Jump-Starting Ecological Restoration

Restoration Ecology for the American landscape

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Ecosystem Services: Benefits Supplied by Natural Ecosystems

- Purification of air and water
- Mitigation of droughts and floods
- Generation and preservation of soils
- Cycling and movement of nutrients
- Partial stabilization of climate

ESA Issues in Ecology, #2, 1997

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Why Native Plants ??

- Ecological values
- Essential for biological diversity and ecosystem integrity
- Economic values (medicinals, herbals, landscaping, food)
- Create self-sustaining ecosystems for restoration and/or re-vegetation

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Why Native Plants ??

- Executive Order 13112 to use native species and control invasives
- More than **200 plants** have become extinct since the early 1800s
- Nearly **5,000** native species are "at risk"
- **One in ten** plants faces extinction
- **Only 526** plants have been offered protection under the Endangered Species Act

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1995: Installing the sewer pipeline across Park (West to East)

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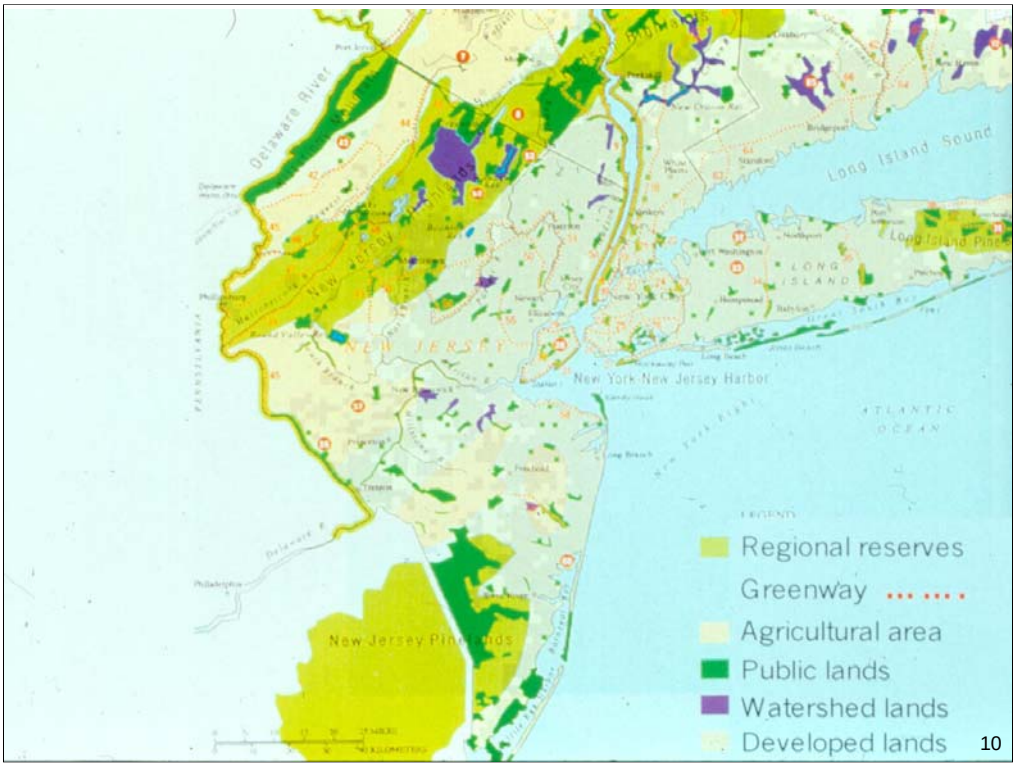
Delaware River
Long Island Sound
NEW JERSEY
New York-New Jersey Harbor
ATLANTIC OCEAN
New Jersey Pinelands
Regional reserves
Greenway
Agricultural area
Public lands
Watershed lands
Developed lands
10


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Urban Soils

- Variable
- Compaction
- Hydrophobic crust
- Elevated pH
- Restricted aeration and water drainage
- Nutrient cycling and soil organisms
- Pollution
- Higher soil temperature

