

# Environmental Restoration in a Crowd: A Pier and an Estuary in New York City





HOW A GOOD COP GOT A BAD RAP BY CRAIG HOROWITZ

STYLE WARS  
FASHION MAGS'  
MUSICAL CHAIRS

JULY 18, 2001

# NEW YORK

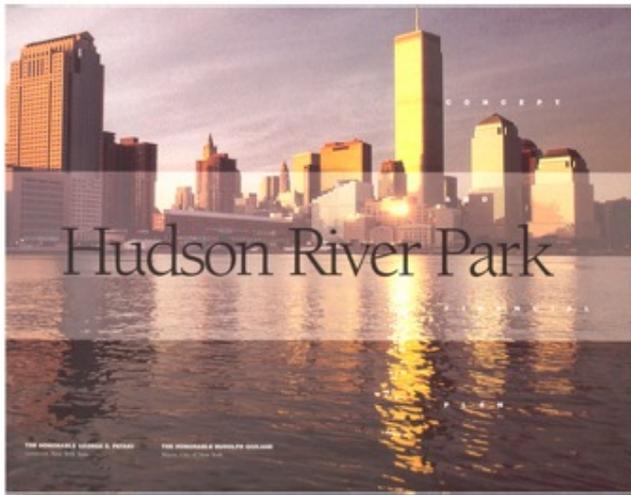
Taking back  
**The Waterfront**  
for fun and profit

PLUS **This Town's  
a Beach!**  
**30** great places to sunbathe,  
sail, kayak, jet-ski, and everything  
else you used to travel to  
the Hamptons for

## The Next Wave

BY JOSEPH GIOVANNINI





Hudson River Park

# Hudson River Park

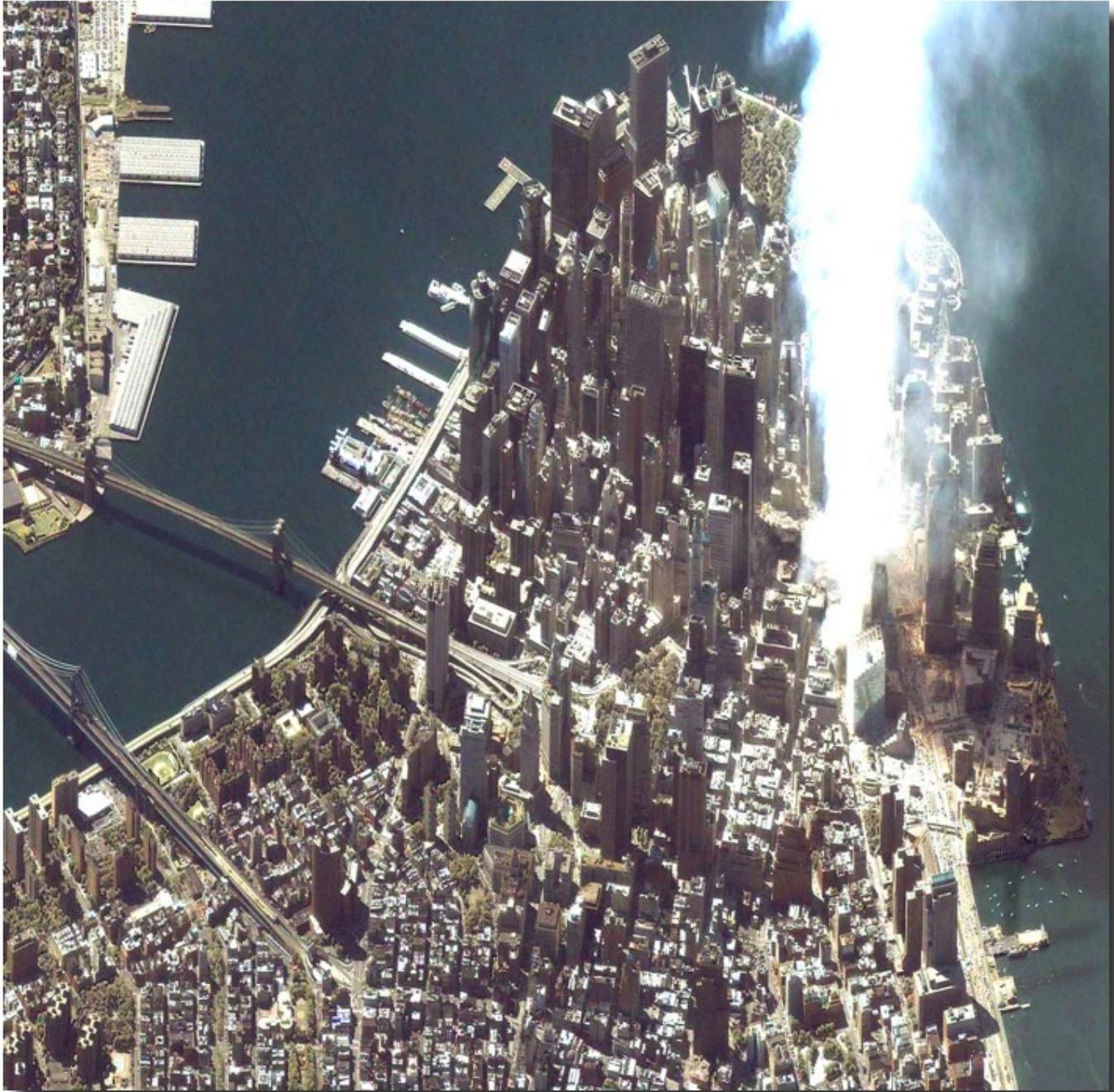
**Hudson River Park Trust** is a NY state & city partnership charged with the design, construction and operation of the **Hudson River Park**, a new **five mile**, 550 acre park along **Manhattan's westside** from Battery Park to 59th Street.





Hudson River Park







PIER 25

WORLD TRADE CENTER RECOVERY

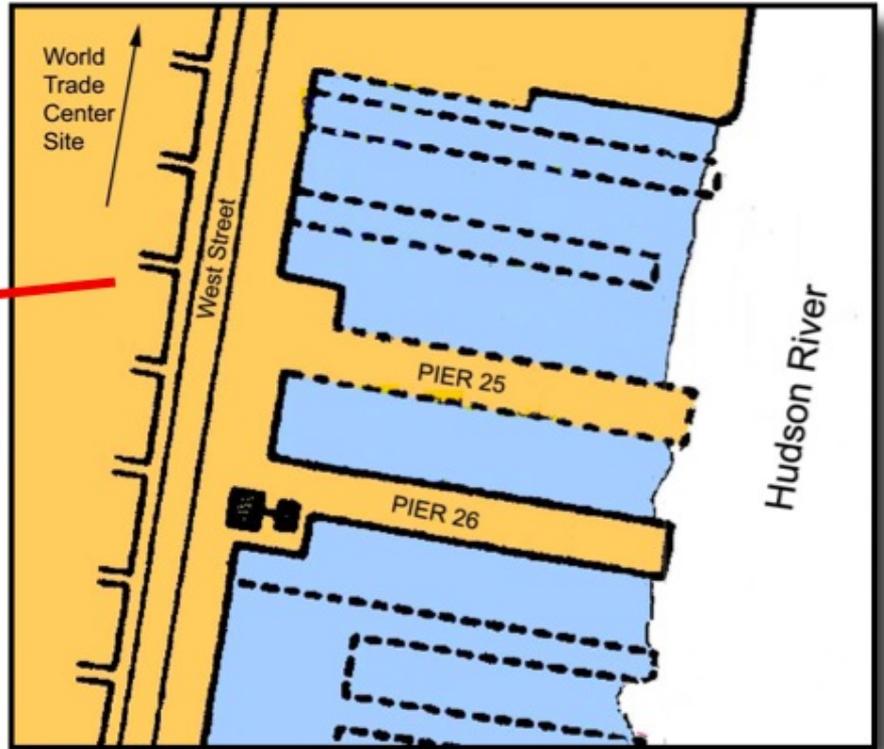
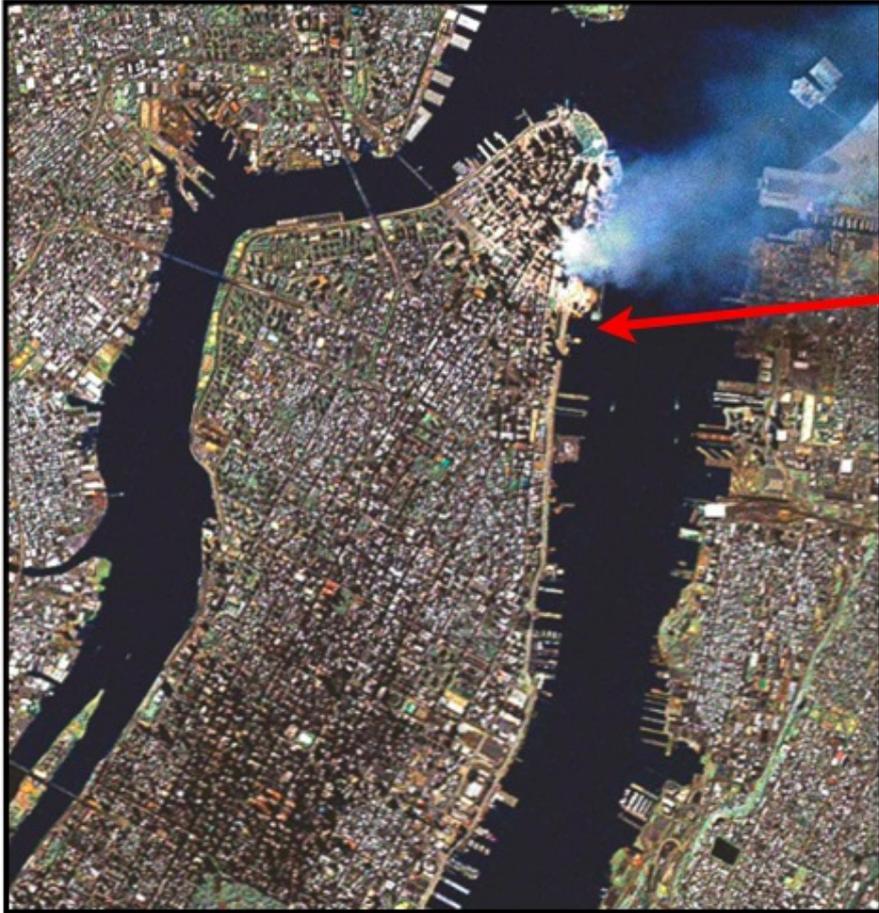
AS OF 5/8/02 THIS FACILITY:

