

# Hackensack River Oyster Project: Integrating Volunteer Monitoring to Develop a Benthic Restoration Plan

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# Collaborative Effort

- Rutgers University
- Hackensack Riverkeeper
- NY/NJ Baykeeper
- Explore 2000 Middle School  
(Hudson County Schools  
of Technology)
- New Jersey Meadowlands  
Commission (NJMC)



# WHY THIS SEMINAR?

## Audience Survey

- What type of organization do you work for?
  - Government/Regulatory Agency
  - Watershed Organization
  - Water/Wastewater Treatment
  - University/Higher Education
  - Teacher (K-12)
  - Other?

# WHY THIS SEMINAR?

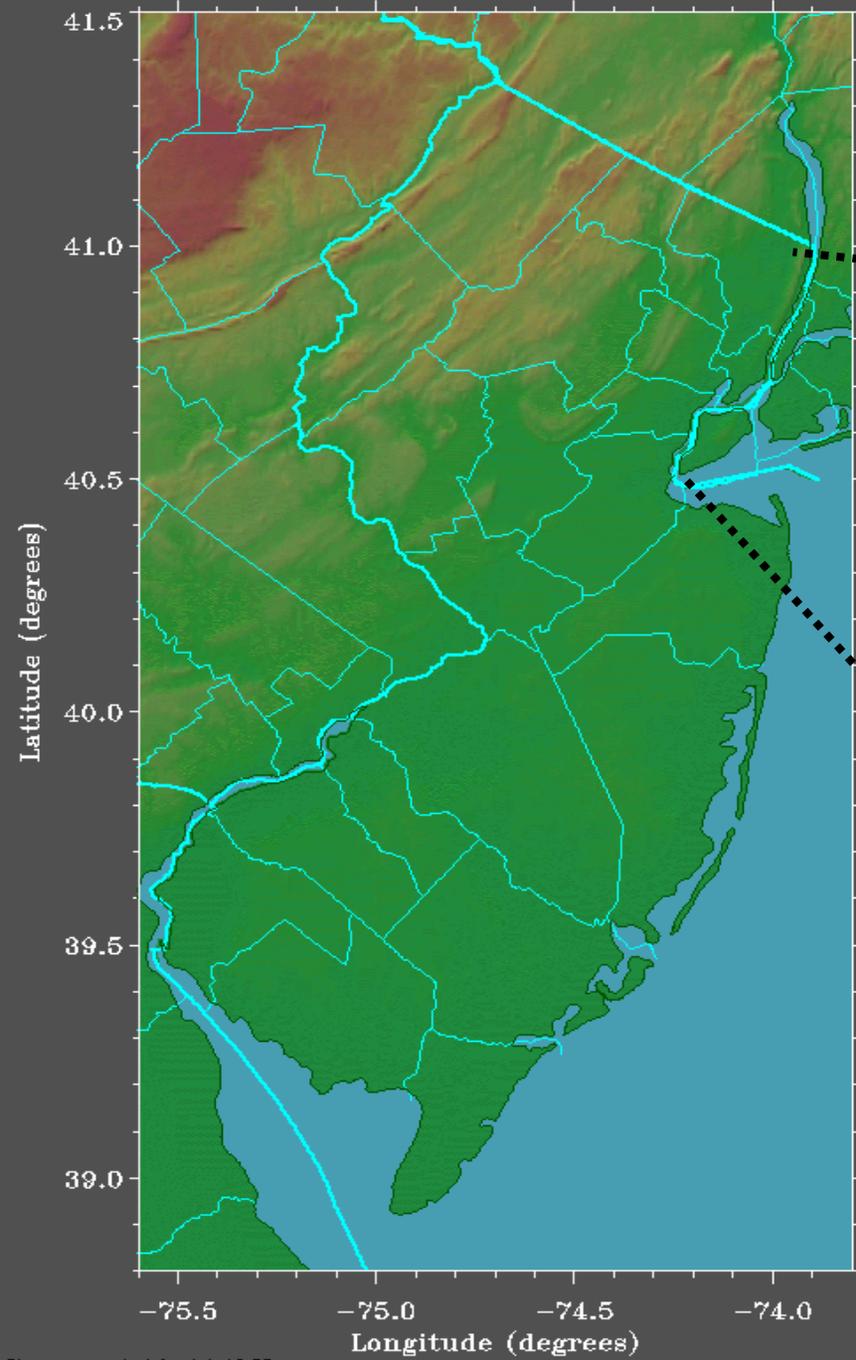
## Audience Survey

- Does your organization use volunteers?
- How?
  - Collect Water Quality Data
  - Data Entry
  - Data Analysis
  - Outreach
  - Other?

# WHY THIS SEMINAR?

## Audience Survey

- Does your organization partner with local groups?
  - Schools (K-12 & Universities)
  - Scouts
  - Watershed Organizations
  - Businesses
  - Civic Groups
  - Other?



# HACKENSACK RIVER

## History







# ***Pollution***

***Pollution***

***Land Use***

***Neglect***

# ***Pollution***

*Challenges*

*Strategies*

*Achievements*

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# ***Pollution***

*Challenges*

*Strategies*

*Achievements*

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# ***Pollution***

*Challenges*

*Strategies*

*Achievements*

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# ***Land Use***

# ***Pollution***

*Land Use*

*Neglect*

# Land Use

## Challenges

- Improper zoning
- Filling wetlands
- Destruction of natural resources for development
- Transportation infrastructure fragmenting land, making it important
- Impervious surfaces
- Combined

