

# Long-Term Eelgrass Monitoring in the Peconic Estuary

Results and Discussion of the 2016 Monitoring Season and Proposed Changes for 2017 and Beyond

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# Presentation Outline

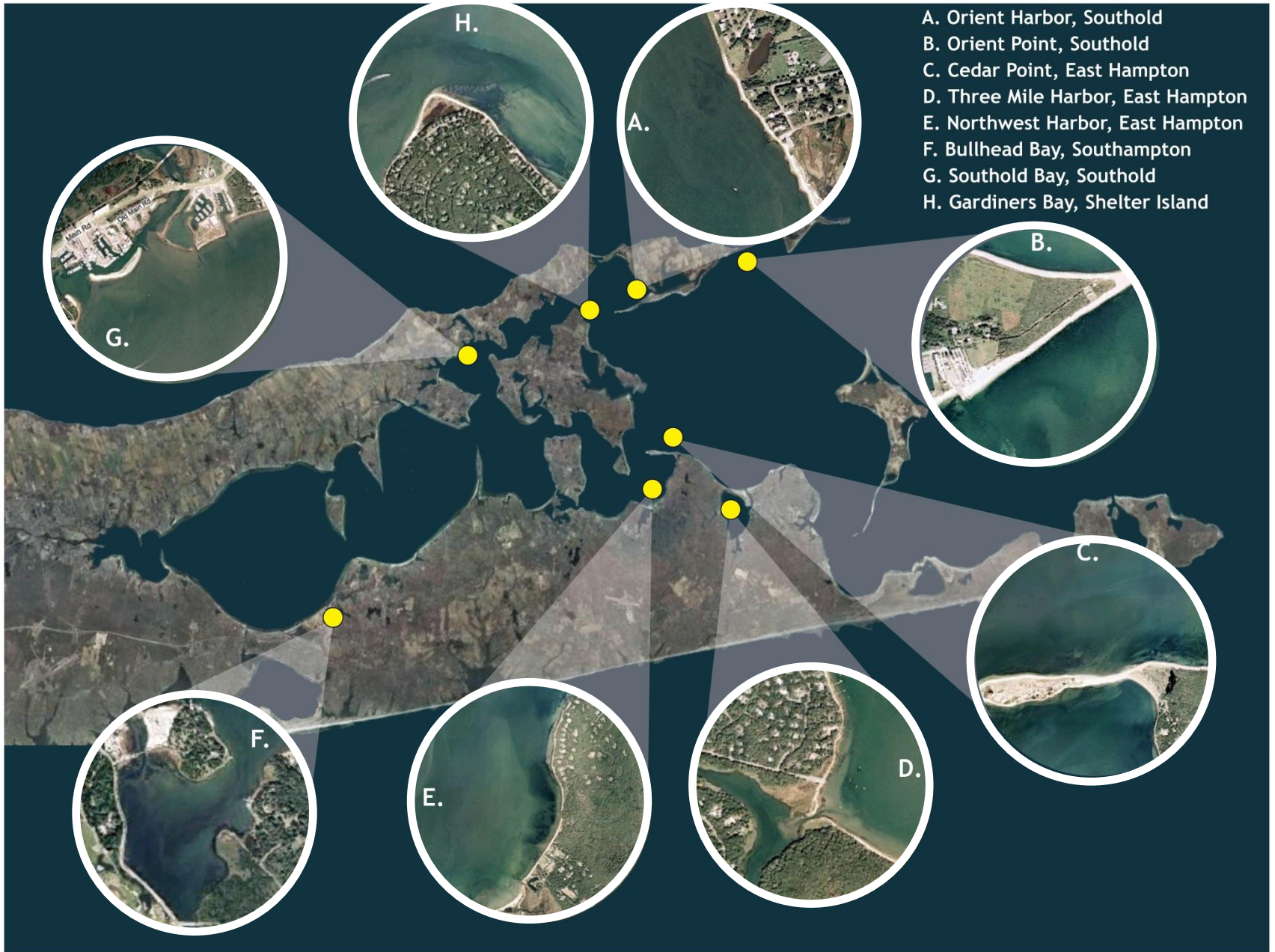
- **Background**
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# Background