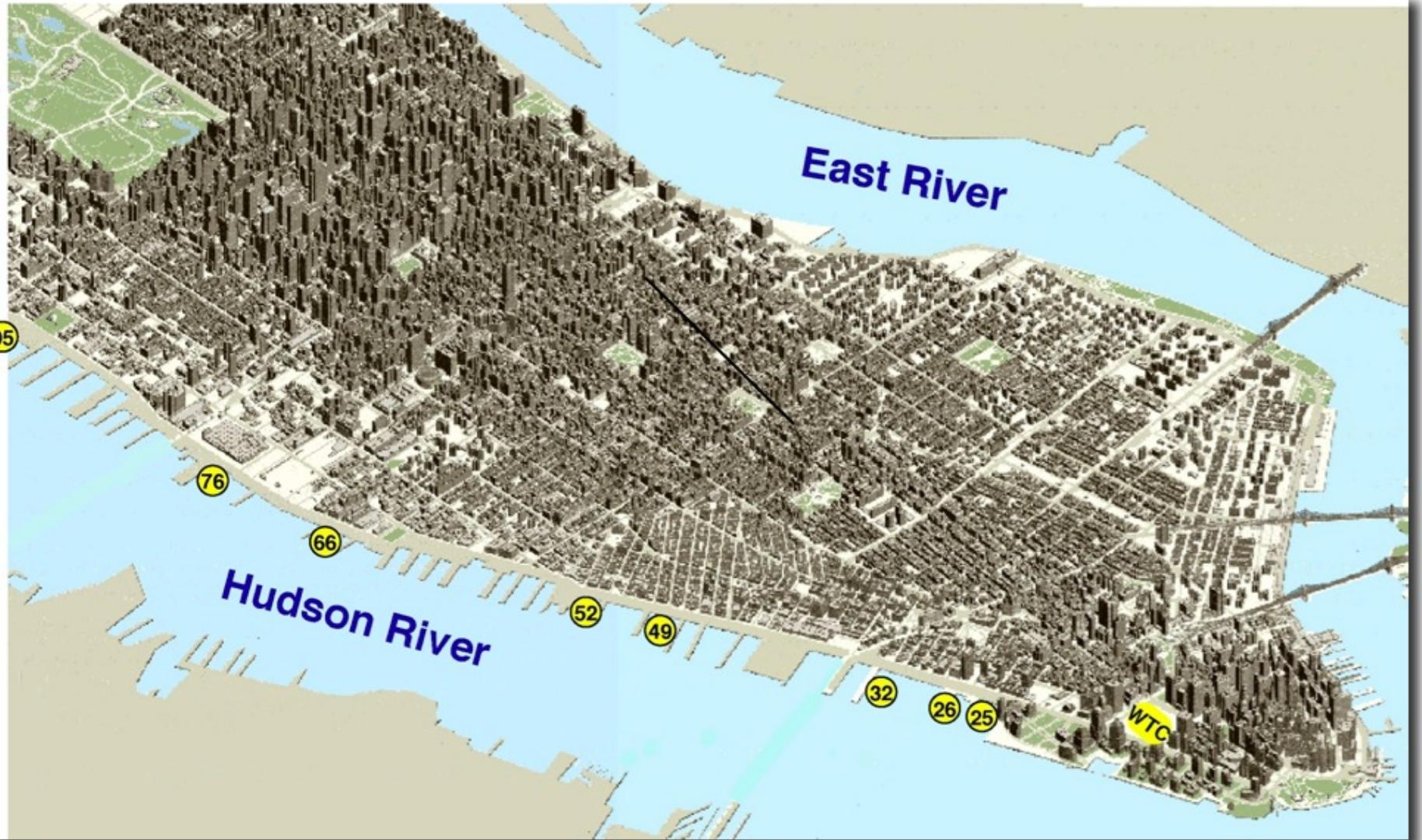
TOTAL TRUCKS UNLOADED 62,581

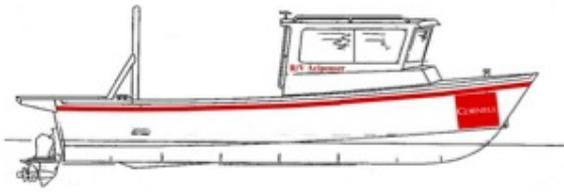
TOTAL TONNAGE 1,118,460 TONS

*Thanks for your support*



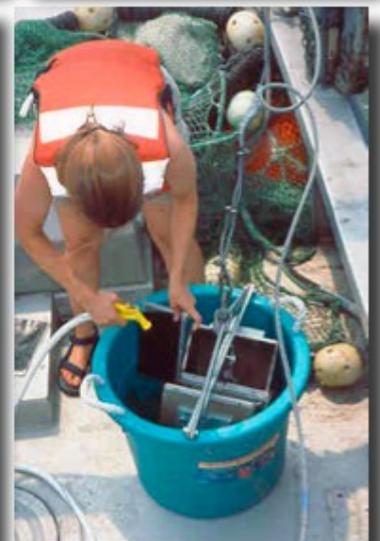


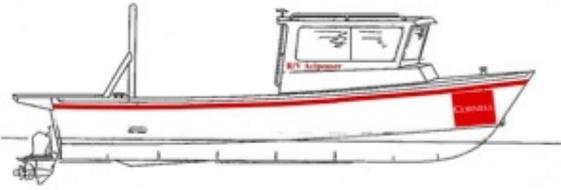




Hudson River Park

## Anne Gallagher and the Benthos

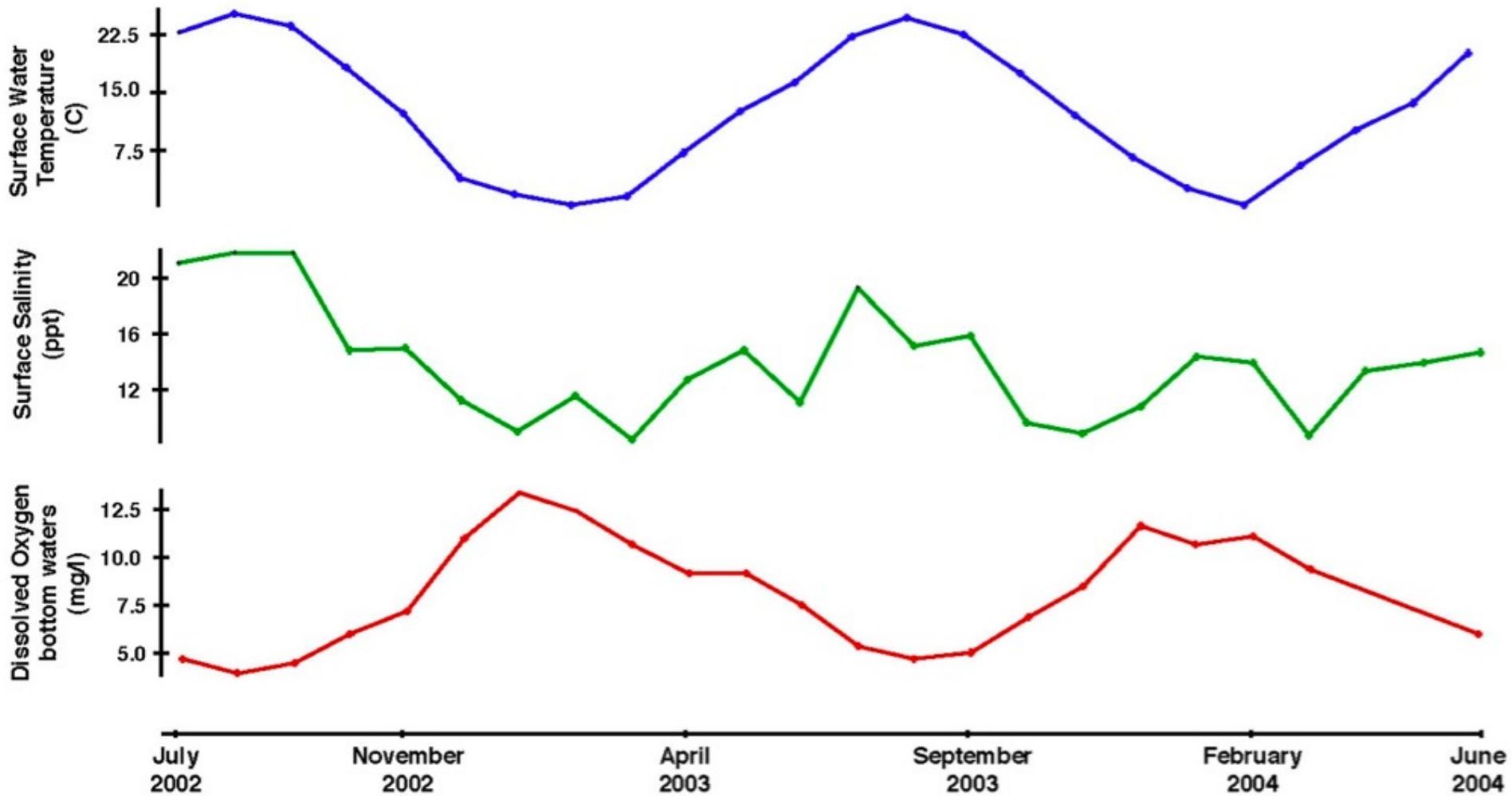
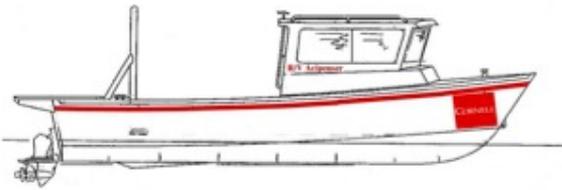