## Strategies



## Achievements

• Efficient use of property

• Investments for

• Better

• Older cities

# Land Use

*Challenges*

*Strategies*

*Achievements*

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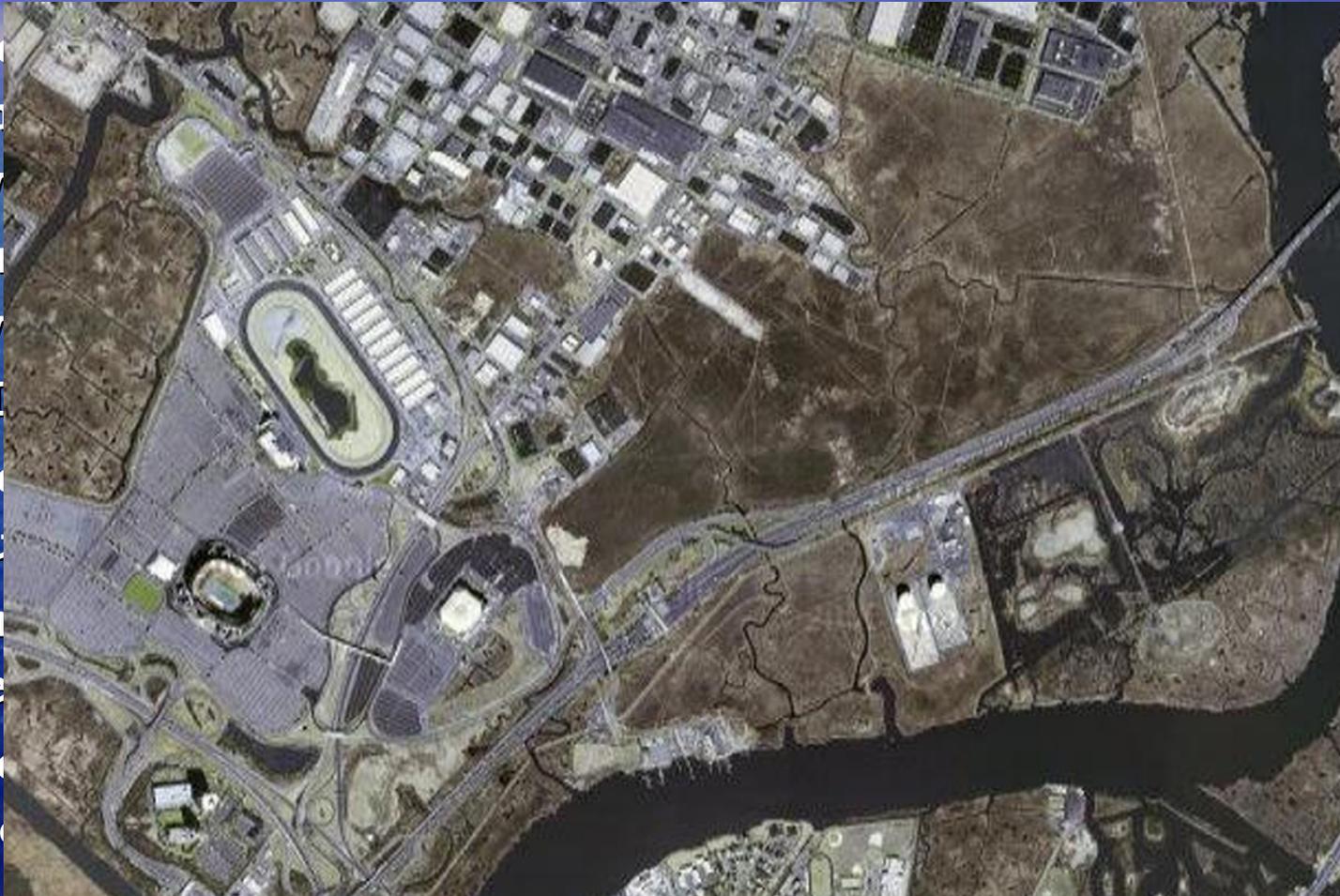
# Land Use

*Challenges*

*Strategies*

*Achievements*

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*Pollution* ***Land Use*** *Neglect*

# Neglect

*Challenges*

*Strategies*

*Achievements*

- Lack

- Cultural  
resistance

- Corruption

- Over  
pollution



# Neglect

*Challenges*

*Strategies*

*Achievements*

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# Neglect

*Challenges*

*Strategies*

*Achievements*

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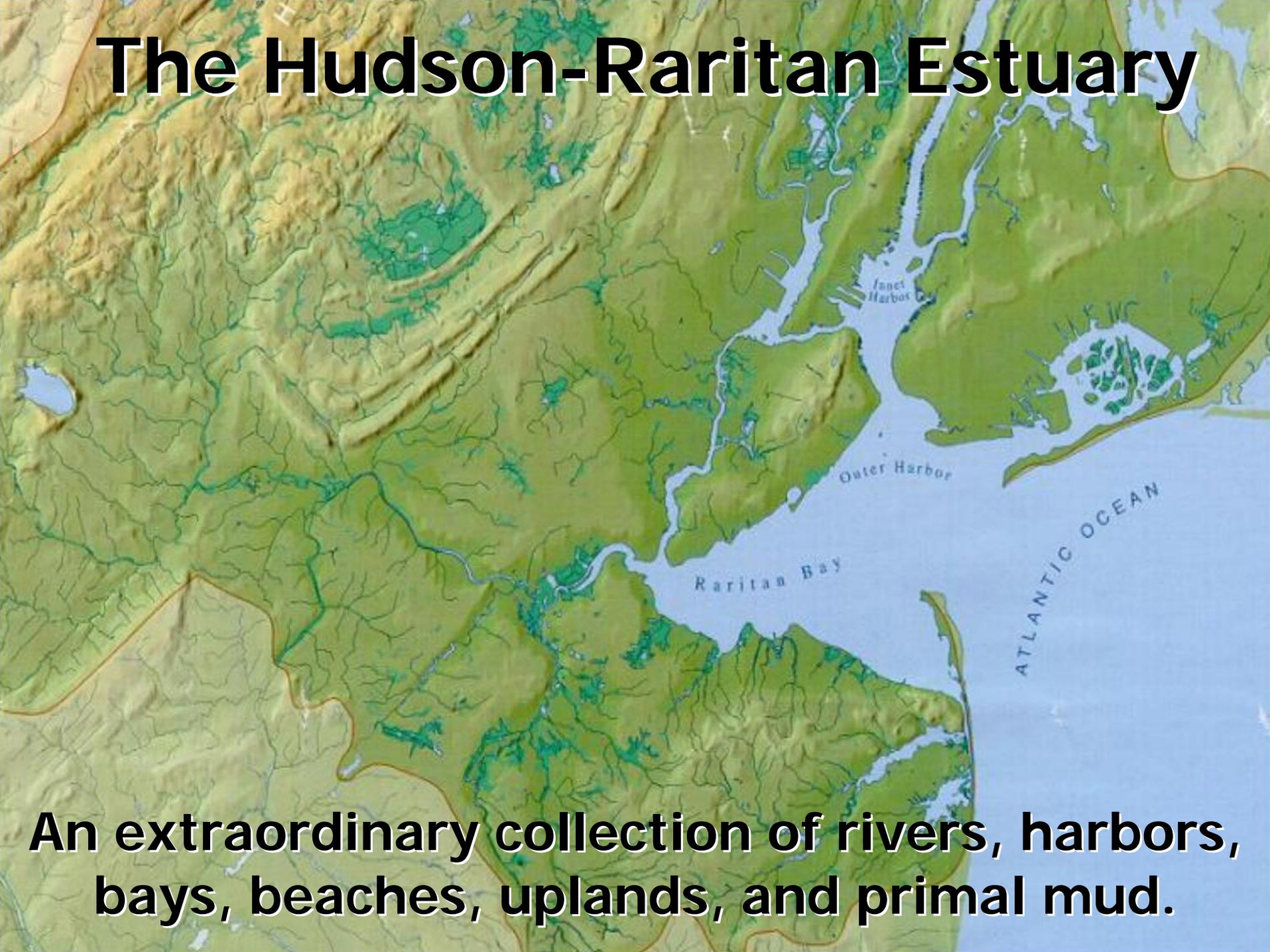
***Neglect***