- The PEP CCMP Habitat and Living Resources Management Plan states as one of its objectives, “Develop and carry out an estuary-wide research, monitoring, and assessment program to guide and evaluate management decisions concerning the estuary and to ensure management and policy decisions are based on the best available information.”
- The basic purpose of the long term monitoring program (LTEMP) is to collect data, on a scheduled basis, in order to develop a basic understanding of the ecology of eelgrass (*Zostera marina* L.) in the Peconic Estuary and support management and policy decisions
- The PEP LTEMP is the only long-term dataset on eelgrass in New York waters





- A. Orient Harbor, Southold
- B. Orient Point, Southold
- C. Cedar Point, East Hampton
- D. Three Mile Harbor, East Hampton
- E. Northwest Harbor, East Hampton
- F. Bullhead Bay, Southampton
- G. Southold Bay, Southold
- H. Gardiners Bay, Shelter Island



# Monitoring Protocol

- **Currently, eight (8) sites are included in the annual LTEMP monitoring**
  - **Four sites support eelgrass populations: Bullhead Bay (Southampton), Gardiners Bay (Shelter Island), Cedar Point (Easthampton), and Orient Point (Southold)**
  - **Four sites were former eelgrass meadows: Northwest Harbor (Easthampton), Orient Harbor (Southold), Southold Bay (Southold), and Three Mile Harbor (Easthampton)**
- **Each site has six (6) stations spread throughout the meadow, with the exception of the Gardiners Bay site with eight (8) stations**
  - **Station center points are set GPS locations that are revisited during annual monitoring visits.**
  - **Sampling is conducted within a 10 meter (33 foot) radius around the station center point.**
- **Eelgrass monitoring is conducted by CCE divers at each station. Divers use 0.10 meter<sup>2</sup> (~1 foot<sup>2</sup>) PVC quadrats to sample the parameters below:**
  - **Vegetative Analyses:**
    - **Shoot density and shoot classification (vegetative or flower)**
    - **Macroalgae biomass and species composition**
  - **Faunal Analysis**
    - **Species present**
    - **Enumeration of commercially-valuable species**
  - **Sediment sample collection, when necessary**
- **Divers also collect video footage of the conditions within each station.**



# Monitoring Protocol

- **Additionally, light availability and water temperature data are collected at each of the four meadow sites, as well as two of the former eelgrass sites.**
  - **PAR light loggers are deployed for 10 days, monthly, July-September**
  - **Water temperature loggers are deployed June-October**



# Results-2016

## Temperature

***\*Long-term exposure to water temperatures above 25°C (77°F) can be detrimental to eelgrass health and survival. Shorter periods of exposure to temperatures of 27°C (81°F), or greater, significantly increases eelgrass mortality.\****

- A survey conducted in 2011 of water temperatures throughout the Peconic Estuary, in extant and extinct eelgrass meadows, found that sites experiencing 30 or more days annually with water temperatures above 25°C have suffered a decline and eventual loss of eelgrass at the site (\*except Bullhead Bay)
- During the 2016 LTEMP season, only one site, Southold Bay, recorded temperatures exceeding 25°C (77°F) for more than 30 days. Bullhead Bay and Southold Bay were the only sites to record a daily average temperature  $\geq 27^\circ\text{C}$  (81°F).
  - Bullhead Bay likely experienced more than 30 days above 25°C (77°F), but the temperature logger was lost/removed in late August-early September.



