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Eelgrass Monitoring in the Peconic Estuary: Historic distribution and current trends

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Marine Program

Overview

1) Historic Distribution of Eelgrass (*Zostera marina* L.) in the Peconic Estuary
   - Methodology
   - Historic versus Current Distribution
2) PEP Long-term Eelgrass Monitoring Program
   - Background
   - Methodology
   - Trends

Historic Distribution

Methodology

- Locate and Obtain Historical Aerial Photographs
- Scan aerial photographs and register in a GIS format
- Delineate Potential Eelgrass Beds from Photographs
- Baymen and citizens corroborate delineations

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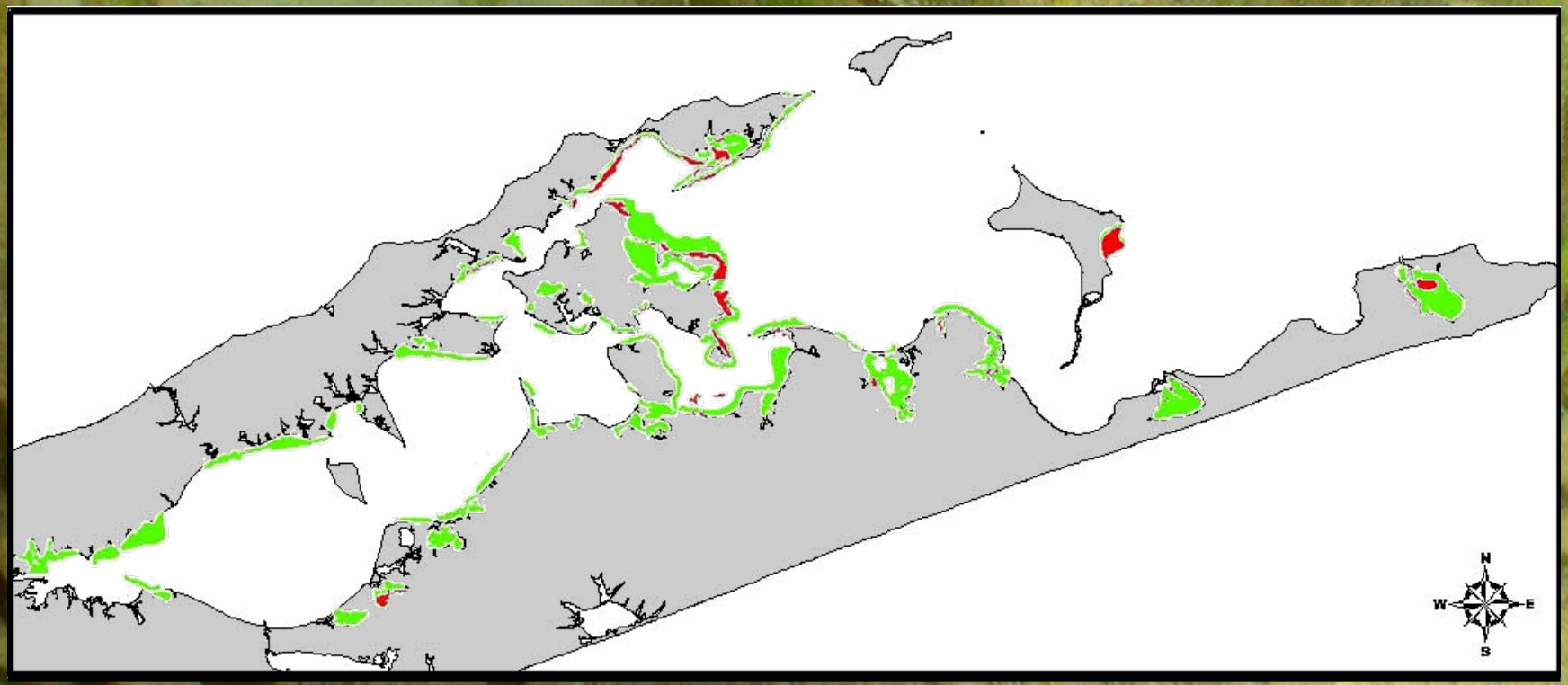
Historic Distribution

