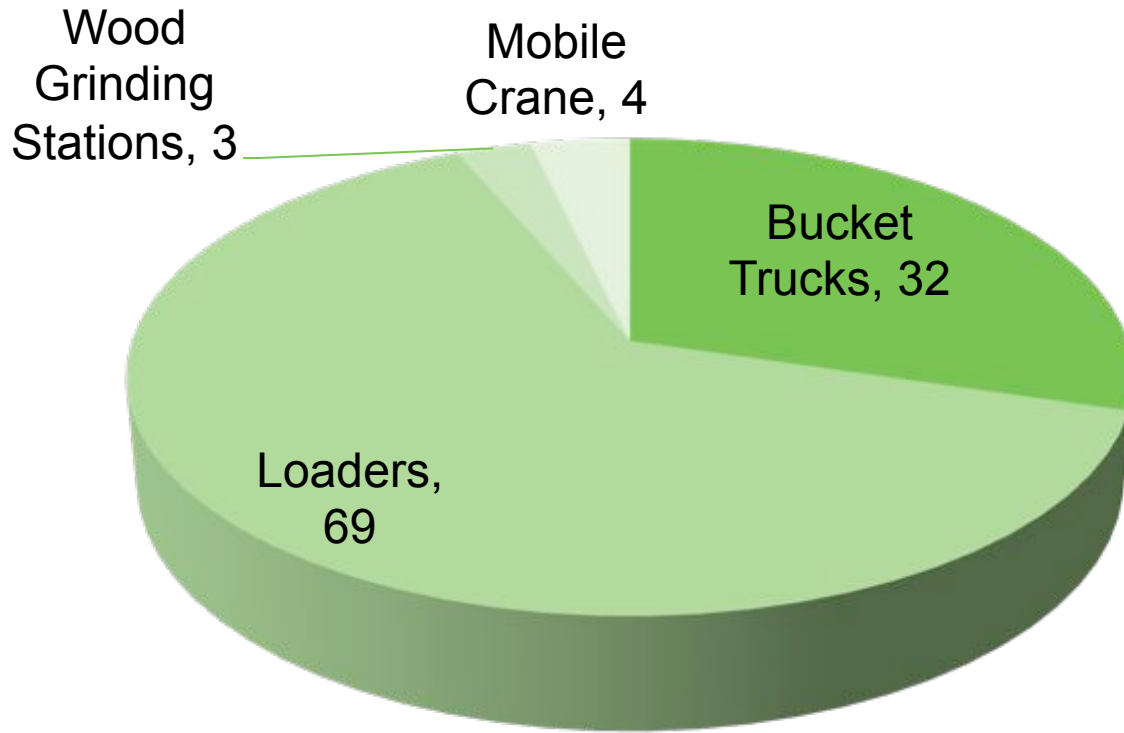


# Sandy Tree Damage





# Emergency Contract Crews



# Wood Debris Reduction



Emergency Tree Risk Management in NYC



# Wood Debris Disposal



Emergency Tree Risk Management in NYC

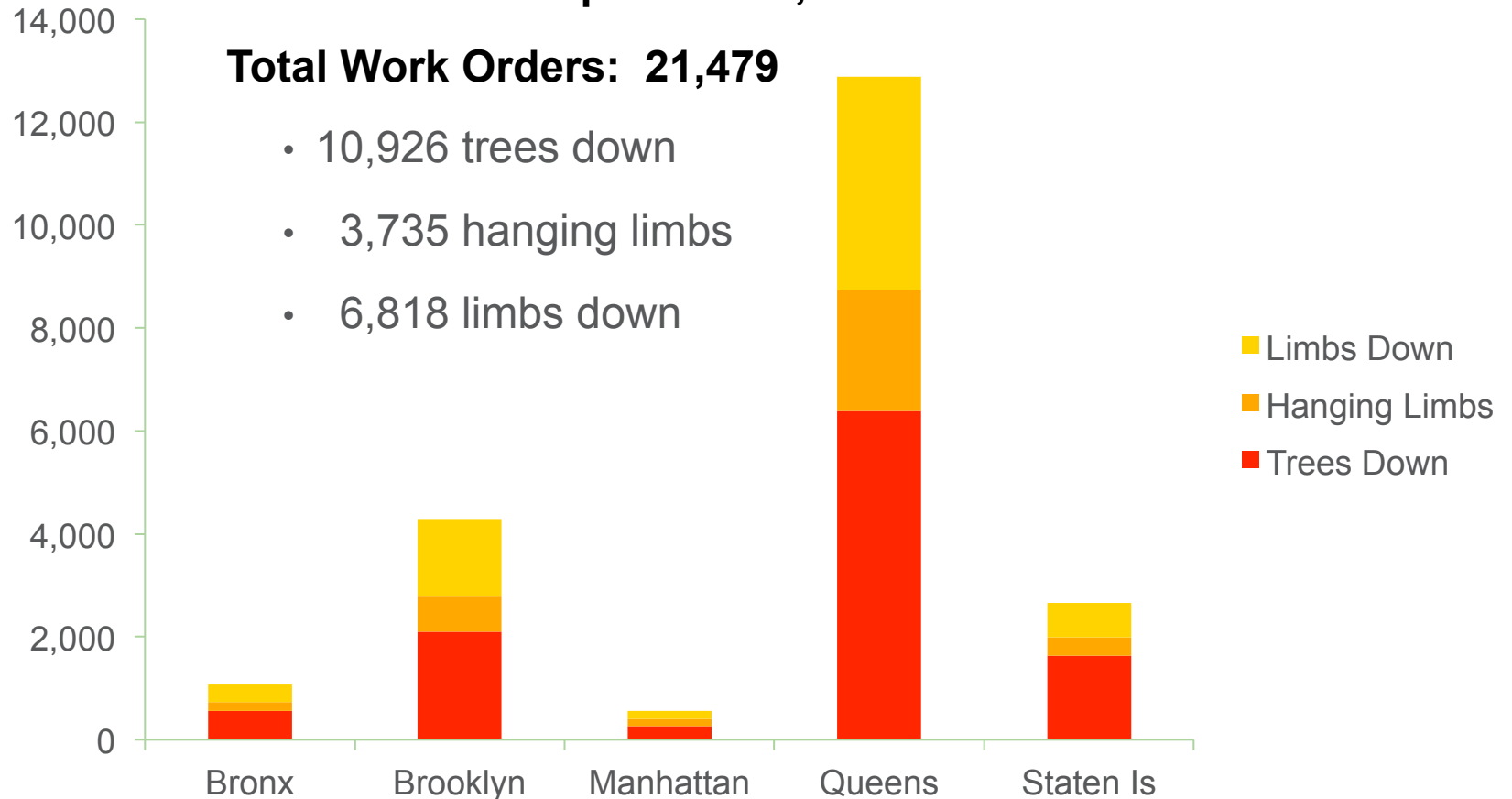
# Sandy vs NYC Trees

**47 Days of Activation**

**Total Service Requests: 26,011**

**Total Work Orders: 21,479**

- 10,926 trees down
- 3,735 hanging limbs
- 6,818 limbs down



Emergency Tree Risk Management in NYC



NYC Parks

# Lessons Learned



Storm Mobile was a huge success and provided a solid backbone to the Forestry response



