Monitoring the Condition Of Eelgrass Habitat

Hilary Neckles
USGS Patuxent Wildlife Res. Center
Augusta, Maine

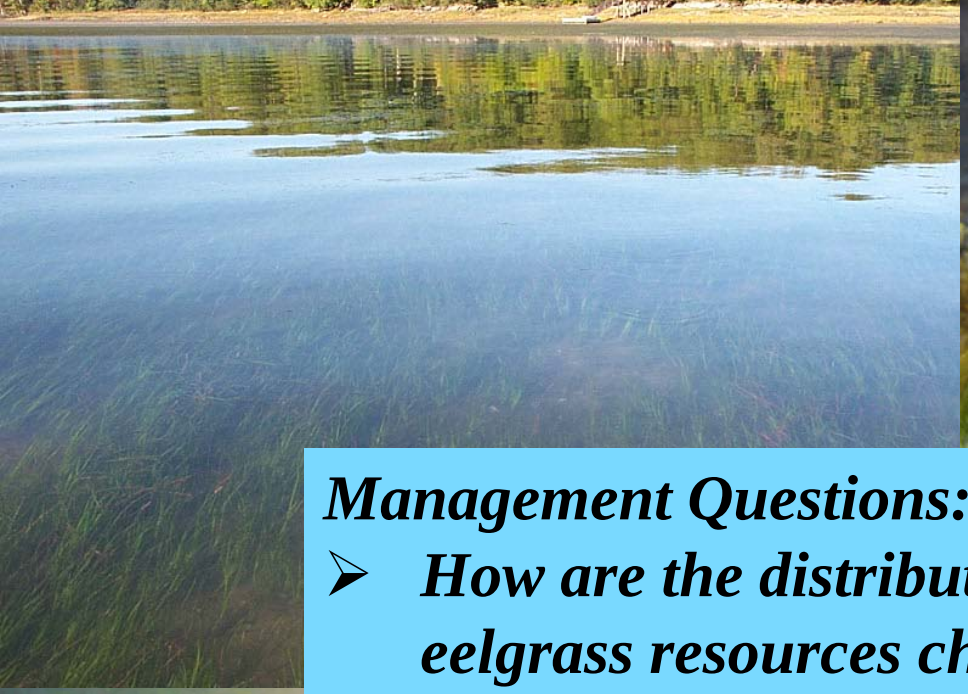
Eelgrass Beds

10 0 10 Kilometers

Map: Seth Barker, Maine DMR

Photo: John Sowles, Maine DMR

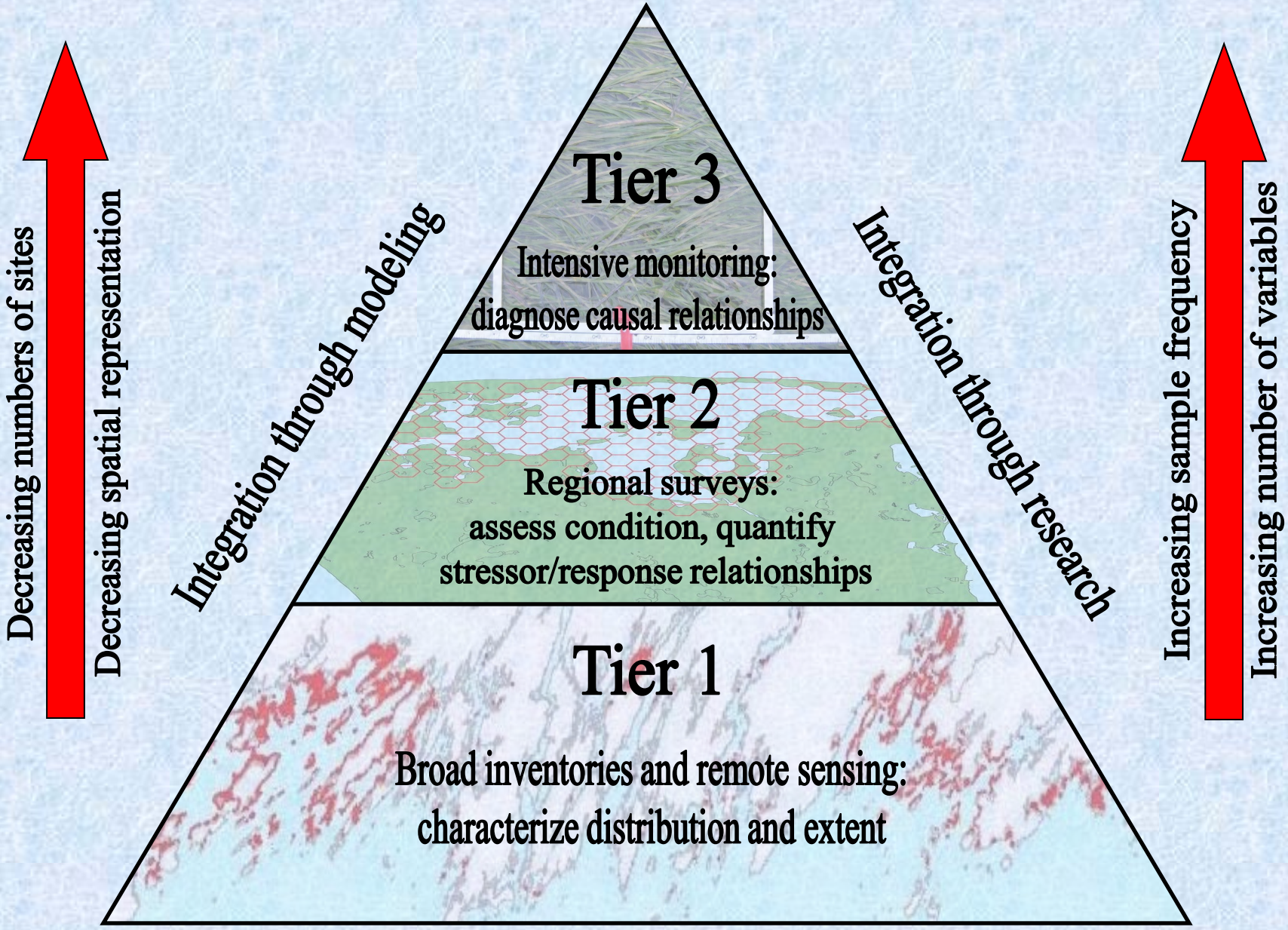
USGS



Management Questions:

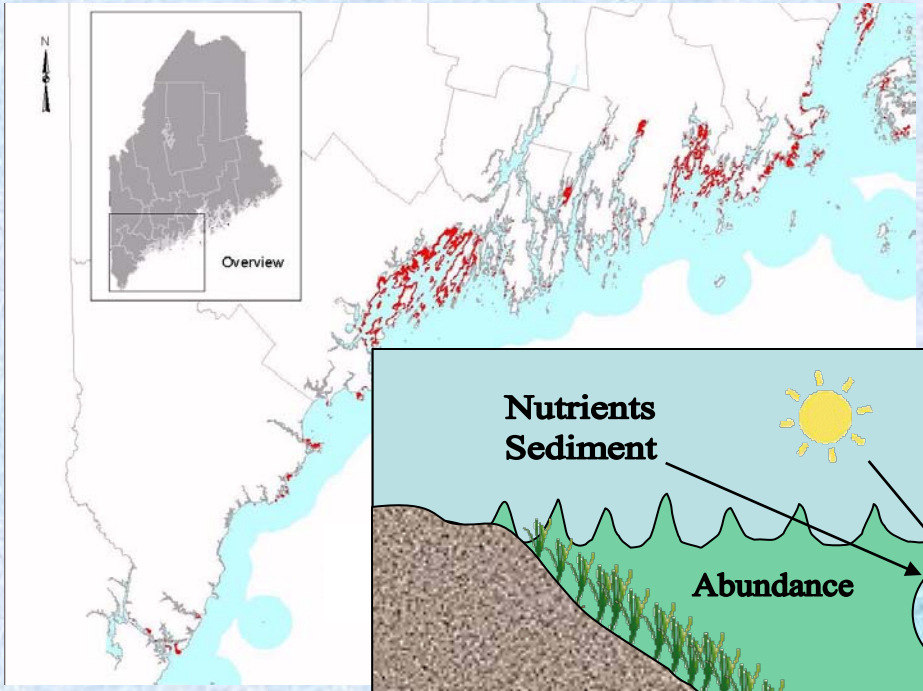
- ***How are the distribution and extent of eelgrass resources changing over time?***
- ***How is the condition of eelgrass resources changing over time?***
- ***What are the causes of change?***