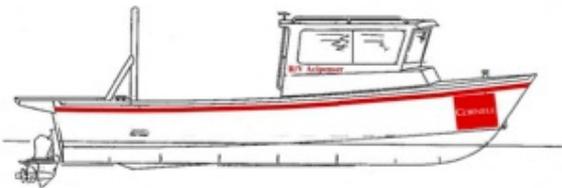


Hudson River Park

## Geof Eckerlin and the Fish







Hudson River Park

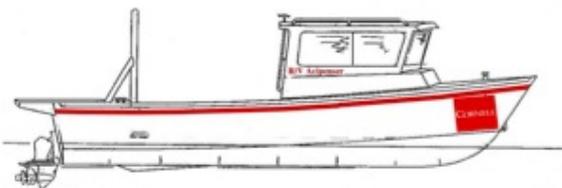
**In 2 years -**

**626 trawls**

**35,869 fish**

**43 species**

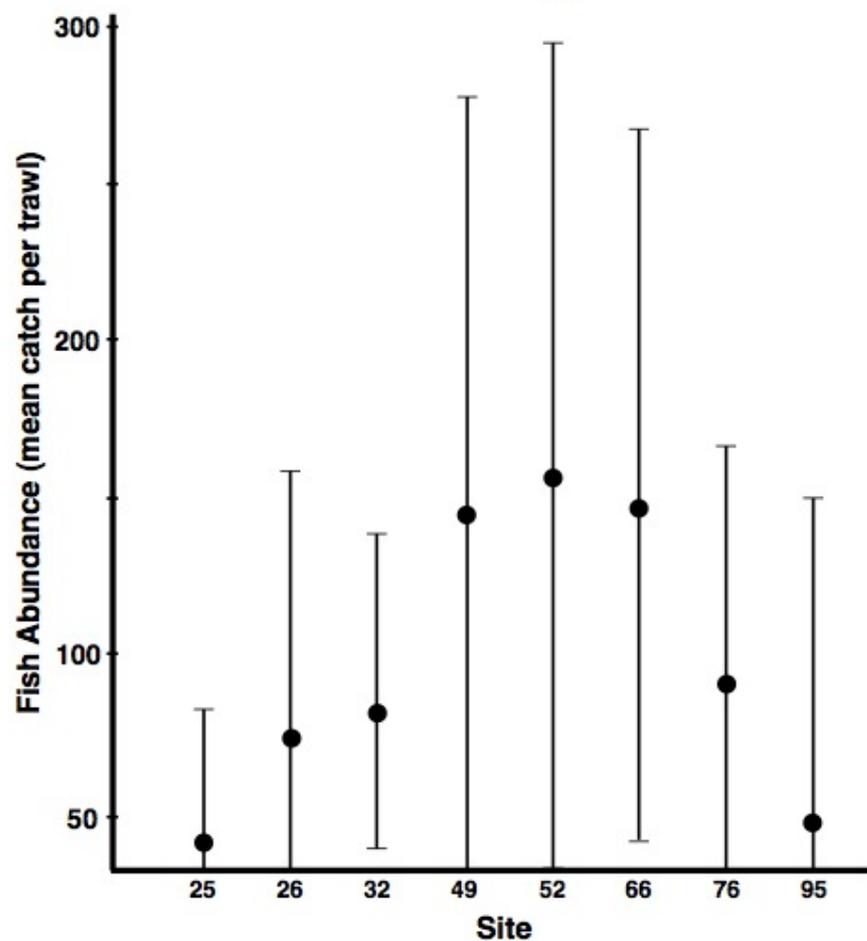




Hudson River Park

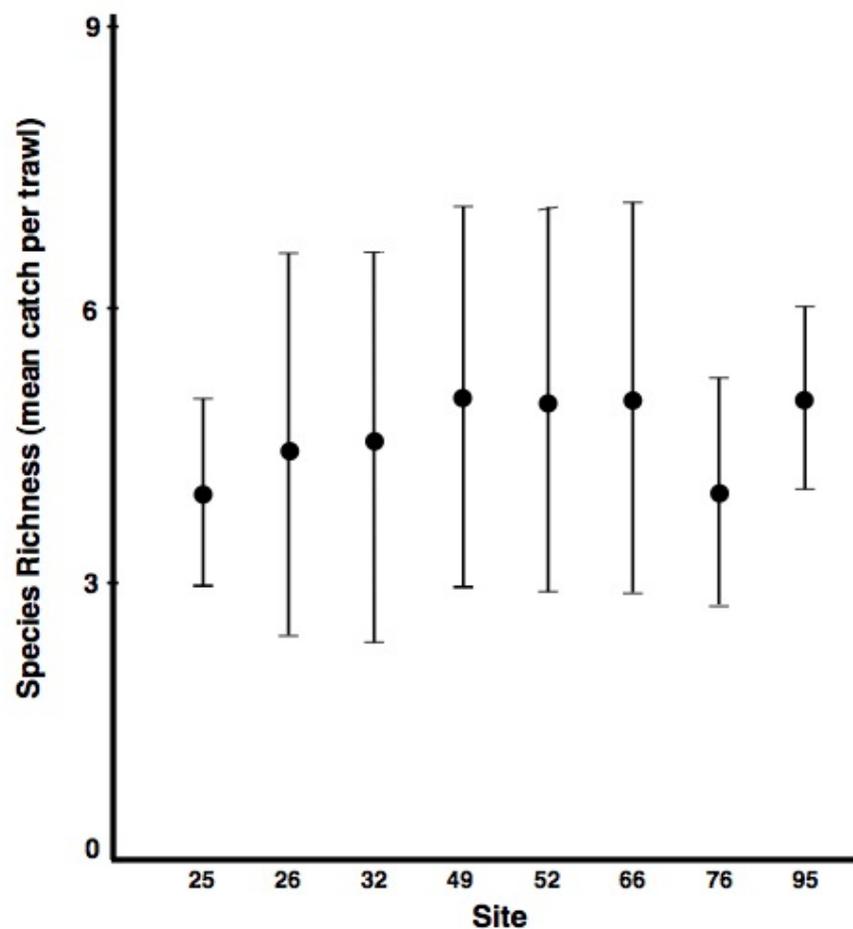
## Number of Fish Caught

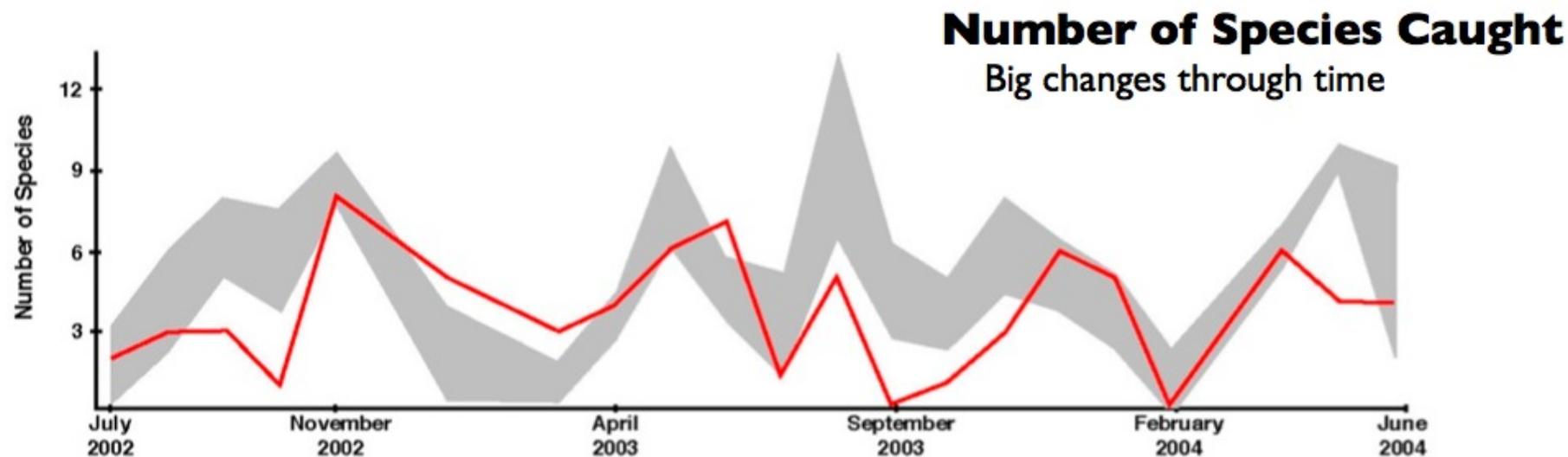
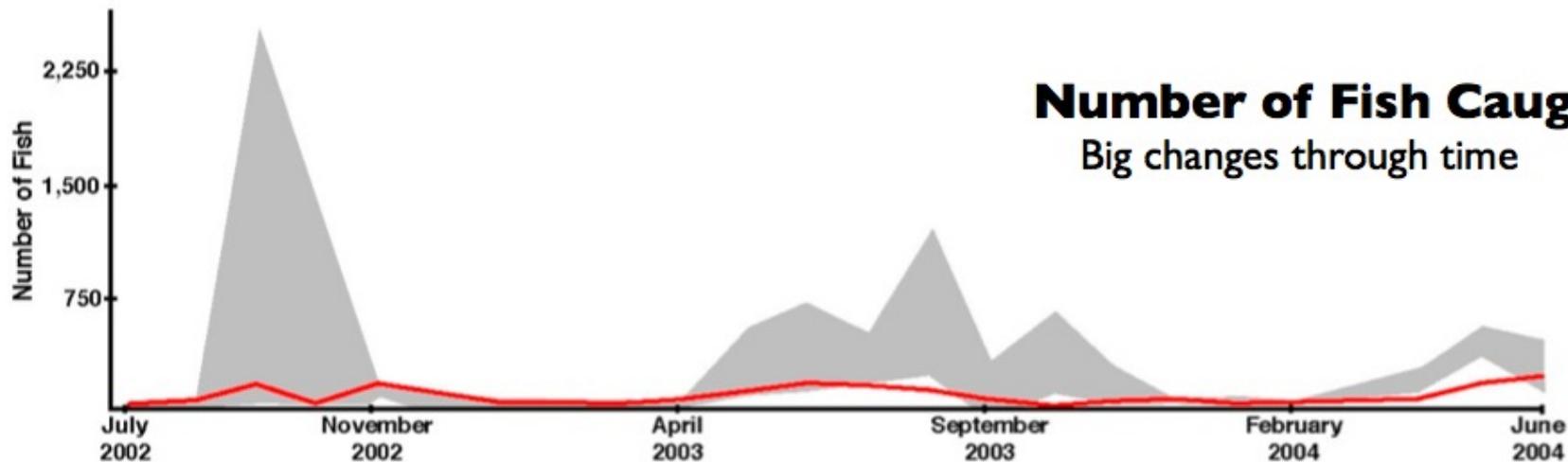
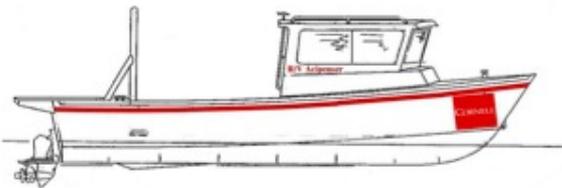
No differences among sites