# Results-2016

## Water Temperature – Number of ‘extreme’ temperature days

Meadow	2016		2015		2014		2013		2012		2011		2010	
	Days ≥ 25°C	Days ≥ 27°C	Days ≥ 25°C	Days ≥ 27°C	Days ≥ 25°C	Days ≥ 27°C	Days ≥ 25°C	Days ≥ 27°C	Days ≥ 25°C	Days ≥ 27°C	Days ≥ 25°C	Days ≥ 27°C	Days ≥ 25°C	Days ≥ 27°C
Bullhead Bay	16*	8*	72	25	52	2	50	21	69	29	54	24	52	27
Gardiners Bay	24	0	18	0	0	0	7	0	19	0	4	0	1	0
Southold Bay	49	8	40	0	3	0	23	0	ND	ND	33	0	38	0
Cedar Point	1*	0*	2	0	0	0	1	0	ND	ND	2	0	1	0
Orient Point	0	0	0	0	0	0	ND	ND	0	0	0	0	ND	ND



# Results-2016

## Light

1. *The PEP-recommended eelgrass habitat optimization goal is a light extinction coefficient ( $K_d$ ) of 0.75 m<sup>-1</sup> or less*
  2. *H<sub>comp</sub> ≈ 12.3 hours; H<sub>sat</sub> ≈ 8 hours, for eelgrass in the Peconic Estuary*
- There is a general trend in the Peconic Estuary that light becomes less limiting for eelgrass as one moves from west to east.
  - The light data collected during the period of July-September 2016 supports this trend, with three sites (meadows) in Gardiners Bay meeting minimal requirements and two sites (one meadow and one former meadow) west of Shelter Island showing light limitation.



# Results-2016

Light – Average hours for Hcomp and Hsat for July-September 2016

Meadow	<u>2016</u>		<u>2015</u>		<u>2014</u>		<u>2013</u>		<u>2012</u>	
	Hcomp	Hsat	Hcomp	Hsat	Hcomp	Hsat	Hcomp	Hsat	Hcomp	Hsat
Bullhead Bay	12 (-0.3)	6.3 (-1.7)*	12 (-0.3)	7.2 (-0.8)	9.9 (-2.4)	6.3 (-1.7)	13.4 (+1.1)	9.7 (+1.7)	12 (-0.3)	7.4 (-0.6)
Gardiners Bay	12.3 (0)	9.1 (1.1)	12.6 (0.3)	9.5 (1.5)	12.3 (0)	9.5 (+1.5)	13.3 (+1.0)	8.75 (+0.75)	13.1 (+0.8)	9.2 (+1.2)
Southold Bay	11.8 (-0.5)	6.2 (-1.8)	12.1 (-0.2)	8.2 (0.2)	11.8 (-0.5)	7.2 (-0.8)	ND	ND	12.6 (+0.3)	7.6 (-0.4)
Cedar Point	12.5 (0.2)	9.3 (1.3)	12.6 (0.3)	9.8 (1.8)	12.3 (0)	9.8 (+1.8)	12.9 (+0.6)*	10.2(+2.2)*	12.5 (+0.2)	8 (0)
Orient Point	12.2 (-0.1)	9.5 (1.5)	12.4 (0.1)	8.9 (0.9)	12.4 (+0.1)	9.8 (+1.8)	13.4 (+1.1)	9.8 (+1.8)	13 (+0.7)	9.2 (+1.2)