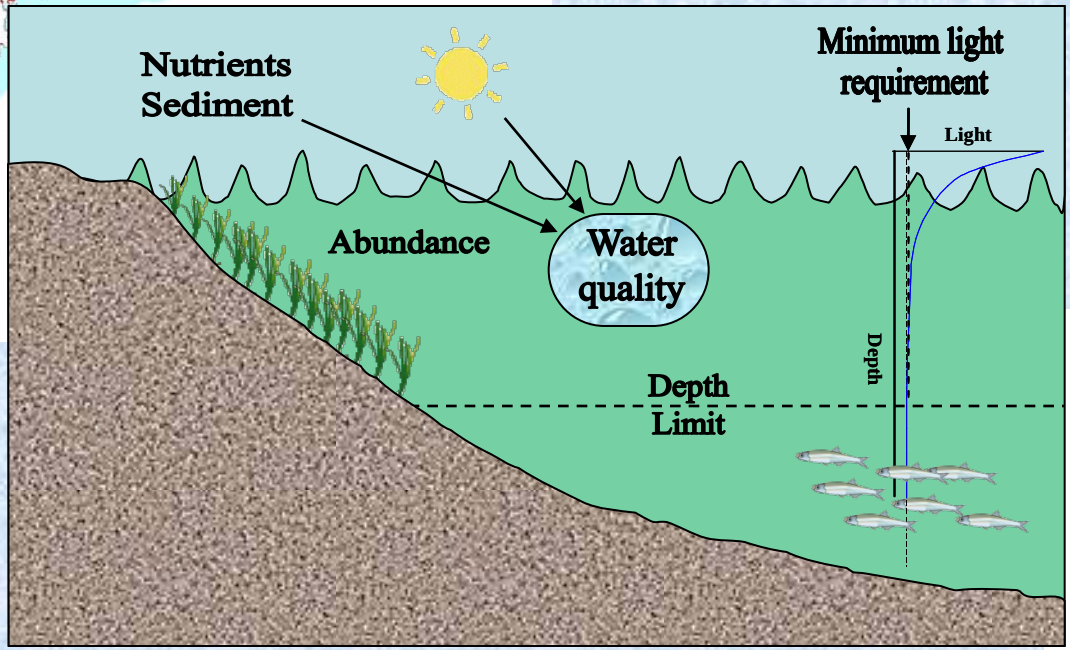
Hierarchical Monitoring Framework



Integration of Monitoring Across Scales

Tier 1 Tier 2 Tier 3





Thayer et al. 1984

Kilometers ← SPACE → Centimeters

Decades ← TIME → Days

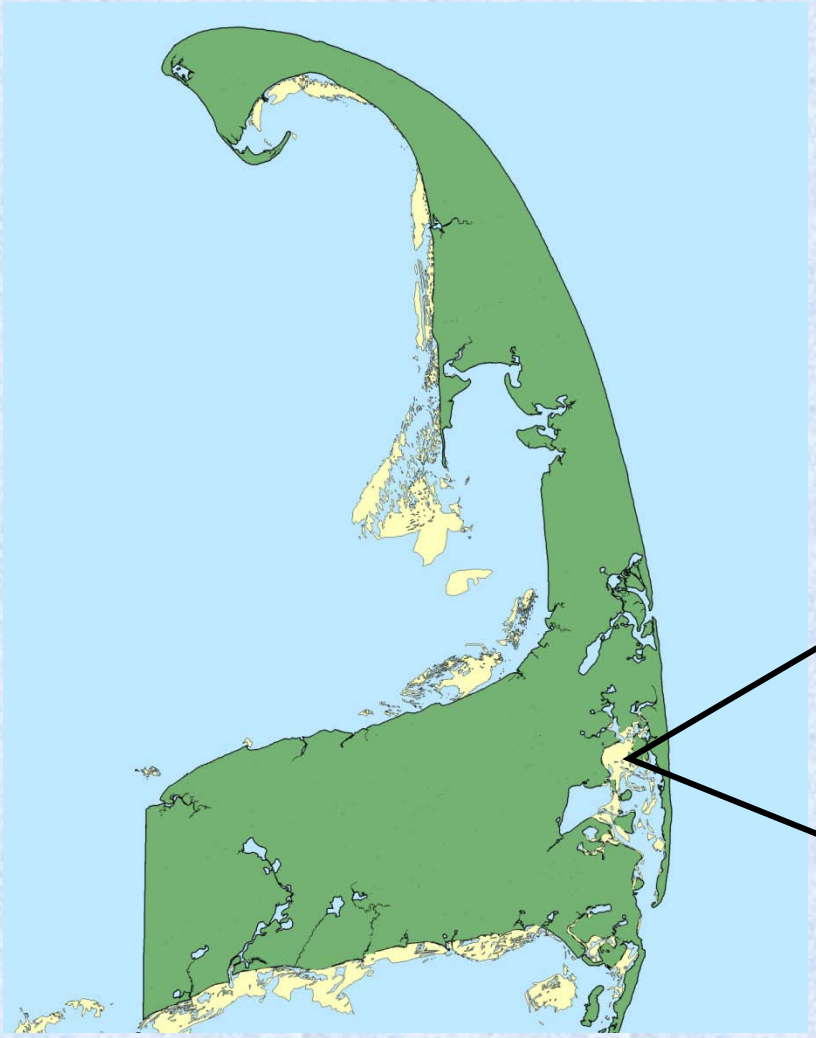
Ecosystem ← COMPLEXITY → Molecules

Characteristics of Effective Monitoring Variables

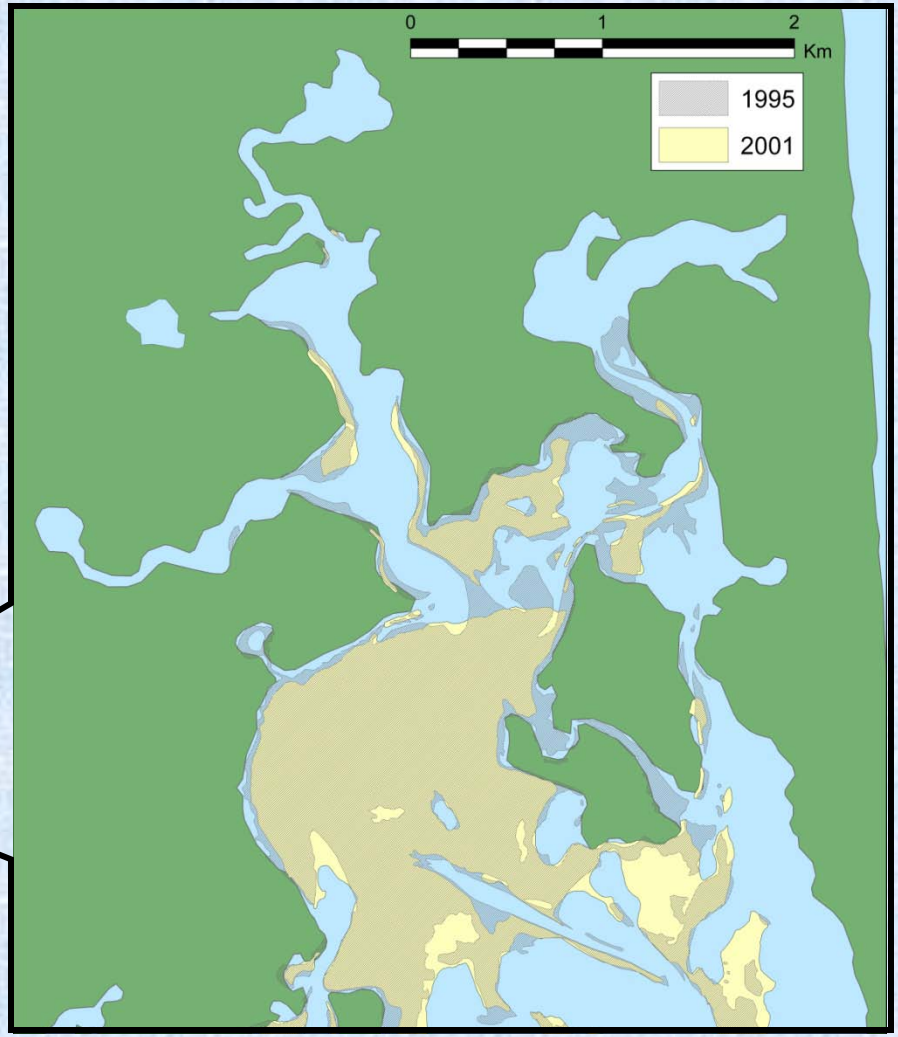
- Responsive to stressors
- Directly related to management actions
- Comprehensive but concise
- Measurable and consistently applied
- Understandable

Dale, V.H. and S.C. Beyeler. 2001. Ecological Indicators 1:3-10.
Jackson, L.E., J.C. Kurtz, and W.W. Fisher, eds. 2000. EPA/620/R-99/005.
Kurtz, J. C., L. E. Jackson, and W. S. Fisher. 2001. Ecological Indicators 1:49-60
Keeney, R. and R. Gregory. 2005. Operations Research 53:1-11.