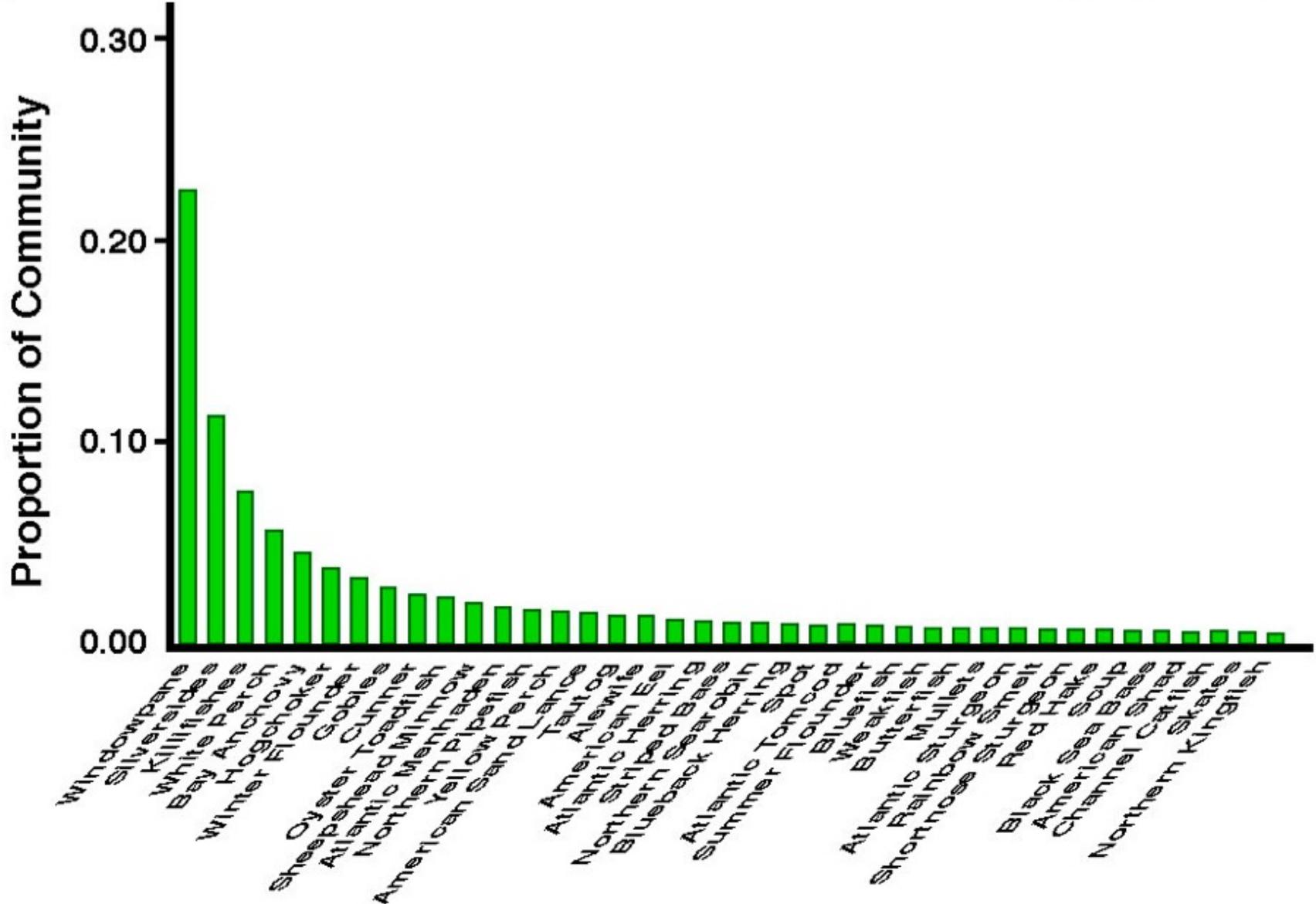
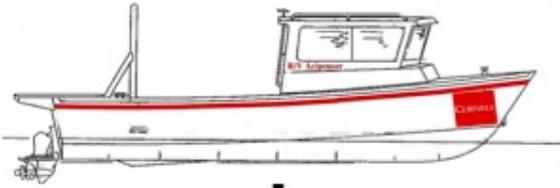


