


PLANT CONSERVATION IN THE URBAN CONTEXT



Greenbelt
Native Plant Center

City of New York  Parks & Recreation



Is Anything Really “Natural” in New York City?

•Within the 5 Boroughs of New York:

- More than 1,000 naturally occurring native plant species
- Diverse plant communities (23 types):


- Shallow emergent marsh
- Deep emergent marsh
- Low salt marsh
- High salt marsh
- Maritime beach
- Maritime dune
- Maritime grassland
- Serpentine barrens
- Successional old field
- Oak opening
- Shrub swamp
- Maritime shrubland
- Successional shrubland
- Floodplain forest
- Bottomland Forest
- Red maple- hardwood swamp
- Mixed oak-hickory forest
- Rich mesophytic forest
- Successional mixed hardwoods
- Oak-tulip tree forest
- Chestnut oak forest (mixed oak forest)
- Maritime oak forest
- Successional Maritime oak forest



•Although remnant natural areas in NYC are highly **fragmented, biologically isolated**, and under tremendous **pressures from the environment** they still provide vital **ecological services** for the city.

•In this context, its important that they remain **healthy**. (Healthy = **Sustainable**)

•As more and more of our natural world becomes fragmented, **lessons learned** about sustainable ecosystems in places like NYC are providing significant insights.



**We are learning how a greener city
might serve to reconnect
ecosystems in unexpected ways
(More on this at the end)**

- **PlaNYC/Million Trees NYC**
 - **Greenstreets**
 - **Backyards**
- **Examples: Pollinators, Hydrologic Services**



What is Biodiversity?

- Biological diversity, or "biodiversity," refers to the variety of all life on earth, and the complex relationships among living things, and between living things and their environment.
- Biodiversity includes **genetic variability**, species diversity, and variability in communities, ecosystems and landscapes

Why is Biodiversity important?

Healthy, biodiverse ecosystems provide **essential services:**

- **Generation and renewal of soils**
- Wetlands **filter toxins** and provide **clean water**
- Estuaries act as **seafood nurseries**.
- Forests **supply fresh water and oxygen, control erosion, and remove and sequester carbon** from the atmosphere, helping reduce the effects of global warming.
- **Protection from floods and droughts.**

Why is Biodiversity important?

- Diverse ecosystems are **reservoirs of genetic variation and adaptive potential**
- Diverse ecosystems are essential for the adaptation and survival of our biotic environment under **changing global conditions.**
- As biodiversity increases in an ecosystem, so too does the **sustainability** of the ecosystem.



Local Plant Populations are Genetically
Encoded with **Local Adaptations**

- Their loss has adverse consequences for the health and biodiversity of local ecosystems

Populations Locally adapted to:

- Climatic conditions
- Soil conditions
- Other environmental conditions



Local plants have co-evolved with:

- Pollinator species
- Seed disperser species
- Predators and Diseases
- Other plant species



- Pollinator species
 - Over 225 species of native bees in NYC alone
 - Many have specific or a few host flowers
 - Most are seasonal, dependant on flowering times of hosts



- Pollinator species

- Many caterpillar and adult butterflies are host specific
- Highly specific chemical, tactile cues for laying eggs
- Most are seasonal, dependant on flowering times of hosts





Seeds from **Non-local** Populations may
be Genetically Novel and/or
Maladapted to Local Environment

This usually is due to:

- Adaptations to local environmental conditions **at seed source**, which **differ from planting site**.
- **Limited seed collection** in making up bulk seed mix
- Other genetic factors



When these non-local ecotypes are used in restoration projects they can lead to **large scale failures** of plantings at planting sites



Negative Genetic Impacts of Using **Non-Local** Plant Materials

- On **existing populations on site**
- On **new plantings on site** (over several to many generations)
- On **existing populations off-site** (but within distance to exchange genetic material)




Plants from **Local** Seed Sources:

- Increase long- and short-term **sustainability** of project sites; **most cost effective** in long-term
- **Fully integrate** with local ecosystems
- **Avoid negative impacts** to native plants on and off-site

What is The Greenbelt Native Plant Center?