Tier 1: Eelgrass Mapping



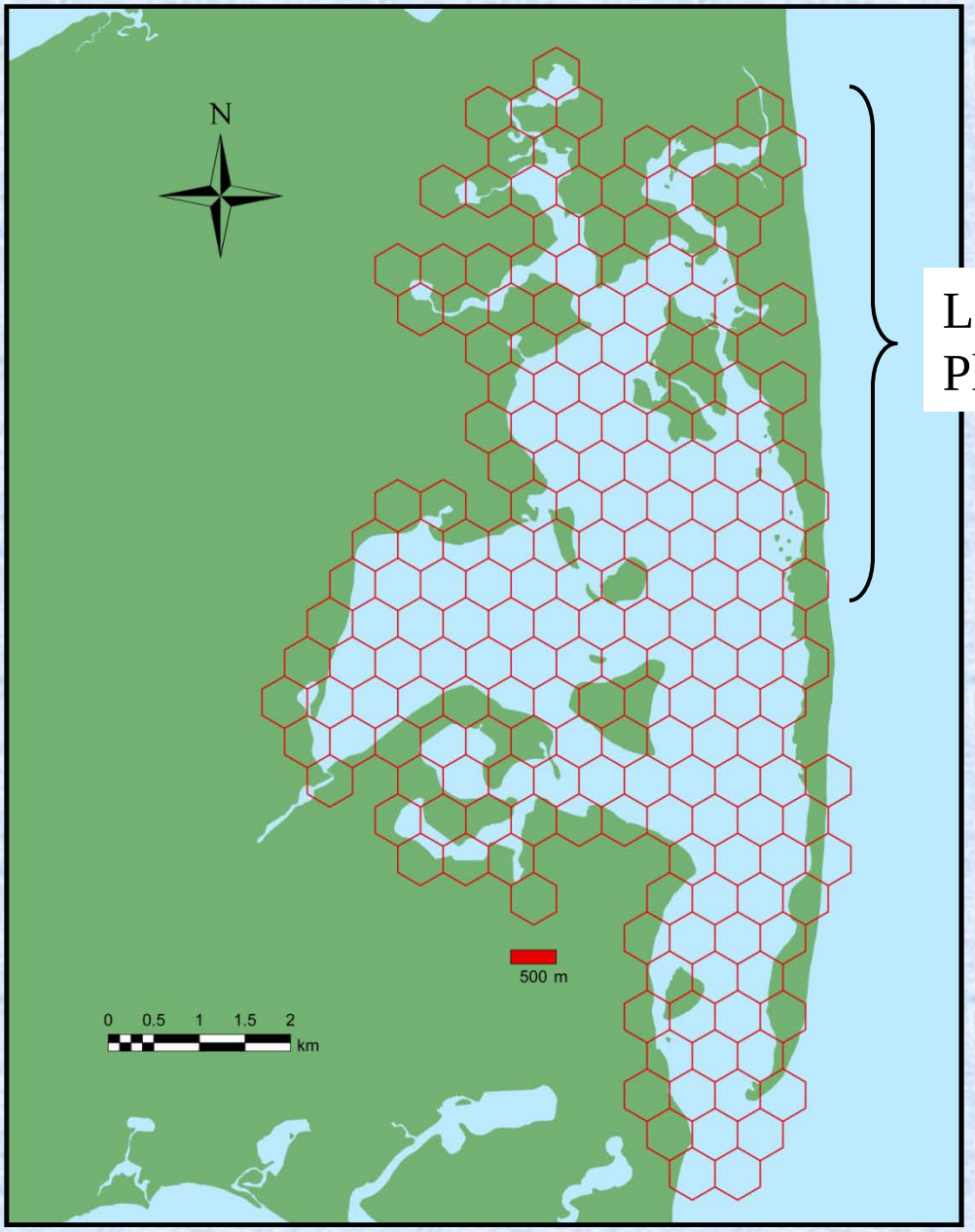
Cape Cod seagrass beds



Eelgrass in Little Pleasant Bay

Mapping by Massachusetts DEP Wetlands Conservancy Program
based on 1:20,000 aerial photographs at 5-yr intervals

