The Giving Trees: Finding Takers for Woody Debris in NYC

New York State ReLeaf Conference
November 18, 2022

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Forestry, Horticulture and Natural Resources

NYC Parks & Recreation
Susan M. Donoghue, Commissioner
Jennifer Greenfeld, Deputy Commissioner, Environment and Planning

NYC Parks Tree Count* ~4.1 million

forest
~3.3 million
80%

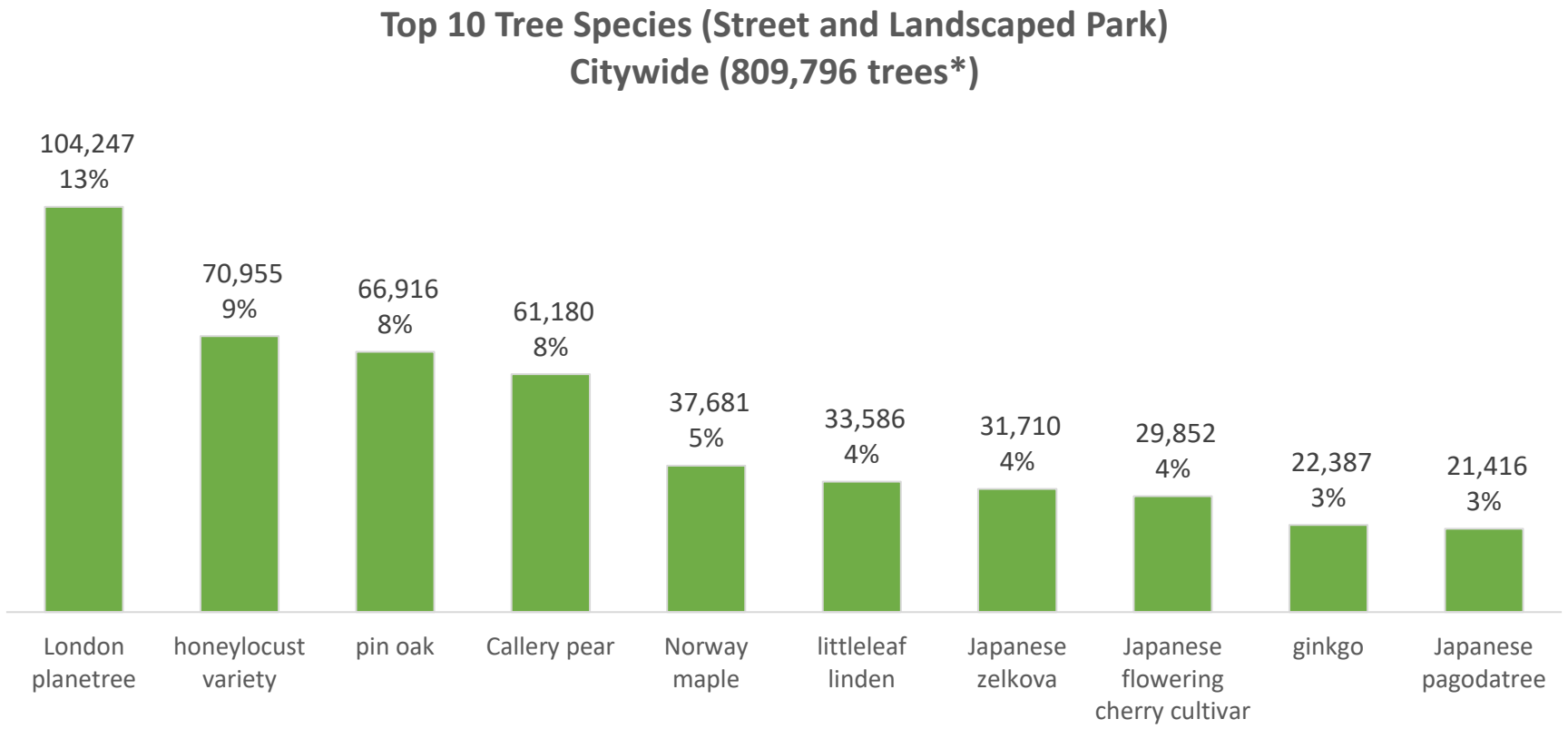
street
666,134
16%

park
156,625
4%

non-forest
822,759
20%

*trees on parkland or in the right of way under Parks jurisdiction

NYC Parks' Individually Managed Urban Forest Composition

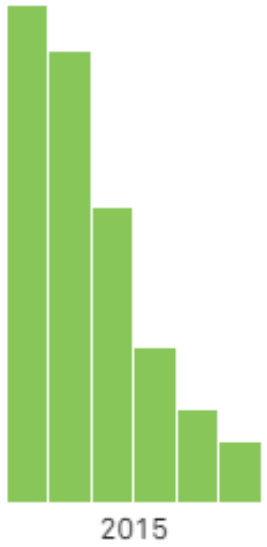


* As per 2015-2016 TreesCount street tree inventory and the 2017-2018 inventory of landscaped park trees

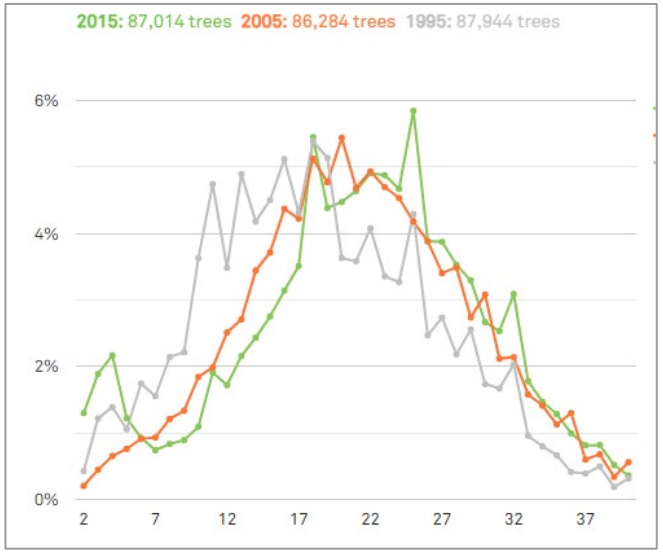
NYC Parks

NYC Parks' Individually Managed Urban Forest Composition

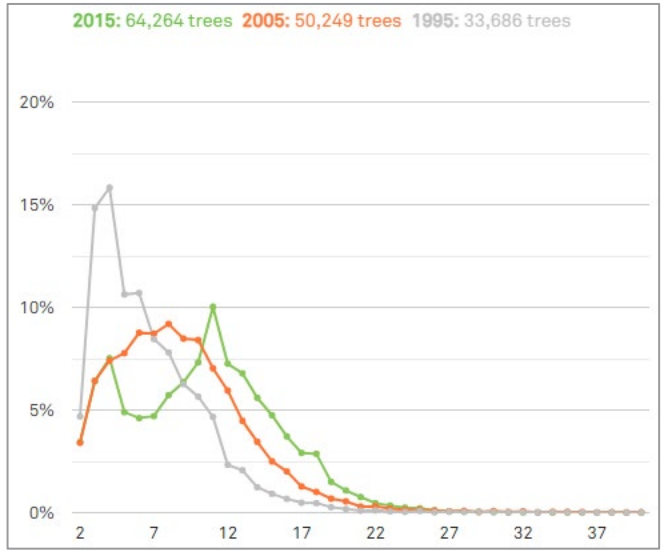
Total – 2015



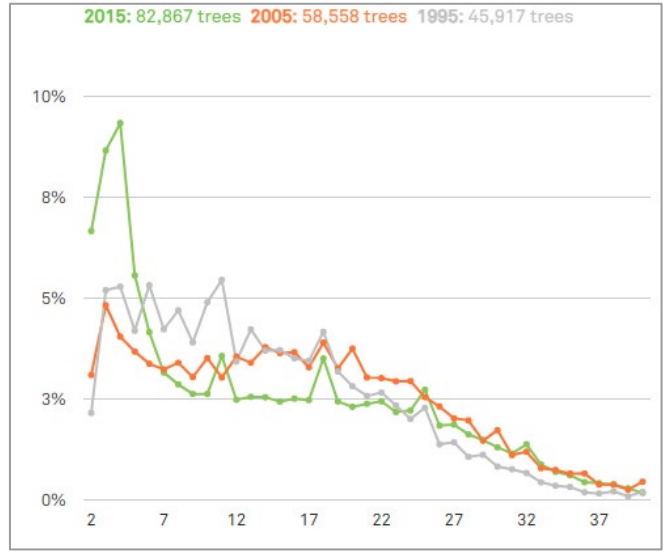
London Planetree



Honeylocust



Oaks (all sp.)



% of species

Tree diameter (in)

NYC Parks

- As per 2015-2016 TreesCount street tree inventory
- http://media.nycgovparks.org/images/web/TreesCount