## Number of Species Caught

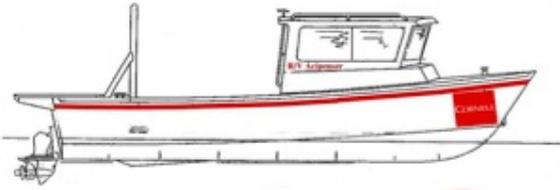
No differences among sites



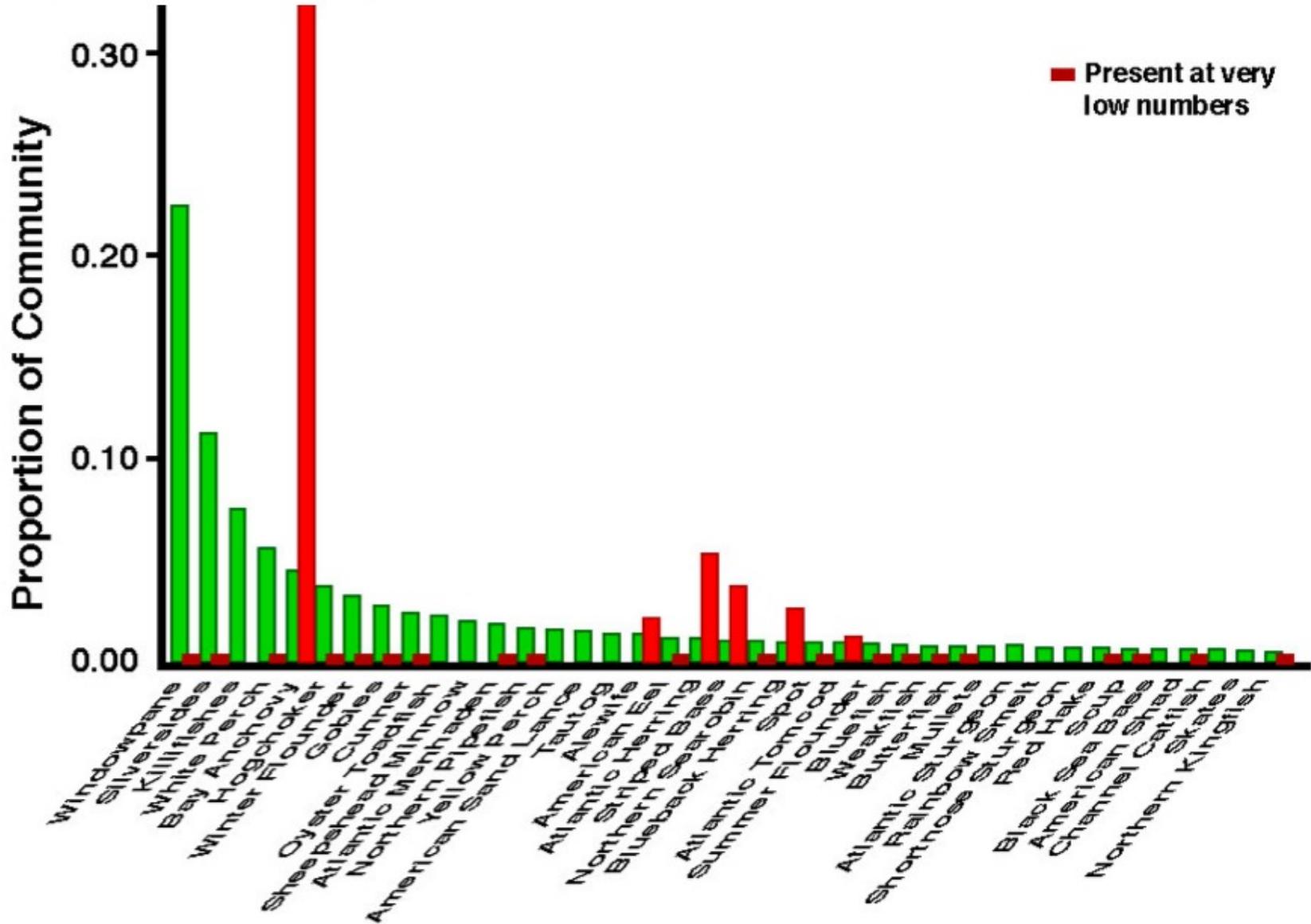


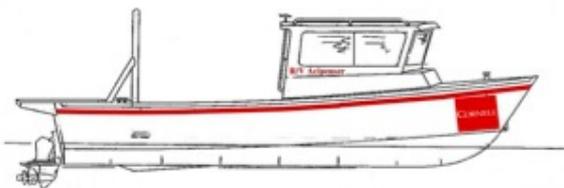






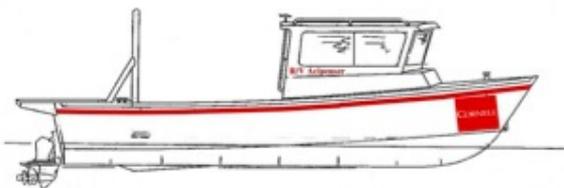
Hudson River Park





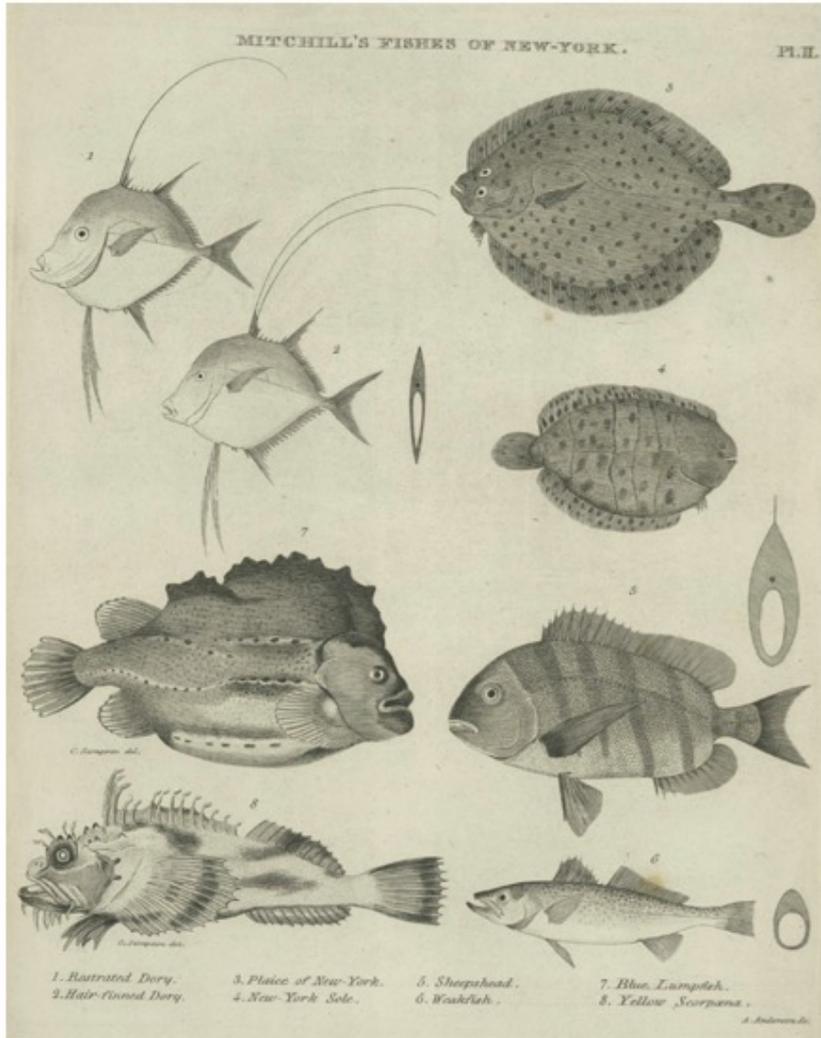
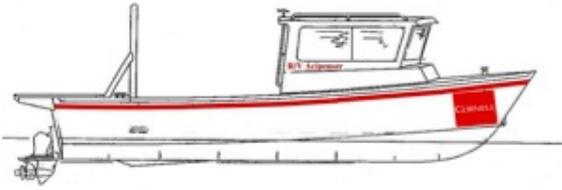
## Under-Represented Fishes

Species	Habitat	Water Quality
Windowpane	Sandy bottom	Oxygen sensitive
Silversides	Marsh edges, Vegetation	
Killifishes	Marsh edges, Vegetation	Thermal and oxygen hardy
White Perch	Shallow, soft bottom	
Hogchoker	Shallow, soft bottom	Thermal and oxygen hardy
Winter flounder	Inshore, muddy sand to very coarse, vegetation	Thermal and oxygen sensitivity
Gobies	Still waters, vegetation	
Cunner	Cover oriented, vegetation	
Oyster Toadfish	Shallow with debris and cover	
Sheepshead minnow	Shallow, vegetation	Thermal and oxygen hardy
Atlantic Menhaden	Open waters	
N Pipefish	Shallow, soft bottom	Thermal tolerant
Yellow Perch	Vegetated waters	Low salinity



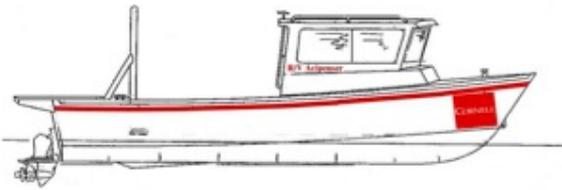
## Over-Represented Fishes

Species	Habitat	Water Quality
Bay Anchovy	Open water	
Atlantic herring	Open water	
Striped bass	Orients to prey	
Blueback herring	Open water	



1. & 2. Lookdown
3. Windowpane
4. Hogchoker
5. Sheepshead
6. Weakfish
7. Blue Lumpfish
8. Sea Raven

From: Samuel L. Mitchill  
*The Fishes of New York*  
Literary and Philosophical  
Society of New York.  
Transactions. Vol. 1, no. 5  
(New York, 1815)



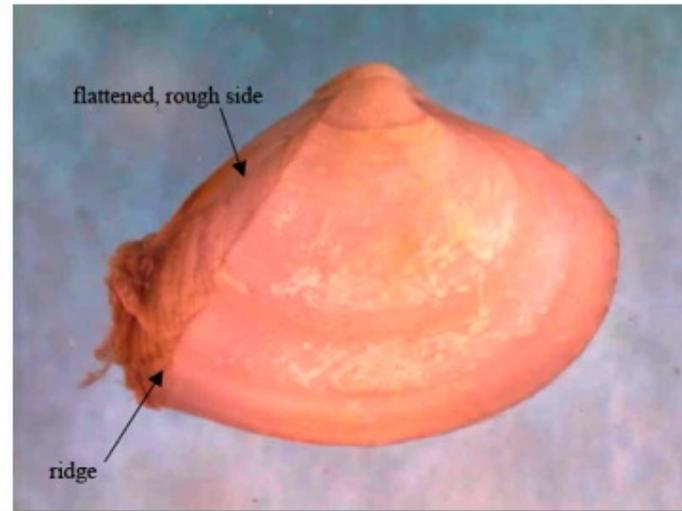
## Benthic Invertebrates

**In 2 years -**

383 samples  
78,945 organisms  
162 taxa

### Dominant Taxa

Dwarf Surfclam  
*Mulinia lateralis*

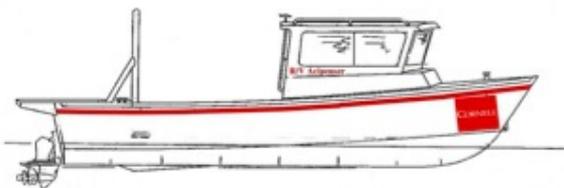


Capetellid Thread Worms  
*Mediomastus ambiseta*

Mud Worms  
*Streblospio benedicti*



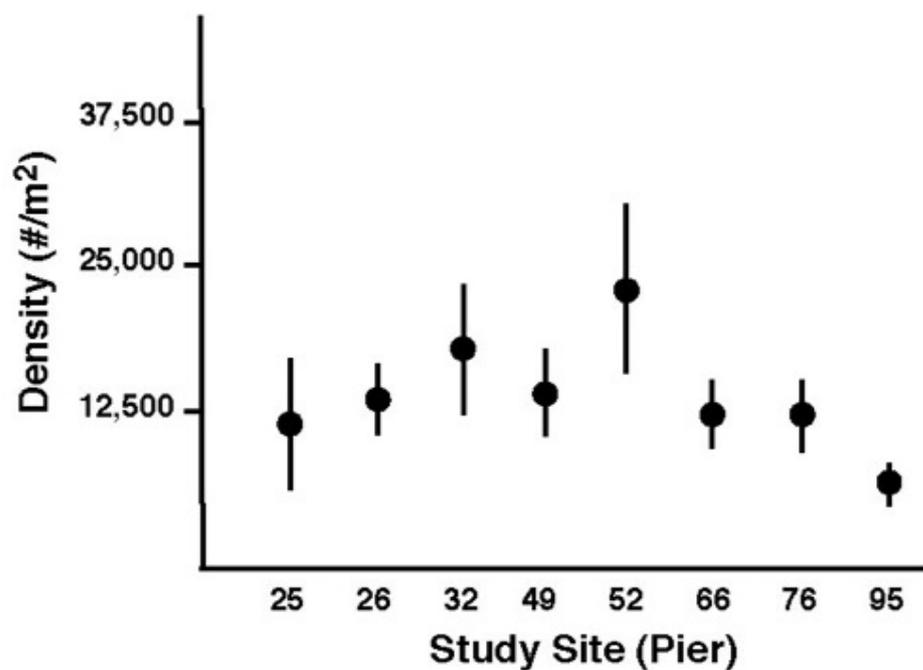
Tubificid Worms  
Oligochaeta, Tubificidae



## Benthic Invertebrates

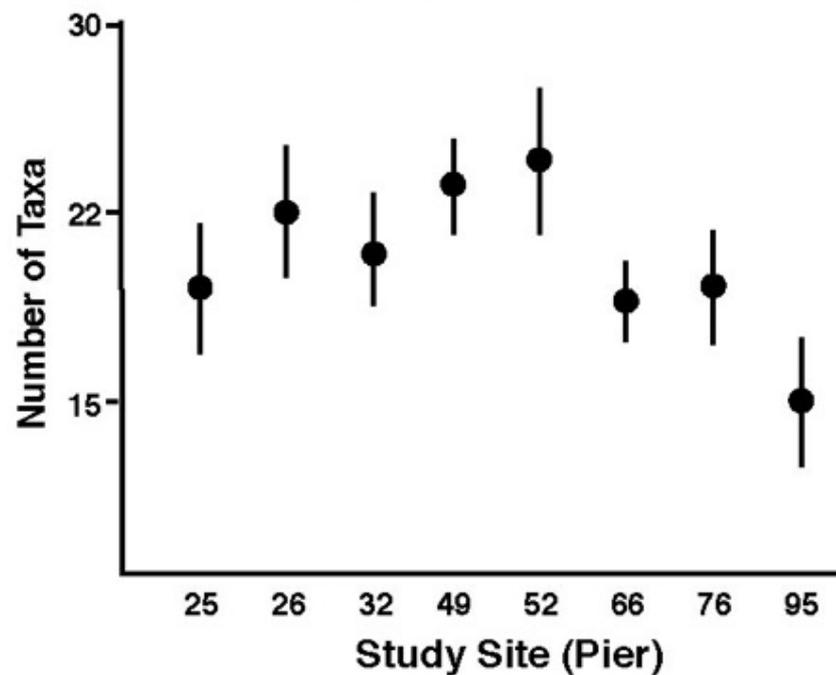
### Density (#s/area)