- 
- Owned & operated by the City of New York, Department of Parks & Recreation
 - (Initially jointly-funded with the Greenbelt Conservancy of Staten Island)
 - Located on Staten Island, adjacent to Fresh Kills Park
 - Purchased in 1992 as part of consent agreement between NYSDEC and New York City.



Approximately 13 acres

- 20,000 sq. ft. of greenhouse production space
- 4 acres of irrigated container nursery yard
 - Also Fresh Kills Park/ North Park
- 5 acres of bulk seed operations
 - Also Decker Farm
 - Also Fresh Kills Park/ North Park

- 
- Approximately 300,000 plants and 250 to 350 species in production at any time; all from seed of local populations:

- Trees, shrubs, vines (1 to 5 year production cycle)
- Forbs (wildflowers) (3 to 12 month production cycle)
- Grasses and sedges (3 to 12 month production cycle)



Who uses our plants?

- **Uses**

- Upland forest, wet and dry meadow, freshwater wetland, coastal dune, salt marsh (coastal) wetland, etc.
- Urban restoration sites: brownfields, landfills
- Urban horticulture: Greenstreets, neighborhood parks



Who uses our plants?

- **Projects (over 3 million plants to-date)**

- **Department of Environmental Protection**

- Staten Island Bluebelt

- Penn-Fountain Landfills

- **Department of Parks and Recreation**

- Martins Field, Queens

- Conference House Park, Staten Island

- **NYS Department of Environmental Conservation**

- Bridge Creek Salt Marsh Restoration, Staten Island

- **US Army Corp of Engineers**

- Woodbridge, NJ Salt Marsh Restoration

Programs at the Greenbelt Native Plant Center



Seed Collection



-Wild-collected seed
-Collected for genetic diversity (To avoid founder effects, etc.)







