IMPROVING INDICATORS OF WATER QUALITY DEGRADATION IMPACTS FOR MANAGEMENT OF ESTUARIES AND COASTAL WATERS

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OUTLINE

- History
- NEEA/ASSETS Update
- CICEET Project
- Preliminary Results
  - NEEA/ASSETS Methods
  - MRFSS Human use indicator

HISTORY

- NOAA's Estuarine Eutrophication Survey (1996-97)
- National Estuarine Eutrophication Assessment (NEEA, Bricker et al, 1999)
- ASSETS (Bricker, Ferreira, Simas, 2003)
- National Estuarine Eutrophication Assessment Update: Workshop Summary and Recommendations for Development of a long term monitoring and assessment program (Bricker et al, 2004)

NEEA Update

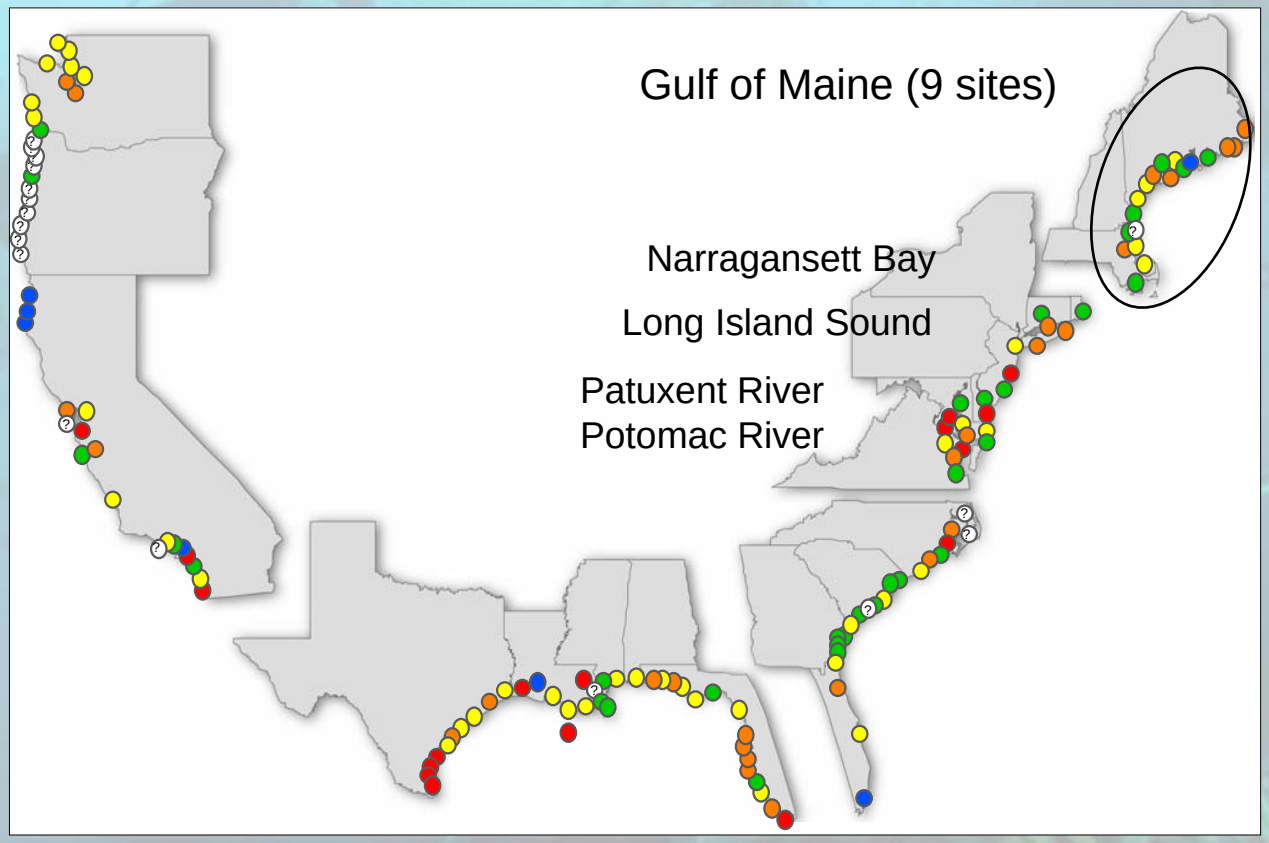
- Why?
  - Examine water quality changes since early 1990s
  - Human use impairments
- What?
  - Use data instead of expert knowledge
  - Develop type classification
  - Evaluate method sensitivity and refine as appropriate for different regions/types
  - Use GIS supported spatial data
  - Use recreational fish catch as prototype human use indicator