Push 911 tree related service requests into Storm Mobile as well as 311



Further develop ForSE protocol for working with utilities



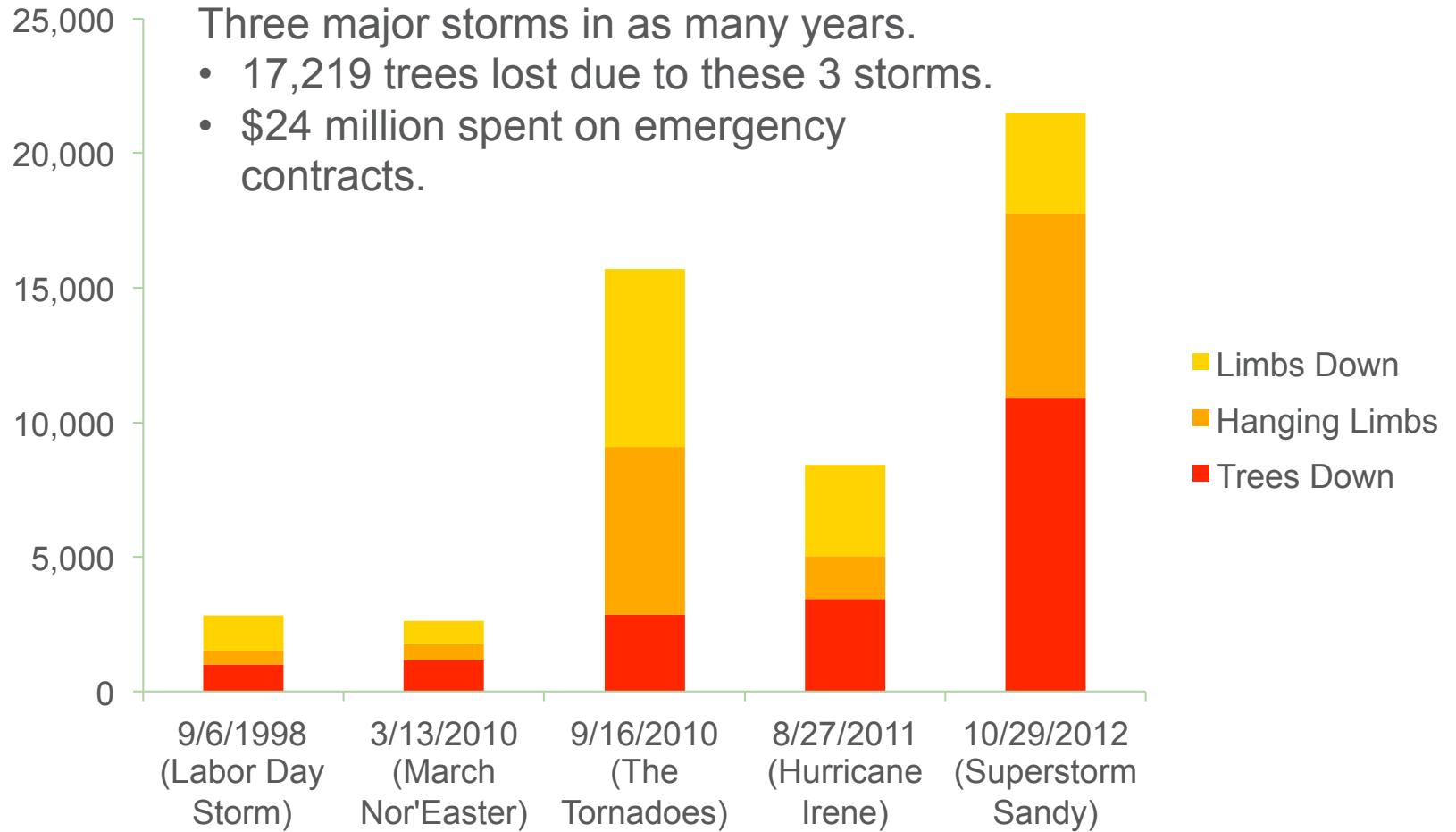
Further develop ForSE debris management protocol and strategize on opportunities for re-purposing