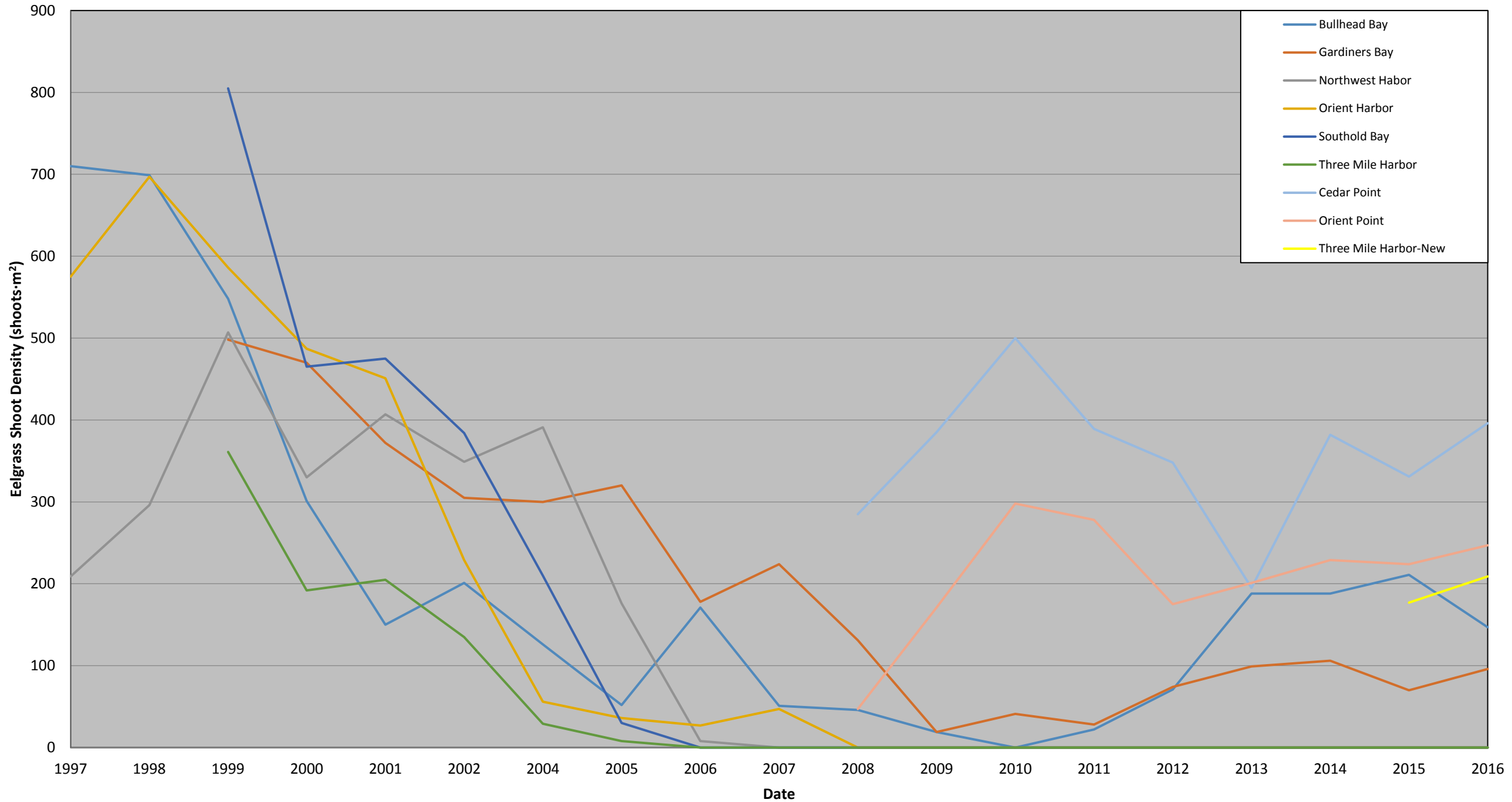
# Results-2016

## Eelgrass Shoot Density

- Three out of four eelgrass meadows currently in the LTEMP showed slight increases in eelgrass shoot density during the 2016 season.
- Bullhead Bay was the only meadow to experience a significant change (i.e. decline) in density.
  - Decline in eelgrass density could be the result of large mute swan populations feeding in the meadow at two shallow monitoring stations.
- The Cedar Point meadow lost eelgrass around one station (Station 6) in 2016.