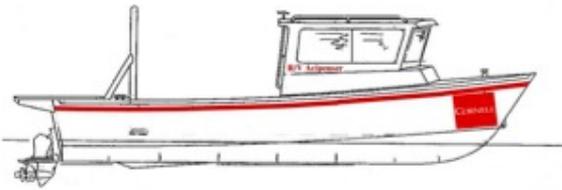
Differences among sites



### Diversity (taxa)

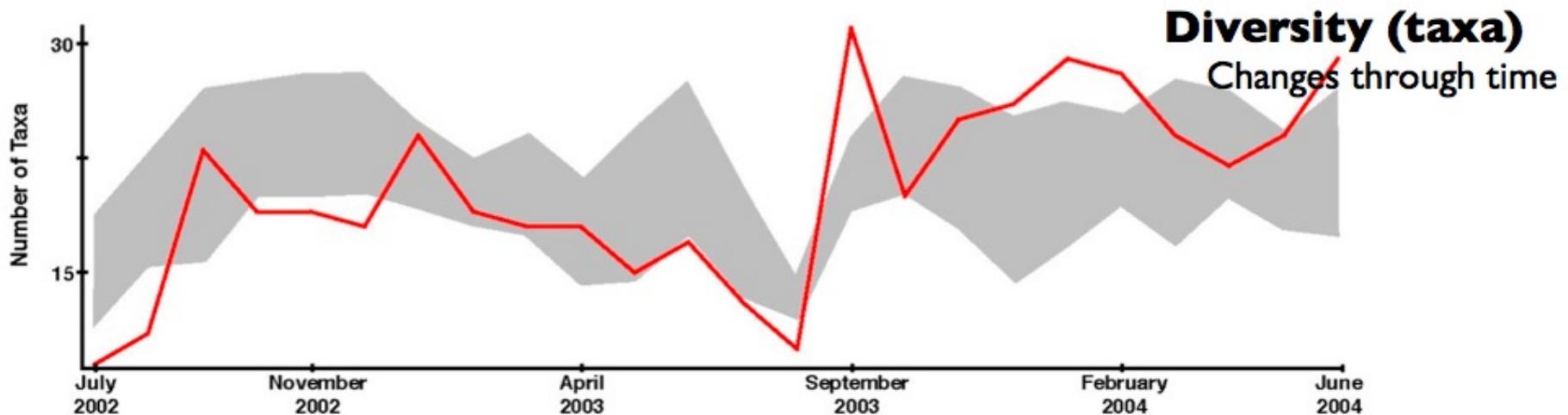
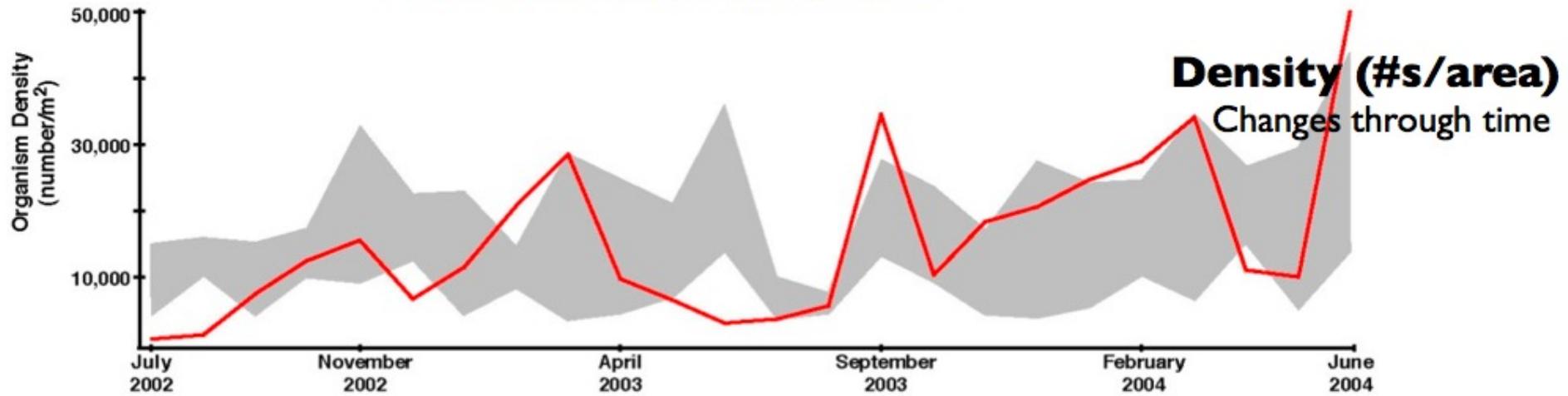
Sites somewhat different

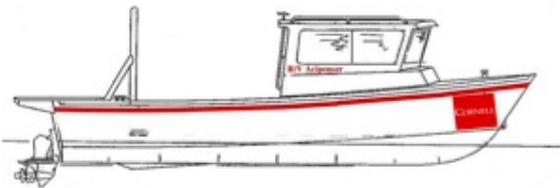




Hudson River Park

## Benthic Invertebrates





Hudson River Park

EPA/902-R-03-002  
December 2003

*Final Report*

**SEDIMENT QUALITY OF THE NY/NJ  
HARBOR SYSTEM: A 5-Year Revisit**

1993/4 - 1998

An Investigation under the Regional Environmental Monitoring and Assessment Program  
(REMAP)



Darvene Adams

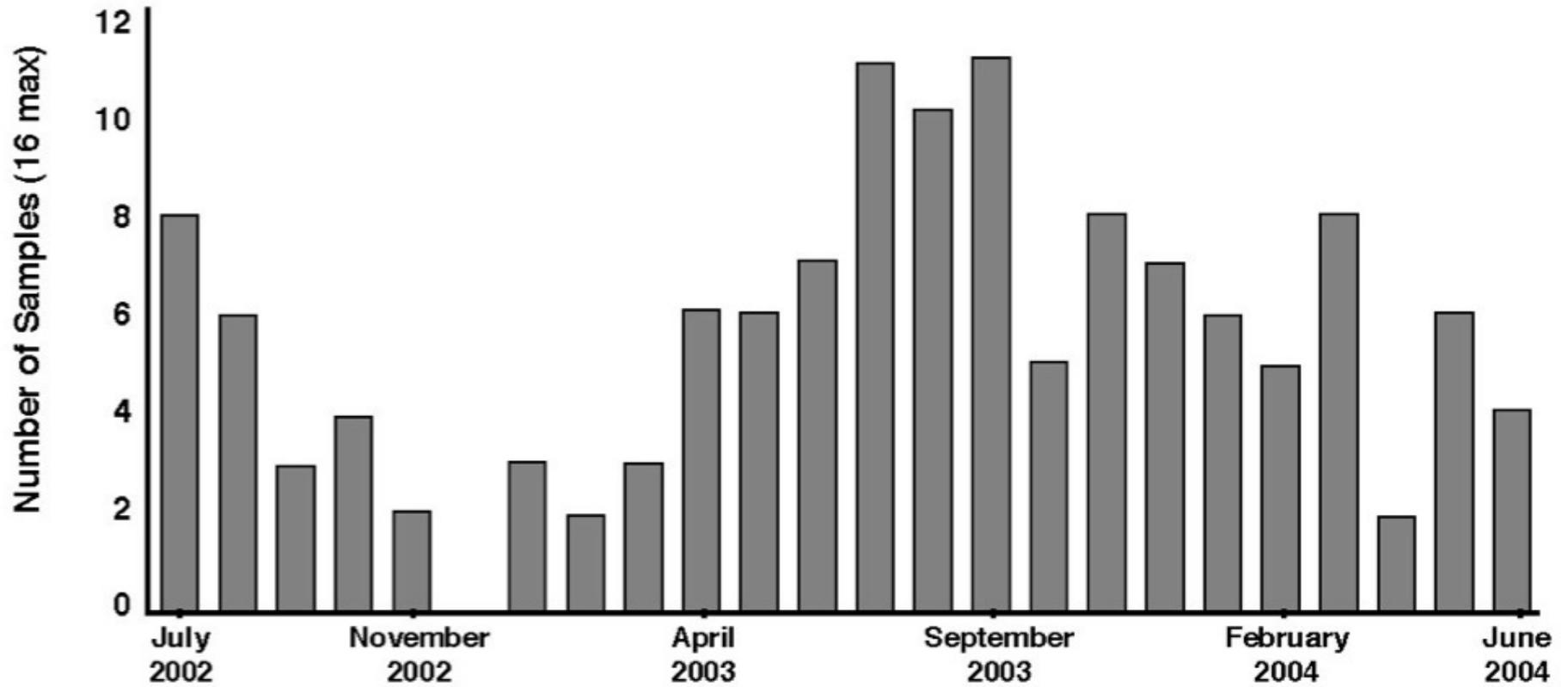
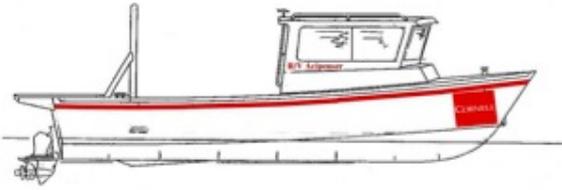
USEPA-Region 2, Edison, NJ

Sandra Benyi

USEPA-ORD, Narragansett, RI

<b>Metric</b>	<b>1 point</b>	<b>3 points</b>	<b>5 points</b>
<b>Number of species</b>	14 or fewer	15-20	More than 20
<b>Abundance (#/m2)</b>	Low (<1500) or very high (>20,000)	Relatively low (1500-3000) or Relatively high (20,000-20,000)	Moderate (3,000 - 10,000)
<b>Proportion of pollution tolerant taxa</b>	More than 40%	10 to 40%	Less than 10%
<b>Proportion of pollution sensitive taxa</b>	Below 3%	3 to 15%	Greater than 15%
<b>Proportion of carnivore and omnivore taxa</b>	Below 4%	4 to 15%	Greater than 15%

**Samples classified as stressed if average score is less than 3 points**



# Worms, Fish, and 9/11: Aquatic Life and Coastal Restoration in the City of New York

1. Dredging at Pier 25: No evidence for impact on fish and benthos.
2. Fish community does not reflect typical coastal estuarine habitat.
3. Fish community poor in shallow shoreline species but proper species occur in Park waters.
4. Invertebrates sensitive to local conditions and possibly low oxygen periods.
5. Invertebrates often reflect stressed conditions.
6. Enhanced habitats could improve fish fauna within constraints of periodic water quality stress.



**How could the  
waterways be  
restored?**





US Army Corps  
of Engineers  
New York District

# Significance of The Port of New York and New Jersey

- **Largest Port on the East Coast (59% share)**
  - **3<sup>rd</sup> in US (13% share); 14<sup>th</sup> in World**
- **\$114.5 billion in cargo**
- **728,000 automobiles**
- **230,000 jobs**
- **\$9.4 billion in port region wages**
- **\$2.2 in NY/NJ state and local tax revenue**
- **35 percent of US population served**



# Our Vision of a World Class Harbor Estuary

Navigation

Environment

## O & M

- Drift Removal
- Dredged Material Management
- Channel Maintenance

## Channel Deepening

- Kill Van Kull & Newark Bay 45'
- Port Jersey 41'
- Arthur Kill 41/40'

## Hudson-Raritan Estuary

- Comprehensive Plan
- Liberty State Park
- Gowanus Canal
- Lower Passaic River
- NJ Meadowlands

Ben. Use of Dredged Material

Harbor Estuary Program  
Jamaica Bay  
Gerritsen Cr.