Historic vs. Current: Peconic Estuary



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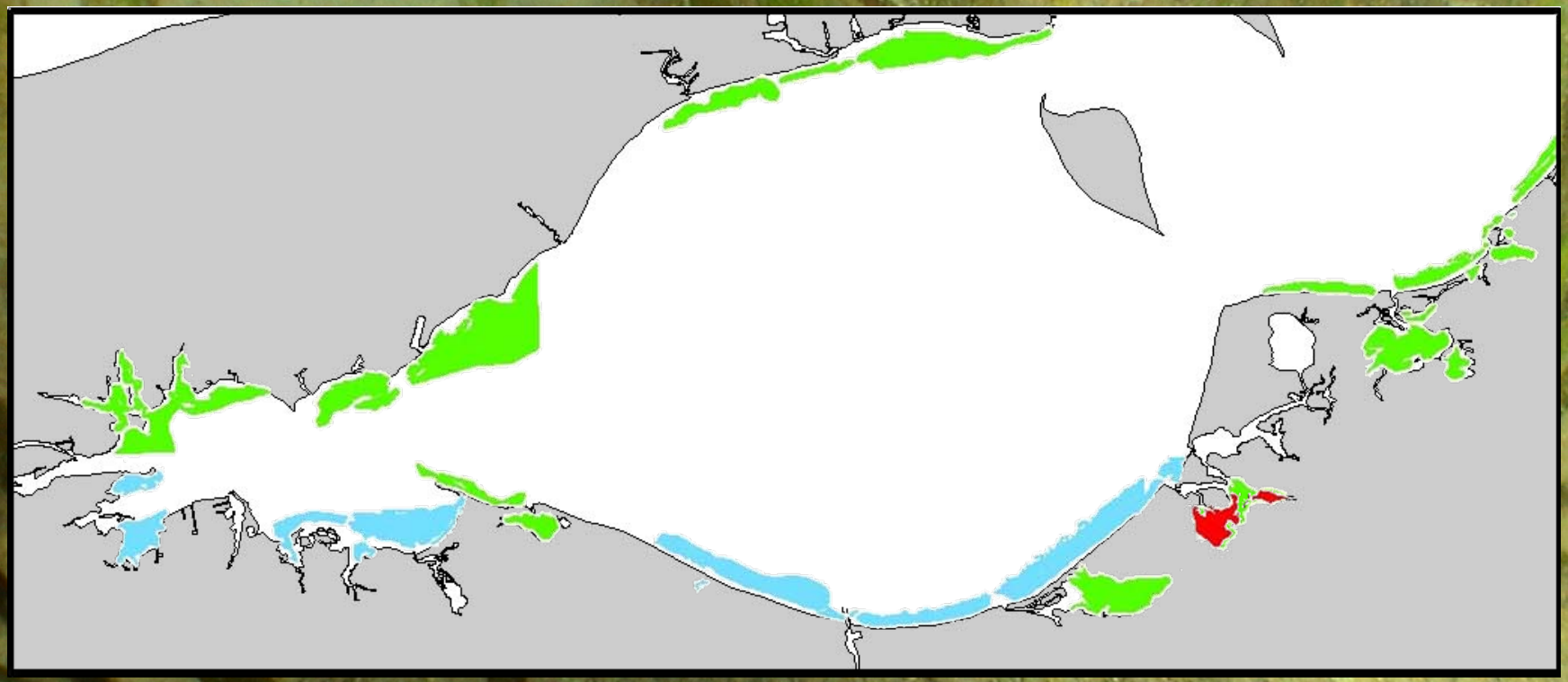
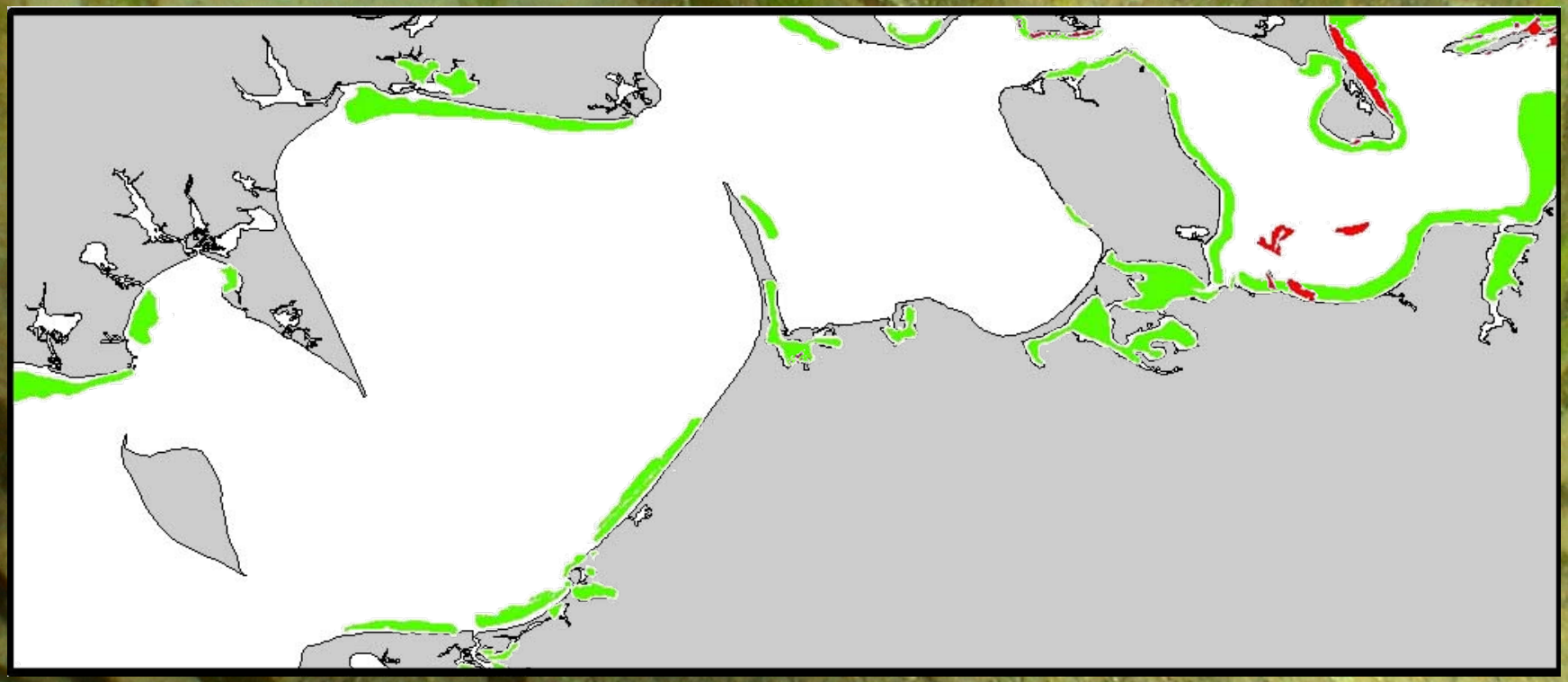
Historic Distribution