Blue Sky Reasons for Tree Removal

Tree Mortality

Tree Risk

Pests/disease

Construction Conflict

Work Order Prioritization in Major Storm Event

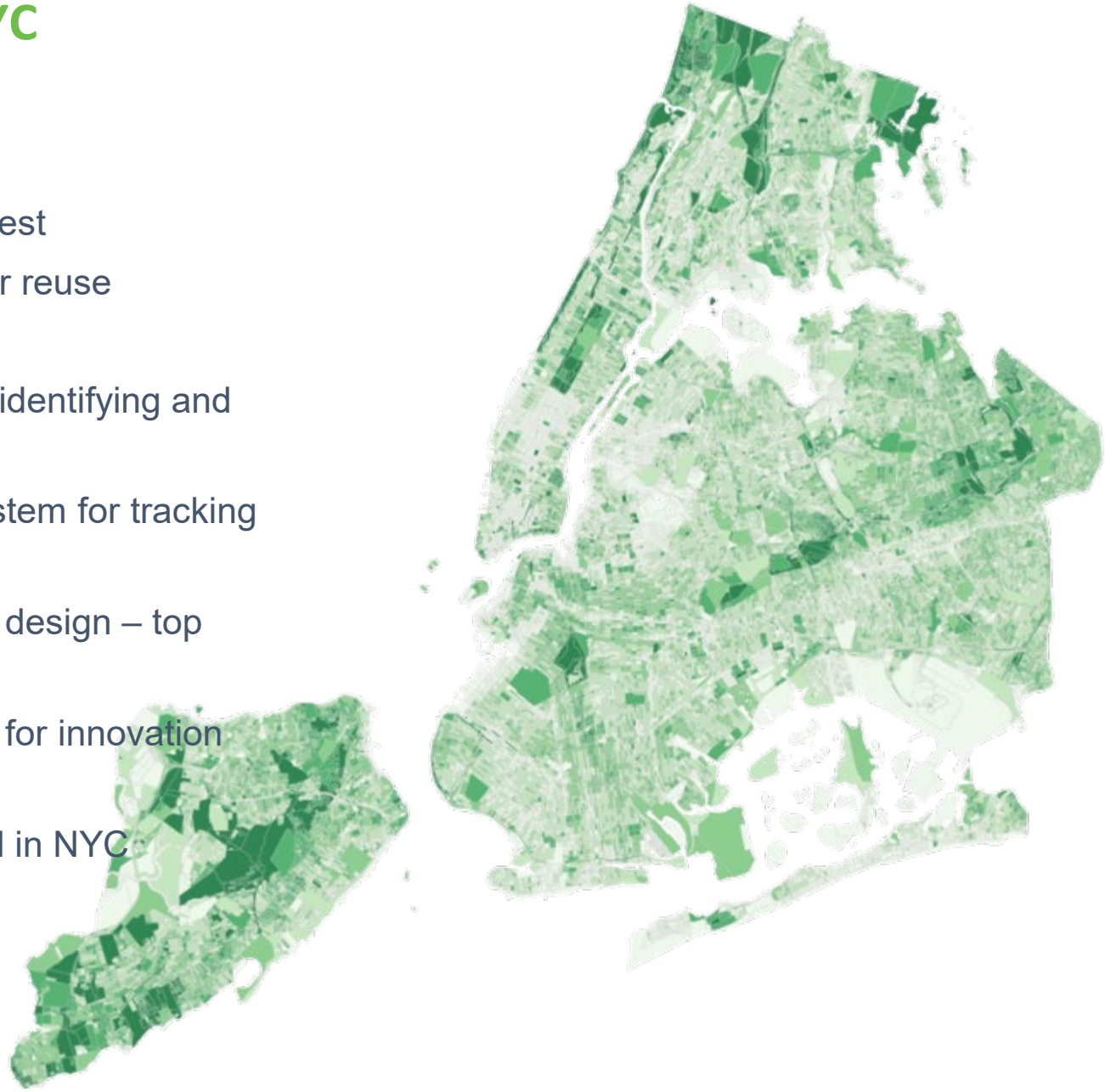
1. Life safety and obstructed roadways
2. Property preservation
3. Quality of life
4. Vegetative debris collection and reduction
5. Sidewalk restoration and replanting

How does wood salvage impact these considerations?

Opportunities for Wood Reuse in NYC

Opportunities

- Single entity manages >50% of NYCs urban forest
- Steady supply of high-volume fresh cut wood for reuse
- Robust tree replacement and planting program
- Skilled arboricultural workforce for available for identifying and surveying salvageable logs
- Existing advanced information management system for tracking inventory, inspections, and work
- NYC is professional mecca for architecture and design – top potential specifiers of wood waste products
- Existing government and private sector support for innovation and sustainability projects
- High potential for workforce development based in NYC demographics



NYC Parks

Challenges to Wood Reuse in NYC

Challenges

- Log quality
- Selective diversion (operational, logistical, transportation and staffing costs to separate suitable logs from regular wood debris waste stream across 5 boroughs)
- Identifying reuse products for urban species (such as London Plane)
- Operationalizing wood reuse (assessment, specialized equipment, drying time)
- Milling challenges (condition, foreign objects)
- Siting (Local Undesirable Land Use)

Needs ✓

- Wood utilization feasibility study
- Infrastructure (land, equipment, staff) to sort and process wood debris (blue sky and gray)
- Market for recycled urban wood products
- Partnerships to support a circular wood economy (government, private industry, educational, non-profit sectors)

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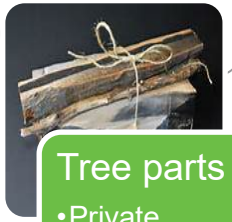
Wood Debris Reduction & Collection - Sandy

1996 - 2019



Tree parts
- Private property
- ALB q zone

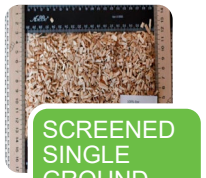
CHIPPER

Trees
- street
- park

CHIPPER

CHIPS
- dog runs
- trails
- compost browns?
- Weed suppressant

TUB GRINDER



SCREENED SINGLE GROUND WOOD
- BIOFUEL

TUB GRINDER

DOUBLE GROUND WOOD
- ORNAMENTAL MULCH (TREES, FLOWERBEDS, GREENSTREETS)
- COMPOST BROWNS?

Hurricane Sandy Storm Inundation

Inundated Area

This area was identified by FEMA on November 6, 2012 as inundated based on recorded surge and elevation.

Greenstreets

Total area citywide:	173 Acres
Area affected:	26 Acres
Percentage of total:	15%

Park Properties

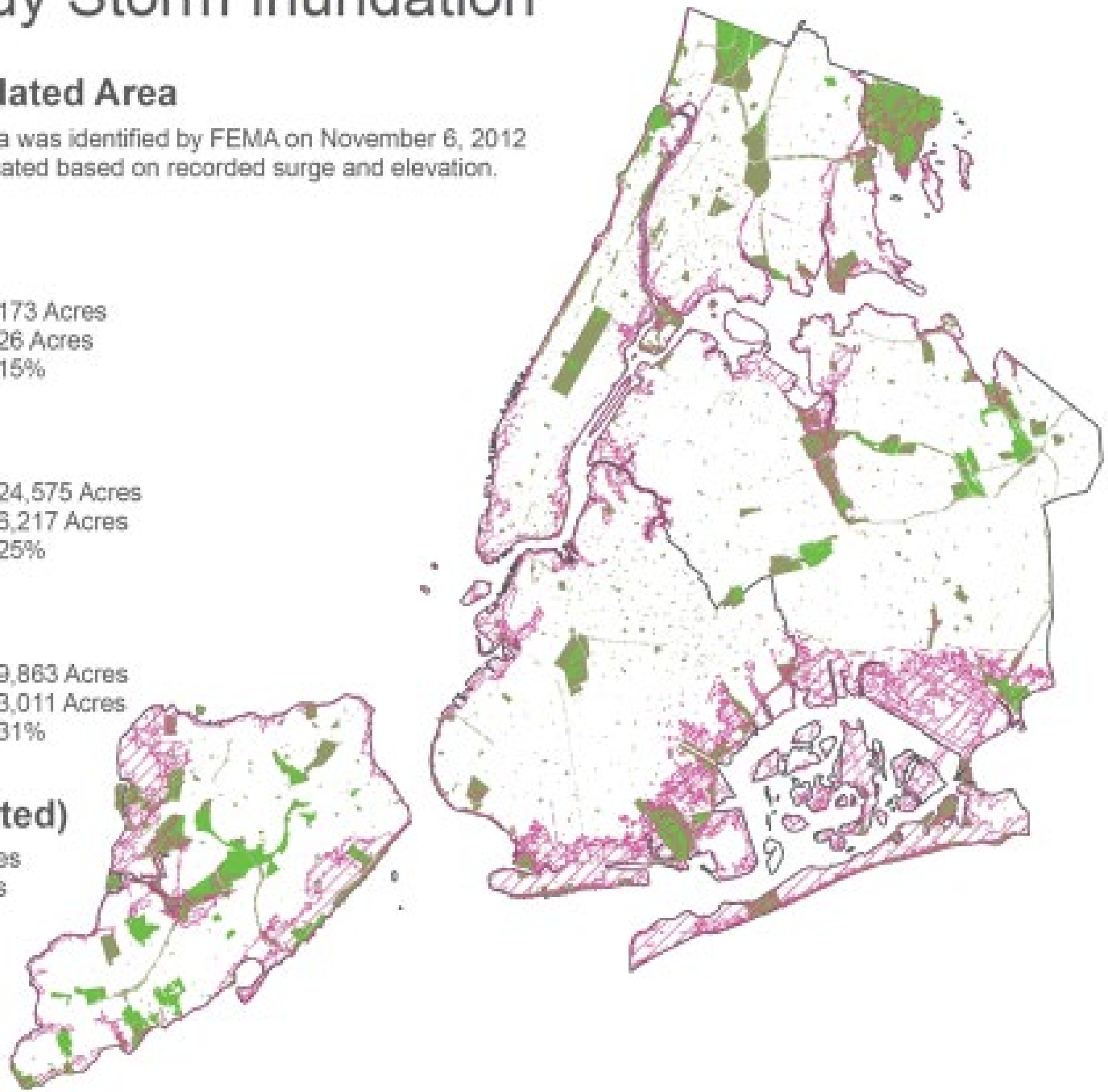
Total area citywide:	24,575 Acres
Area affected:	6,217 Acres
Percentage of total:	25%

Natural Areas

Total area citywide:	9,863 Acres
Area affected:	3,011 Acres
Percentage of total:	31%

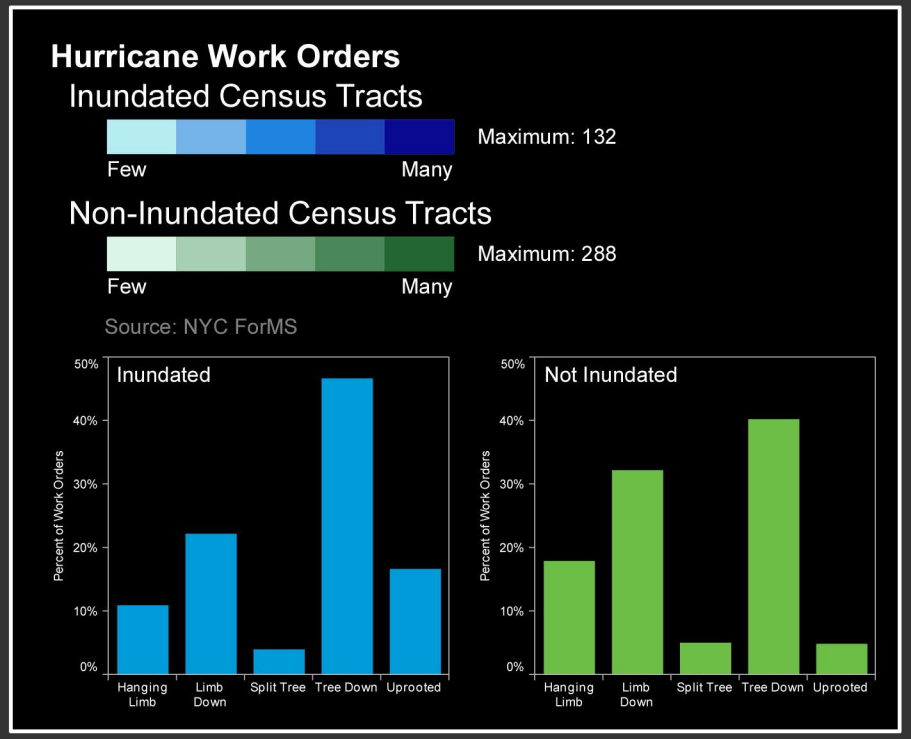
Street Trees (Not depicted)