Seed Collection

-Labeled for Collection Data

viburnum dentatum
8/3/06 Corner of Travis and Vic

Seed Collection

-Each Collection Accessioned Separately

Sorghastrum Nutans
Seaview Hospital
10-16-06 SAN# 5558



Seed After Ripening





Seed Processing





Seed Storage



REGIONAL ACTIVE SEED BANK







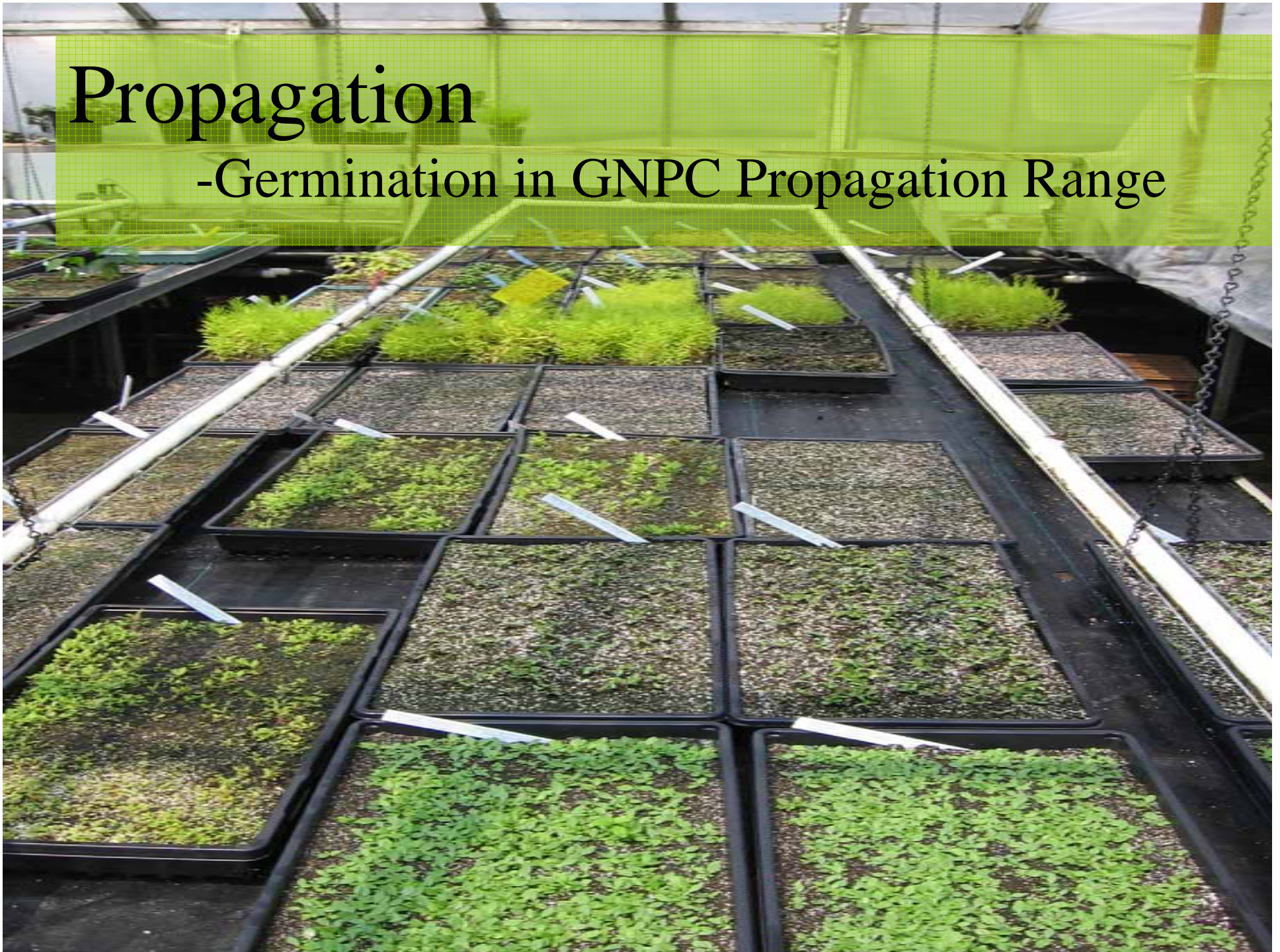
Propagation

- Pretreatment in climate controlled coolers
- Documentation of protocols



Propagation

-Germination in GNPC Propagation Range



Production

-Greenhouse operations







Production

-Nursery Yard Operations



IRRIGATED NURSERY YARD



- Most tree & shrub production in 1-gallon pot size
- Crops take 18 months- 3 years to mature

Bulk Seed Production



- Seed Mix Development
- Founder Seed Production (~25 spp. in 2009)
- Seed Banking of Wild Populations and of Founder Seed