PEP LTEMP Eelgrass Shoot Density Trends (1997-2016)





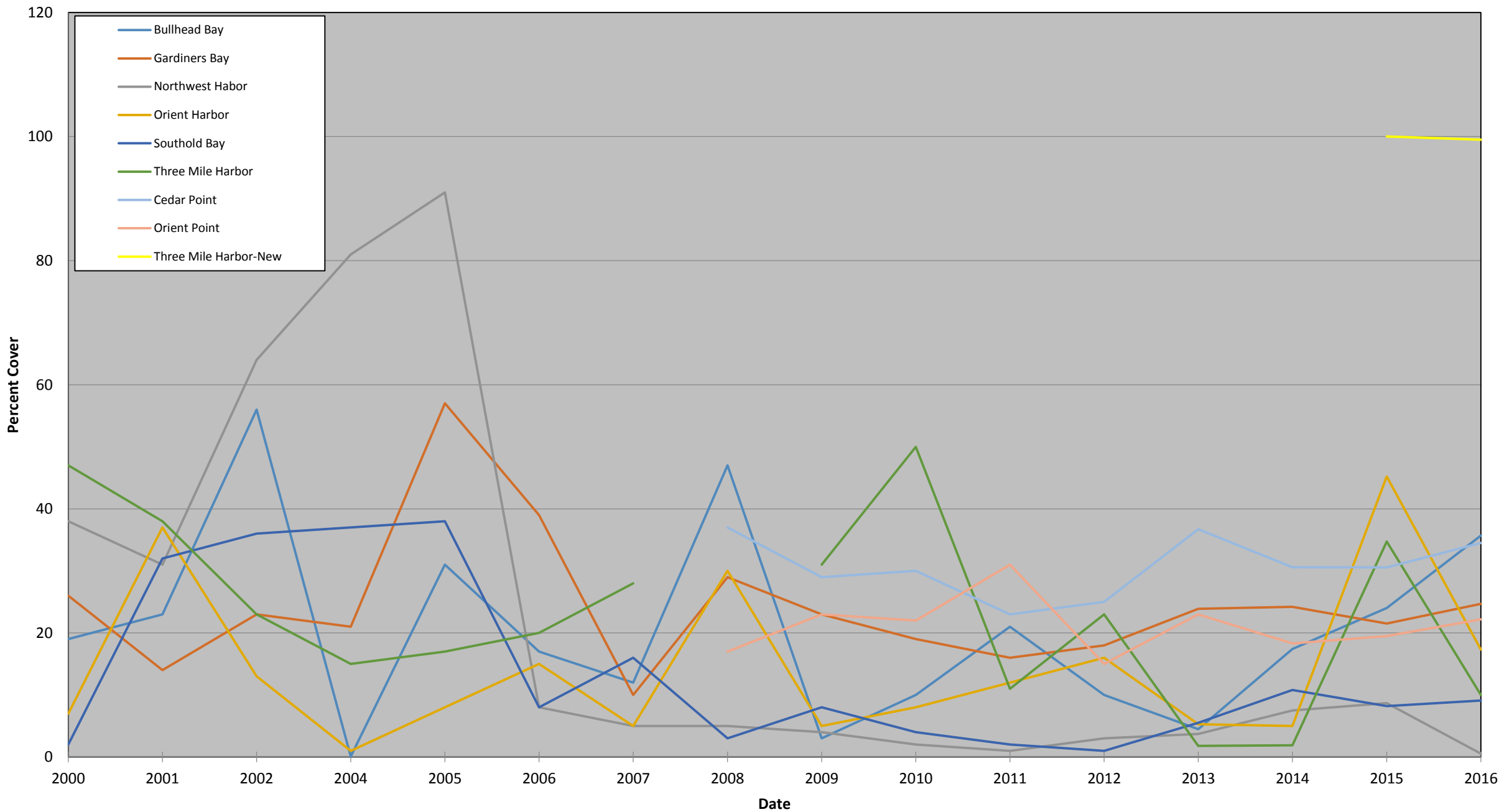
# Results-2016

## Macroalgae Cover

- Typically, macroalgae percent cover has been highly variable, both between years and between sites.
- For the 2016 Season:
  - Three LTEMP sites (Northwest Harbor, Orient Harbor, and Three Mile Harbor) reporting significant declines in macroalgae cover.
  - Three sites (Southold Bay, Cedar Point, and Orient Point) showed slight increases.
  - Two sites (Gardiners Bay and “new” Three Mile Harbor) showed nominal changes.
  - Bullhead Bay showed a significant increase (12% from 2015).