Historic vs. Current: Peconic River to North Sea Harbor



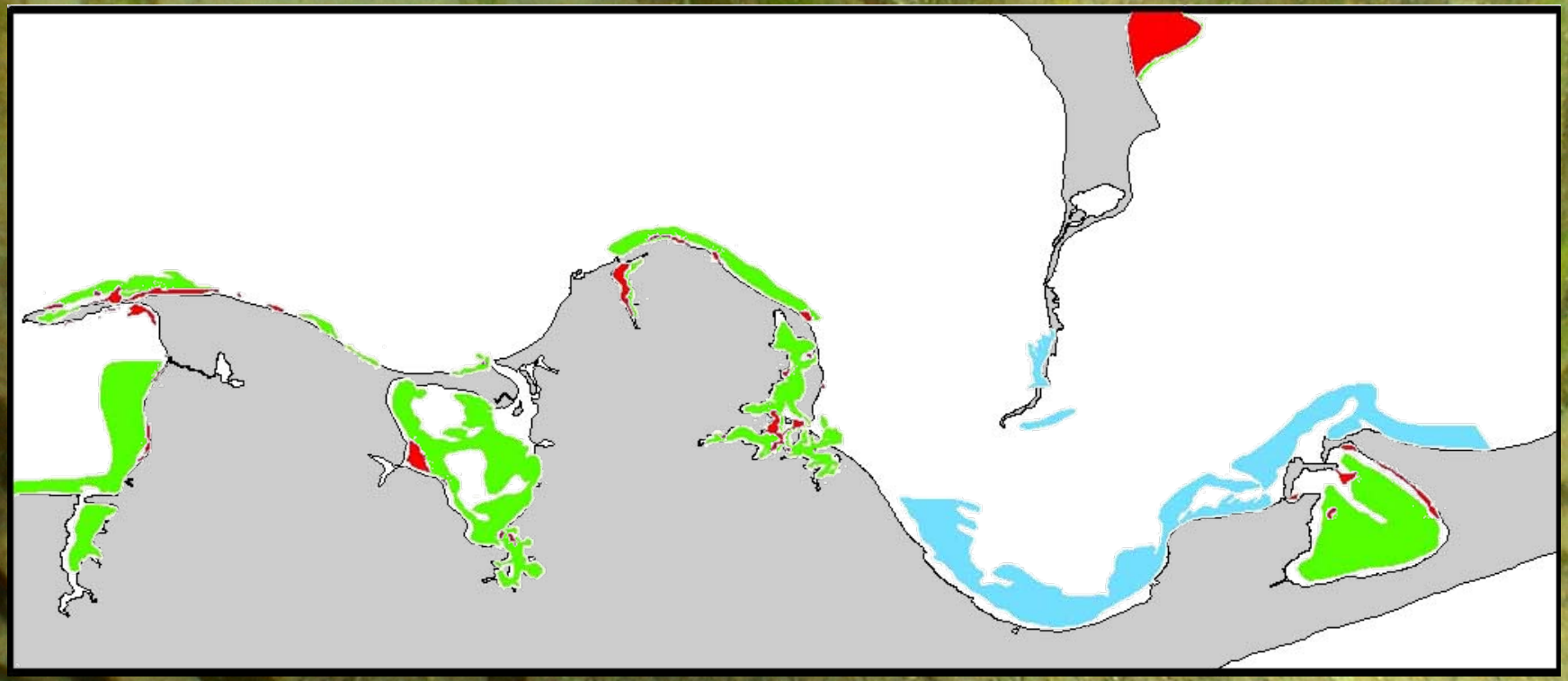
Historic Distribution

Historic vs. Current: North Sea Harbor to Sag Harbor



Historic Distribution

Historic vs. Current: Sag Harbor to Napeague Harbor



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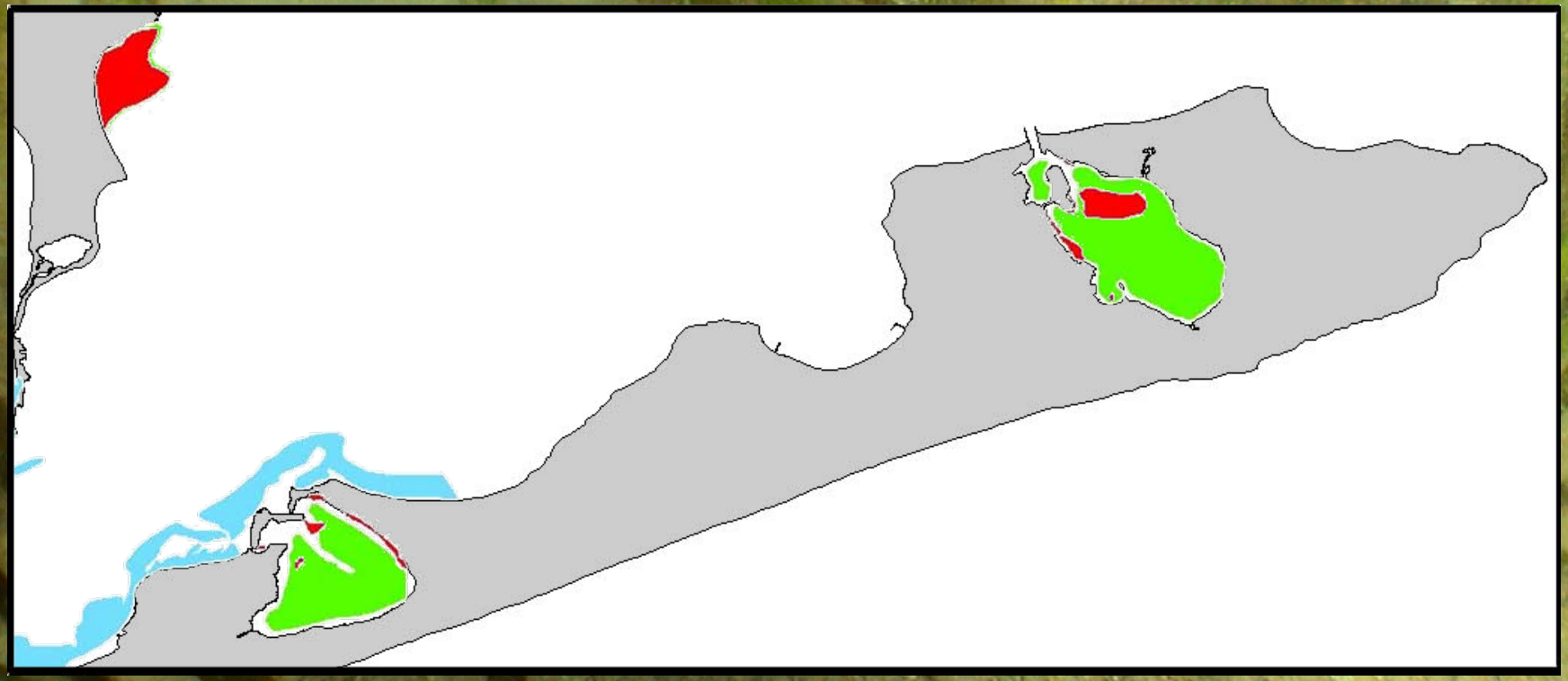
Historic Distribution