***Pollution***

***Land Use***

***Neglect***

# The Hudson-Raritan Estuary

A topographic map of the Hudson-Raritan Estuary region. The map shows the Hudson River flowing from the north into the Raritan Bay. The Raritan Bay is connected to the Atlantic Ocean. The map also shows the Outer Harbor and Inlet Harbor. The terrain is depicted with green and brown colors, indicating different elevations and land cover. The Atlantic Ocean is labeled on the right side of the map.

**An extraordinary collection of rivers, harbors, bays, beaches, uplands, and primal mud.**

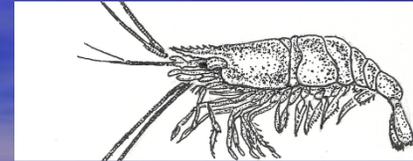
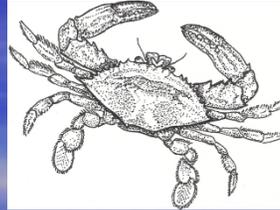
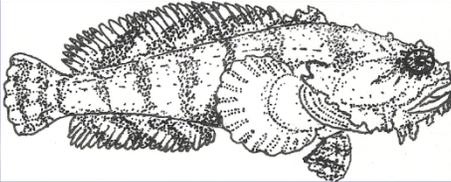
# WHY RESTORE THIS ECOLOGICALLY IMPORTANT SPECIES?

- Water filtration capacity to improve overall water quality
- Increase species diversity of fish population
- Enhance benthic habitat with complex reef structure

**Oysters are “keystone” species.**



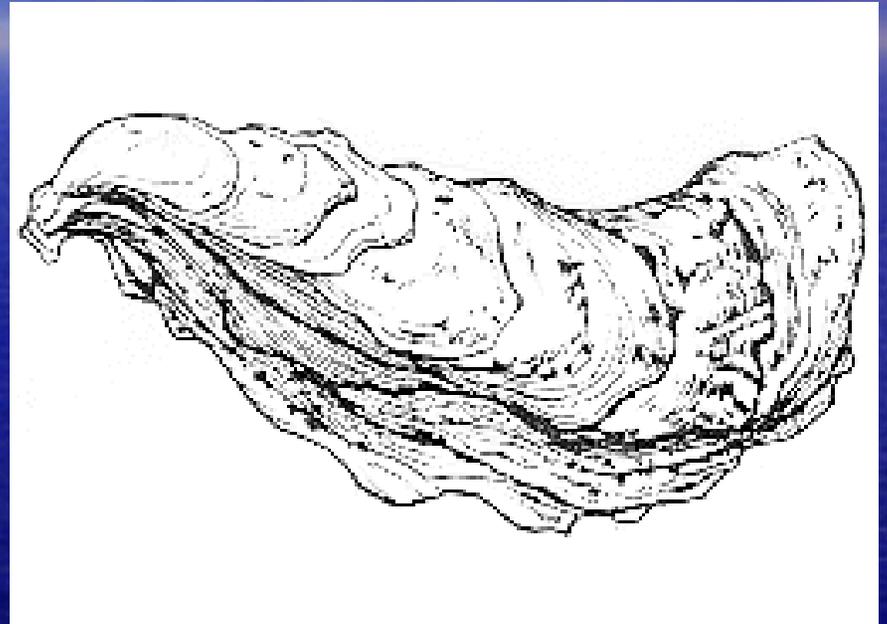
# WEB OF LIFE



Oyster reefs provide refuge for a variety of marine organisms including anemones, barnacles, crabs, and fish. For this reason, oysters are considered a "keystone" species because they link benthic and pelagic food webs creating an interconnected food web. Research has shown that over 30 species of fish are associated with oyster reefs, including juvenile striped bass, tautog, black sea bass, and adult black drum.

# THE AMERICAN OYSTER

*Crassostrea virginica*



# OYSTERS ARE NATURAL FILTERS

An adult oyster can  
filter 10 quarts of  
water per hour.

Dense populations of  
filter-feeding shellfish  
can have basin-wide  
water quality effects.