- 50' Deepening

Green Port Opportunities

Comprehensive Port Improvement Plan

Cross-Harbor Freight Inland Distribution Network

Terminal Improvements

Port





## **Ecosystem Restoration Targets for the Hudson - Raritan Estuary**

*A project by Cornell  
University and the Hudson  
River Foundation by Mark  
Bain, Dennis Suszkowski,  
and James Lodge for the US  
Army Corps of Engineers  
and the Port Authority of  
New York and New Jersey.*

## **Some needs of implementing agencies:**

### **Purpose and benefits of restoration**

Program justification

Public and political appeal

### **Tangible and practical objectives**

### **Projects to execute; not details**

*“what needs to be done; not how”*

### **Measurable accomplishments**

Performance accounting

### **Scientific credibility**

Interdisciplinary input

Independent scientific review



## Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy

*Returning an ecosystem to its former, undisturbed state with the original functions and structure.*



# RETURNING the original condition



Columbus, 1492.

T. de Bry, 1594. Brown University



New York City as seen from Williamsburg, 1848.

Brown, Eliphalet M., 1816-1886

# REWILDING

restart the  
evolutionary  
process



THE REWILDING INSTITUTE



Vol. 436(18 August 2005

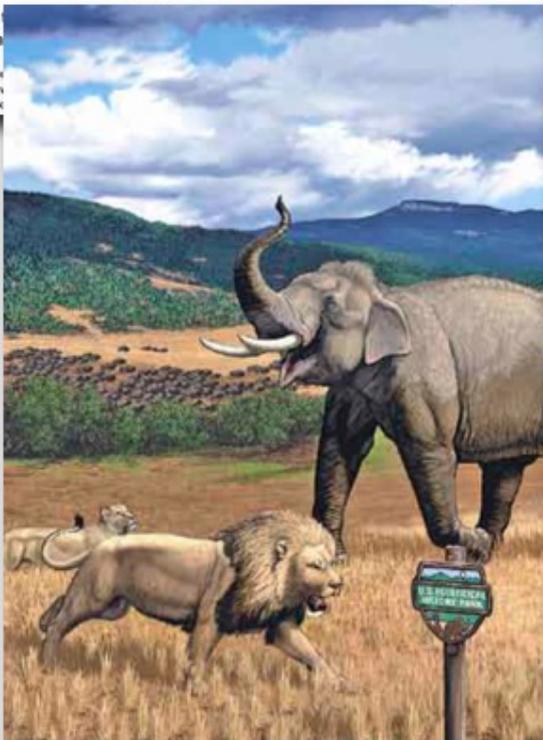
nature

Nature, 2005

## Re-wilding North America

A plan  
alterna

N

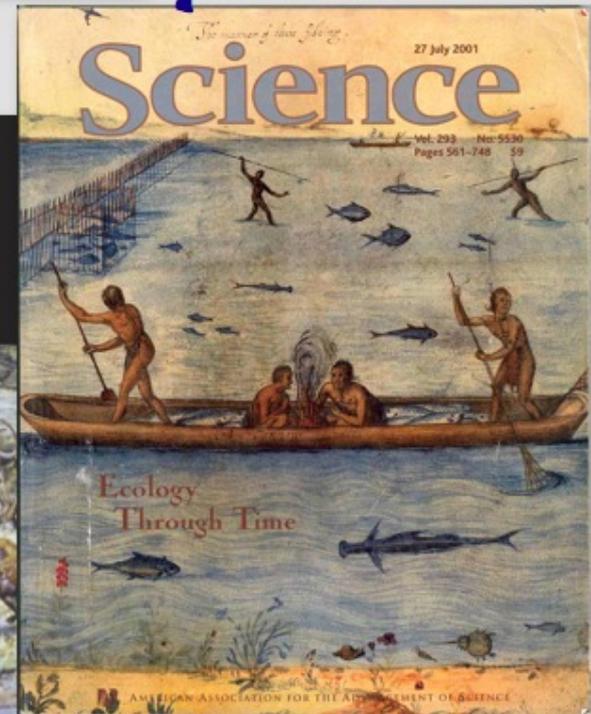


## TWILIGHT OF THE MAMMOTHS

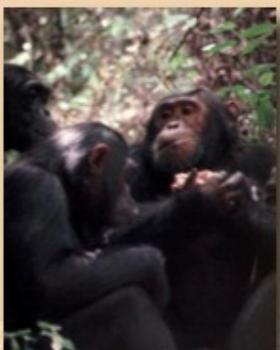


ICE AGE EXTINCTIONS  
AND THE REWILDING OF AMERICA

PAUL S. MARTIN  
FOREWORD BY HARRY W. GREENE



***“Long before the dawn of written history, human impacts were responsible for a fantastically destructive wave of extinctions around the globe”***



4 Million Years Ago

3 Million Years Ago

2 Million Years Ago

1 Million Years Ago

Present Day

# The Human Family Tree

*Ar. ramidus*

*A. anamensis*

*A. afarensis*

*P. aethiopicus*

*A. africanus*

*P. boisei*

*P. robustus*

*H. rudolfensis*

*H. ergaster*

*H. habilis*

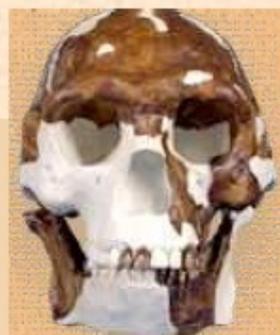
*H. erectus*

*H. neanderthalensis*

*H. sapiens*



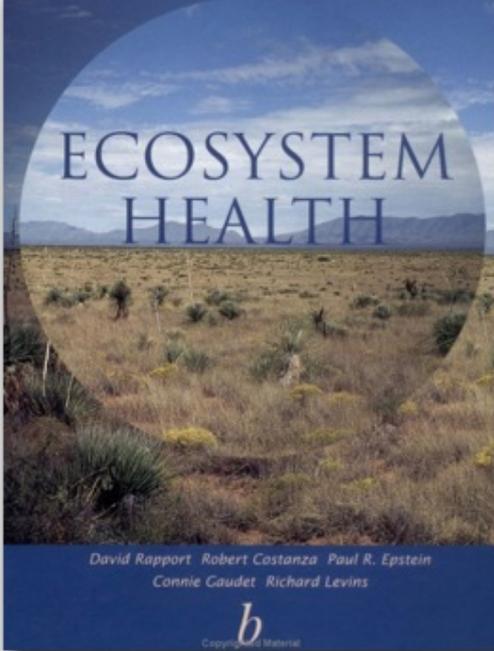
*Homo habilis*



*Homo erectus*

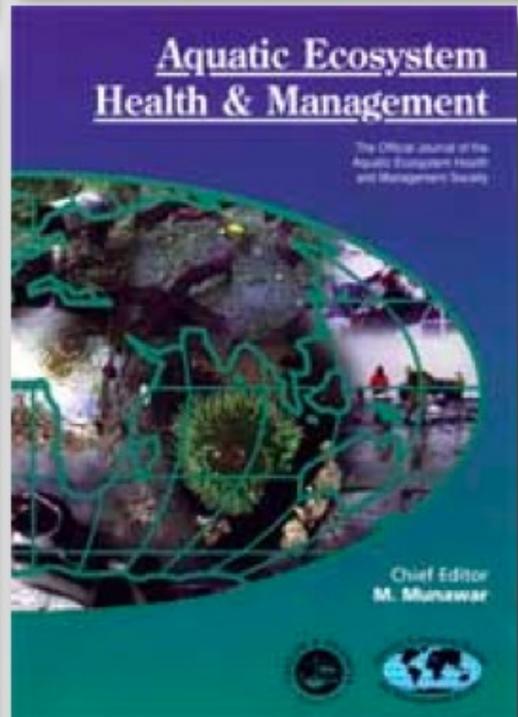
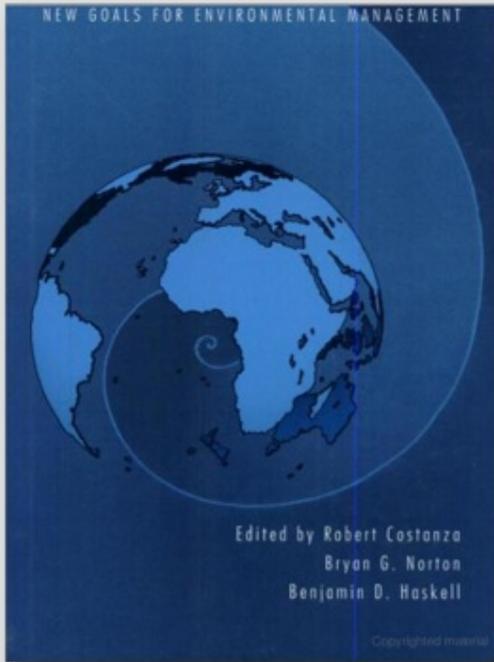


*Later Homo sapiens*

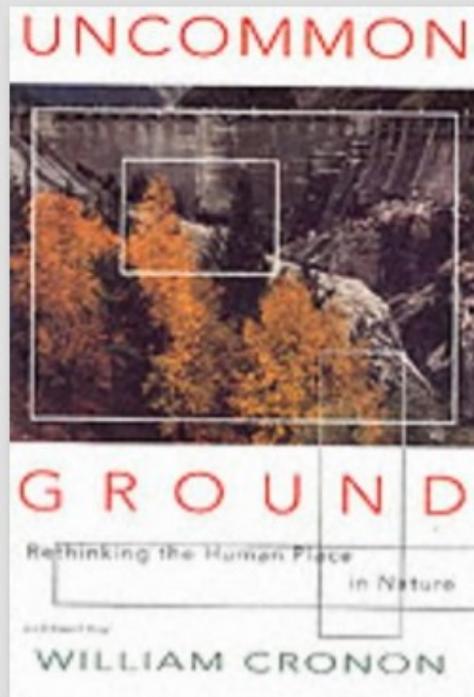
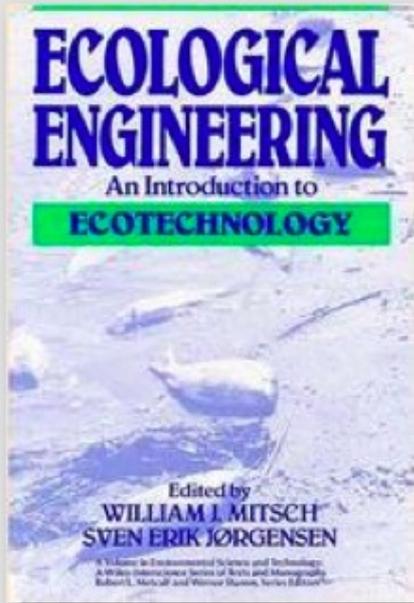