Historic vs. Current: Napeague Harbor to Montauk Point



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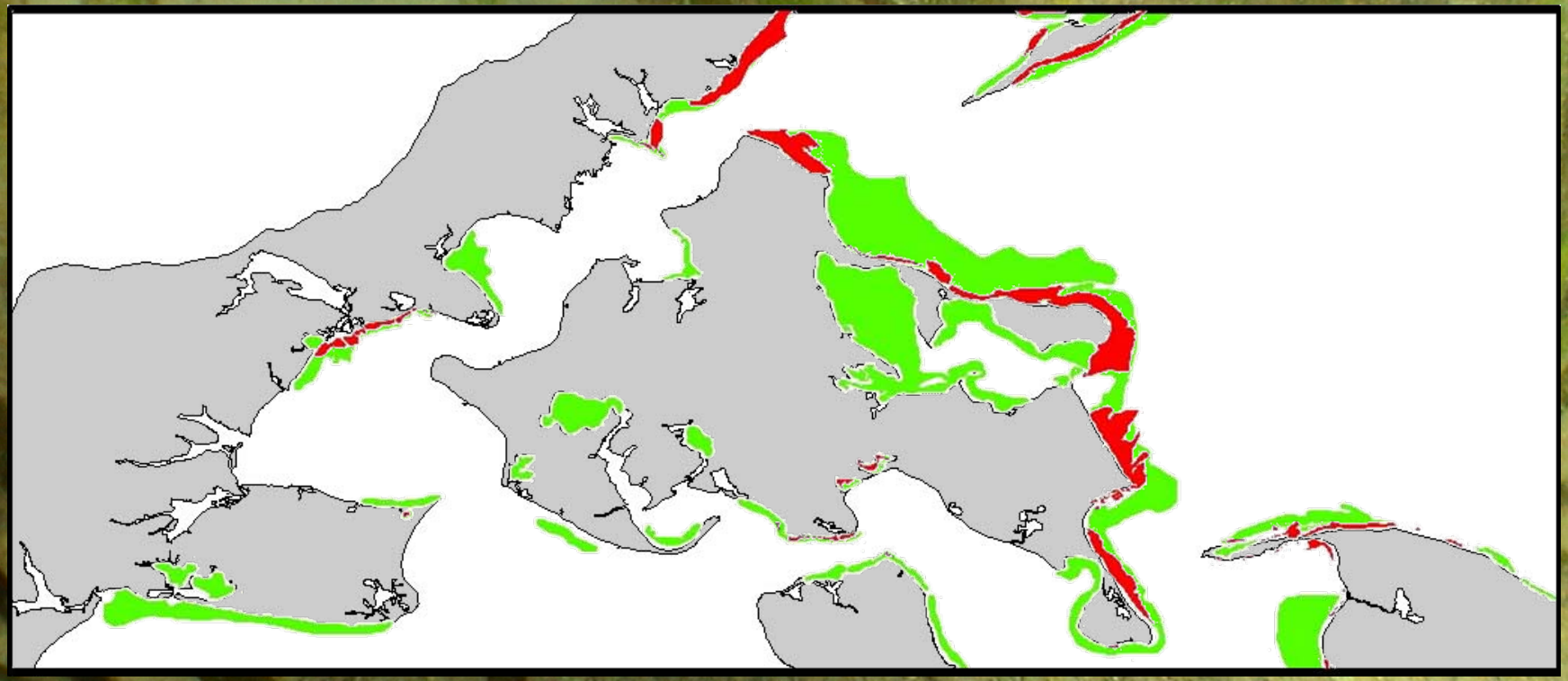
Historic Distribution