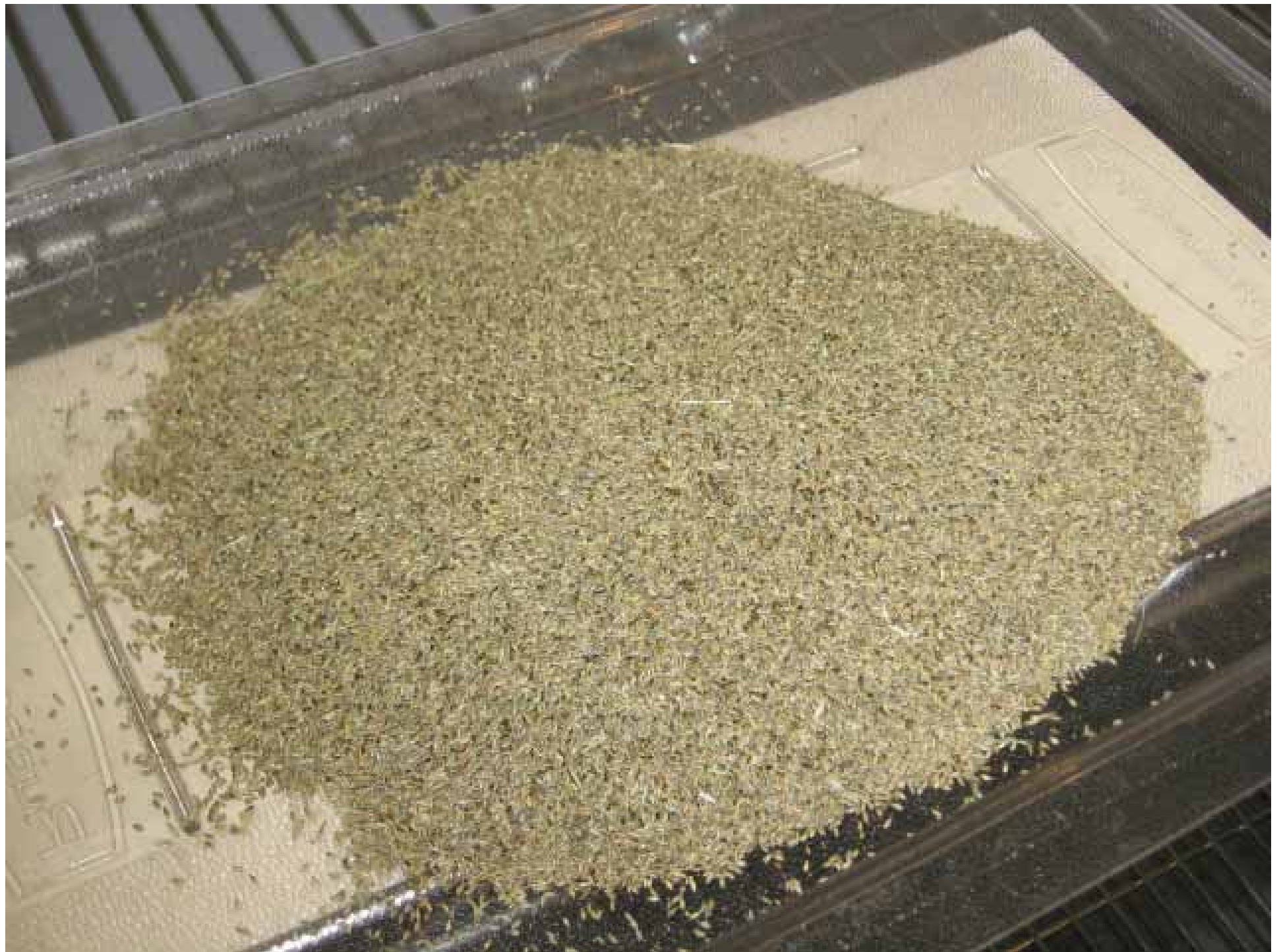












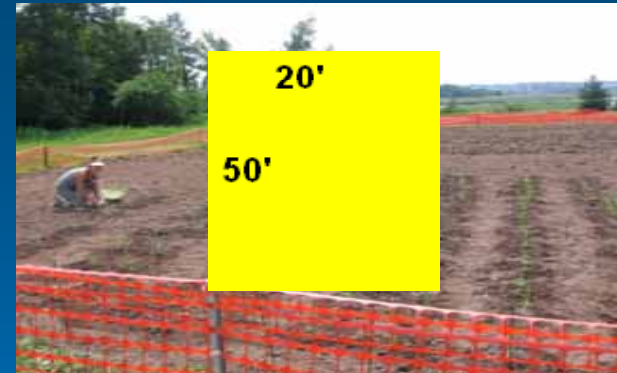
Seed Available for Cover Seeding at Project Sites



Overview of the Seed Increase Process

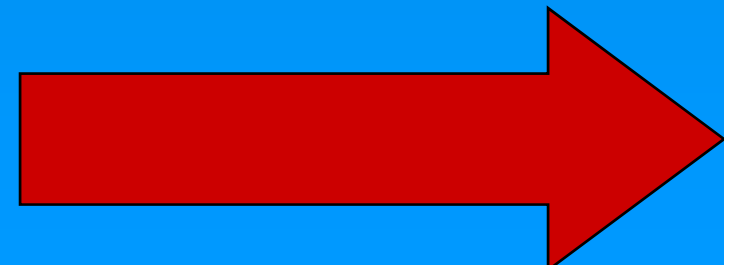
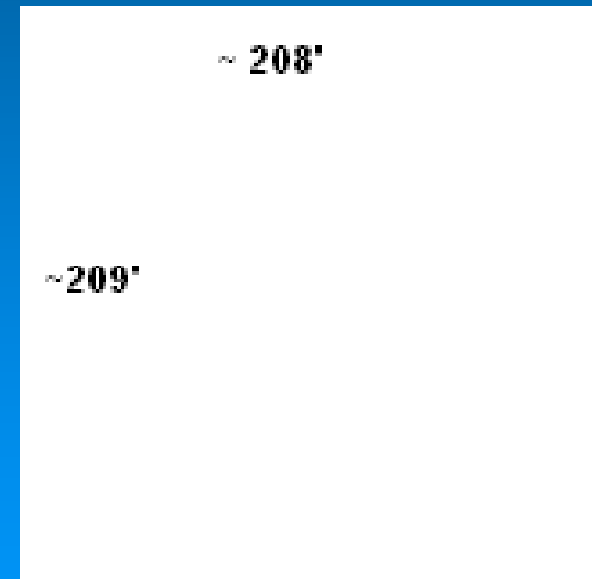
Founder Seed
Production