Tier 2: Ground-based Rapid Assessment

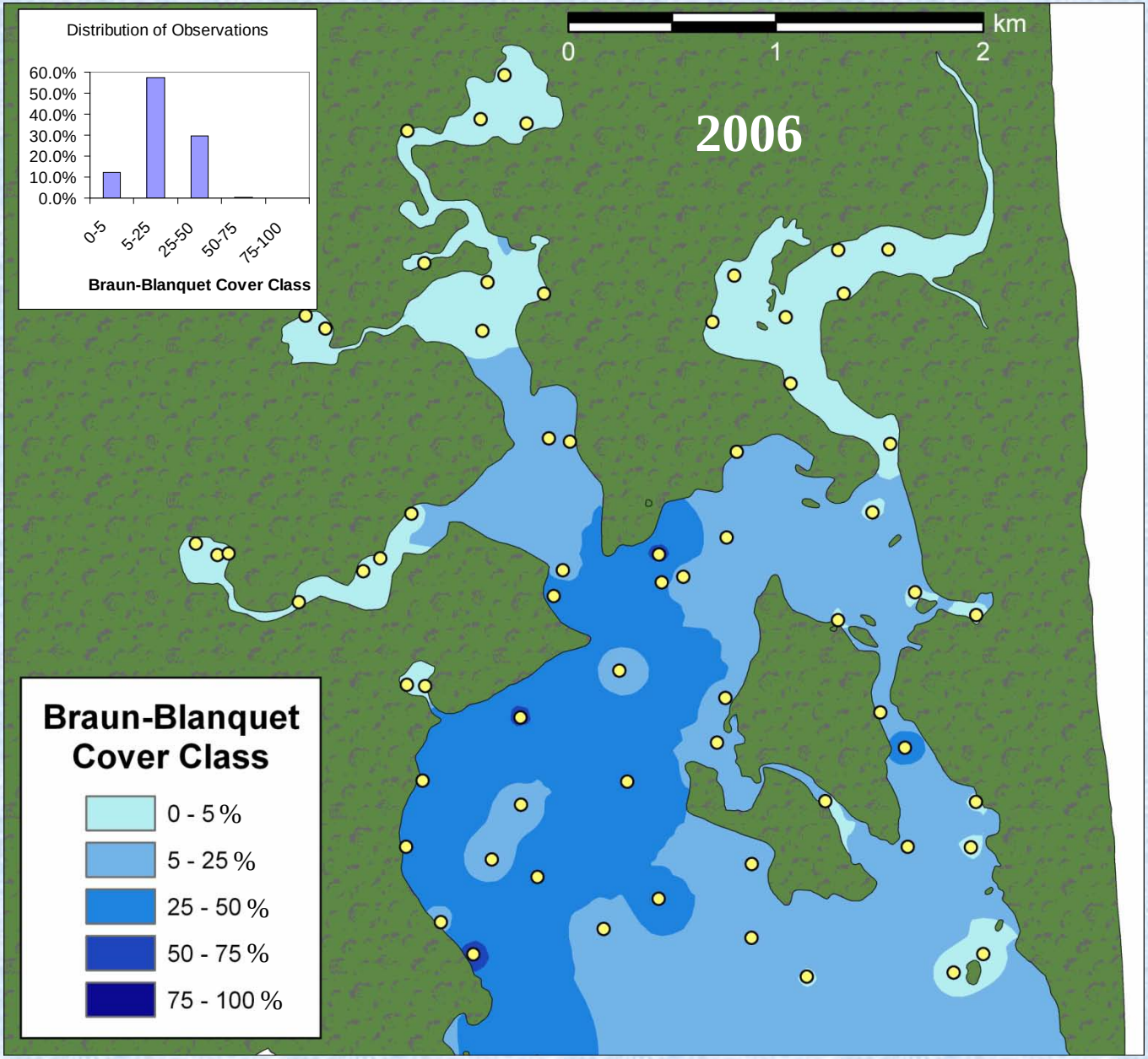


Tier 2: Station Measurements

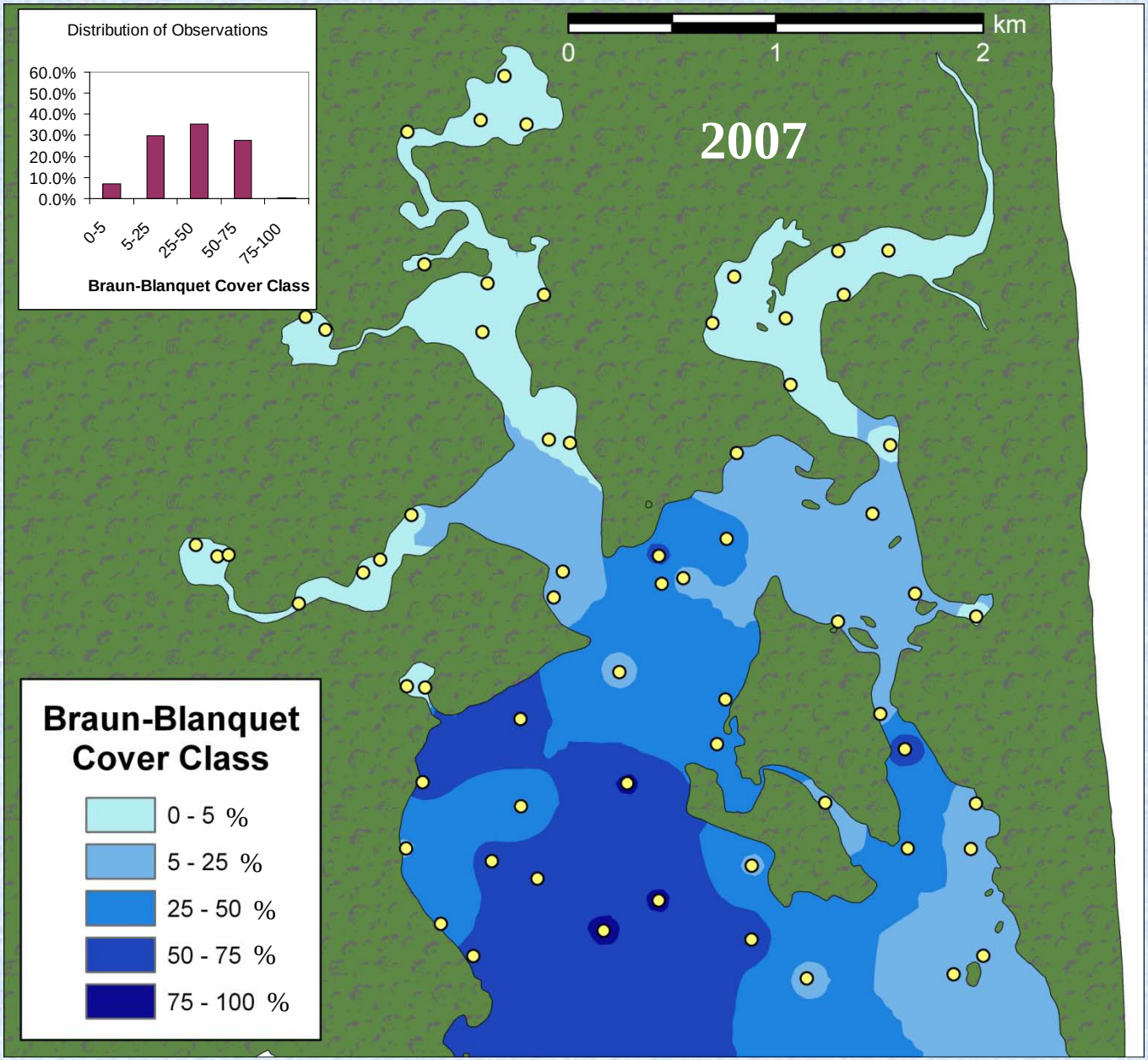
Rapid assessment measurements:

- percent cover in 0.25 m^2 quadrat
- canopy height
- maximum shoot length
- shoot width
- water depth