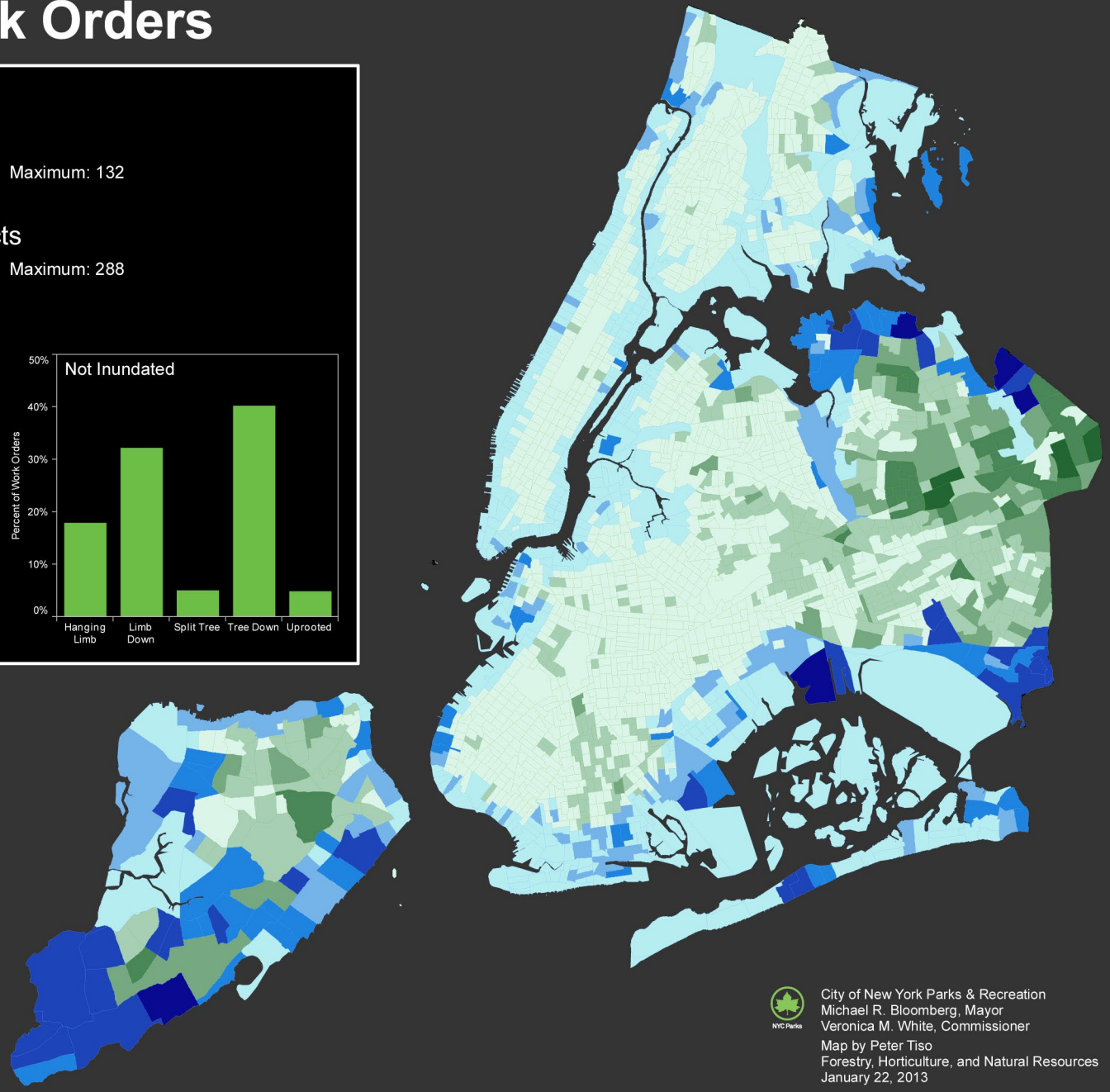
Total citywide:	686,321 Trees
Number affected:	48,637 Trees
Percentage of total:	7%



NYC Parks

Street Tree Work Orders





City of New York Parks & Recreation
Michael R. Bloomberg, Mayor
Veronica M. White, Commissioner

Map by Peter Tiso
Forestry, Horticulture, and Natural Resources
January 22, 2013

SANDY WOOD DEBRIS SUMMARY

(October 30 - December 17, 2012)

Site	Total Cubic Yards IN	Total Cubic Yards OUT
Cunningham Park*	102,632	24,951
Floyd Bennett Field	37,187	0
Forest Park**	25,000	0
Prospect Park	22,337	7,104
Orchard Beach	18,641	90
Aqueduct	15,091	719
Midland Beach	14,208	750
Wolfe's Pond Park	9,282	0
Randall's Island	5,932	725
Van Cortlandt Park	2,446	0
TOTAL Cubic Yards	**252,755**	**34,339**
TOTAL Tons (Est.)* **	**21,358**	**2,902**

Notes:
*NYC Parks operational wood debris collection site
**estimate based on debris measurement at the site, not incoming trucks
***1 cubic yard wood debris = .0845 tons (National Recycling Coalition Measurement Standards and Reporting Guidelines; EPA; FEECO and CIWMB 2006)

Long Term Effects of Inundation

- 14% of all street trees (almost 50,000 trees)
- London plane trees most affected

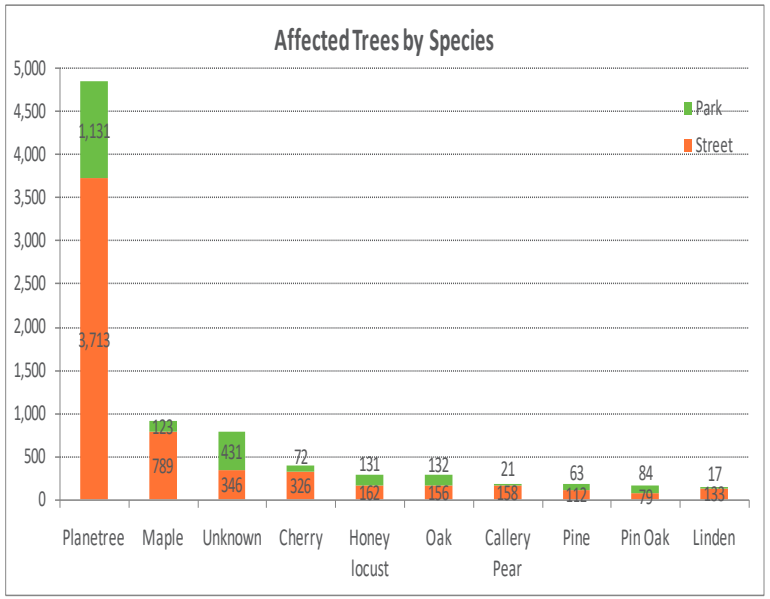
The New York Times

Bare Trees Are a Lingering Sign of Hurricane Sandy's High Toll

Todd Heisler/The New York Times

A branch on the Lower East Side should have many more leaves at this time of year.

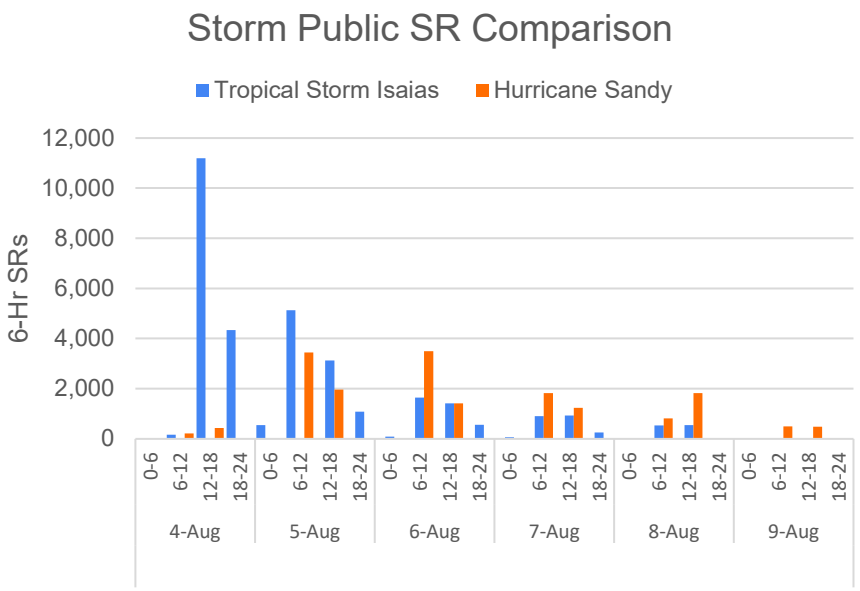
By KIA GREGORY
Published: August 18, 2013