Historic vs. Current: Shelter Island



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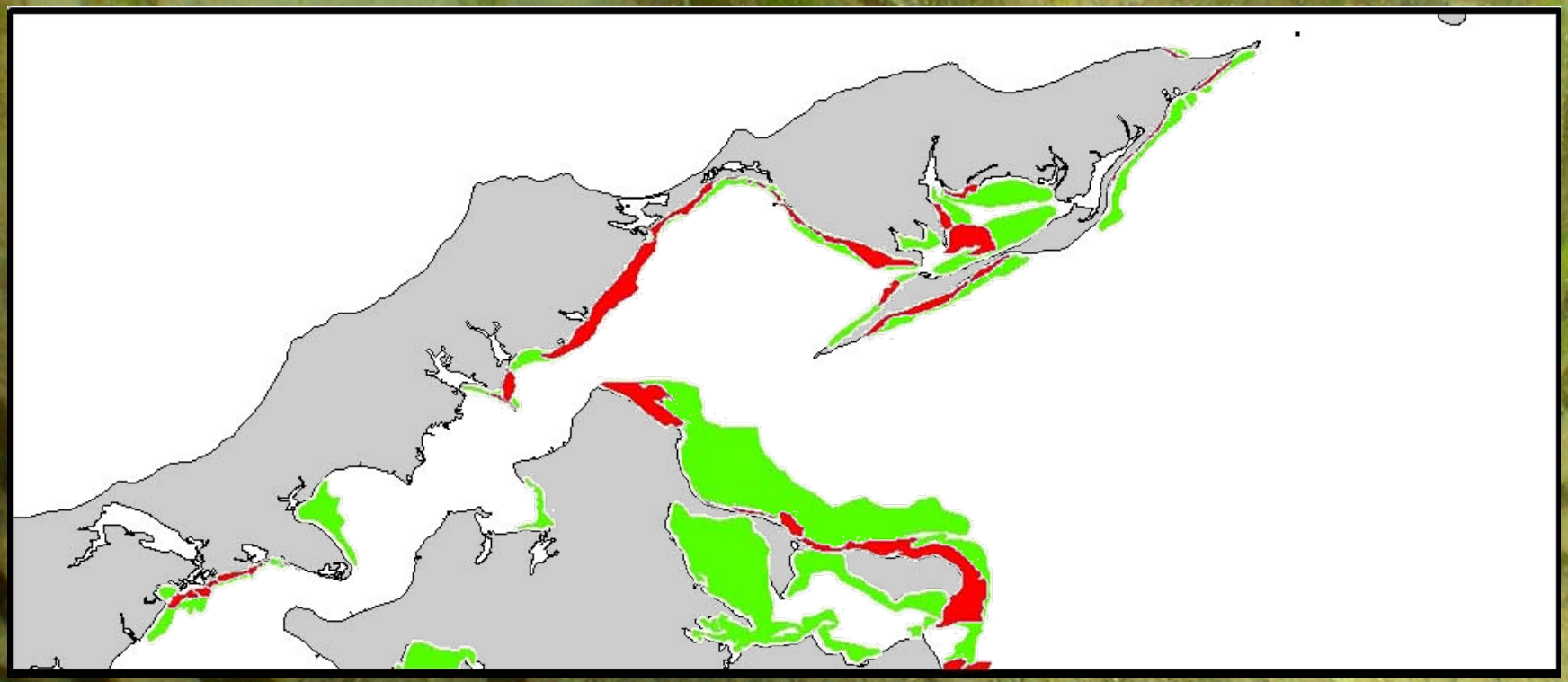
Historic Distribution

Historic vs. Current: Southold Bay to Orient Point



Historic Distribution

Events that have attributed to eelgrass loss

1933-34

- "Wasting Disease" results in up to 90% loss of the eelgrass population in the Atlantic Ocean

1938

- "Hurricane of '38" resulted in severe erosion/sedimentation of near-shore habitat

1944

- "Great Atlantic Hurricane"

1954

- "Hurricane Carol"

1959

- Dredging of creeks begins in Southold Town (Southold Town LWRP)

1960

- "Hurricane Donna"

1985

- First Brown Tide event
- "Hurricane Gloria"