# Oyster Bar



© Alice Jane Lippson

Oyster spat  
Oyster drills  
Sea squirts  
Mud crabs  
Striped sea bass

Flat worms  
Tautog  
Killies  
Mussels  
Flounder

Blue claw crab  
Barnacles  
Grass Shrimp  
Anemones  
Mud snails

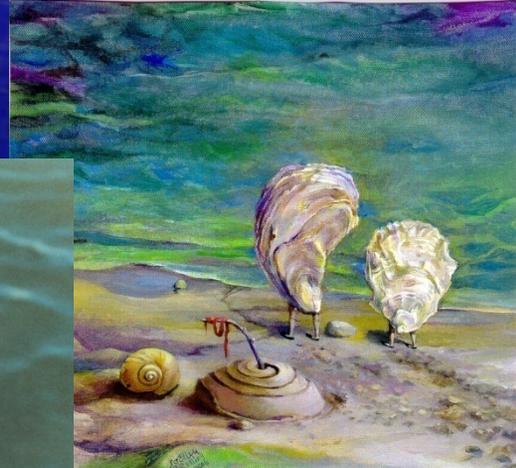
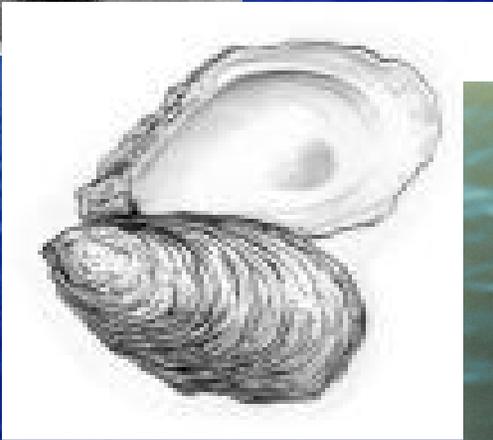
# REASONS FOR DECLINE OF OYSTER POPULATION

- Overharvesting
- Pollution
- Dredging
- Siltation
- Disease





# REEF RESTORATION



# BAYKEEPER'S RESTORATION EFFORT



# CONSTRUCTION OF KEYPORT REEF (2001)



# CONSTRUCTION OF NAVESINK REEF (2003-PRESENT)



# HOW DOES BAYKEEPER BUILD OYSTER REEFS?

Create a layer of surf clam shells so the oysters do not get buried in the sediment

Plant a layer of oysters from the Oyster Gardening Program and Aquaculture Program

Oyster Layer

Surf Clam Shells



# AQUACULTURE CENTER



# REMOTE SETTING AQUACULTURE PROGRAM

- Receive oyster larvae when they are about to settle
- Provide the larvae with bags of shells to settle on
- After oysters are the size of a quarter they are planted on the reef
- 2007: 266,000 spat on shell planted





# OYSTER GARDENING

- Volunteers grow 500 - 2000 clutchless oysters in floats around the Estuary.
- School classes, scout troops, families, civic groups and boat clubs participate.
- Maintain oysters on a monthly basis for one year, measuring growth and recording observations of organisms.



**PRESENTLY:**

**40 ACTIVE SITES IN NJ**  
**17 ACTIVE SITES IN NY**



**VOLUNTEERS ARE INVOLVED  
IN EVERY ASPECT OF THE  
OYSTER PROGRAM:**

**Reef Building**

**Gardening Oysters**

**Bagging Shell**

**Aquaculture Facility**

**Monitoring/Field Work**

**Workshops**

# THE BEGINNING OF A REEF....



# PROJECT OBJECTIVES

- Identify Hackensack River locations where oyster reef habitat would be desirable
- Determine the viability of Eastern Oysters at these locations in the Hackensack River
- If oysters prove to be viable prepare a Benthic Habitat Restoration Plan for the Hackensack River

**This plan would be implemented in years 2-5 following the preliminary study and would include the following elements:**

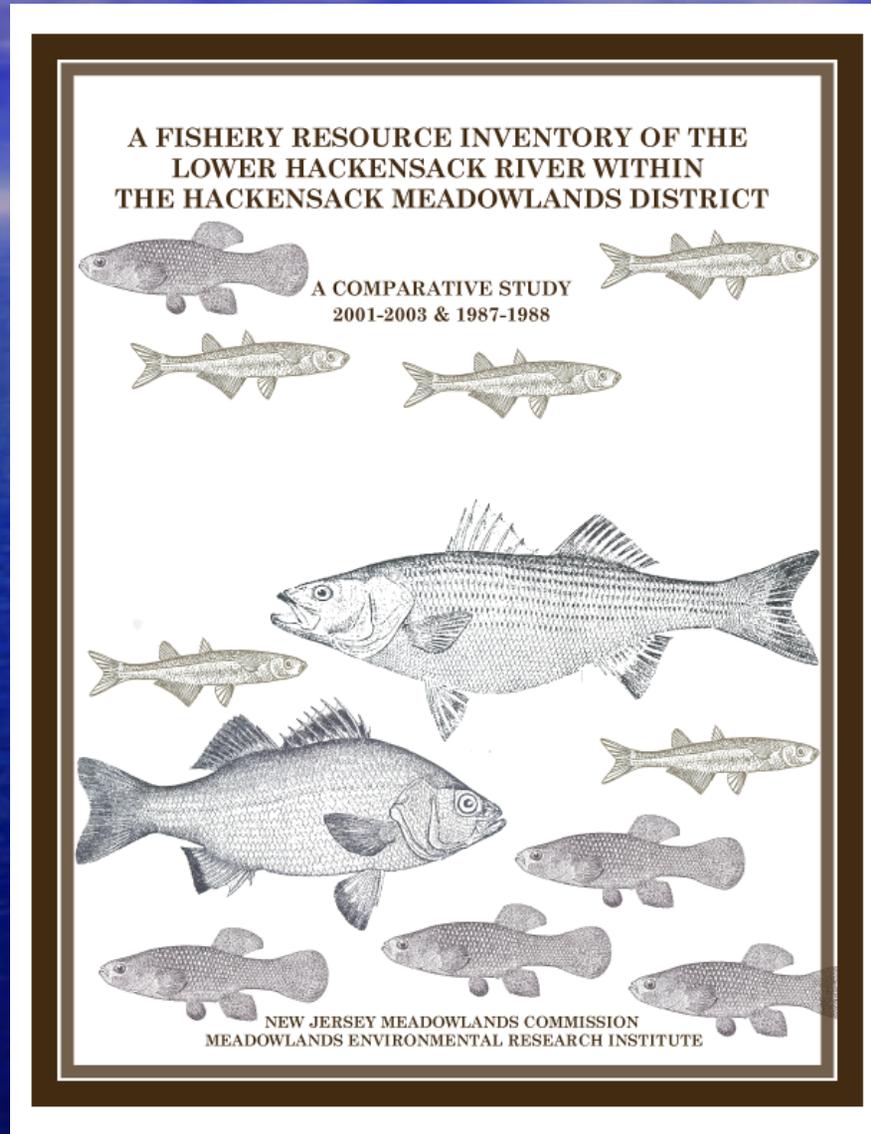
Identification of suitable oyster habitat locations.