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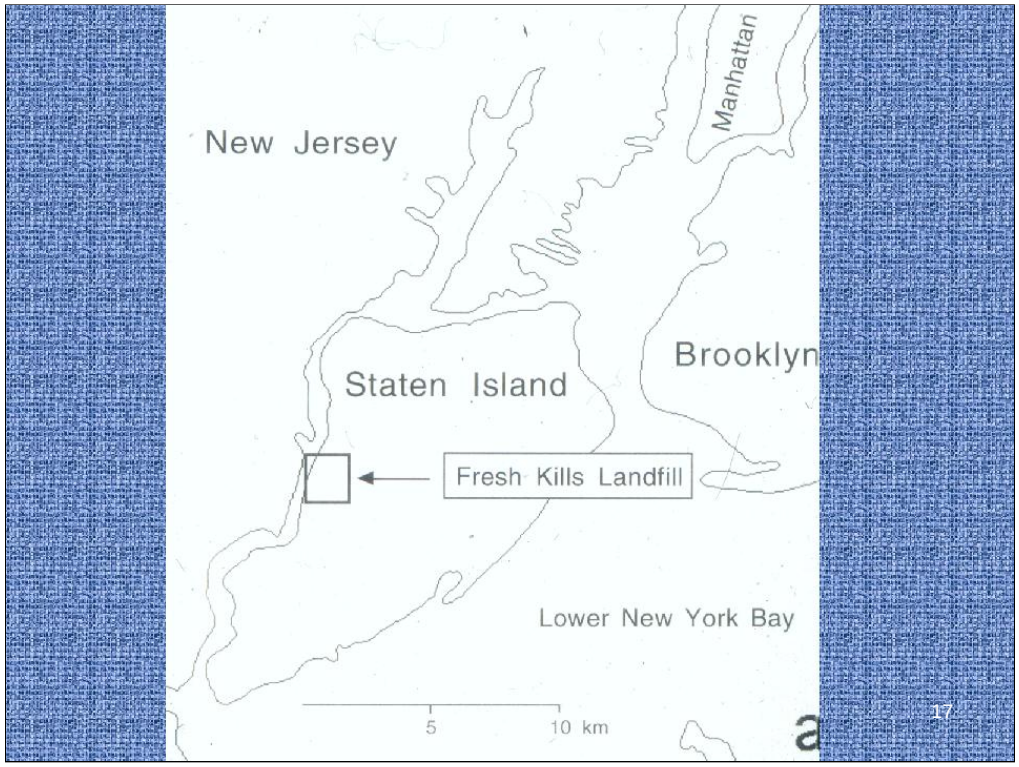
New Jersey
Manhattan
Brooklyn
Staten Island
Fresh Kills Landfill
Lower New York Bay
5
10 km
a


18


20

21

Surviving seedlings from fenced direct seeding experiment by year.

Species (# Seeds)	1992	1993	1994
Aronia (1250)	187	10	1
Celtis (540)	284	82	95
Cornus am. (400)	174	21	2
Cornus fl. (230)	15	0	1
Lindera (250)	13	2	1
Quercus a. (100)	100	34	27
Rhus arom. (250)	47	3	4

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Fruits, Seeds, and Dispersal Agents

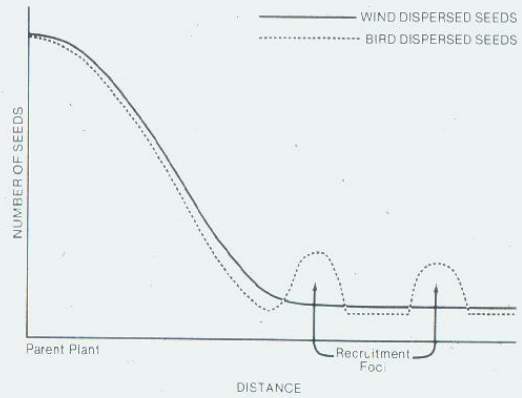

Figure 3–6. Animal dispersal creates patches of seed deposition (recruitment foci) at centers of animal activity.