1990

- Second Brown Tide Event

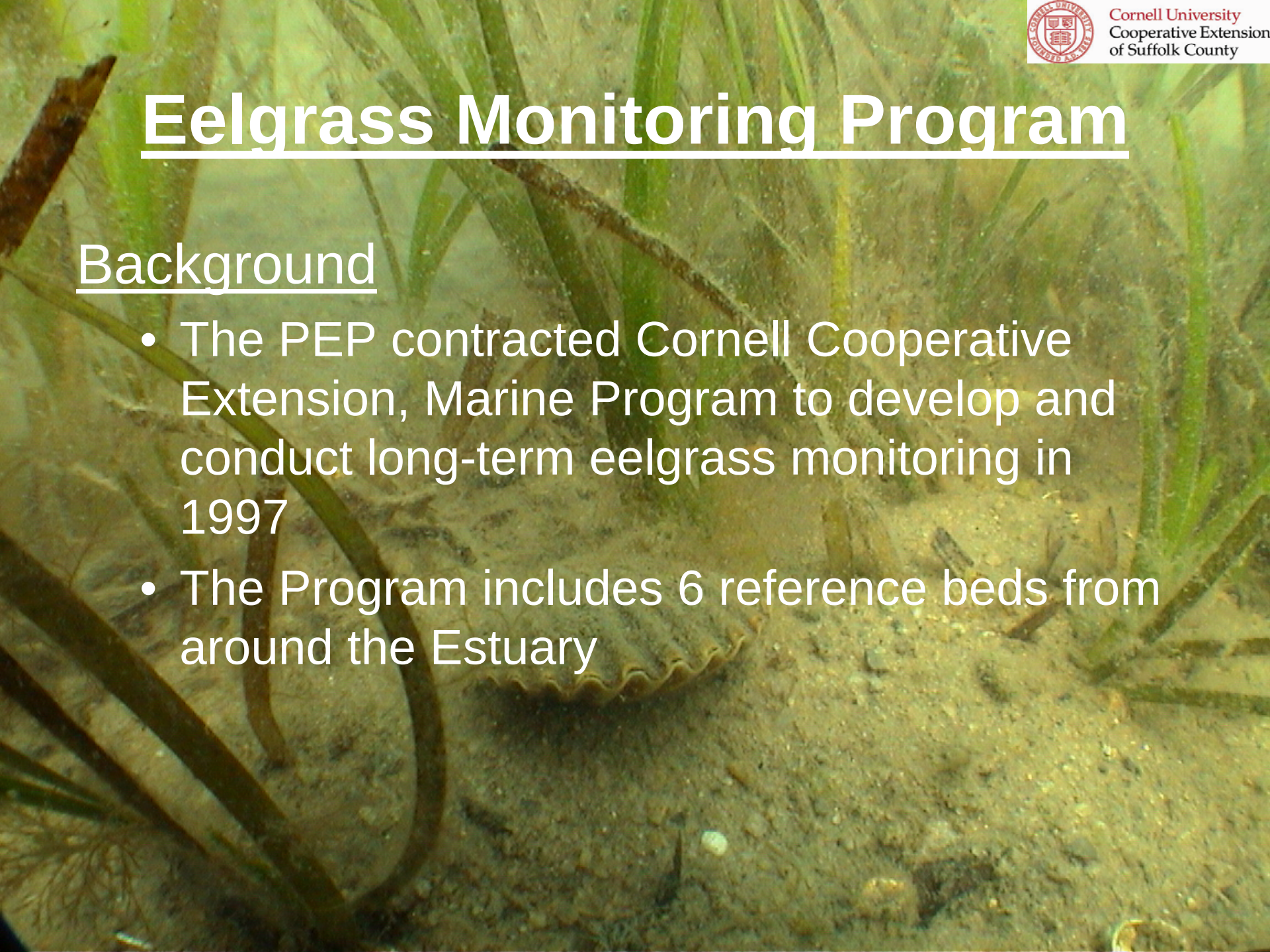
Historic Distribution

Summary

- The Peconic Estuary contained 8,720 acres of eelgrass in 1930 (This is a conservative estimate and does not include 1,990 acres of unconfirmed beds).

- The Tiner report (2003) calculated 1,552 total acres of eelgrass based on 2000 aerials, though that number is likely low as undocumented beds have since been identified and the areal extents of some beds were underestimated.

- This represents a loss of over 80% in a 70 year period (~100 acres/year).



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Eelgrass Monitoring Program

Background

- The PEP contracted Cornell Cooperative Extension, Marine Program to develop and conduct long-term eelgrass monitoring in 1997
- The Program includes 6 reference beds from around the Estuary

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Eelgrass Monitoring Program

Methodology

- 6 reference sites (beds), each with 6 monitoring stations
- Eelgrass shoot density is collected from 10 randomly placed 0.10 m^2 quadrats (Total of 60 quadrats per bed) at each station
- Percent cover of macroalgae, macroalgae species, and animals observed are recorded

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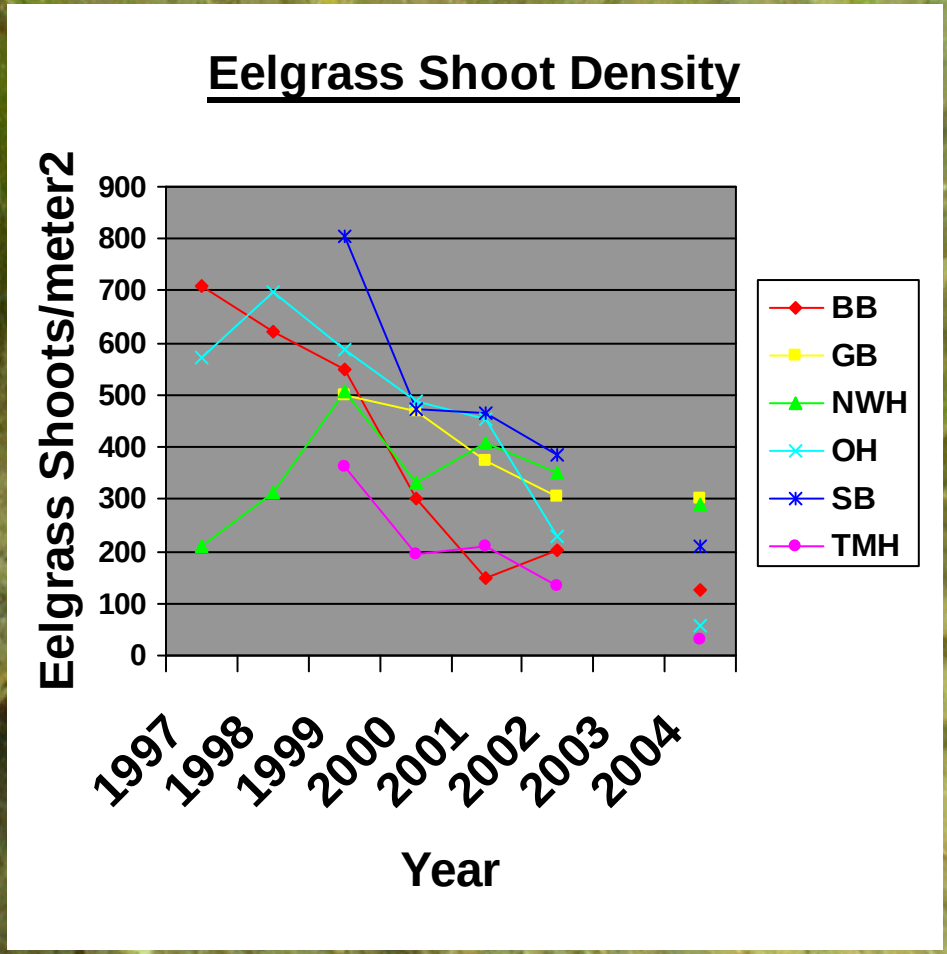
Eelgrass Monitoring Program