Proposed ecological community assemblages.

A program of public participation, education, and outreach.

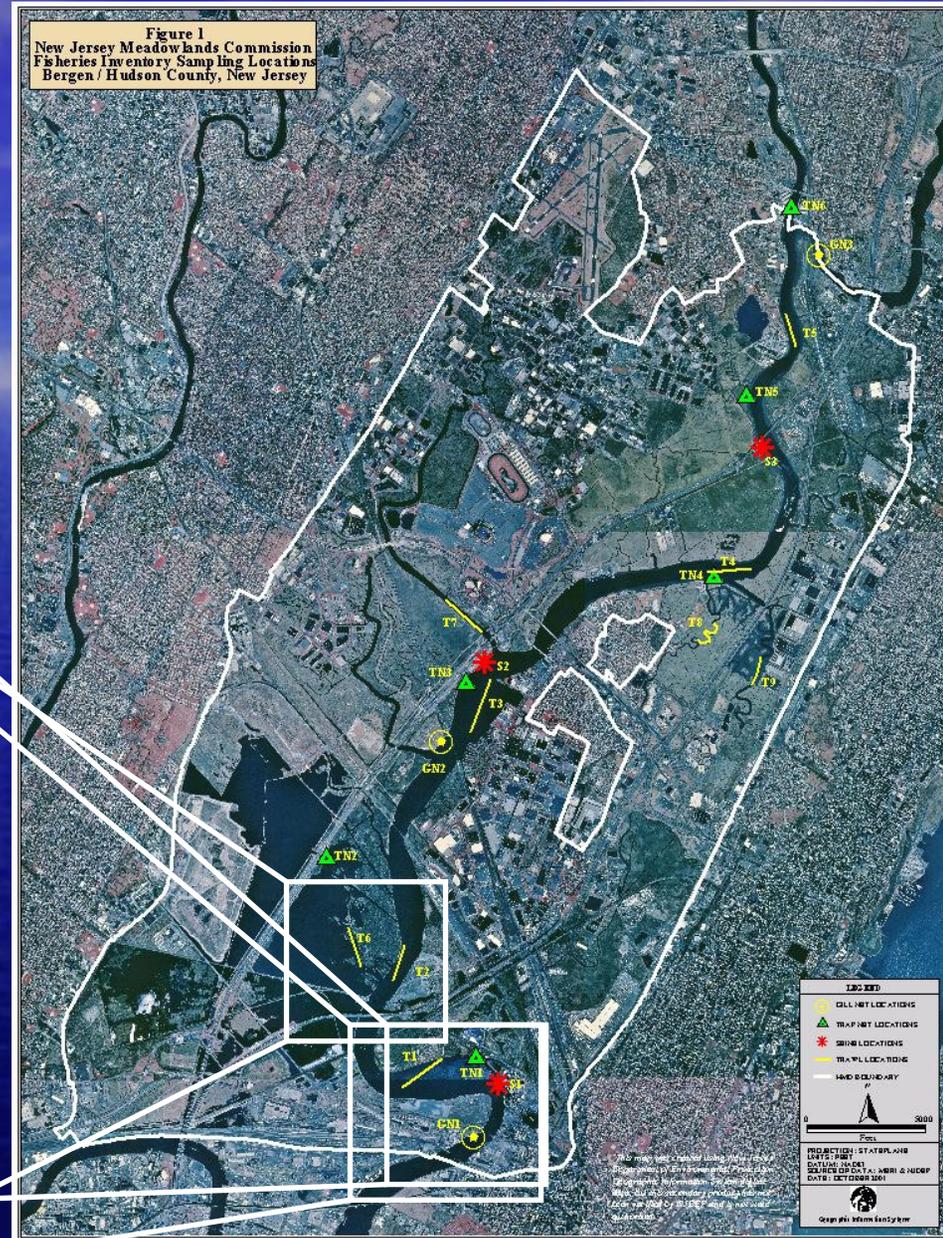
Identification of potential project partners and funding sources.