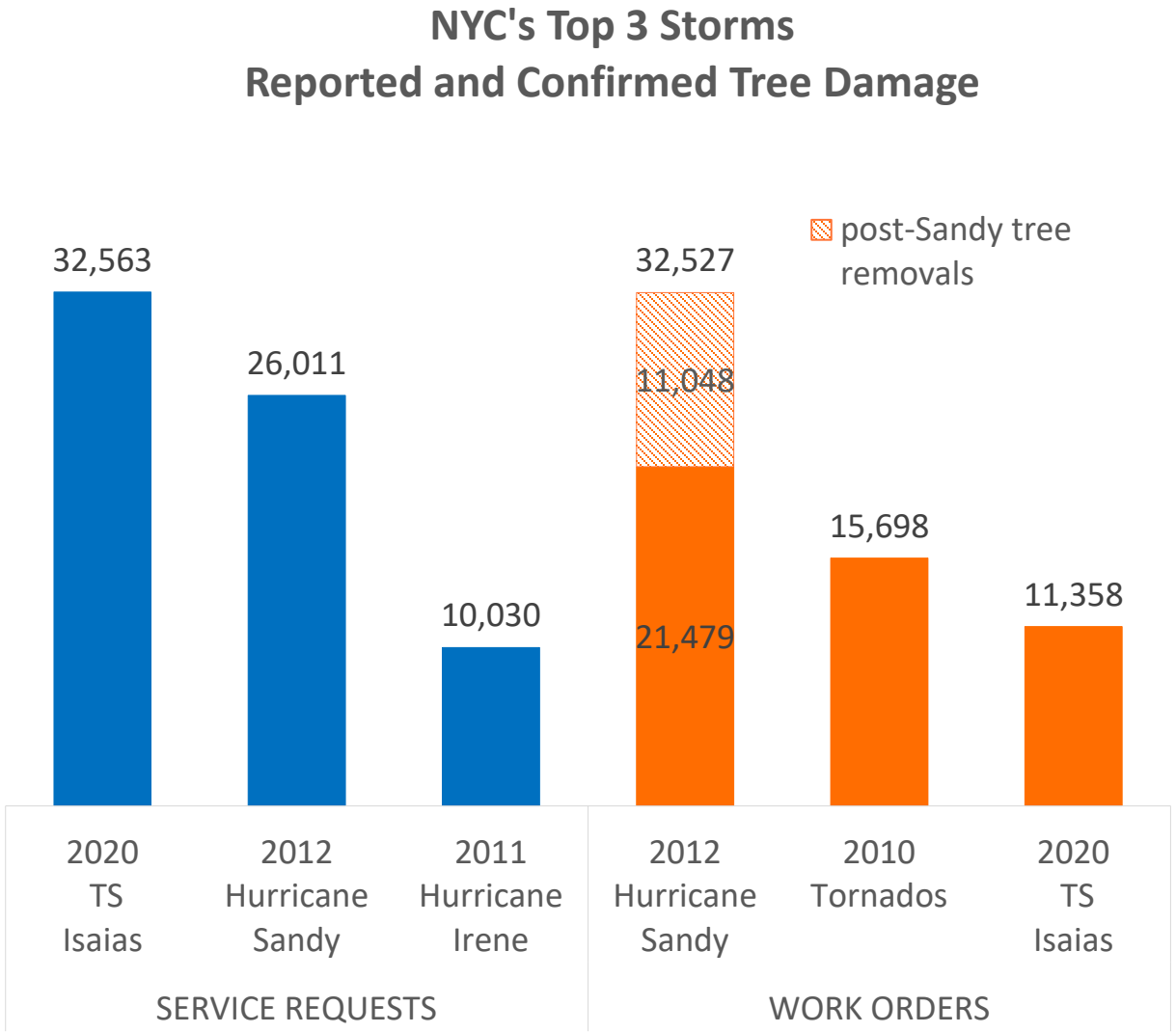


Salt Damaged London Planetrees

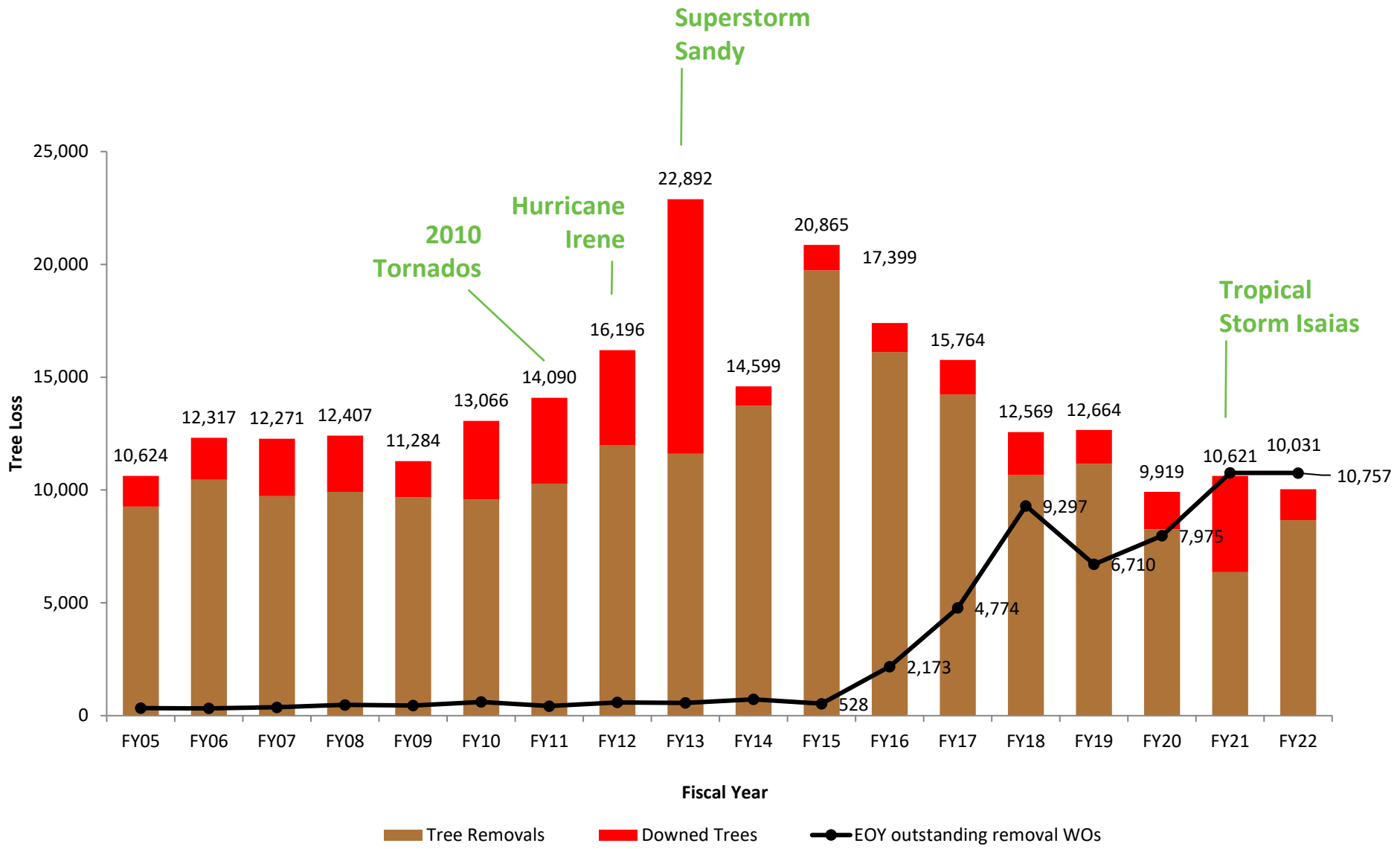
NYC's Top 3 in 30 (1990 – 2020)

- Post storm damage – flooding vs. wind
- Reports vs. confirmed



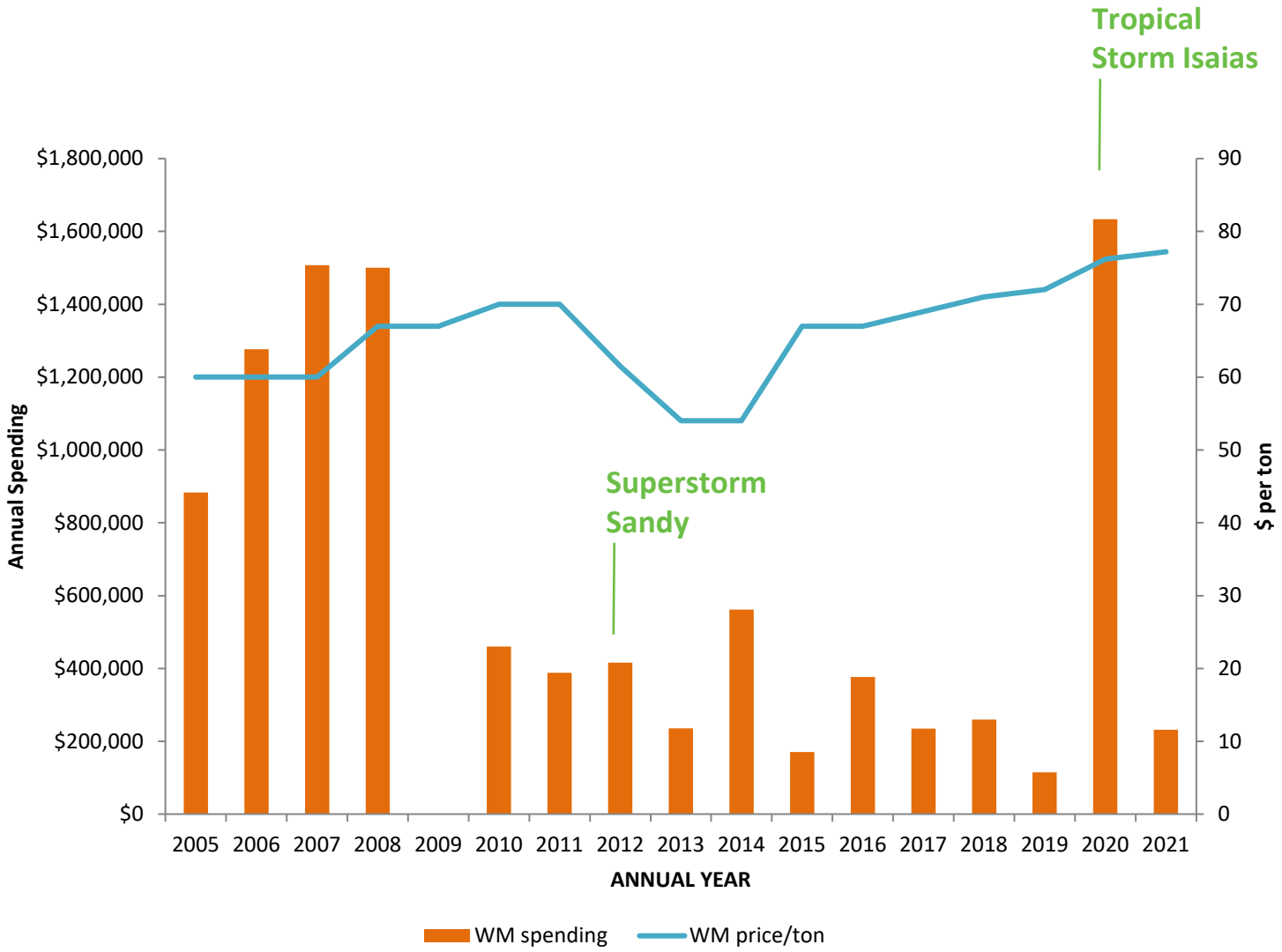


NYC Parks Tree Loss FY05 – FY22



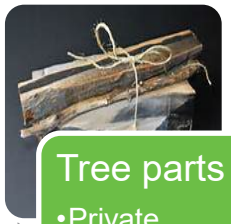
NYC Parks

Wood Debris Contract Spending (Waste Management)



NYC Parks

Wood Debris Reduction & Collection Potential – Post ALB



Tree parts
- Private property
- ALB q zone

CHIPPER

CHIPS
- dog runs
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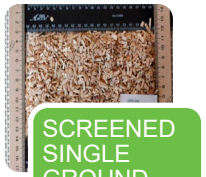
TUB GRINDER



SCREENED SINGLE GROUND WOOD
- BIOFUEL

SCREENER

SINGLE GROUND WOOD
- PATHS/TRAILS
- COMPOST BROWNS?

TUB GRINDER

DOUBLE GROUND WOOD
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- COMPOST BROWNS?