CICEET Project

- Development and testing of indices to describe the status and track trends of nutrient related water quality
- Evaluation of NEEA/ASSETS assessment parameters for study sites
- Development of a complementary Human Use indicator

CICEET Project (continued)

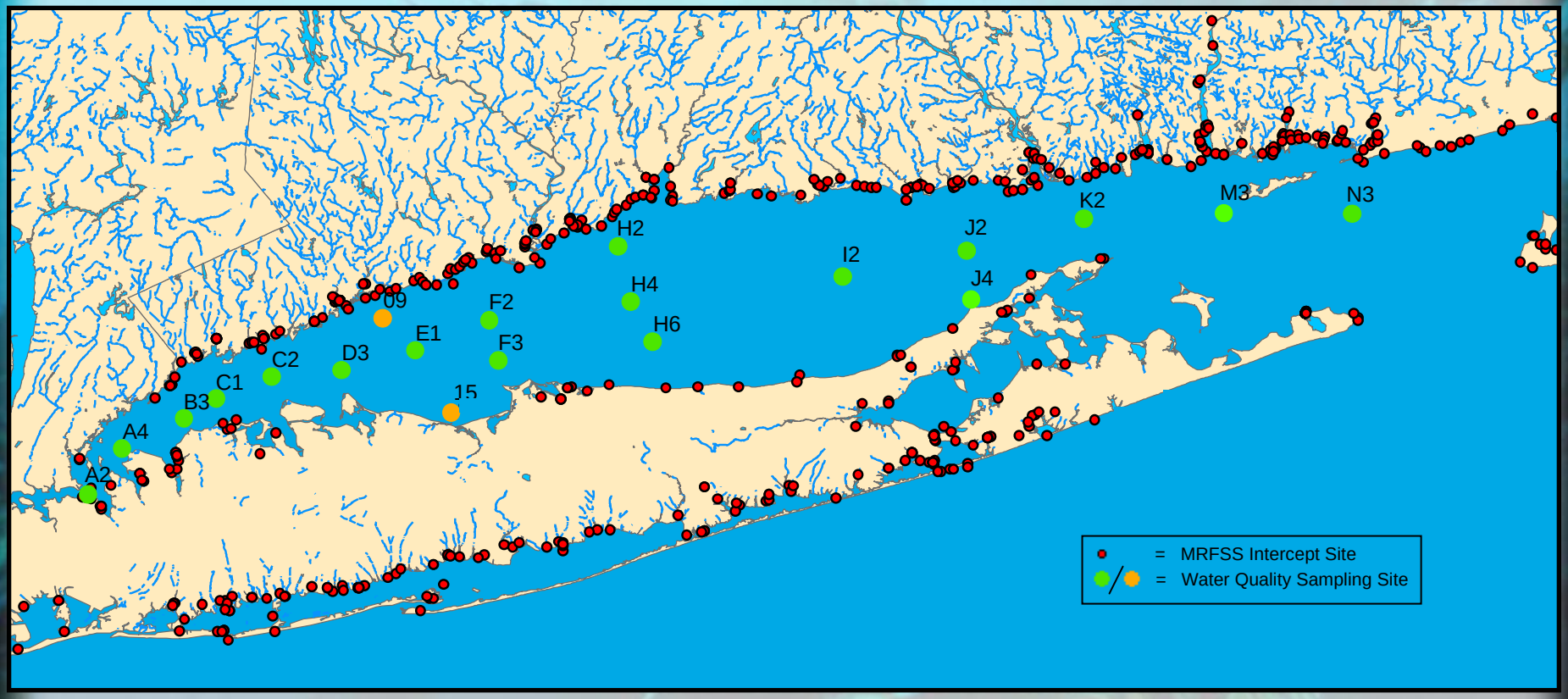
- Selection of 13 Mid Atlantic/Northeastern US estuarine systems to perform pilot project



Human Use Indicator

- Merge NEEA/ASSETS water quality data with Marine Recreational Fisheries Statistical Survey (MRFSS) data

MRFSS Sites & Water Quality Sampling Sites



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Long Island Sound (2002) – NEEA/ASSETS Application