Further develop ForSE protocol for collecting Situational Awareness

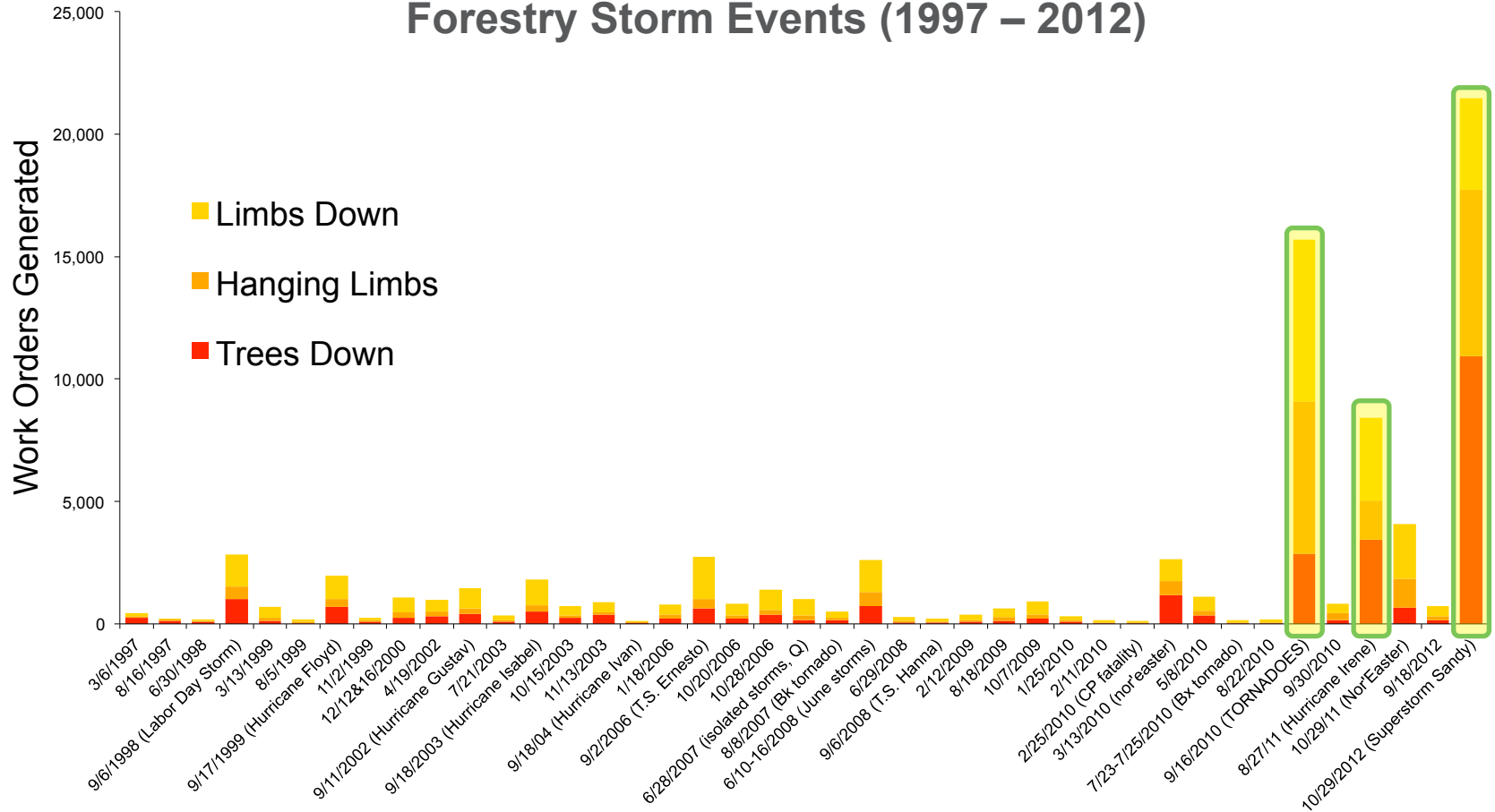


# Sandy vs Historic Storms



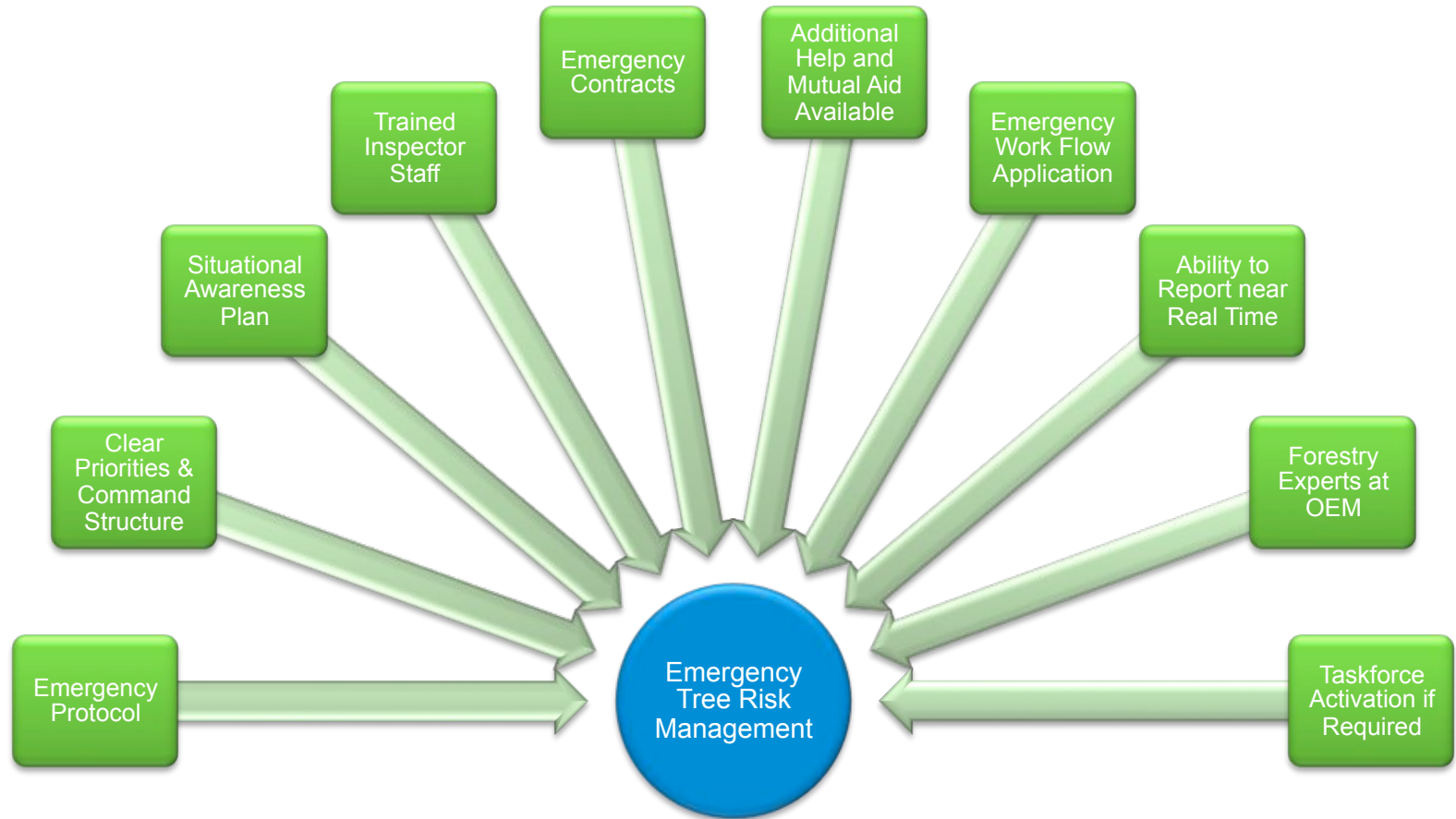
# NYC Storm History

## Forestry Storm Events (1997 – 2012)





# Elements of Comprehensive Emergency Tree Risk Management





# Thank You

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Parks