CHIPPER

Trees
- street
- park

LOADER/CONTAINER TRANSPORT

WOODY DEBRIS
- BRUSH
- LIMBS
- STEMS
- STUMPS

TUB GRINDER

LOGS
- < 4 ft. wide

SPLITTER

FIREWOOD

LOGS
- > 12 in. wide
- > 4 ft. long

PORTABLE MILL

MILLED LUMBER
- FLOORING
- SIDING
- TRIM

NYC Urban Wood Reuse Pilot

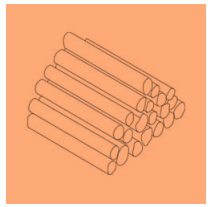
2019 - present

Parks

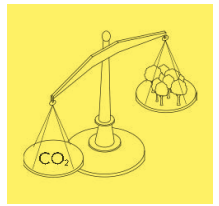
IN PARTNERSHIP WITH TRI LOX

Goals of Urban Wood Reuse System in NYC

- **Sustainability** – aligns with broad resiliency goals in NYC - especially decarbonization (reuse lowers the carbon footprint by storing carbon that would otherwise be emitted)
- **Cost and Waste Reduction** – lowers NYC Parks wood debris removal costs and reduces solid waste taken to landfills.
- **Support a Developing Market** –jump-start a wood reuse economy by supplying the raw material to begin primary and secondary processing of salvaged wood for a diverse array of end use products. Connects higher value products to higher value markets.
- **Workforce Development** – green jobs and/or workforce training.
- **Keeping it Local** – NYC site processing supports the local economy, reduces negative externalities of transporting the salvaged logs, and increases the likelihood for use of end products in NYC.
- **Storytelling** – help increase public awareness of the overall benefits of wood reuse.



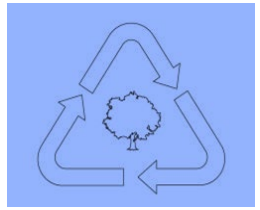
Jumpstart a local wood supply chain base on a circular model



Reduce NYC's carbon footprint

Create local green jobs

Produce locally-sourced, locally-manufactured wood



Increase the resilience of resiliency projects

Urban Wood Reuse Initiatives in NYC

Reports and Studies

- Cambium Carbon – opportunity analysis for NYC Parks wood waste recycling
- NYC Urban Forest Agenda – Action Item - Develop Conditions to Transform Wood Waste into a Sustainable Local Resource (Forest for All NYC)
- Study on Organic Resource Recovery Towards a Carbon Neutral NYC

Projects and Partnerships

- East Side Coastal Resiliency Project (DDC, NYC Parks, Tri-Lox)
- Madison Square Park (MSP, Tri-Lox, Rocking the Boat); Green-Wood Cemetery; Trust for Governors Island
- Local Green Jobs - Brooklyn Woods (Brooklyn Workforce Innovations)
- Local Manufacturing (Stickbulb)
- National Retail (Room & Board)
- Compost (NYC Compost Project, Environmental Education Center at the Greenpoint Library)

NYC Parks Wood Debris Operational Pathways

NYC Parks Wood Debris Pathways

Entity	Operator	Activity	Source Materials	Volume	Current Processing	Reuse
NYC Parks	In-House	tree removal	logs, chips		Chipping and logs sent to landfill	chips (?%) reused on parkland landscapes
NYC Parks	In-House	storm damage	logs, chips, stumps			
NYC Parks	In-House	pruning	chips			
NYC Parks	Contractor	tree and stump removal	logs, chips, stumps		unknown	
NYC Parks	Contractor	storm damage	logs, chips, stumps		landfill (City pays*)	
NYC Parks	Contractor	block pruning	chips		unknown	
DOT Arterials	In-House	pruning	chips		unknown	
DDC	Contracor	storm response	chips		unknown	

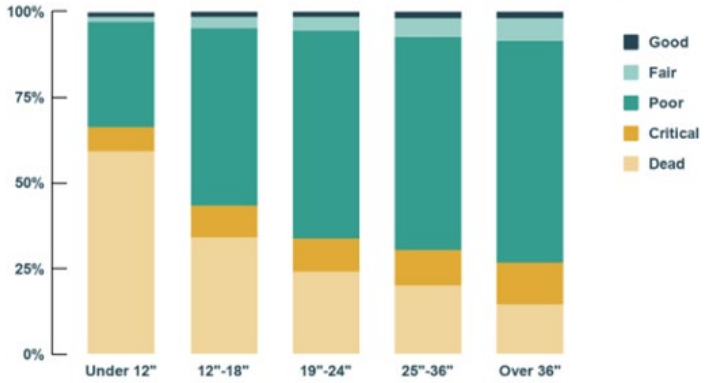
Pathways shaded in orange represent opportunity for wood waste capture

*in large storm response to faciliate speed of clean up. Contract also provides for contractor to handle cost.

NYC Parks

Cambium Carbon Report

- Analyzed NYC Parks tree removals (2015-2020)
- Performed 27 stakeholder interviews
- 5% of wood waste is high quality; some lower grade for milling; most mid to low grade end use such as pallets, firewood, chips
- Identified potential contract cost savings, reduced transportation costs and increased efficiencies, active revenue generation, and improved resource efficiency



NYC Parks tree removals by condition and size (2015-2020)

Wood Reuse Applications

Value Category	Value	Source Material	Primary Processing	Secondary Processing	Product Applications
High	$1,200+/ton	Tree logs (8-, 10-, 12-foot)	milling dimensional lumber and slabs, drying	fabrication	exterior and interior built ins, furniture, home décor
Mid-range	$150/ton	Wood processing byproducts (sawdust, shavings, etc.)	chipping, pressing	n/a	pellets (biofuel); compost;
Mid-range	$80/ton	tree logs, branches, stumps	splitting, drying	n/a	firewood
Low	$30/ton	tree logs, branches, stumps	chipping, grinding	pyrolysis (for biochar)	chips, mulch, compost, biochar

Cambium Carbon Report Recommendations

1. **Centralize wood waste collection, management, and infrastructure.** City wood waste from in-house and contracted forestry activities is fragmented in many waste streams. Centralizing can reduce disposal costs and maximize return on investment in collection and processing infrastructure.

2. **Establish a wood waste sort and reclamation yard to serve Queens and Brooklyn**. This will capture the most material and reduce the number of entities involved and transport costs. Sort yard could be run by a City agency, concession, or through private incentives.

3. **Use policy levers to foster wood utilization**. Develop contract specifications and city purchasing agreements that prioritize salvaged wood to support a robust supply chain.

4. **Engage the private sector**. Local wood processors and buyers noted a lack of communication channels between the city and the private sector. Increasing visibility of opportunities to participate in wood salvage will be critical to engaging the market and enabling program success.

The NYC Urban Forest Agenda

*Urban wood reuse is one of 12 priorities in this plan, released by **Forest for All NYC** in June 2021, to enhance the urban forest and ensure that trees and their benefits are equitably accessible for all New Yorkers.*

Action Item 3.3

Develop Conditions to Transform Wood Waste into a Sustainable Local Resource

- Identify and implement at least 2 wood waste reuse pilot projects
- Assess supply chain for fresh-cut wood waste, including challenges and market barriers
- Leverage the above to recommend policies, help establish infrastructure to support wood reuse, support innovation, transform waste into a local resource, and catalyze local green careers