Trend Analysis

1) Eelgrass shoot densities have been on a decline (Ave. rate of ~30% since 2000)

2) 2002-2004 saw significant losses to several beds (75% and 78% for OH and TMH, respectively)



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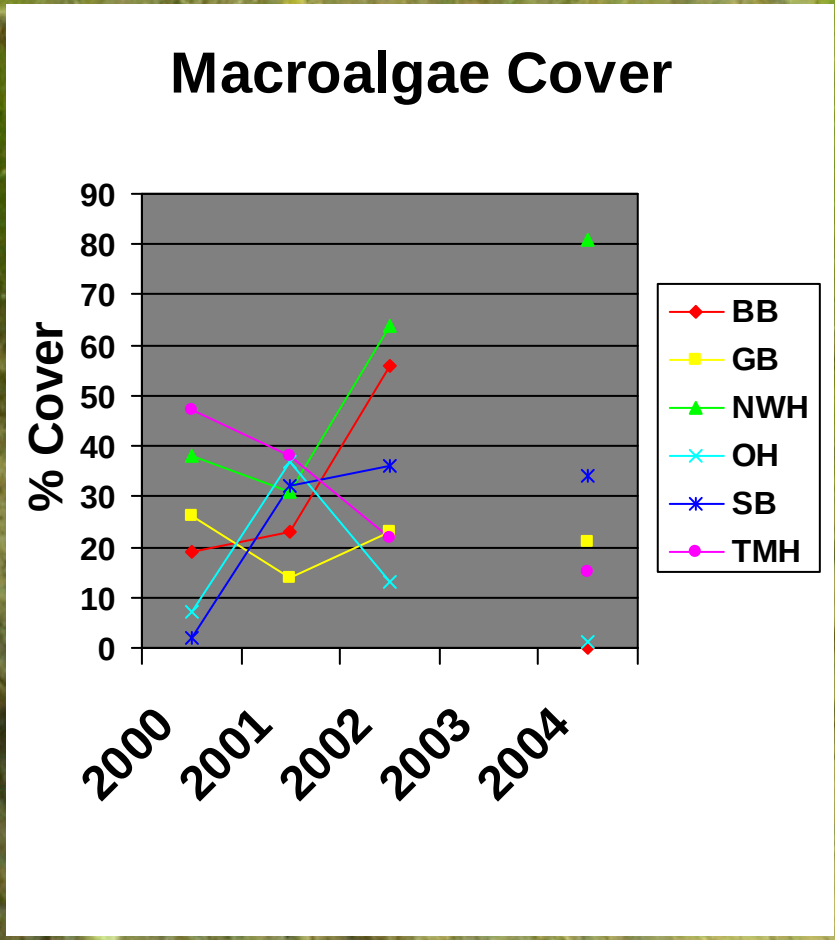
Trend Analysis