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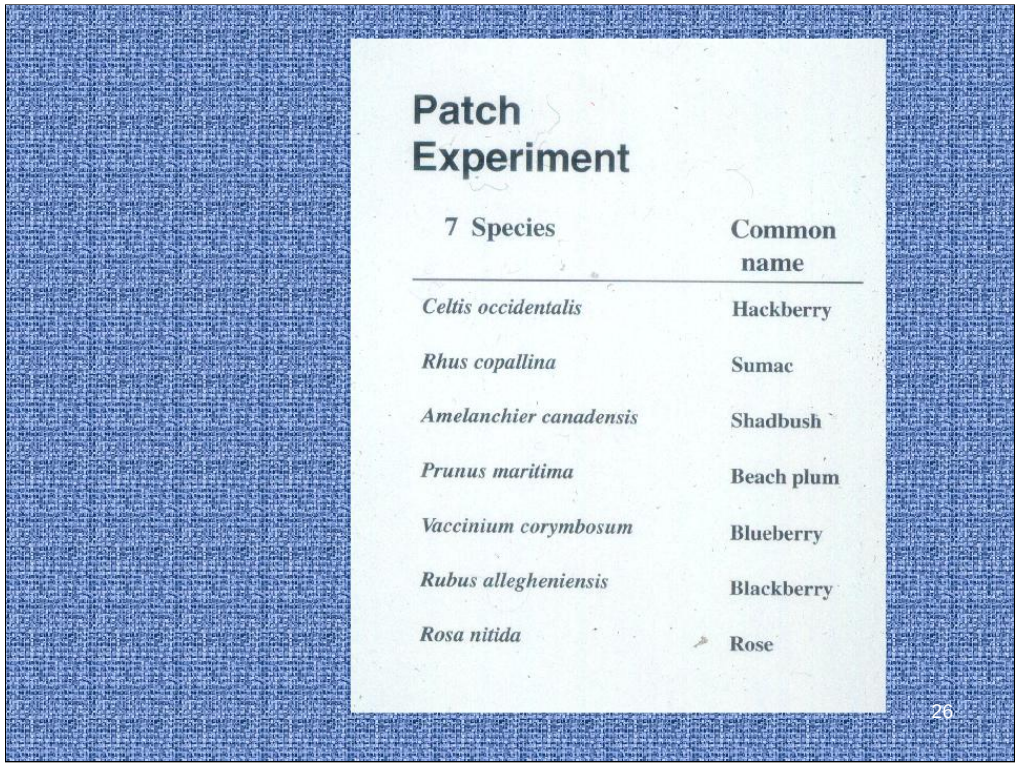
Patch Experiment
7 Species
Common name
Celtis occidentalis
Hackberry
Rhus copallina
Sumac
Amelanchier canadensis
Shadbush
Prunus maritima
Beach plum
Vaccinium corymbosum
Blueberry
Rubus allegheniensis
Blackberry
Rosa nitida
Rose
26


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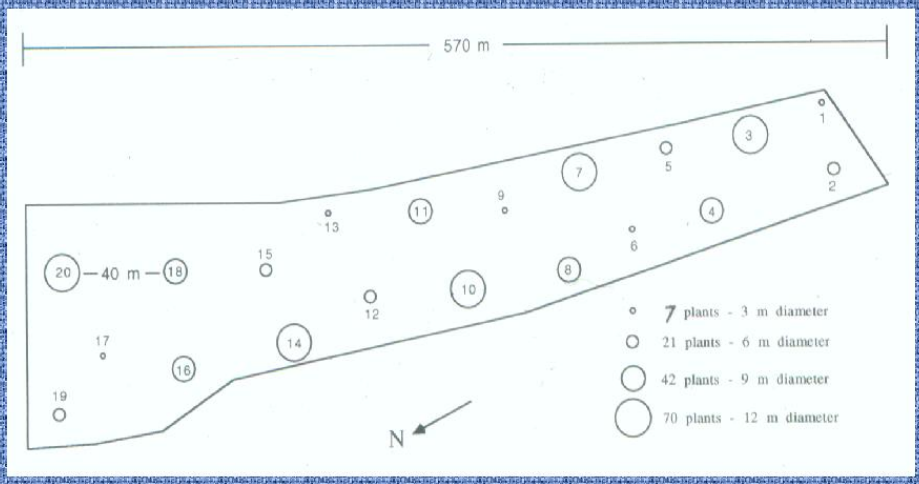
570 m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
19
20
40 m
18
7 plants - 3 m diameter
21 plants - 6 m diameter
42 plants - 9 m diameter
70 plants - 12 m diameter
N


29


30

Number of woody plant seeds collected by species from all of the seed traps at the NSF site from August - November 1994

Virginia Creeper	7,581
Arrowwood	3,113
Black Gum	1,440
Winged Sumac	957
Bayberry	457
Sassafras	205
+14 others	730
TOTAL	14,483
Outside Plots	14