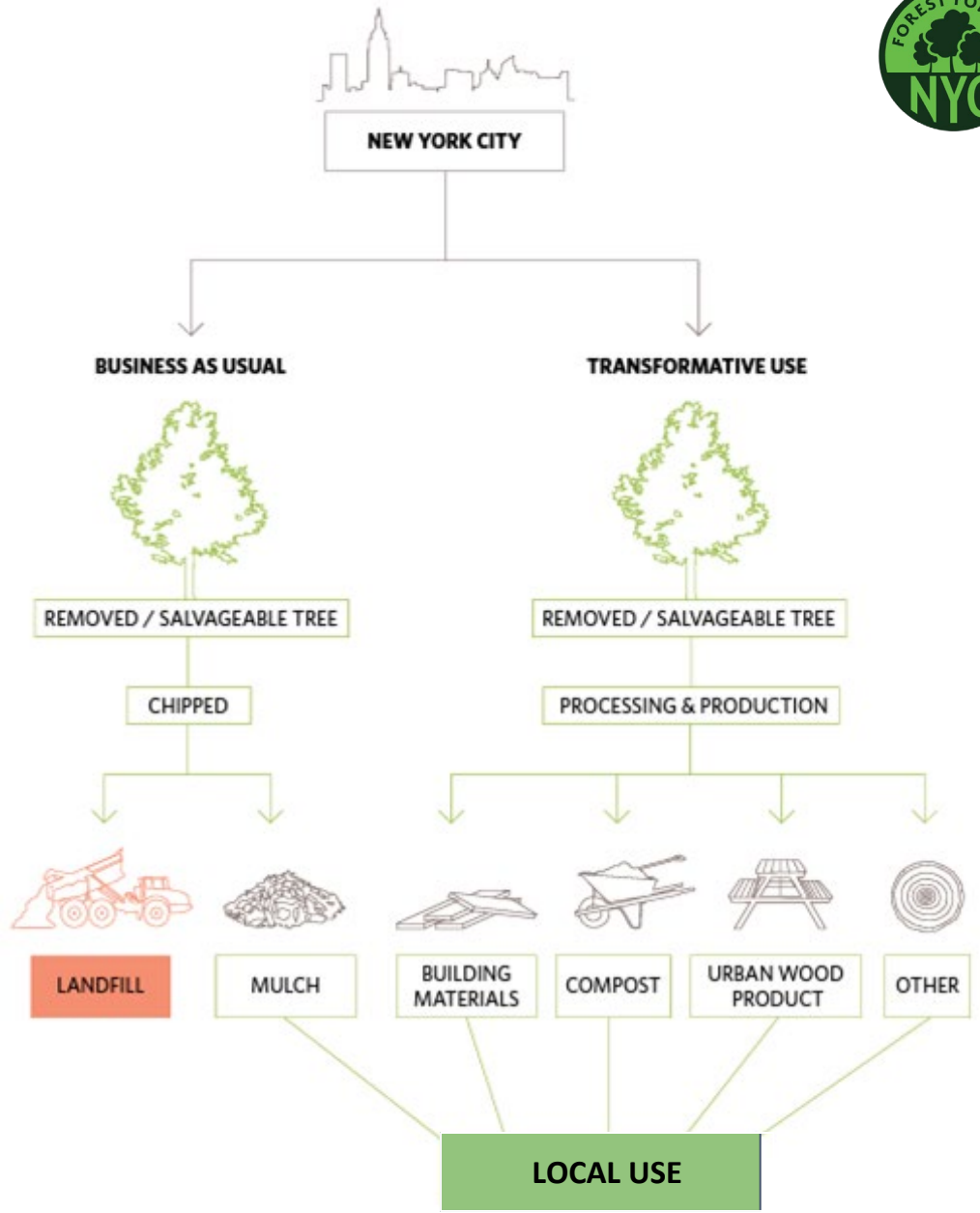
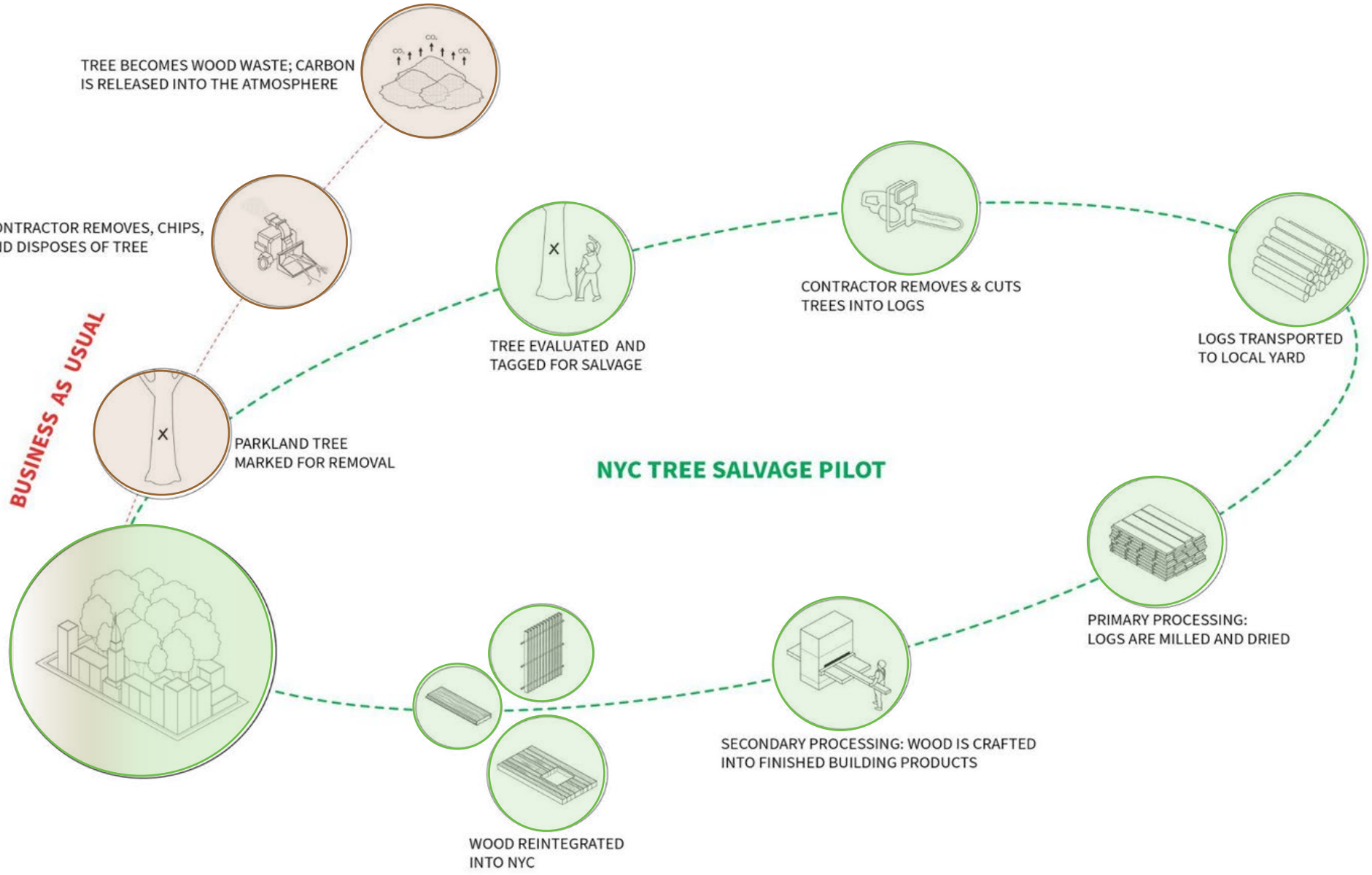


Image from the NYC Urban Forest Agenda (p. 76)

Building a Circular Wood Reuse System



TRI LOX

Steps to Wood Reuse Salvage Pilot

- **Planning and Design** – scoping and specifications, survey method development, market research and outreach, fundraising
- **Tree Survey** – tree assessment for salvage and data collection (including photos)
- **Tree Removal** – log extraction for salvage, including staging and transport for primary processing
- **Primary Log Processing** – milling and drying
- **Secondary Log Processing** - product development
- **Marketing** – identifying consumers for recycled goods
- **End Use** – new life for salvaged log products

NYC Urban Wood Reuse Pilot Deliverables to Date

Procurement

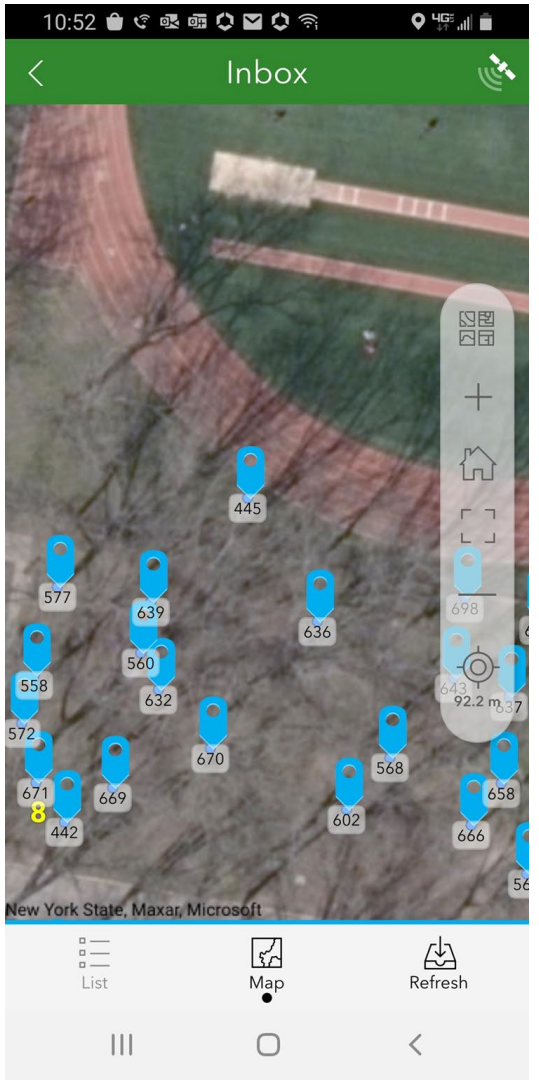
1. *Contract specification* – City capital bid item for tree removal for salvage vs. regular tree removal
2. *Procurement method* - Request For Expression of Interest from City agency for vendor to take salvaged logs and process for reuse

Tree Assessment

3. *Methodology* – developed methods and materials to identify salvage potential in standing trees
4. *Training* – ~ 10 NYC Parks foresters trained on standing tree salvage assessment methodology and collected data on 300 trees

Technology

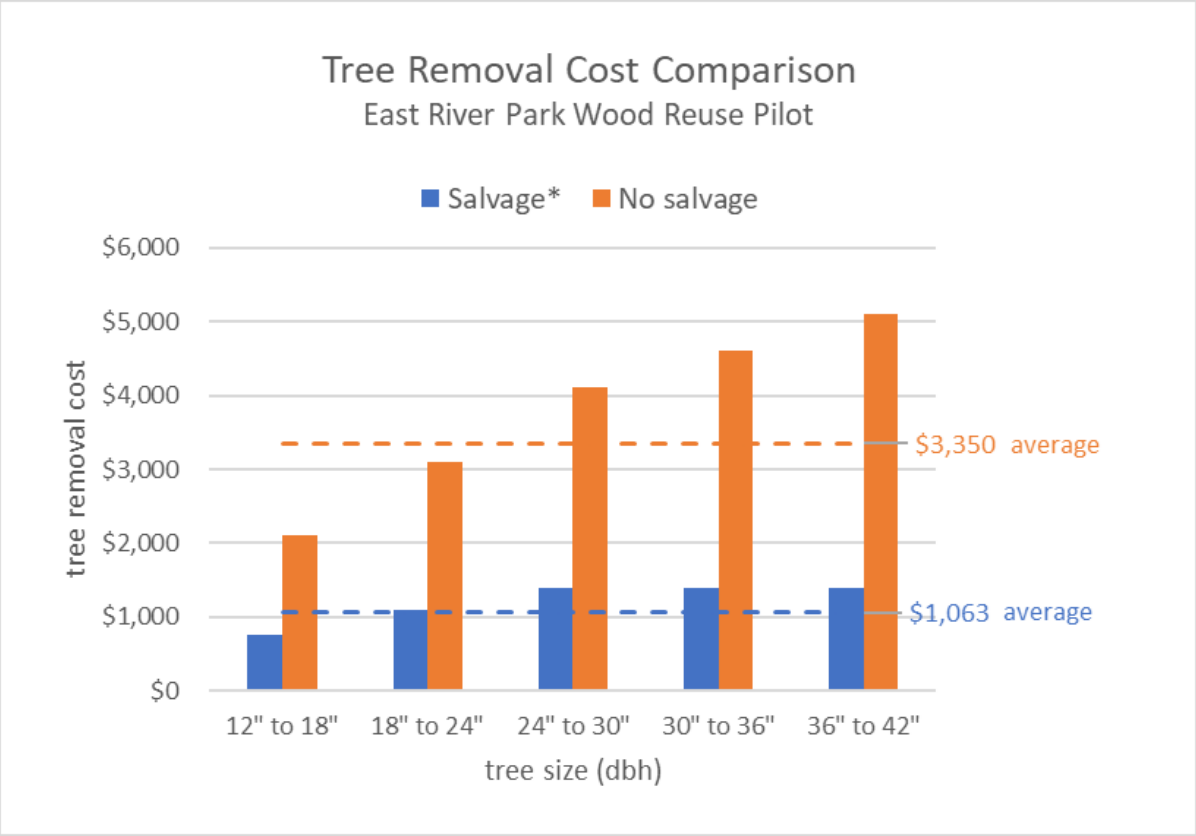
5. *Developed mobile+desktop application* – captures survey data including salvage prescription, tree location and photographs and guides tree removal including assigning inventory record numbers for tree removal