# REVITALIZE health and integrity

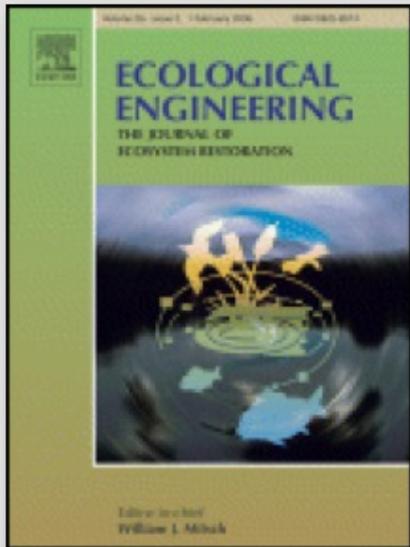
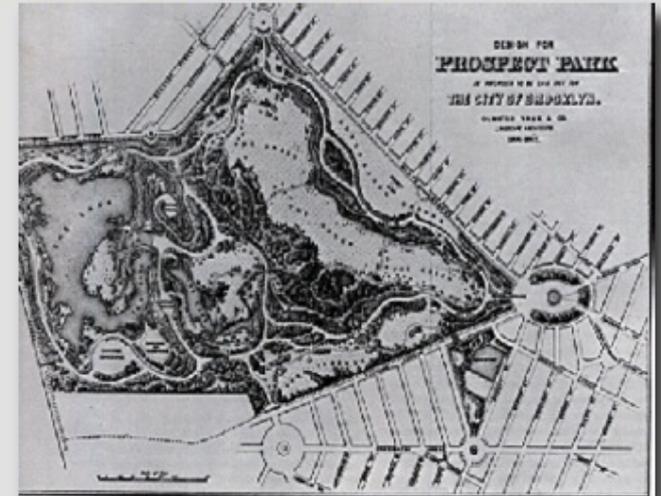
**Protect the  
vital processes  
of nature**



*A peer reviewed international journal devoted to understanding ecosystem performance, function and management from integrated, multi-disciplinary and sustainable perspectives.*



# RENATURING increasing natural and human benefits



## Uncommon Ground Rethinking the Human Place in Nature

design of  
ecosystems for  
the mutual  
benefit of  
humans and  
nature



Frederick  
Olmsted  
and parks  
in NYC.

**ECOLOGICAL ENGINEERING**  
The Journal of Ecosystem Restoration



## **Ecosystem Restoration Targets for the Hudson - Raritan Estuary**

*A project by Hudson River  
Foundation and Cornell University  
for the US Army Corps of  
Engineers and the Port Authority of  
New York and New Jersey.*

## **Four fundamentals of the ecosystem:**

- ❖ **Human dominated and will remain so**
- ❖ **Has been irreversibly changed in almost all its properties**
- ❖ **Dynamic and will change further**
- ❖ **Science and technology can make clear and valuable enhancements**

## **Goal for restoration:**

**A mosaic of habitats that provide society with new and increased benefits from the estuary environment**

# Setting Targets for Restoration of the Hudson-Raritan Estuary

Report of an Interdisciplinary Workshop

Mark Bain, Dennis Suszkowski, Jim Lodge, & Lijie Xu  
Cornell University and The Hudson River Foundation



January 2006



## Target Ecosystem Characteristic (TEC)

- ❖ **A specific ecosystem property or feature**
- ❖ **Broadest planning element that is measurable**
- ❖ **Attributes of societal and management value**

### TEC making:

*The quantity of an ecosystem attribute in a region for a stated duration*

**The elements of a definition:**

**[amount] [attribute] [area] [period]**



## **Our TECs:**

- ❖ **Shorelines and Shallows**
- ❖ **Islands for Waterbirds**
- ❖ **Enclosed and Confined Waters**
- ❖ **Oysters and Oyster Reefs**
- ❖ **Habitat for Fish, Crabs, and Lobsters**
- ❖ **Eelgrass Beds**
- ❖ **Coastal Wetlands**
- ❖ **Tributary Connections**
- ❖ **Sediment Quality**
- ❖ **Public Access**
- ❖ **Maritime Forests**

# Shorelines and Shallows

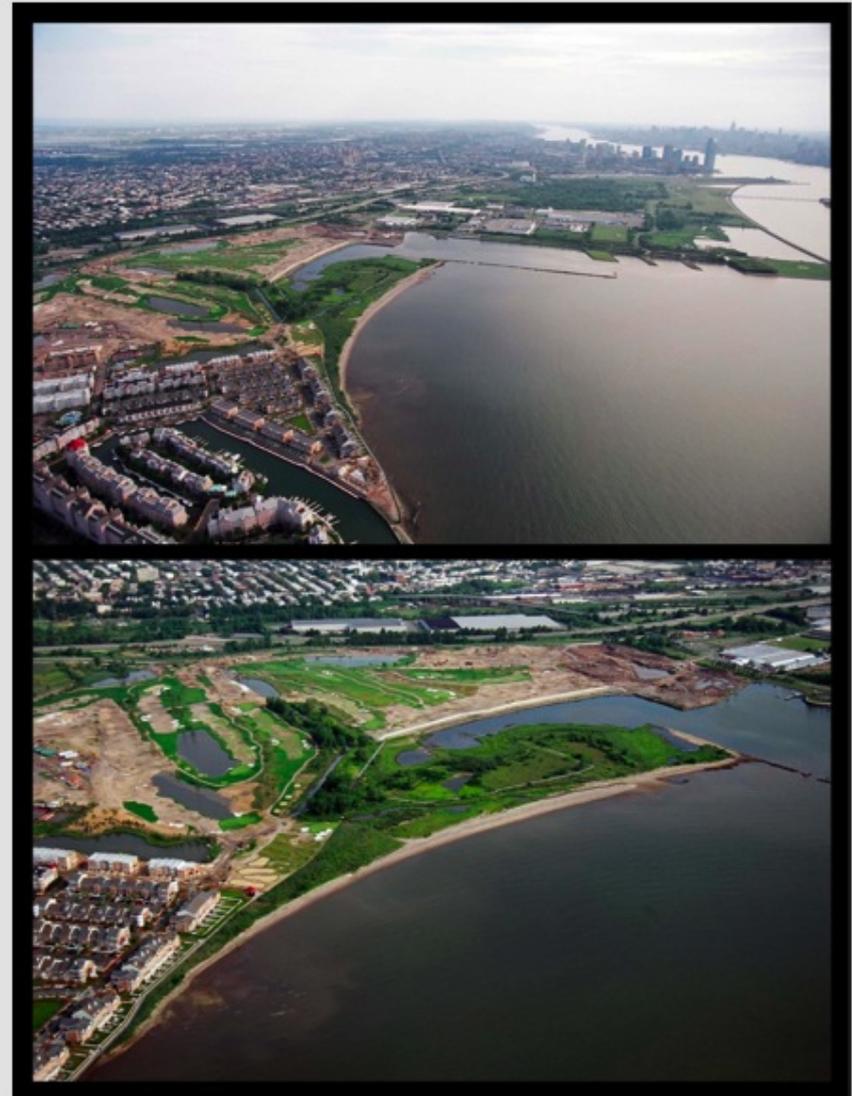
**By 2012:** Develop two shoreline and shallows sites in two of the four regions identified for action.

**By 2050:** Restore all available shoreline and shallows sites in the four regions identified for action.

***Restoration of shorelines and shallows is defined in terms of vegetation for the riparian zone (30 m), gradual slope for the inter-tidal zone (10-30% slope), and water depth (< 3 m) for the shallow littoral zone.***

***For Nature: habitat for many species, diversified habitats together, retain sediments and nutrients, absorption of wave energy, trapping of organic matter.***

***For People: natural waterfront settings, shorelines for public use, nature contact, open space, green corridors.***



# Enclosed and Confined Waters

**By 2012:** Upgrade the designated use of eight enclosed waterways or tidal creeks to match the designated use of their receiving waters.

**By 2050:** Upgrade the designated use of all enclosed waterways and tidal creeks to match or surpass the designated use of receiving waters.

***The condition of many enclosed basins and tidal creeks is lower than adjoining, larger waterbodies. Each impaired creek and enclosed basin will likely require a different set of actions.***

***For Nature: increased shallow habitat, pollutant reductions, increased benthic production, aquatic community support.***

***For People: reduced bacterial exposure, enhanced aesthetics at high contact locations, direct access, nature viewing, water recreation.***



# Islands for Waterbirds

**By 2012: Enhance one island within each region to provide roosting and nesting sites.**

**By 2050: All islands provide roosting and nesting sites.**

***Islands will be restored by enhanced vegetation (trees and shrubs for roosting, softened shorelines for feeding, and isolation from human disturbance.***

***For Nature: diversify biota, predators on shallow-water life, migration stops, protected nesting sites.***

***For People: observable wildlife, favorite wildlife for viewing, support bird counts, ecocruise sites, benefits with limited direct contact.***



# Eelgrass Beds

**By 2012:** One test bed of eelgrass in each region.

**By 2050:** Three established eelgrass beds in each region capable of supporting seagrasses.

***Provide proof-of-concept that eelgrass restoration is viable; establishing self-sustaining and expanding eelgrass beds is the long-term target.***

***For Nature: sediment trapping and stability, juvenile fish habitat, feeding sites for waterbirds, shellfish habitat, substrate surface.***

***For People: enhanced fish production, quality indicators, erosion reduction, enhanced water clarity, visible habitats.***





## **Points of Controversy.....**

- ❖ **Not restoration - just another form of human manipulation**
- ❖ **How true are the targets? - judgement and creativity being used**
- ❖ **How can we know what is best for the future?**
- ❖ **Who is qualified to design an ecosystem?**

# Perhaps think of restoration ..... as a Renaissance

**Period of vigorous intellectual activity**

**Rebirth, renew, remake, create in a new form**

*Forward looking, positive, can be practical, needs creative ideas*

**Include culture - the City is a great achievement**

*Recognizes people as part of the ecosystem and the future*