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Seeds Found in Traps
Amelanchier
Ampelopsis
Aralia
Celastrus
Celtis
Cornus
Eleagnus
Ilex
Juniperus
Lindera
Liriodendron
Lonicera
Malus
Morus
Myrica
Nyssa
Parthenocissus
Prunus
Quercus
Rhus
Rosa
Rubus
Sambucus
Sassafras
Smilax
Solanum
Taxus
Toxicodendron
Viburnum
Vitis
Acer
Ailanthus
Betula
32

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RECRUITMENT OF PLANTS TO WOODLAND RESTORATION
Fresh Kills, Staten Island, New York

Alien species found after one growing season

Ailanthus altissima	- tree-of-heaven
Albizzia julibrussin	- mimosa tree
Celastrus orbiculatus	- Asian bittersweet
Lonicera japonica	- honeysuckle
Paulownia tomentosa	- princess tree
Rosa multiflora	- wild multiflora rose

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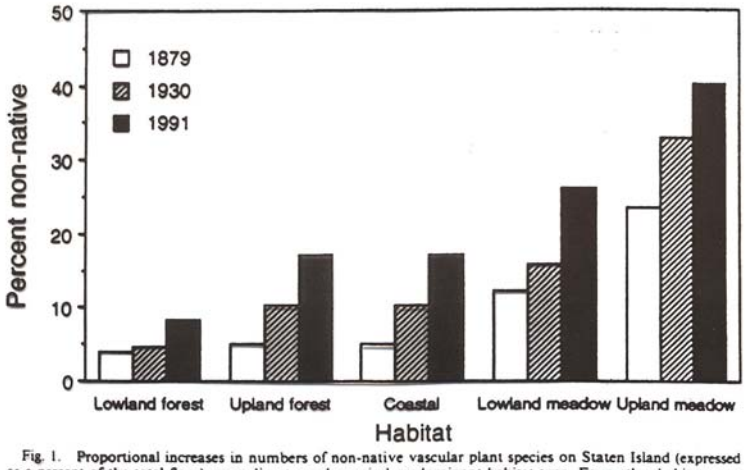

Fig. 1. Proportional increases in numbers of non-native vascular plant species on Staten Island (expressed as a percent of the total flora), according to each species' predominant habitat type. Four other habitat types are excluded because they have experienced only a small number of invading alien species (saltwater and freshwater marshes), or because they have been occupied largely by non-native species (roadsides/wastelands and agricultural fields), during the period examined.

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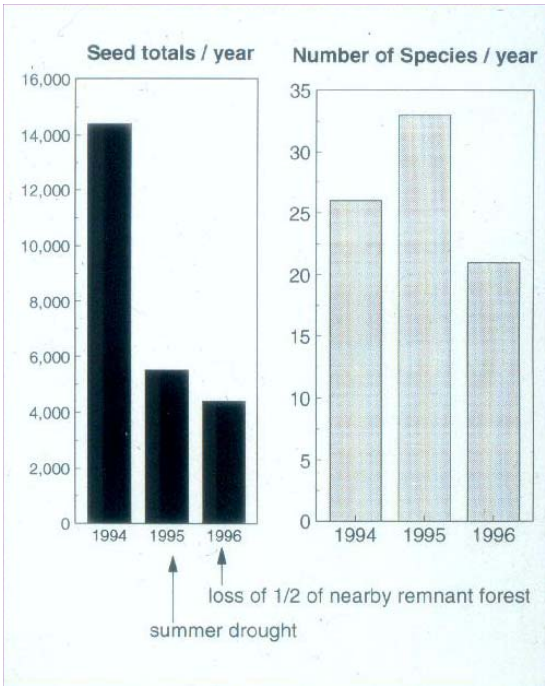
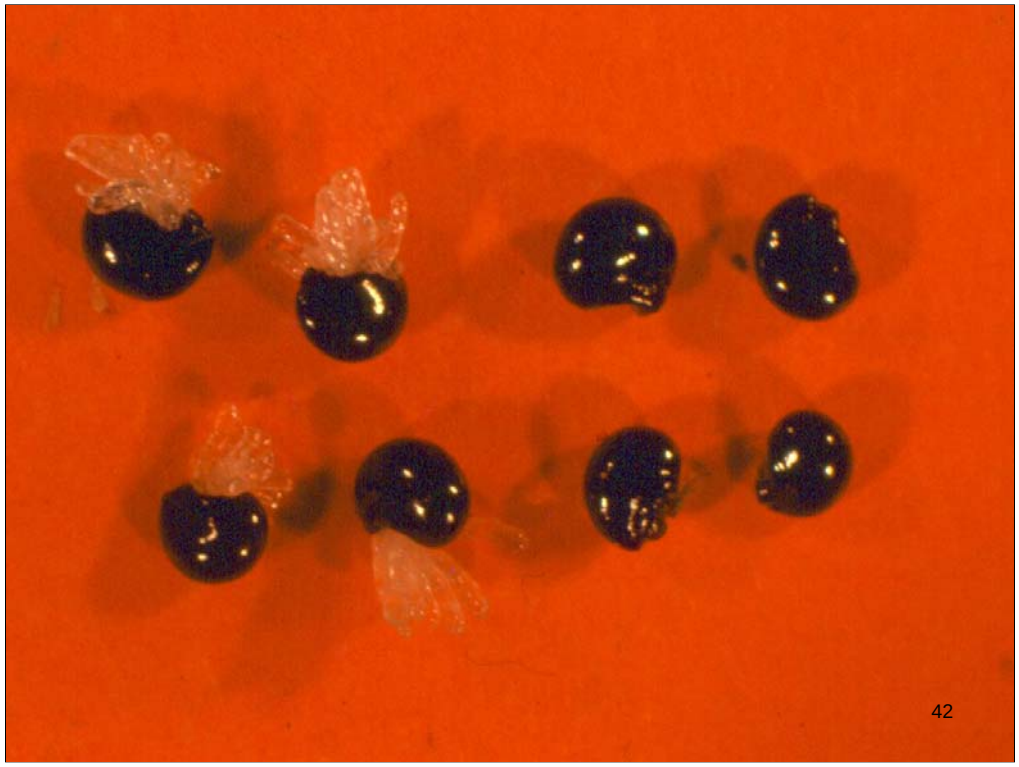