PEP LTEMP Macroalgae Percent Cover Trends (2000-2016)





# Results-2016

## Areal Extent (Acreage)

- Changes in areal extent of the for meadows in the LTEMP were mixed in 2016.
  - Bullhead Bay lost almost six-acres of meadow between 2015 and 2016 (Possibly due to mute swan grazing).
  - Orient Point also reported a loss in area of just under 2-acres.
  - Gardiners Bay, Cedar Point, and the “new” Three Mile Harbor site, all reported minor increases in areal extent.
- ❖ Minor changes in annually extent of meadows could result from quality of aerials and subjectivity of photointerpretation, but under most circumstances these should account for less than 10% change.



# Summary

- **Three sites experienced water temperatures in excess of 25°C for more than 30 days in 2016: Southold Bay and both sites in Three Mile Harbor.**
  - Bullhead Bay logger was lost due to tampering, however incomplete data from loggers deployed for another project suggest that the meadow experienced a longer period than 30 days with higher temperatures.
- **Of the four eelgrass meadows remaining in the LTEMP, three sites (Gardiners Bay, Cedar Point, and Orient Point) met their minimum light requirements for the period of July-September 2016. Bullhead Bay was close to meeting Hcomp, but fell almost 2 hours short for Hsat.**
- **Eelgrass shoot density was up slightly at three of the LTEMP meadows, with Bullhead Bay reporting a significant decline.**
  - ❖ Bullhead Bay's decline may be attributed to mute swan grazing
- **Macroalgae cover continues to be temporally and spatially variable**
  - 3 sites with significant declines, 2 sites 'stable', 3 sites with minor increases, and one site with a significant increase.
- **Change in areal extent from 2015 to 2016 varied between meadows**
  - Cedar Point and Gardiners Bay meadows saw minimal increases in acreage
  - Orient Point experienced a minor decline in area
  - Bullhead Bay reported an almost 6 acre loss that may be attributed, in part, to waterfowl grazing.



# Acknowledgements

- The Peconic Estuary Program and EPA for funding and support of this program
- The CCE Habitat Restoration team for data collection and processing
  - Chris Pickerell, Kimberly Manzo, Jason Havelin, and Rachel Neville



# Proposed Changes for 2017

- **Replacement of LTEMP sites that once supported eelgrass ('extinct sites') with new sites that support eelgrass populations.**
  - 'Extinct sites' would be removed from annual monitoring but be revisited on a 3-5year schedule.
  - A total of four (4) new sites would need to be selected.
  - **Potential sites include:**
    1. Coecles Harbor, Shelter Island
    2. Sag Harbor Bay, East Hampton (and Shelter Island?)
    3. Orient Beach State Park, Southold
    4. Napeague Harbor, East Hampton
    5. Tobaccolot Bay (Gardiners Island), East Hampton
    6. Fort Pond Bay, East Hampton
- **Addition of two stations to the meadows at the head of Three Mile Harbor**
  - Currently, 10 quadrats are randomly sample along the length of one meadow.
  - Two sites would be established in the larger meadow and a third in the smaller meadow east of the channel.



# Coecles Harbor, Shelter Island





# Sag Harbor Bay, East Hampton





# Orient Beach State Park, Southold



Google earth

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Data SIO, NOAA, U.S. Navy, NGA, GEBCO



# Napeague Harbor, East Hampton





# Tobaccot Bay, East Hampton





# Fort Pond Bay, East Hampton





# Head of Three Mile Harbor, East Hampton