Tier 2: Percent Cover in 2006



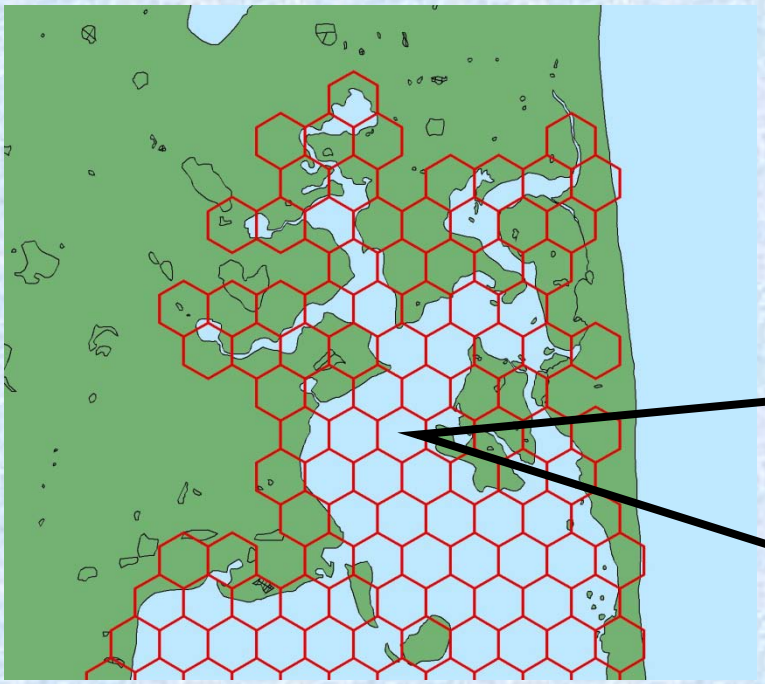
Tier 2: Percent Cover in 2007

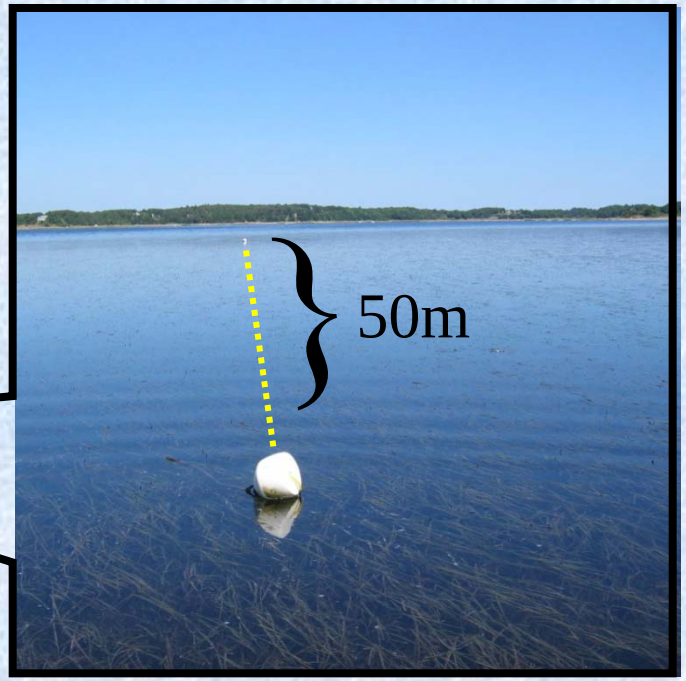


April 2007 - New Inlet

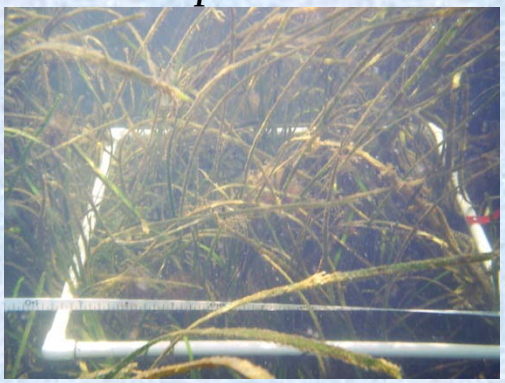
Photo courtesy of Friends of Pleasant Bay

Tier 3: Intensive Monitoring in Permanent Quadrats (SeagrassNet Approach)

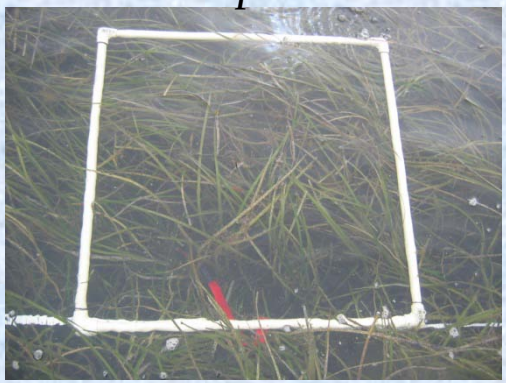




Deep transect



Mid-depth transect



Shallow transect

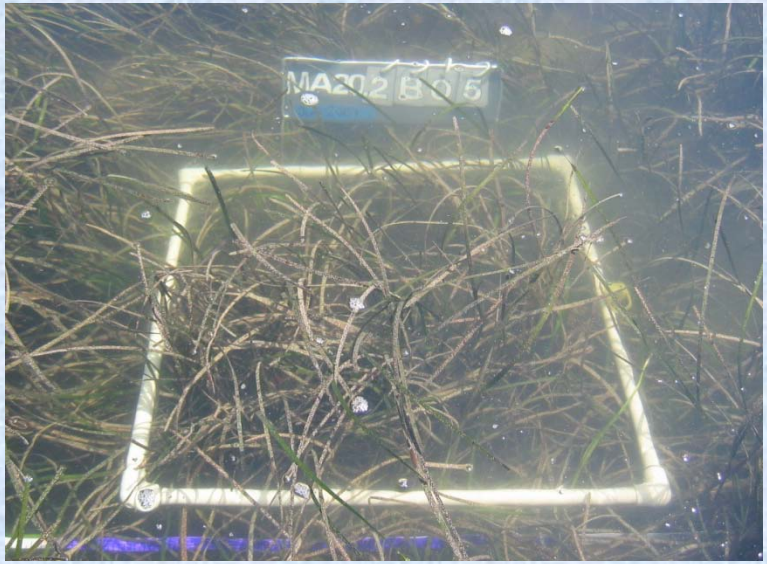
Tier 3: High Resolution Measurements

Site Measurements:

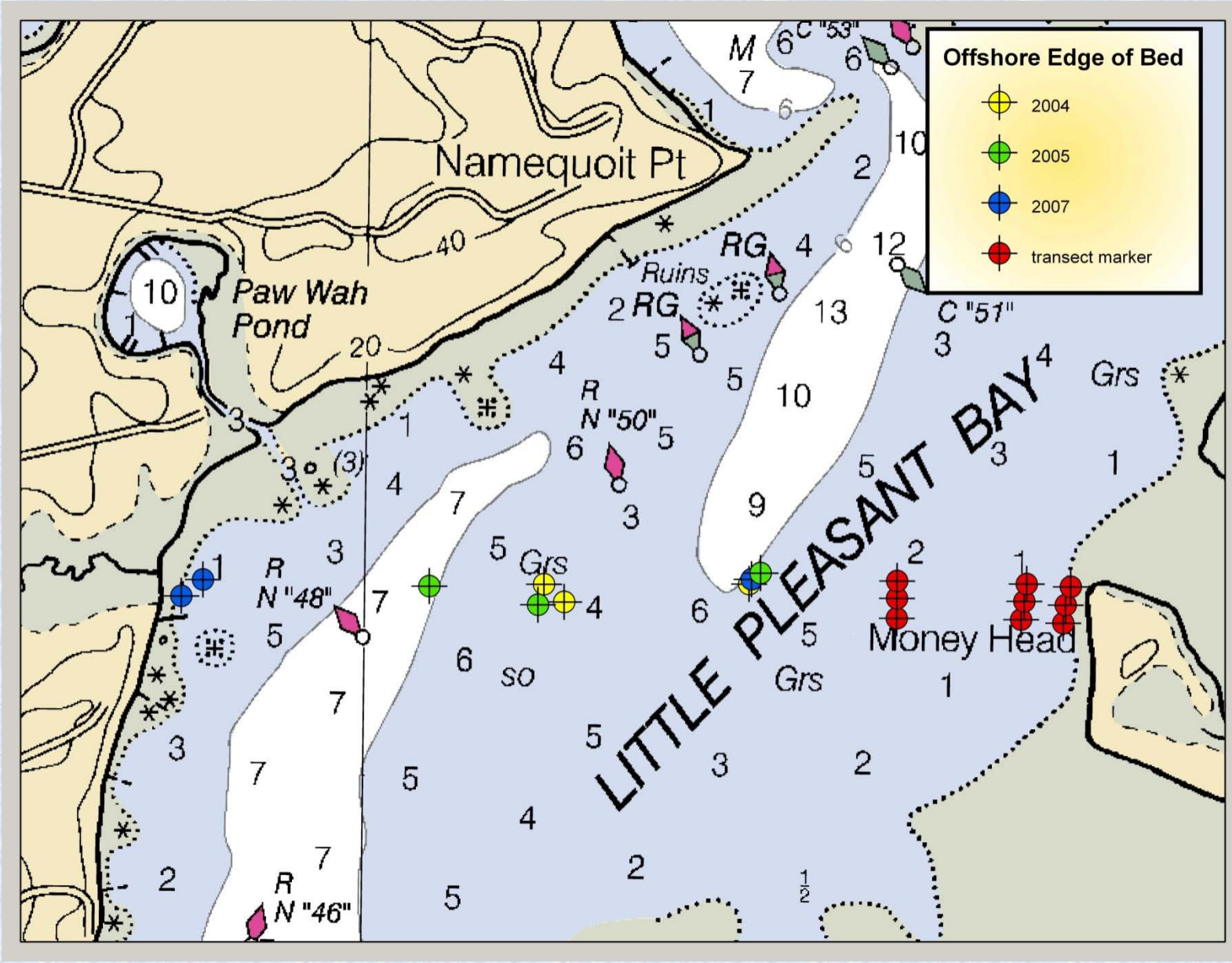
- Location of offshore, onshore bed edges
- Continuous PAR at two depths over a 4-week index period
- Continuous temperature at two depths over annual cycle
- Sediment texture and organic content
- Relative sediment elevation

Permanent Quadrat Measurements:

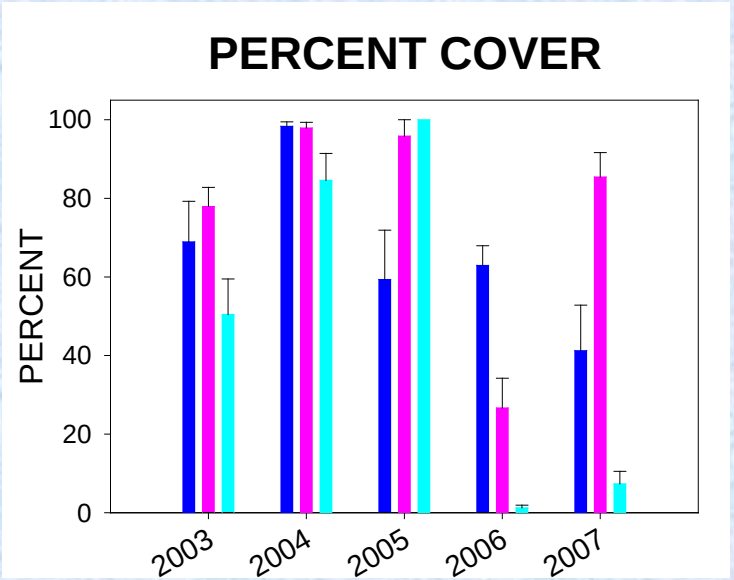
- Eelgrass percent cover
- Canopy height
- Shoot density
- Wasting disease index
- Epiphyte cover
- Biomass partitioned by leaf, sheath, and root/rhizome fractions