Seed totals / year
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1994
1995
1996
Number of Species / year
35
30
25
20
15
10
5
0
1994
1995
1996
loss of 1/2 of nearby remnant forest
summer drought

38


39


40


41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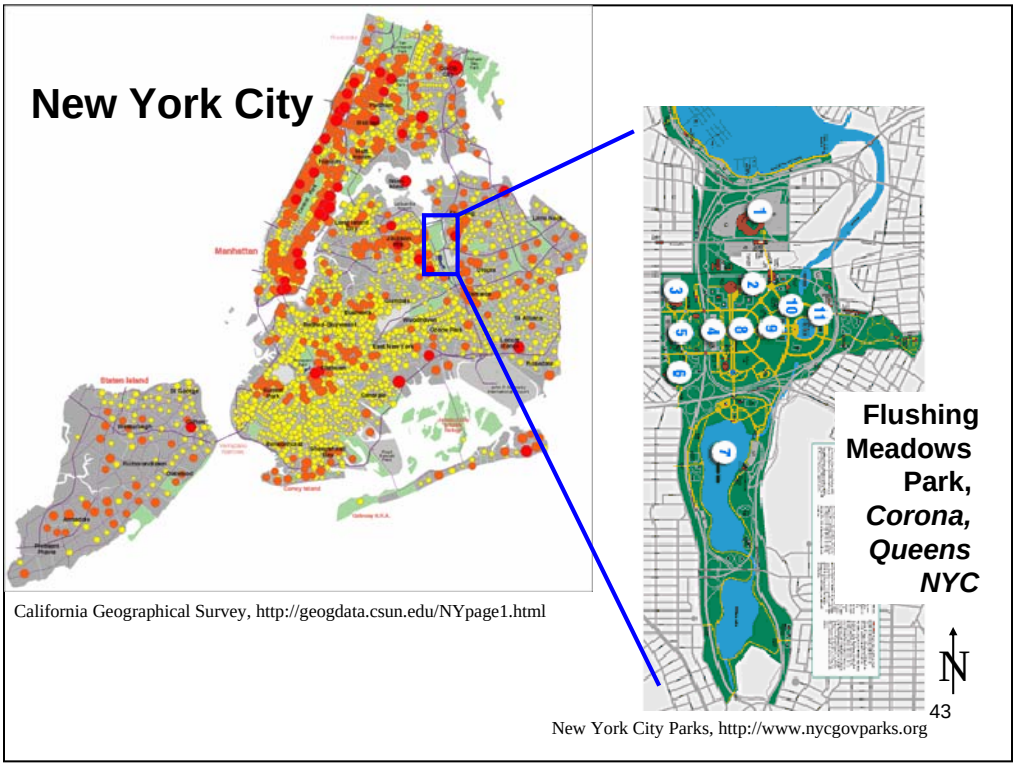