# PRIOR AQUATIC STUDIES



# Oyster Presence

- T1
  - T2
  - T6
  - GN1
  - S1
- } Trawl
- Gill Net
- Seine



# TEST SITE SELECTION

## Meadowlands District Test Site Criteria:

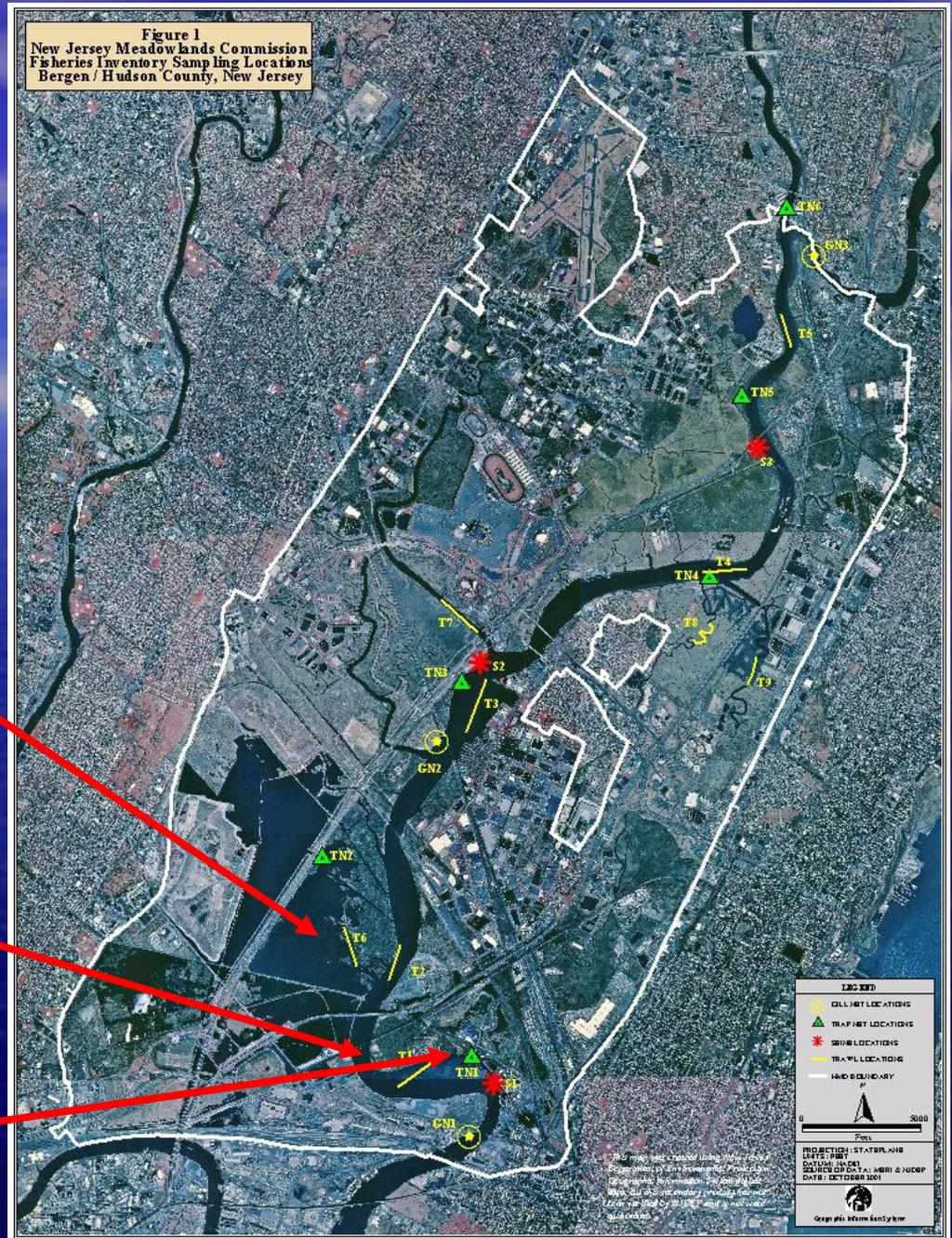
- Locations where it is desirable to slow water velocities and/or reduce turbidity
- Indications that small patches of oysters may be present
- An intermediate salinity range  $>10$  ppt
- Tidal patterns that contribute to larvae retention within a potential "reef area"
- Adequate levels of oxygen and nutrients
- Avoidance of areas where the oysters could be easily harvested to prevent creating an "attractive nuisance"

# TEST SITES

Saw Mill Creek

Riverbend

Penhorn Creek



# EXPERIMENTAL DESIGN

- 5 Locations
  - 18 floats total
  - Oyster density 1000/m<sup>2</sup>
    - Survival
    - Growth
    - Predation
    - New larvae setting
  - Test various substrates for oyster setting
    - Concrete
    - Terra Cotta
    - Wood
    - Limestone