Cost Benefits of Tree Salvage

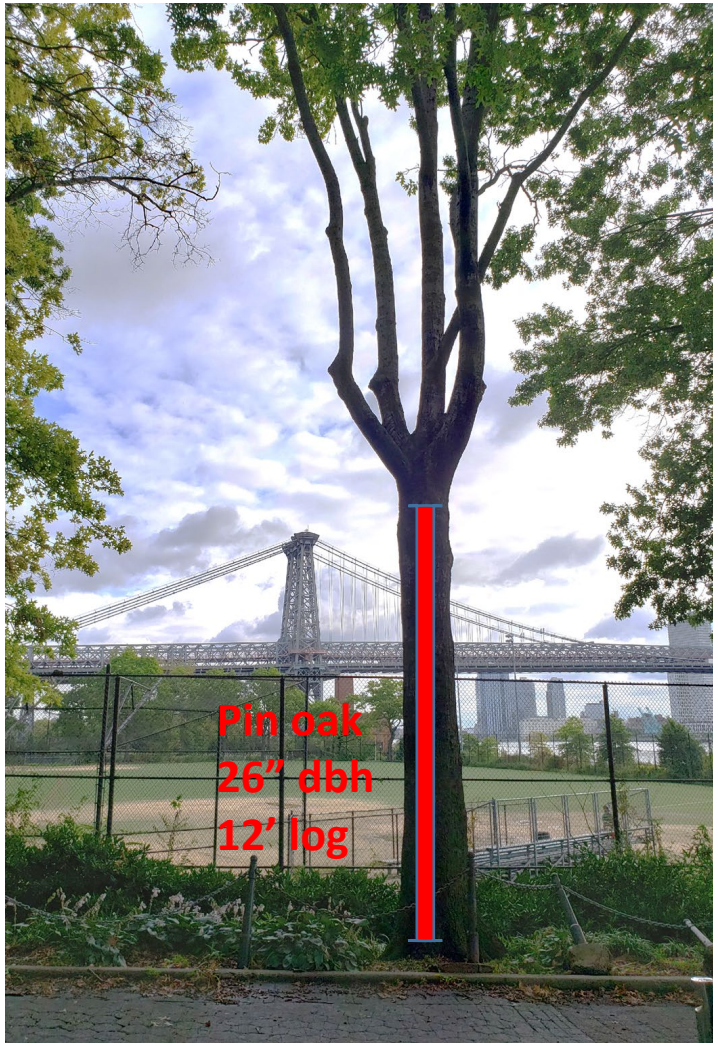
Tree removal cost comparison

1. Tree removal with salvage - cut tree according to number of logs to be salvaged. Dispose of all woody debris other than salvaged logs. Transport salvaged logs to site in NYC.
2. Tree removal without salvage - remove and dispose of entire tree.
3. ESCR contract average prices per tree:
   - **$1,063 removal with salvage**
   - **$3,350 remove without salvage**
   - $2,288 savings to salvage
   - **68% savings**



NYC Urban Wood Reuse Pilot Timeline

- 2019 – tree salvage specification
- 2021 (spring) –
  - Request for Expression of Interest (RFEI) seeking tree salvage vendor
  - data collection tool development
- 2021 (summer) – forester training and tree survey
- 2021 (winter) – tree removals
- 2022 (winter) – log transport
- 2022 (spring/summer) - primary wood processing (milling and drying) and on-site jobs training sessions
- 2023 and beyond (fall/winter) - manufacturing and fabrication at Tri-Lox workshop to transform the material into finished products



Log Delivery & Processing at Bayside in Greenpoint

Log Delivery & Processing at Bayside in Greenpoint

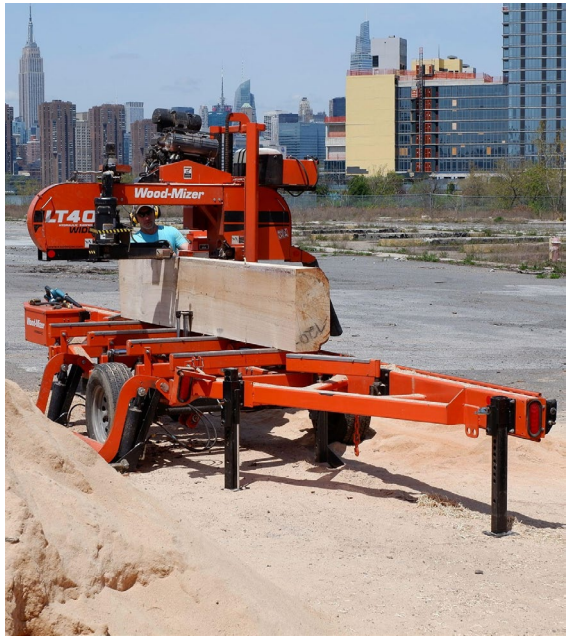
Milling Techniques and Challenges

Tri-Lox's approach – full supply chain visibility:

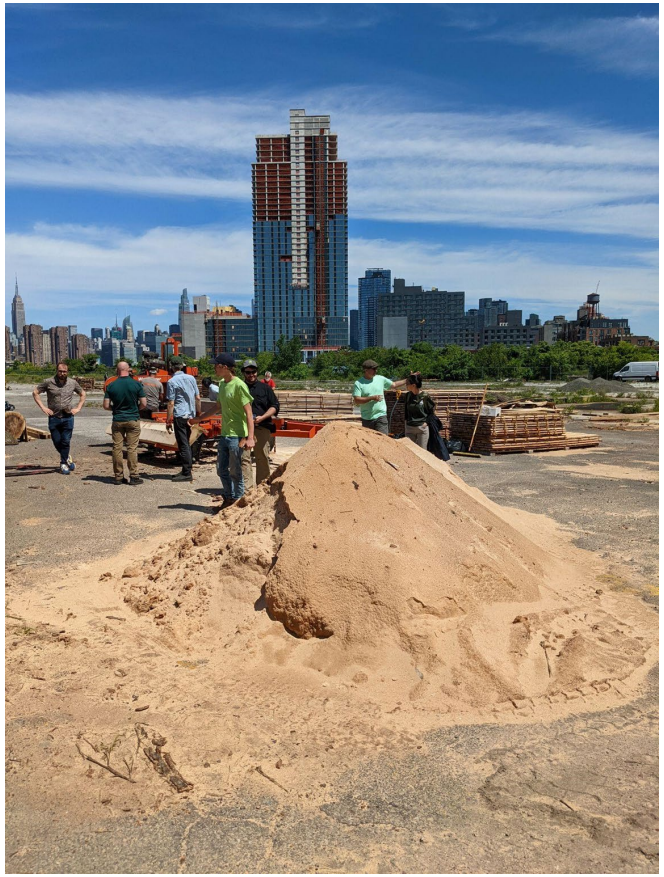
- identify the best applications for use of the wood
- maximize use of the wood when milling

Milling challenges:

- City trees grow in highly trafficked landscaped
- Wood can contain nails, pieces of fencing, and other foreign objects



Hyper Local and Zero Waste



Wood chips/shavings/dust produced from the milling process will be composted through both the NYC Compost Project at Big Reuse and community groups in our own Greenpoint neighborhood.

Green Jobs Training

Tri-Lox has worked with ***Brooklyn Woods***, a division of ***Brooklyn Workforce Innovations***, to build a primary processing curriculum into their woodworking training program.

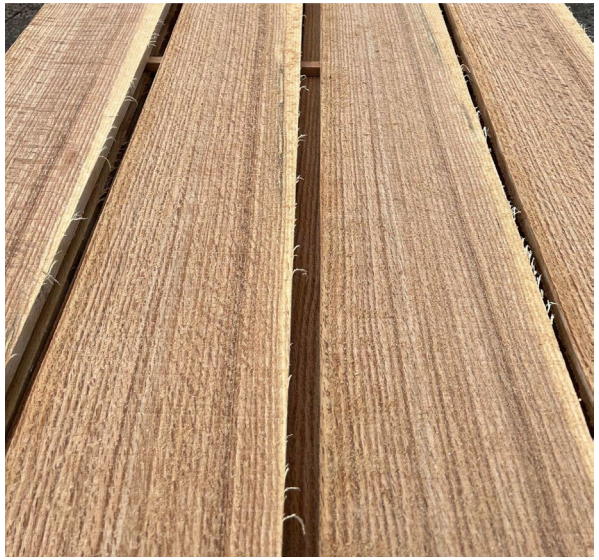
Woodworking Start to Finish
This session provides trainees with firsthand experience of the process that turns logs into lumber.

Learning Objectives

- Understanding where materials come from
- Working with a sawmill
- The drying process
- Inventory tracking

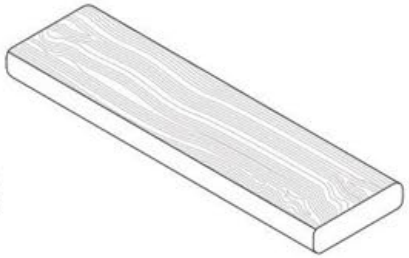
BROOKLYN WOODS

NYC Wood Product Development



Examples of Product Development for Public Use

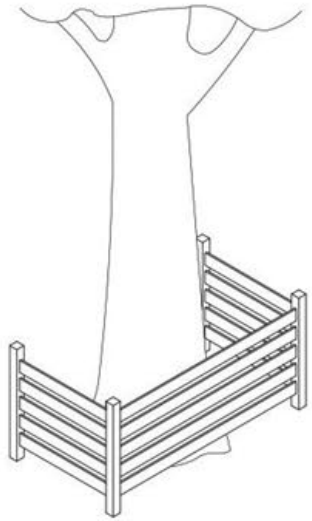
Flooring, Cladding, Siding



Linear Decking

Deck Tiles

Furniture Components



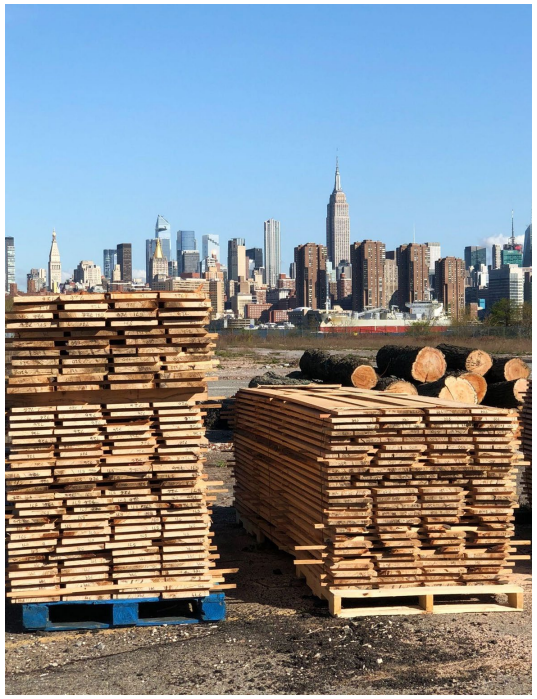
Tree Guards

Technology and Storytelling

East River Park
Tree 505 location
Survey 1,2,3 application

Tree 505
25-inch dbh pin oak
surveyed 8/19/2021

Log 505-1-10
1 salvage log; 10 feet in length
salvaged 12/21/2021



Lumber at Bayside
quarter sawn pin oaks
milled 5/5/2022

Building a Larger System: Tri-Lox's Ongoing Reuse Projects

The New York Times

Maya Lin's Dismantled 'Ghost Forest' to Be Reborn as Boats

Teenagers are making boats using the wood from her grove installation at Madison Square Park, and the artist is happy that the work is seeing a new life.