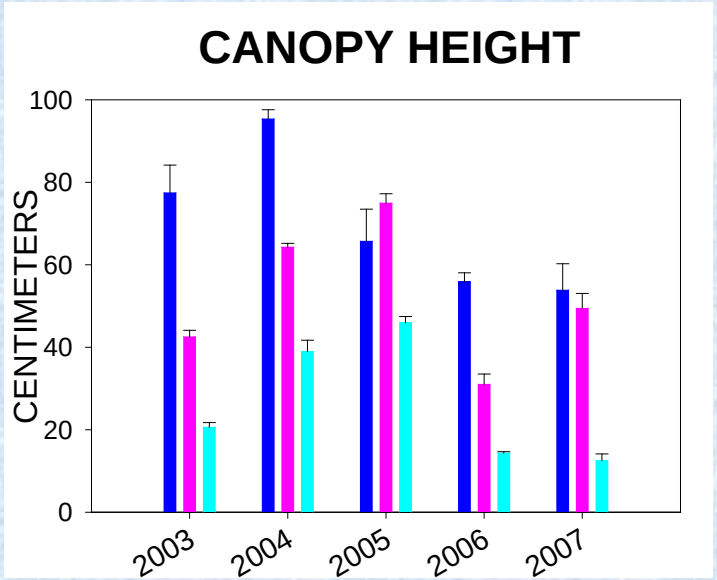


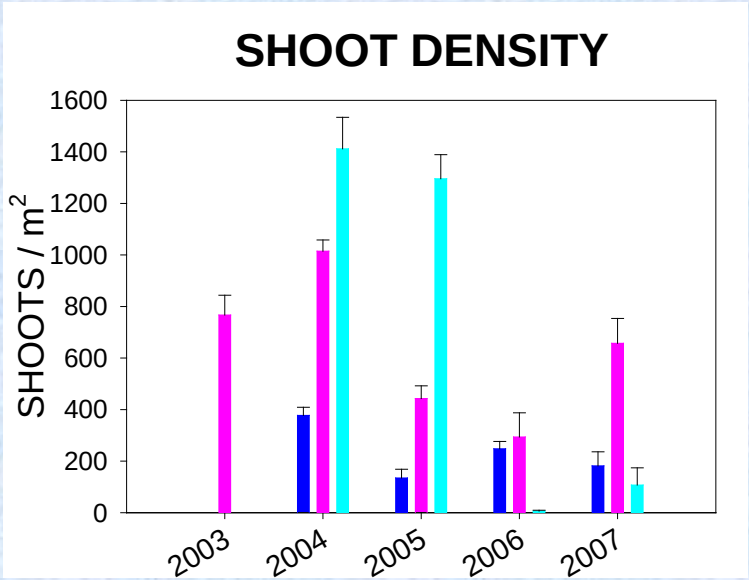
Tier 3: Location of Offshore Bed Edge

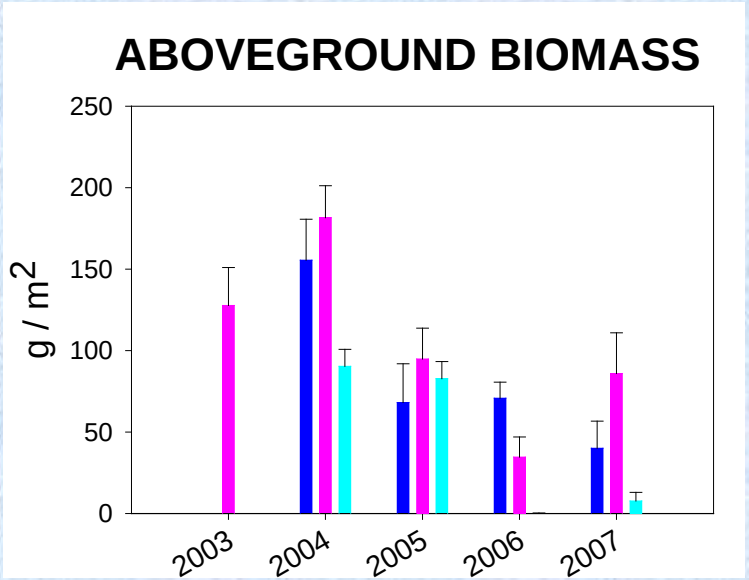


Tier 3: Permanent Quadrat Measurements



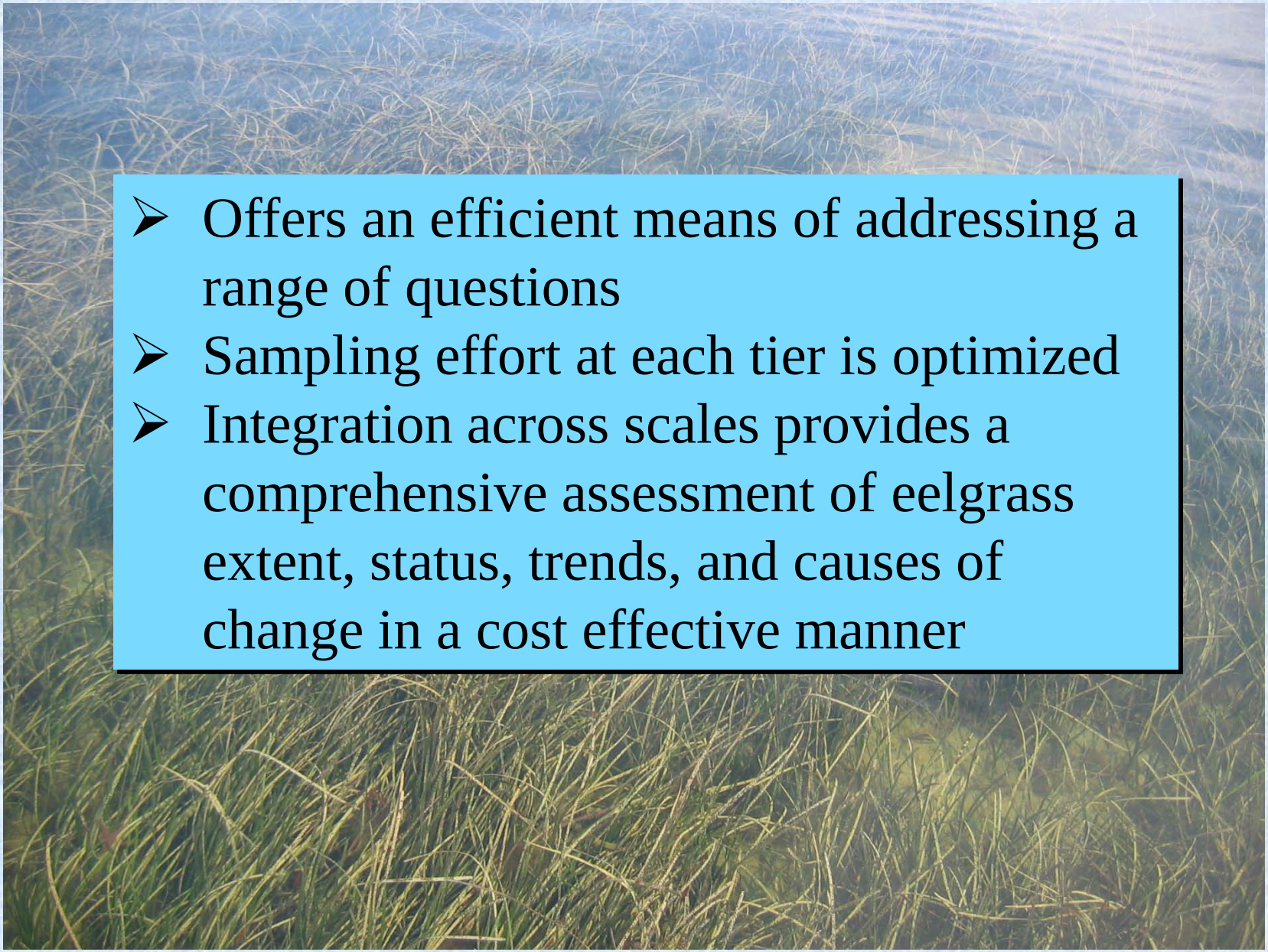






Deep Mid-depth Shallow

Hierarchical Monitoring Framework:



- Offers an efficient means of addressing a range of questions
- Sampling effort at each tier is optimized
- Integration across scales provides a comprehensive assessment of eelgrass extent, status, trends, and causes of change in a cost effective manner

Acknowledgements

- UNH/SeagrassNet: Fred Short, Jeff Gaeckle, Dave Rivers.
- Cape Cod National Seashore: Carrie Phillips, Kelly Chapman, Evan Gwilliam, Krista Lee, Stephen Smith.
- NPS Coastal and Barrier Network: Dennis Skidds, Sara Stevens, Bryan Milstead.
- USGS: Angela Hayes, Susan Simpson, Laura Flight, Josh Kempf, Nick Stasulis
- Numerous others who volunteered time to assist with fieldwork and logistics.