1,000 ft² per plot



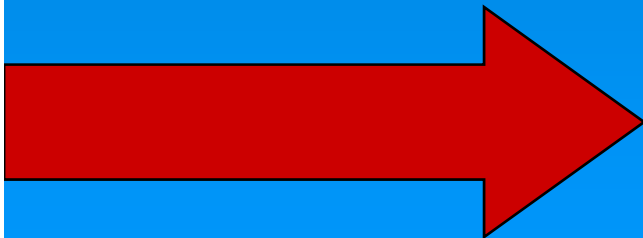
Seed Increase
Production

1 acre parcel

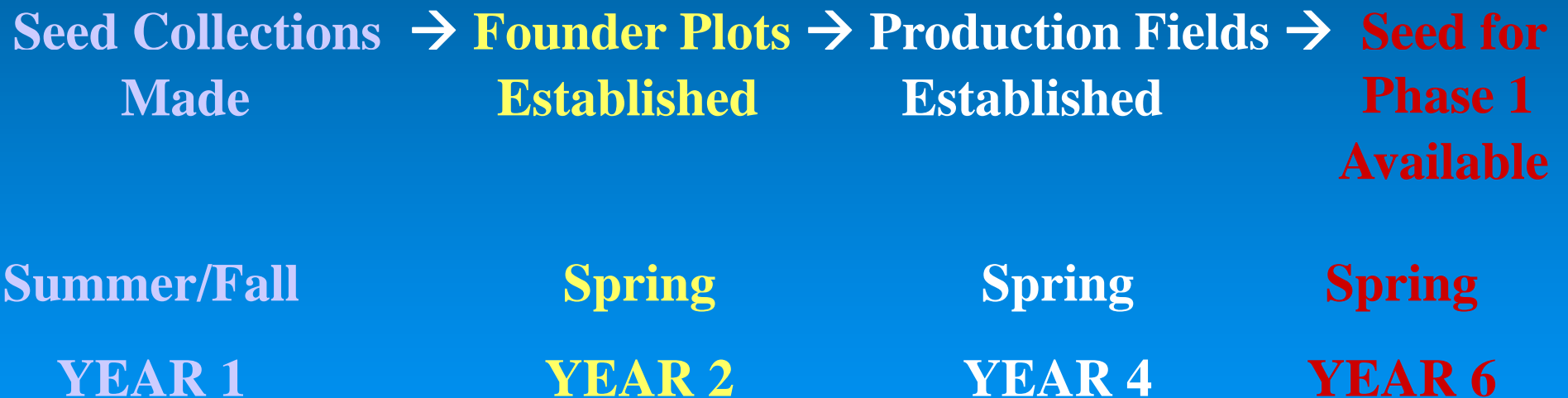


Seed Available for
Final Cover Seeding at
Fresh Kills Landfill

**Approx. 71
acres per year**



Seed Availability Time Line *(Hypothetical)*





north park

A PROJECT OF THE NEW YORK CITY DEPARTMENT OF PARKS & RECREATION

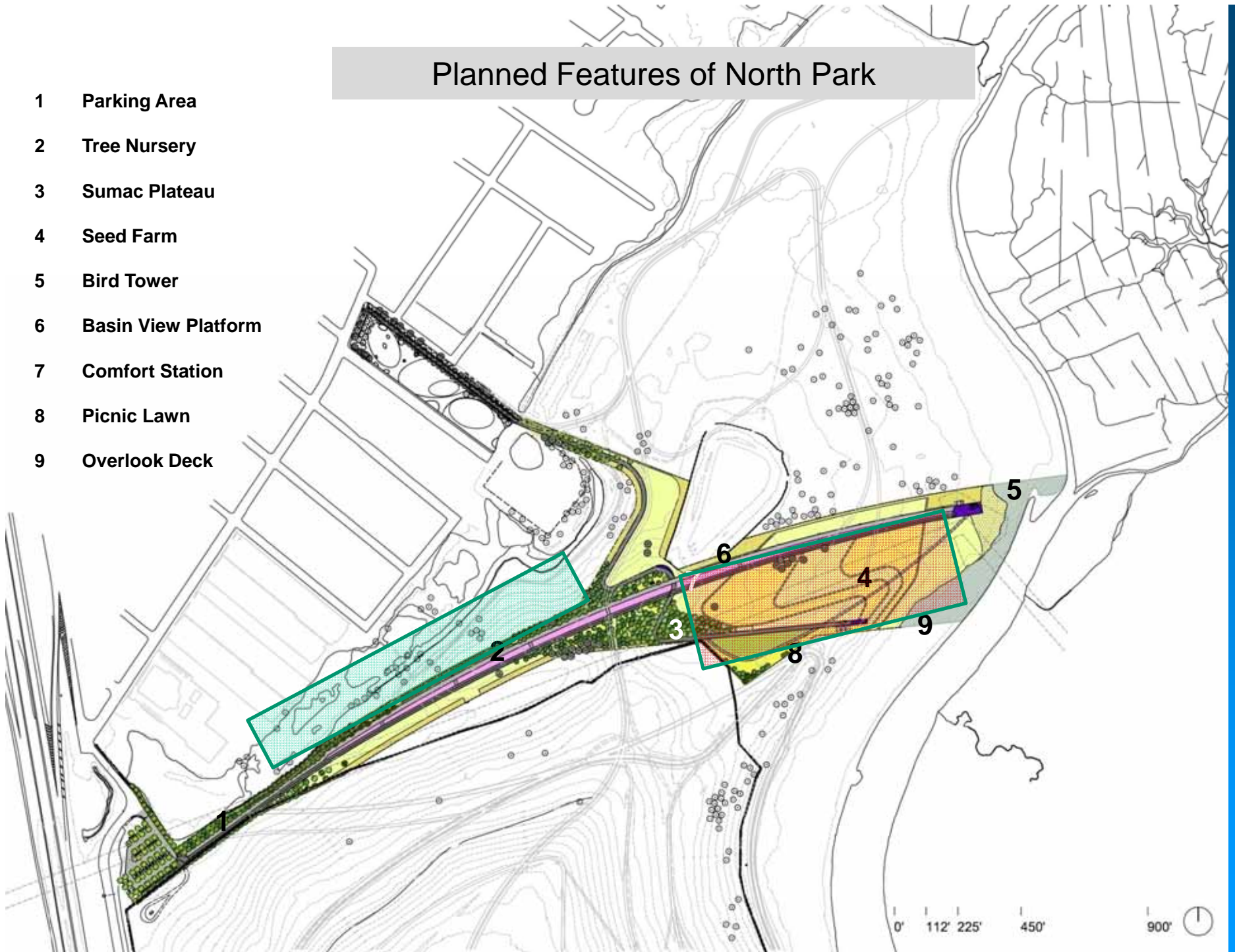
first 20 acres of
240-acre north park