ASSETS: GOOD

Indices	Methods	Parameters	Value	Level of expression	Index
Overall Human Influence (OHI) ASSETS: 3	Susceptibility	Dilution potential	High	Moderate susceptibility	MODERATE
		Flushing potential	Low		
	Nutrient inputs	Moderate nutrient input			
Overall Eutrophic Condition (OEC) ASSETS: 4	PSM*1	Chlorophyll *a*	0.5	Moderate	MODERATE LOW
		Epiphytes	No Data		
		Macroalgae	No Data		
	SSM*2	Dissolved Oxygen	0.25	Low	
		Submerged Aquatic Vegetation	SAV has increased	Low	
		Nuisance and Toxic Blooms	No Data		
Determination of Future Outlook (DFO) ASSETS: 4	Future nutrient pressures	Future nutrient pressures decrease			IMPROVE LOW

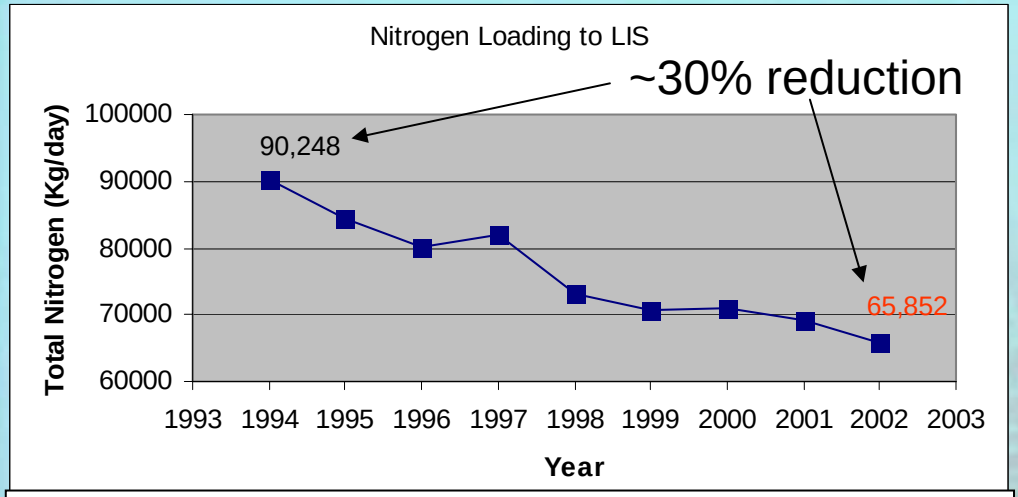
*1 – Primary symptoms method

*2 – Secondary symptoms method

$$\sum_{i=1}^{n}\left(\frac{A_z}{A_t}\right)\left(\begin{matrix}Expression\\value\end{matrix}\right)=$$

Symptom level of expression value for estuary

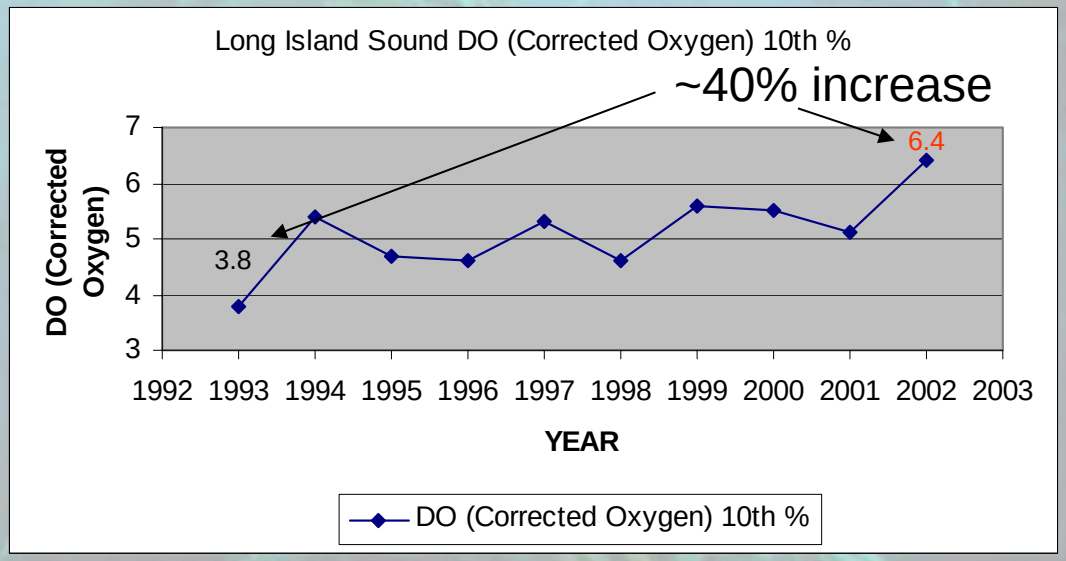
n – Total number of zones
Az – Area of zone
At – Total estuary area