# EXPERIMENTAL DESIGN

- 5 Locations

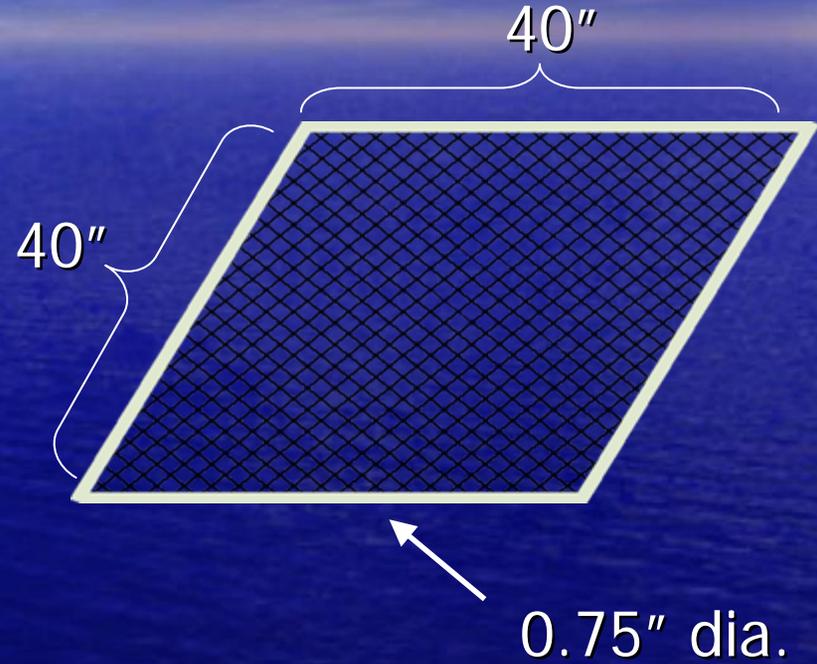
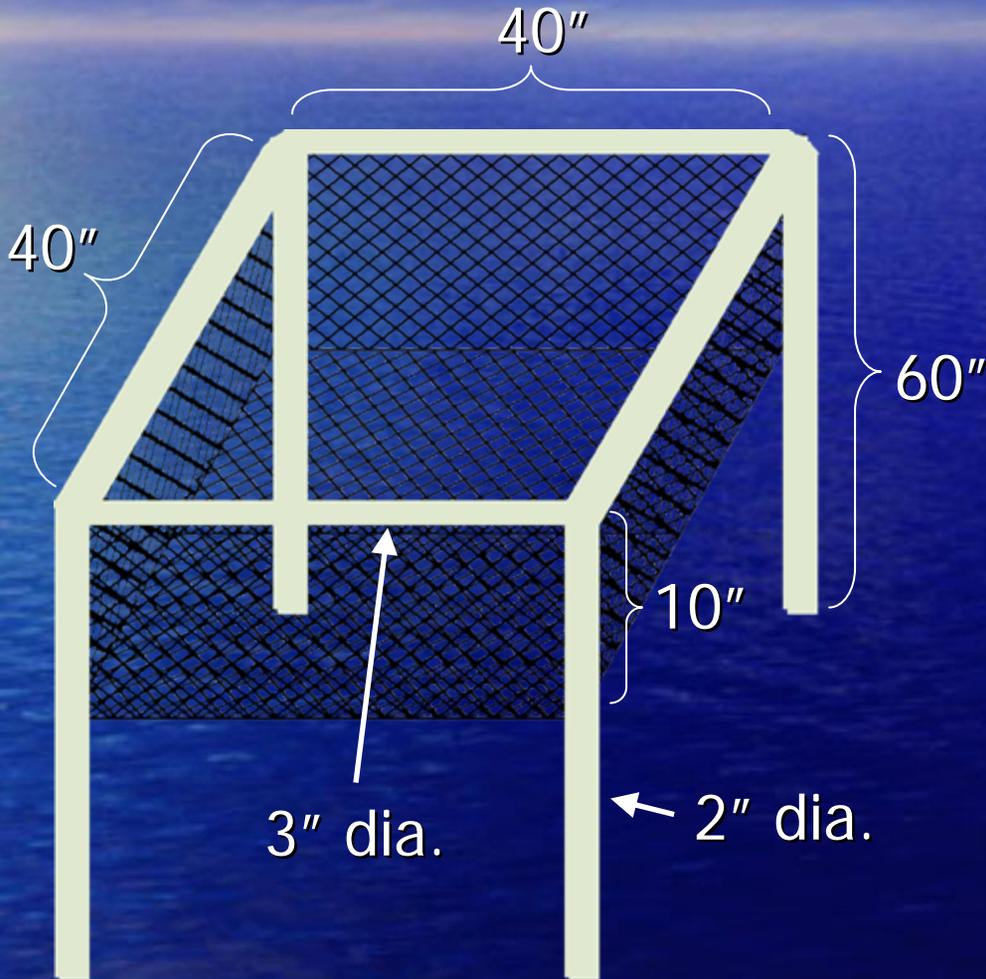
- Upper Saw Mill Creek
  - 3 Enclosures
- Middle Saw Mill Creek
  - 3 Enclosures
- Mouth of Saw Mill Creek
  - 3 Enclosures
- Riverbend Marsh
  - 3 Enclosures
- Malanka Landfill
  - Transect of 5 enclosures



# MODIFIED FLOAT CONSTRUCTION

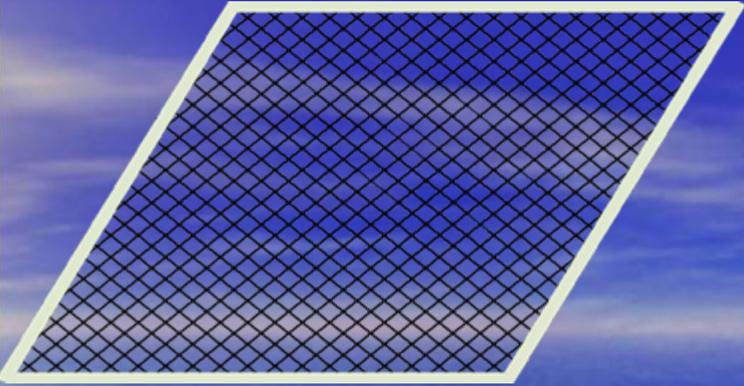
Float

Lid



# OYSTER ENCLOSURES





# SUBSTRATE TEST



# FIELD SAMPLING



- Water Quality Measurements - DO, pH, Salinity, Temperature.
- Oyster Growth Measurements
- Invertebrates and vertebrates logged
- Oyster Mortality

# VOLUNTEER COLLECTED DATA

## Measuring Oysters



# RECRUITING VOLUNTEERS

- Outreach
  - Newsletter
  - Website
  - Media (Press Releases)
  - Presentations (School, Community Groups)
  - Local Events

## **Hackensack River Oyster Monitoring to Resume in March**

*Calling all volunteers; don't miss this opportunity to participate in an exciting project*

In case you missed the last few issues of *Tidelines*, Hackensack Riverkeeper and our partners are engaged in a yearlong study of oysters in the lower Hackensack River. Last August we placed 19,800 oysters at five locations in the river and the marshes of the Sawmill Creek Wildlife Management Area. We then returned in September and October to count and measure the growth of the oysters.

After taking a break for the winter, it is almost time to pick up where we

left off and we are looking for a few hearty volunteers who want to help us with this exciting research project. Beginning on March 18, we will resume our regular oyster monitoring activities.

All oyster monitoring activities will take place at Laurel Hill County Park in Secaucus, NJ. Anyone interested in participating may register by contacting Project Manager Nick Vos-Wein at 201-968-0808 or via email at [Nick@hackensackriverkeeper.org](mailto:Nick@hackensackriverkeeper.org).