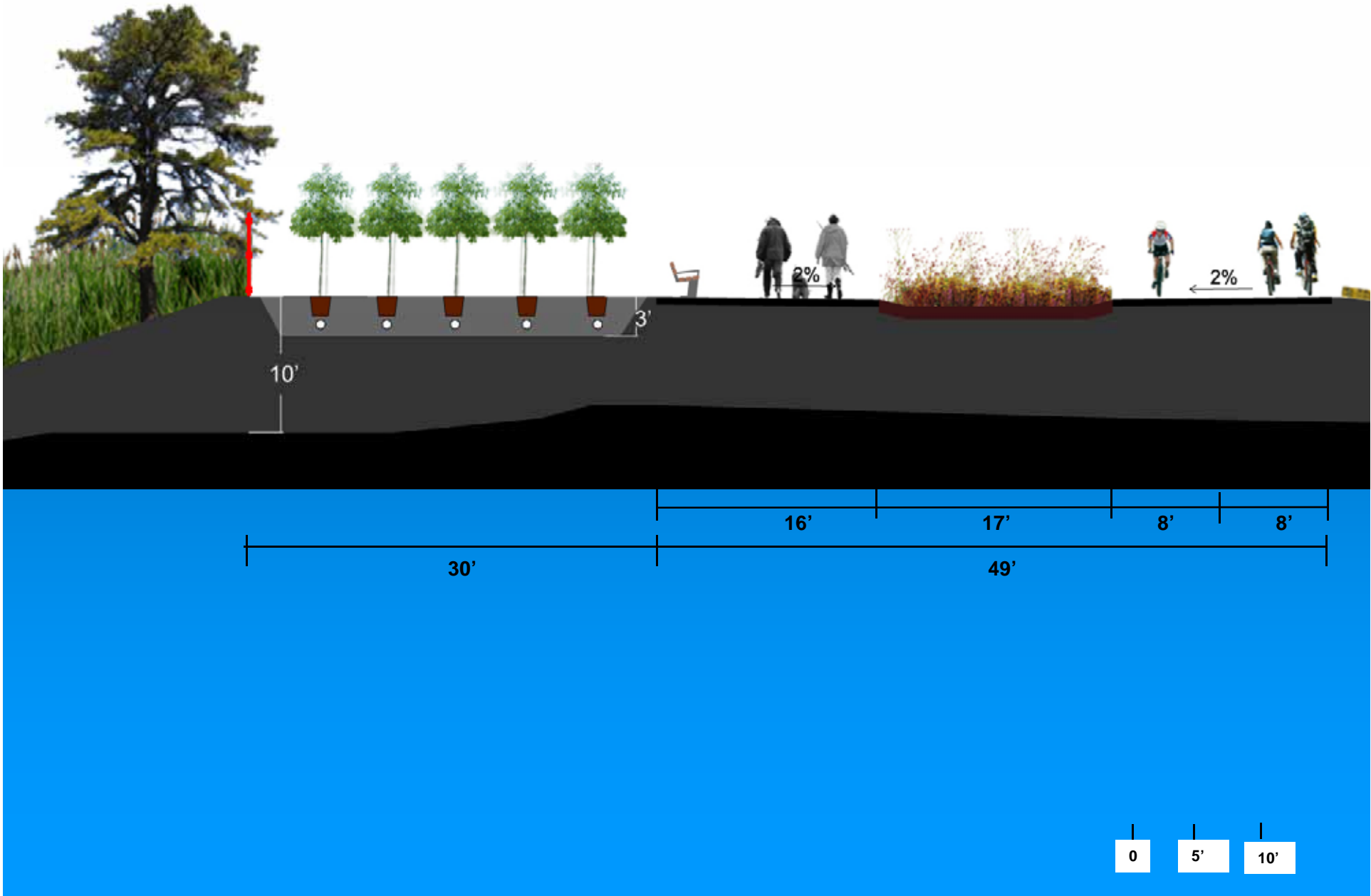
1 mile



Planned Features of North Park

- 1 Parking Area
- 2 Tree Nursery
- 3 Sumac Plateau
- 4 Seed Farm
- 5 Bird Tower
- 6 Basin View Platform
- 7 Comfort Station
- 8 Picnic Lawn
- 9 Overlook Deck











SEED FARM AT NORTH PARK



THEORETICAL CROP ROTATION OF 20 SPECIES TO MEET YEARLY NEEDS FOR BULK SEED AT FRESH KILLS

Plot #	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
1	AV						SC			CC		
2	AC			CC			SL			EF		
3	EG			SC			AV					
4	CC			SL			AS			AC		
5	PV						CC			EG		
6	AI			CC			EF			SNM		
7	SC			AS			PV					
8	SL			EF			AC			CC		
9	CC			SJ			SP			AS		
10	SS						CC			SP		
11	AS			CC			SNM			AI		
12	SJ			SP			SS					
13	SNA			SNM			AI			CC		
14	CC			AC			SNA			CC		
15	SN						CC			SJ		
16	EF			CC			EG			SC		
17	SNM			AI			SN					
18	SP			SNA			TD					
19	CC			EG			SJ			SNA		
20	TD						CC			SL		