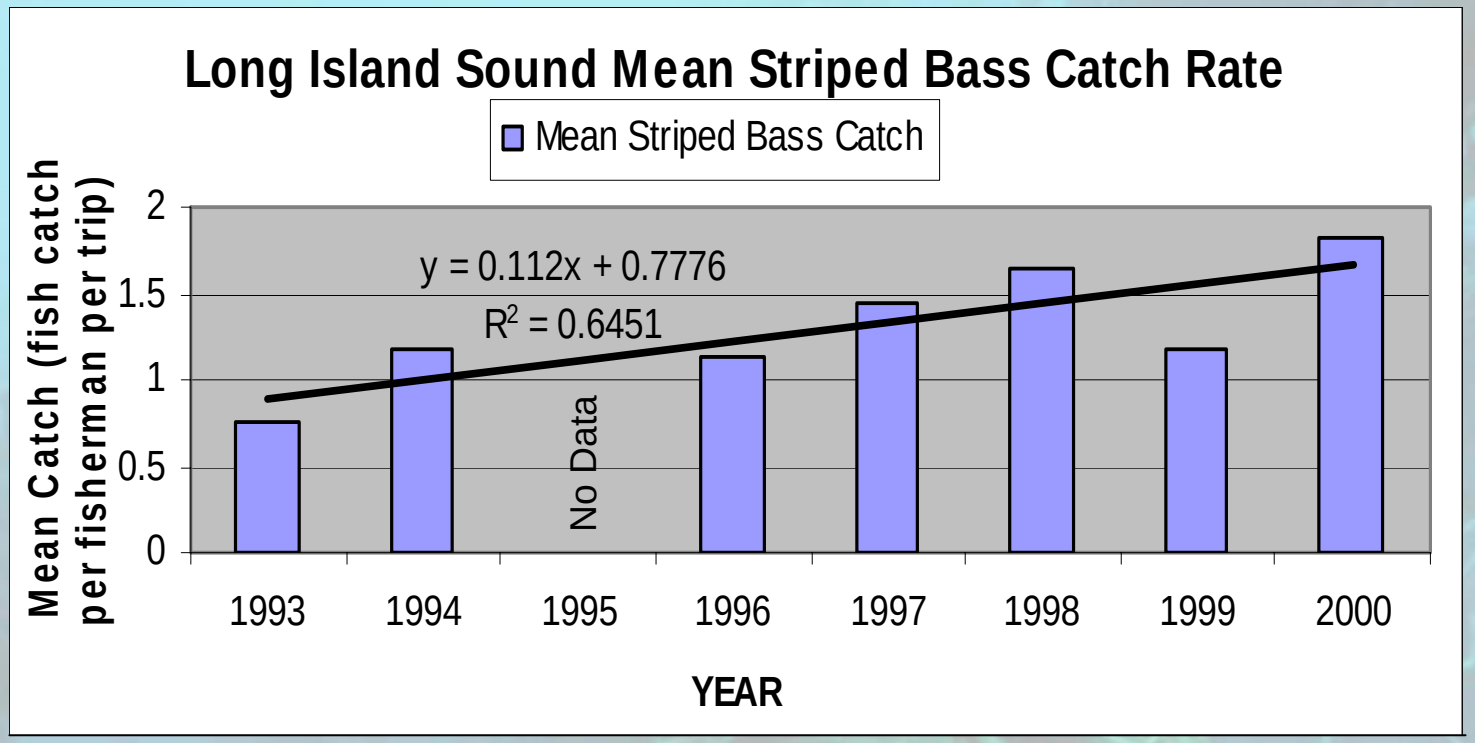
Point source (excluding New York City combined sewer overflows) nitrogen loads from CT and NY STP and major industries (from NYSDEC, CTDEP)