### **VOLUNTEER DATES**

#### **March**

Tue, 18 11:30 am - 3 pm  
Wed, 19 12:30 - 4 pm  
Thu, 20 1 - 4:30 pm

#### **May**

Mon, 5 1:30 - 5 pm  
Tue, 6 2:30 - 6 pm

#### **June**

Mon, 31 11 am - 2:30 pm

#### **July**

Tue, 1 12 - 3:30 pm  
Wed, 2 1 - 4:30 pm

# TRAINING VOLUNTEERS

- Seminars
- History, Biology, Importance of Oysters/Reefs
- Laws and Regulations of Shellfish
- How to measure oysters/data collection
- Materials given out: all materials provided at no cost

# MAINTAINING VOLUNTEERS

- Feed Them!
- Certificates
- Volunteer Awards
- Volunteer Appreciation Party

# GETTING STUDENTS INVOLVED



# STUDENT VIDEO

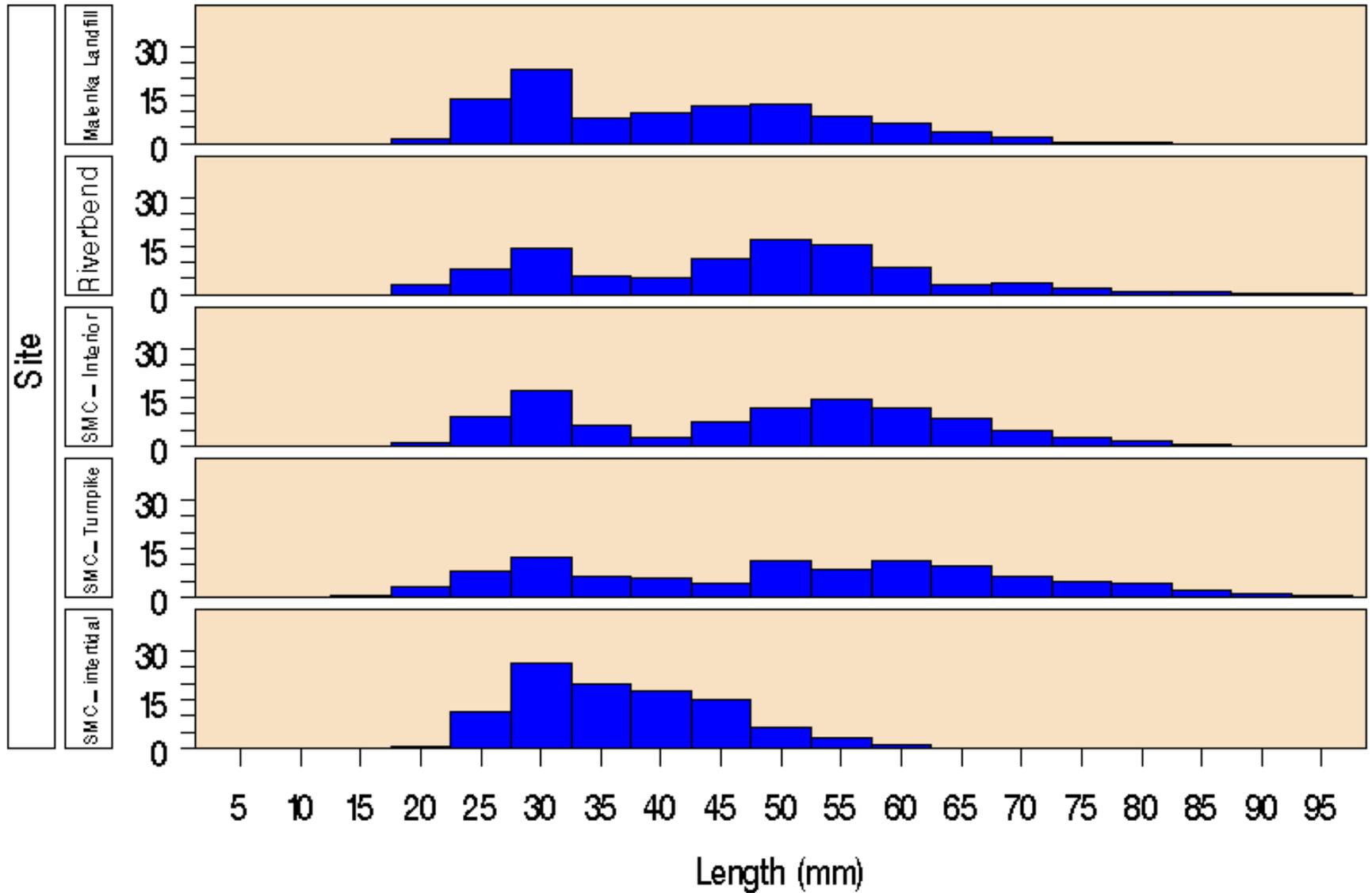


# INITIAL RESULTS



<b>PARAMETER</b>	<b>SMC – E</b>	<b>SMC – I</b>	<b>SMC</b>	<b>RIVER</b>	<b>MALANKA</b>
<b>Water Temp</b>	<b>25.4 + 2.67<sup>a</sup></b>	<b>26.4 + 2.98<sup>b</sup></b>	<b>26.2 + 4.18<sup>b</sup></b>	<b>25.2 + 2.75<sup>a</sup></b>	<b>25.8 + 2.91<sup>a</sup></b>
<b>Salinity</b>	<b>13.2 + 2.59<sup>c</sup></b>	<b>13.3 + 2.44<sup>c</sup></b>	<b>12.4 + 1.21<sup>d</sup></b>	<b>13.4 + 1.40<sup>c</sup></b>	<b>13.8 + 1.69<sup>e</sup></b>
<b>Dissolved O<sub>2</sub></b>	<b>5.74 + 0.31<sup>f</sup></b>	<b>7.8 + 1.52<sup>g</sup></b>	<b>8.9 + 0.94<sup>h</sup></b>	<b>4.3 + 1.00<sup>j</sup></b>	<b>4.5 + 1.02<sup>j</sup></b>
<b>pH</b>	<b>7.9 + 0.08<sup>k</sup></b>	<b>8.1 + 0.19<sup>m</sup></b>	<b>7.9 + 0.59<sup>k</sup></b>	<b>7.9 + 0.03<sup>k</sup></b>	<b>7.9 + 0.02<sup>k</sup></b>

# Hackensack Oysters



The background of the slide features a serene landscape with a clear blue sky filled with wispy white clouds, meeting a calm, deep blue ocean at a distant horizon line. The overall color palette is dominated by various shades of blue.

**Questions?**

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