	Warm-Season Grass
	Forb
	Cover Crop

AI	<i>Asclepias incarnata</i>	SJ	<i>Solidago juncea</i>
AC	<i>Apocynum cannabinum</i>	SNM	<i>Solidago nemoralis</i>
AS	<i>Asclepias syriaca</i>	SN	<i>Sorghastrum nutans</i>
AV	<i>Andropogon virginicus</i>	SS	<i>Schizachyrium scoparium</i>
EF	<i>Eupatorium fistulosum</i>	SL	<i>Symphotrichum laeve</i>
EG	<i>Euthamia graminifolia</i>	SNA	<i>Symphotrichum novae-angliae</i>
PV	<i>Panicum virgatum</i>	SP	<i>Symphotrichum pilosus</i>
SC	<i>Solidago canadensis</i>	TD	<i>Tripsacum dactyloides</i>

Dry/Mesic Seed Mix



Sorghastrum nutans
Schizachyrium scoparium
Panicum virgatum
Apocynum cannabinum
Asclepias syriaca
Euthamia graminifolia
Solidago canadensis
Solidago juncea
Solidago nemoralis
Symphyotrichum laeve
Symphyotrichum pilosus



Mesic Seed Mix

Panicum virgatum
Andropogon virginicus
Vernonia noveboracensis
Solidago canadensis
Solidago rugosa
Euthamia graminifolia
Symphyotrichum novae-angliae



Wet Seed Mix



Panicum virgatum
Andropogon virginicus
Tripsacum dactyloides
Juncus effusus
Scirpus cyperinus
Eupatorium fistulosum
Vernonia noveboracensis
Asclepias incarnata
Euthamia graminifolia



VIEW OF SEED FARM FROM OBSERVATION PLATFORM- NORTH PARK





Special Projects of the GNPC

2 Examples:

- NYC Native Plant Conservation Initiative
 - NYC/DPR- Greenbelt Native Plant Center
 - Brooklyn Botanic Garden
 - Fordham University
 - NYC/DEP
- The Great Pollinator Project
 - NYC/DPR- Greenbelt Native Plant Center
 - American Museum of natural History/ Center for Biodiversity & Conservation

New York City Native Plant Conservation Initiative

*Improving the sustainability of local
native plant populations*



GOALS

- To enhance the sustainability of local plant populations by increasing genetic diversity.
- Add a new dimension of conservation to natural area management strategies in NYC Parks



Methods

- Assess the status of all native plants in NYC, focusing on plant population health
- Produced ranked listings of all native species
 - Identify species of concern
 - Conduct field assessments



Methods

- **Understand genetic consequences of urbanization**

- **Use molecular DNA analysis to:**

- **determine degree of genetic isolation of NYC plant populations**
- **determine degree of loss of genetic variability/genetic inbreeding in fragmented NYC plant populations**



Methods

- **Prepare and implement protocols and recommendations for introduction, restoration, and management of native plant populations in NYC**
- **Initiate pilot program, targeting 25 species of concern.**
- **Collect seeds of species of concern from New York City populations and store in Native Plant Center Seed Bank.**



Factors threatening local population sustainability

- Habitat Fragmentation
- Genetic Isolation
- Small Population Size

Examples of Impacted Species



- Occurs in small fragmented populations throughout NYC parks in the five boroughs

American Sycamore
Platanus occidentalis

Example of Impacted Species

- Dispersed by insects with small home ranges
- Small isolated populations
- Probably self fertilizing



Asarum canadense

Wild Ginger

POLLINATOR CONSERVATION:

The Great Pollinator Project



AMERICAN
MUSEUM OF
NATURAL
HISTORY



The Great Pollinator Project

Two Programs

- Bee Watchers
- Land Managers



ANDRENA ERIGENIAE ON CLAYTONIA

JOHN ASCHER

BEE WATCHERS

- Third Year
- Citizen-Science Project
- Volunteers make observations on frequency of bee visits to their gardens (rough measure of pollinator services in neighborhoods of NYC)
- Expanding this year to include Mobile Bee Watchers program (18 locations across NYC)



COLLETES SPECIES ON WILLOW

JOHN ASCHER

NYC LAND MANAGERS FORUM

- Workshops
- Website- on line resources
- On line bulletin board
- Assistance with implementing pollinator –friendly land management practices



Thank you!