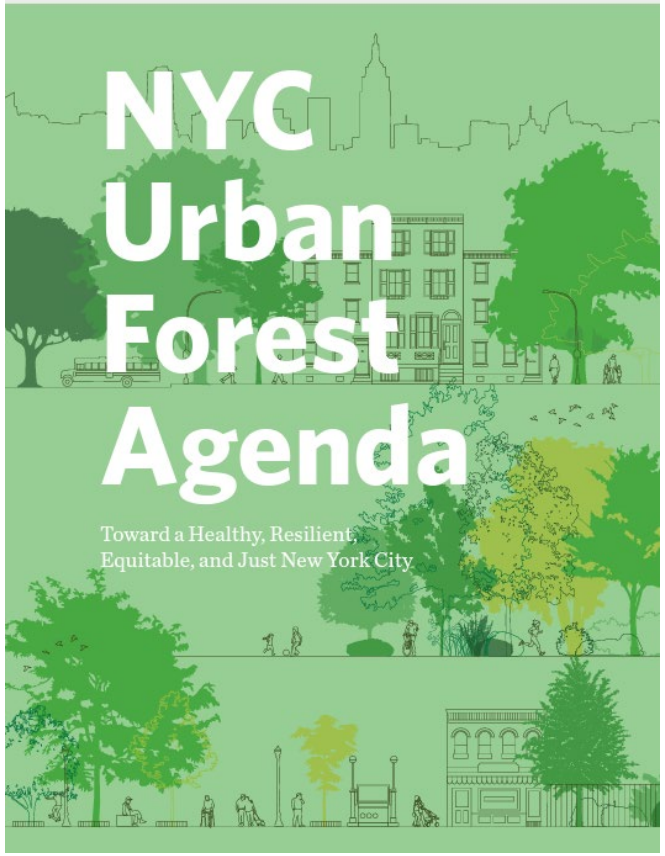
Deborah Simmons, 17, an apprentice, at Rocking the Boat in the South Bronx. "When I'm working on boats, I'm in my happy place," she said. Michelle V. Agins/The New York Times

Salvaging cedar trees from Maya Lin's Ghost Forest in Madison Square Park

Evaluating, milling, and drying logs at Green-Wood Cemetery

Urban Wood Reuse - What's Next?

- **Urban Forest Agenda** - expanding a NYC wood reuse network
  - develop incentives to spur wood reuse economy (legislative, contractual, operational, other)
  - incorporate jobs training and professional development
  - develop uniform standards and terminology (fresh cut-reuse/salvage/reclaim/repurpose)
- **NYC Parks**
  - operationalize tree assessment for salvage, including establishing a salvage grading system (including data capture)
  - establish wood aggregation site for future projects and partnerships
- **Tri-Lox**
  - continue product market development, research, and reporting on the pilot
  - build out permanent primary processing infrastructure that contributes to green job development and a consistent system of urban tree salvage



NYC Parks

FOREST FOR ALL NYC

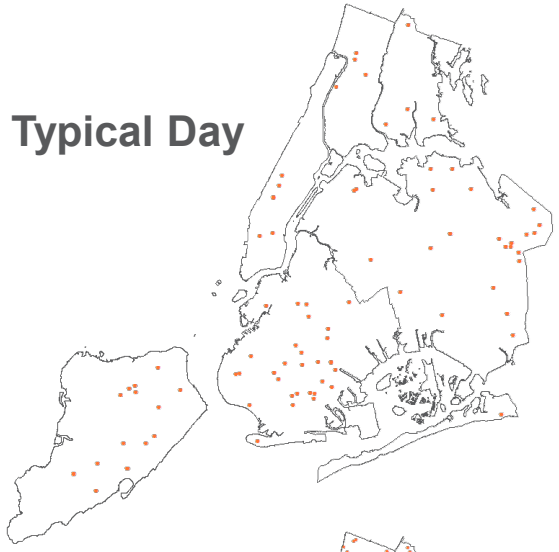
TRI LOX

Appendix

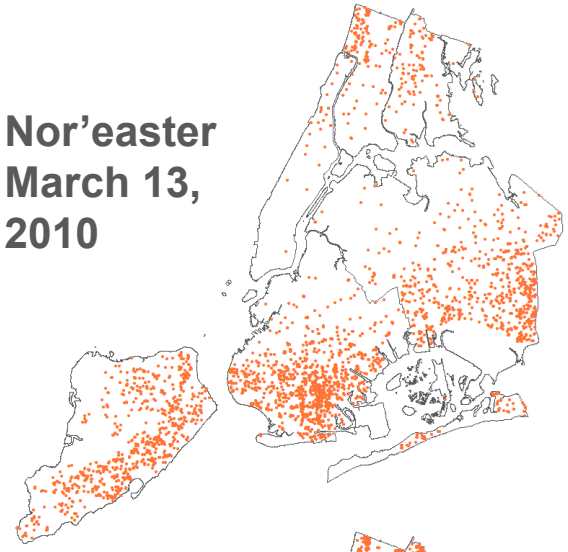
December 17, 2021

Tree Emergencies

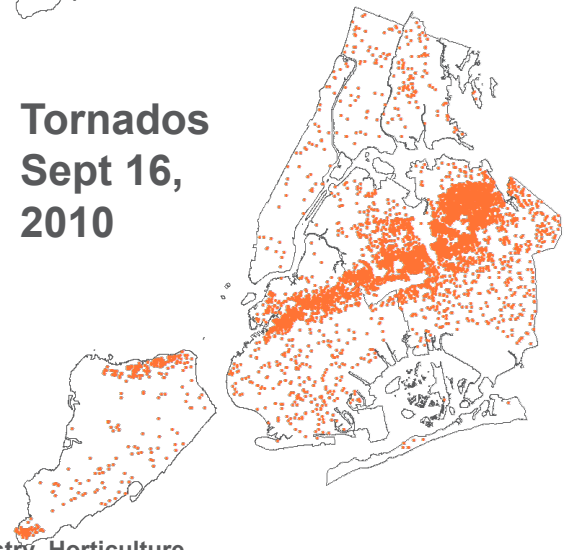
Typical Day



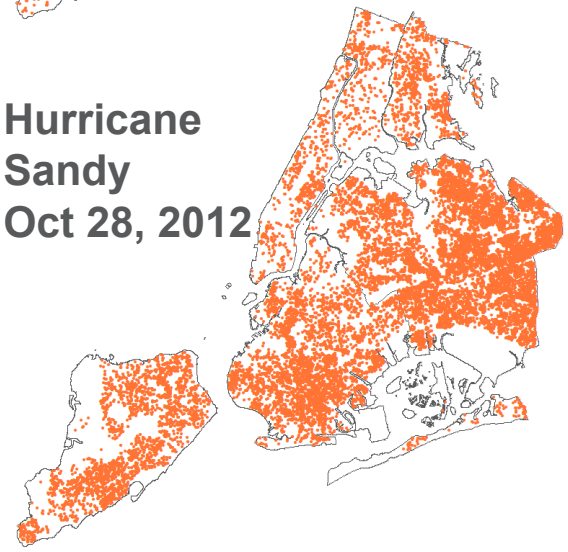
Nor'easter March 13, 2010



Tornados Sept 16, 2010



Hurricane Sandy Oct 28, 2012



GIS at Forestry, Horticulture & Natural Resources

Data Source: 311 Requests, NYC Parks Forestry Management System

NYC Parks

PARKS ORGANICS

Current Practices

- **Woody debris**
  a) In-House:
     a) Chipped at site. Logs and chips and stockpiled at central borough location
     b) Some chips used in parks (unquantified), remaining chips and logs disposed of through private contract
     c) Queens: Cunningham Park tub grinder
     d) Staten Island: taken to DSNY Freshkills compost facility
  b) Indirect: contractors are responsible for woody debris disposal
- **Leaf litter**
  a) Shredded using mowing equipment and left in place
  b) Put in large containers supplied and managed by DSNY
  c) Composted on site/at consolidated borough location
  d) Bagged in brown paper bags, taken to borough drop-off site
  e) Left in place in natural areas
  f) Bagged in black plastic bags
- **Lawn maintenance** (grass clippings):
  a) Grass clippings double-grinded and left in place
- **Horticultural herbaceous debris**
  a) General horticultural debris
     a) Small scale composting
     b) Place in black bags, intermingled with other Parks waste
  b) Horticultural debris in natural areas
     a) Left in place
     b) Bagged and removed (if nuisance/invasive species)

NYC Parks

PARKS ORGANICS

Wood Debris Data Sources and Gaps

- **Existing** and potential data sources:

1. **ForMS**
   - In-house and contracted **tree removals** from FY2016 to present (size, location and entity)
   - In-house trees **pruned** from FY2016 to present
   - Contract **block pruning** from FY19 to present (location and entity)
   - In-house and contracted **trees down, hanging limbs,** and **limbs down**

2. **Waste Management wood disposal receipts**
   - **Tons** of woody debris taken by NYC Parks to Waste Management FY14 to present (by borough and date)
   - Includes some portion of haul and dispose costs from TS Isaias response in FY20 – but likely not all – need data from separate NYC Parks contract
   - Does not include Staten Island Waste Management wood waste disposal

3. **Forestry contractor generated wood waste**
   - No data currently from contractors as disposal is in the bid price (but this is the debris from contracted activities, above)

4. **Private tree work permits**
   - **Tree removals** and **pruning** (tree size and location data from Permits and Plan Review SharePoint files)

5. **Parks Capital**
   - **Tree removals** on Parks Capital projects
   - **Tree pruning** on Parks Capital projects

6. **Other Agency tree work permits**
   - **Tree removals** and **pruning** (size and location data from Permits and Plan Review SharePoint?)

NYC Parks

ESCR Salvage Logs – Phase 1

- 199 trees (mostly oak and planetree species)
- 8, 10, or 12-foot logs
- Transported to NYC Parks site on a 20-foot-long truck with grapple hook for off-loading
- 20 – 25 estimated truck trips from East River Park to NYC Parks site
- Milling with a portable mill (pictured at right) to begin in spring 2022
- 6-8 week milling process, with stacked lumber piles to air dry before removal from site
- NYC Parks site use timeframe: 12 months from log arrival