California Geographical Survey, http://geogdata.csun.edu/NYpage1.html

New York City Parks, http://www.nycgovparks.org

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1995: Installing the sewer pipeline across Park (West to East)


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1995, Turtle habitat construction
near Willow Lake
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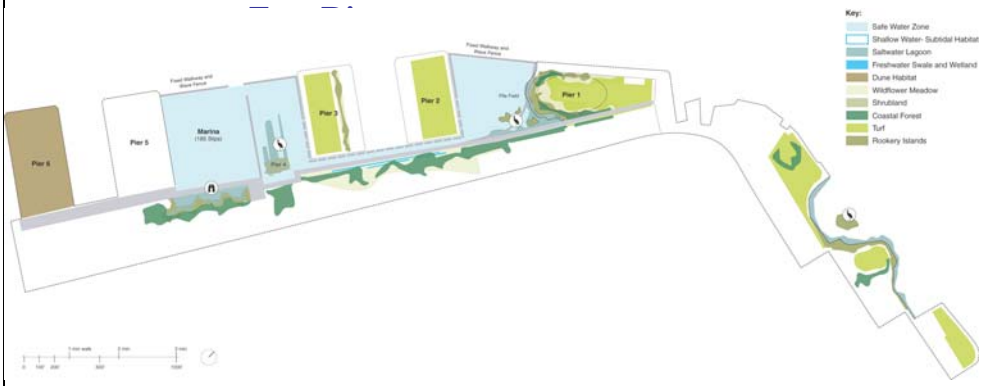
Brooklyn Bridge Park: Proposed Habitats



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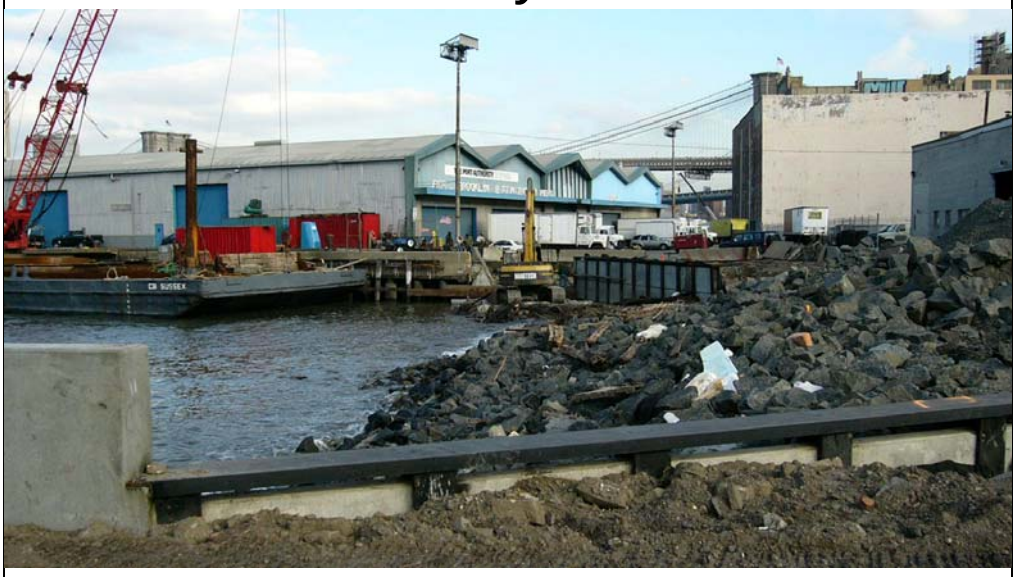
Current Brooklyn Waterfront



Proposed Promenade, Brooklyn Bridge Park

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Beijing 2008 Olympics

←1500 acre Forest Park

←700 acre athletic zone

Beijing 2008

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Beijing 2008 Olympics Forest Park

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Ecological Constraints

- Dispersal
- Degraded plant and animal communities
- Soil quality and biota
- Successional processes (natural disturbance)
- Invasive species

Regulatory Constraints

- Engineering goals are not congruent to ecological goals
- Rooting zone is poor
- Disturbance regimes
- Phasing of construction

Social Constraints

- Beauty and the eye of the beholder
- Different strokes for different folks
- The numbers game
- I want to be alone
- Here comes the sun

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