3) Most sites have seen a net decrease in macroalgae % cover

4) Macroalgae % cover is highly variable between sites and years



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Eelgrass Monitoring Program

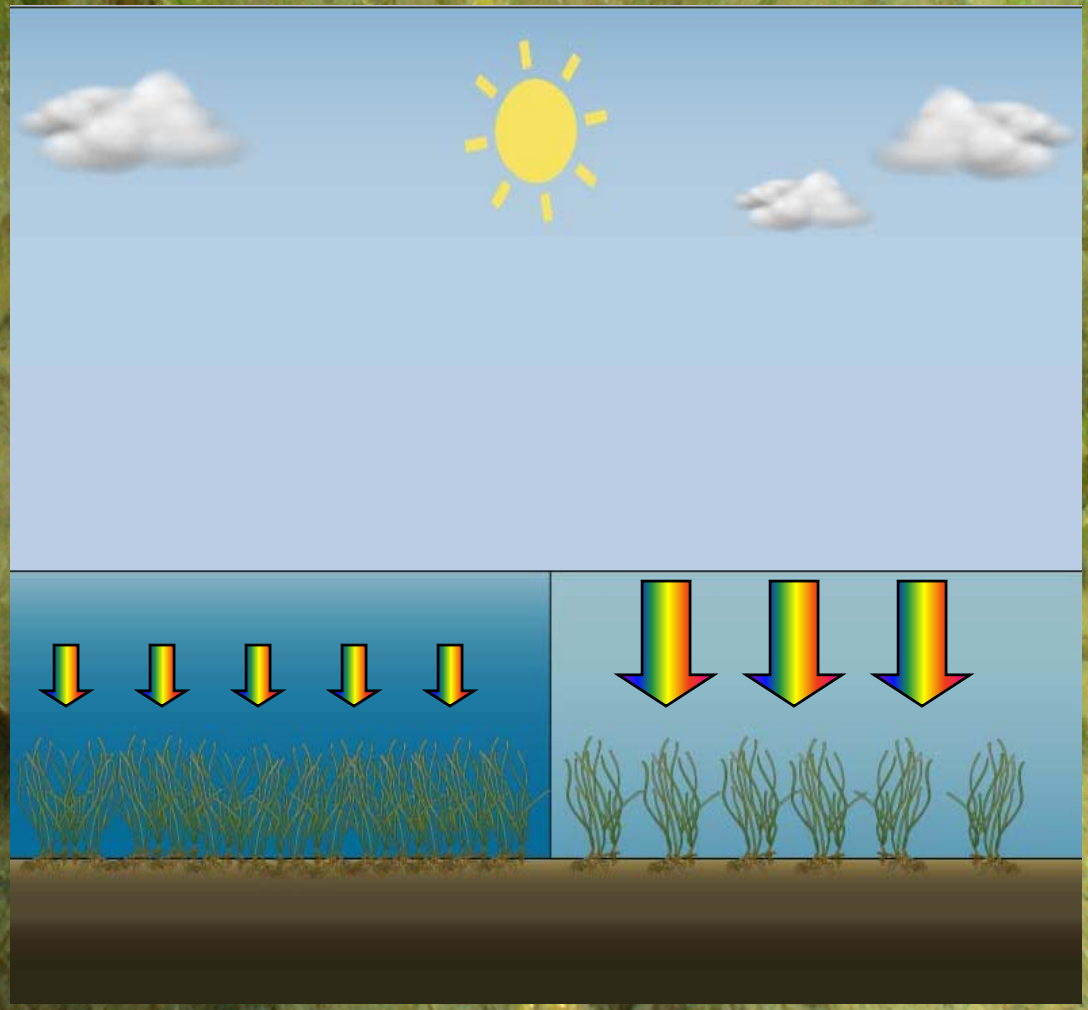
Conclusions

- **Eelgrass Shoot Decline Causes?**
  - **Poor water quality (?)**
  - **Disease (?)**
  - **Disturbance events (*e.g.* ice scour/anchor ice, bioturbation, human activities)**

Eelgrass Monitoring Program

Conclusions

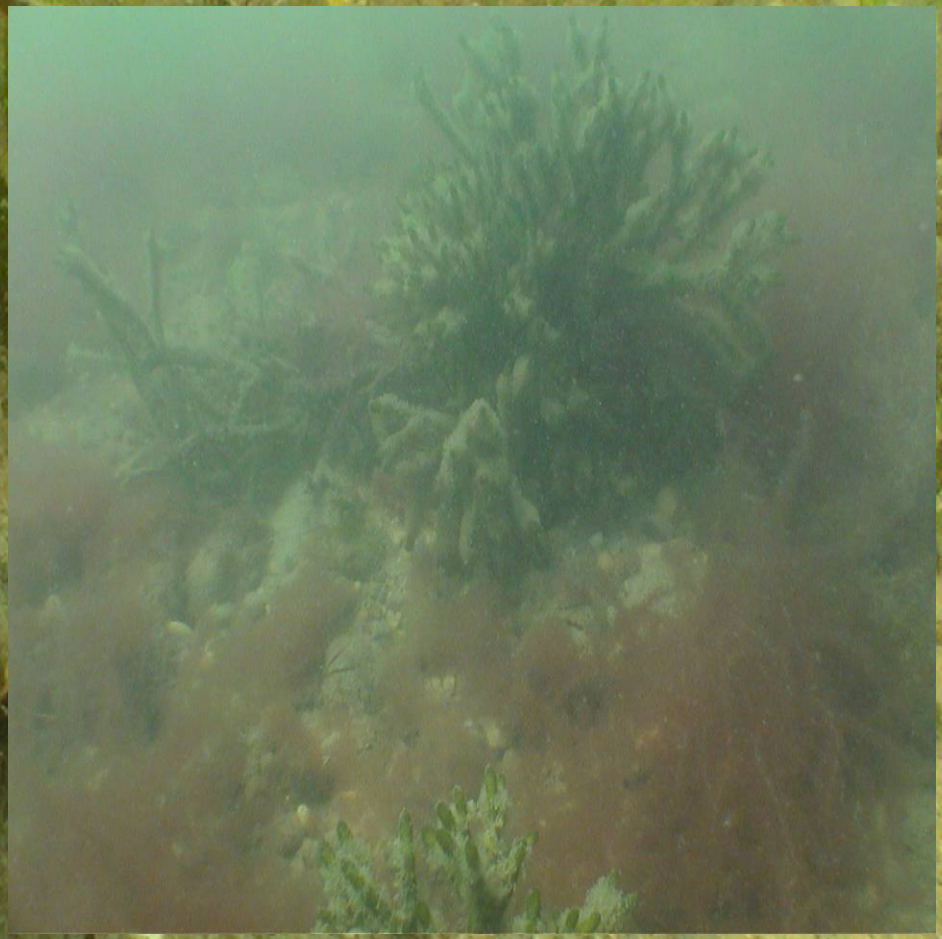
- Alternative Hypotheses
  - Increased water clarity resulting in alleviation of stress response (*i.e.*, reduction in shoot density)



Eelgrass Monitoring Program

Conclusions

- **Macroalgal Competition?**
  - **Minimal with good water quality; High nitrogen favors macroalgae**
  - **Possibly prevent recolonization to areas of loss (especially *Codium*)**



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Eelgrass Monitoring Program

Summary

- The major trend evident in the eelgrass data is the almost constant decline of eelgrass shoot densities in the six monitoring beds. Although this trend is alarming, it may be that this is a natural response to increasingly better water quality (*e.g.*, clarity) as the eelgrass plants become less stressed.

- Major declines in Bullhead Bay, Orient Harbor and Three Mile Harbor may be linked with the severe winters from 2002 through 2004. The extremely cold conditions froze the Estuary and resulted in ice scour in shallow areas and removal of eelgrass.

- Macroalgae, though abundant in most beds, has not been found to be significantly impacting any of the eelgrass beds at this time. Nutrient enrichment of the water column favors seaweeds over eelgrass. Species like *Codium* and *Spyridia* may prevent re-establishment of eelgrass to areas of loss.

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