Nitrogen Point Source Inputs

Dissolved Oxygen 10th Percentile

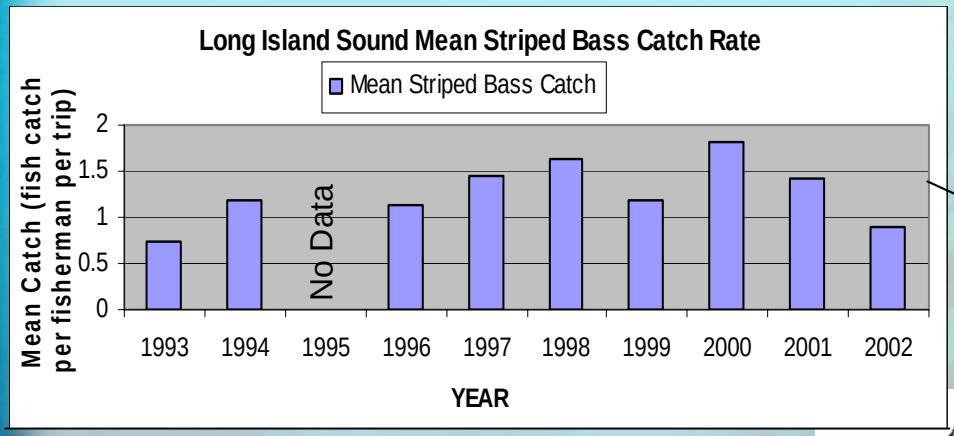


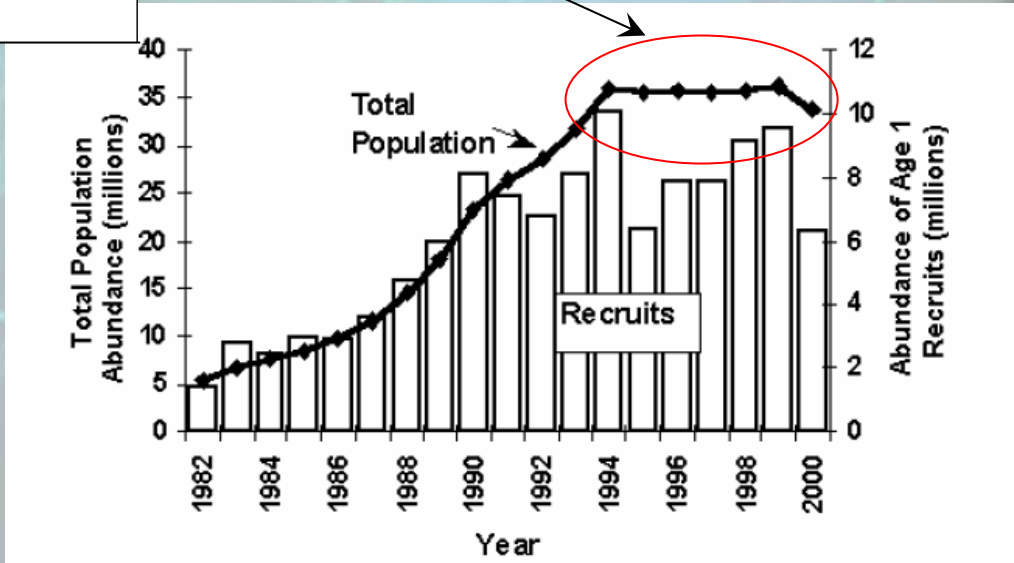
Fish Catch Rate Response



- ~30% Reduction in Nitrogen Loading
- ~40% Increase of DO 10th Percentile
- Significant Increase in Striped Bass Catch Rate

Striped Bass Catch Rate vs. Estimated Striped Bass Population





Taken from: NMFS & US FWS *A Population Study of Atlantic Striped Bass*, 2000

Model

- Fish catch rate is a function of:
  - Temperature
  - Salinity
  - Bottom water dissolved oxygen
  - Historical catch rate of striped bass
  - Fisherman avidity
  - Fisherman experience

(Environmental variables)

(Human variables)

DO significantly affects catch rates. Thus recreational fish catch rates, when properly adjusted for other factors, may be human use indicators of water quality or eutrophication.

Predictive Capabilities

- NEEA/ASSETS
  - What will the overall eutrophic rating be if there is a 50% decrease in nutrient inputs?
  - What areas are likely to remain or become problem areas?
- Human Use
  - What will the fish catch rate be if there is a increase in bottom water dissolved oxygen?
  - Using economic models, predict gain or loss in value of change in catch rates

Conclusions

- Management practices impact and change water quality
- Water quality impacts Human Uses such as fish catch rates
- NEEA/ASSETS methods will predict future conditions, which will in turn affect management decisions and practices