Assessment of eutrophication: A comparison of methods applied to Barnegat Bay

ERF 2005, Norfolk, Virginia
Session SYM-06: Managing River Basins and Estuaries: an International Assessment of Approaches and Progress
October 18, 2005
http://www.eutro.org

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US and EU Legislative Mandates

European Union

Water Framework Directive (2000/60/EC)
Habitats Directive (92/43/EEC)
Urban Waste Water Treatment Directive (91/271/EEC)
Nitrates Directive (91/676/EEC)
OSPAR, HELCOM and Barcelona conventions

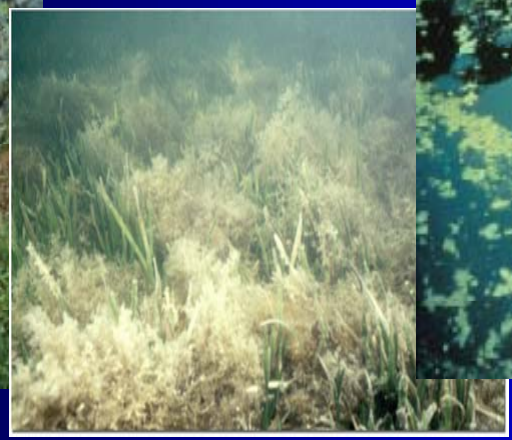
United States

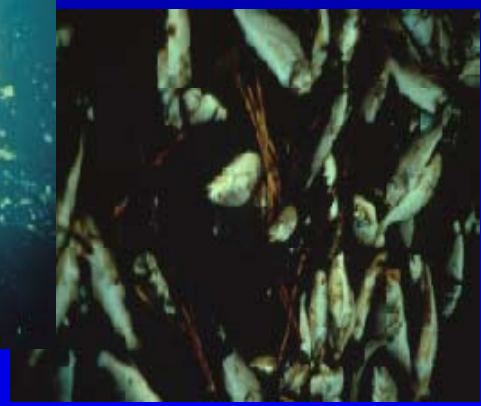
Clean Water Act of 1972
Air Pollution Prevention and Control Act of 1977
Coastal Zone Management Act of 1972
Harmful Algal Bloom and Hypoxia Research and Control Act of 1998

The Problem – Assessment Methods

Symptoms and Consequences of Nutrient Enrichment

Nutrient Inputs and Processing	Primary Impacts	Secondary Impacts	Consequences of Symptoms
Increased N and P concentration	High algal production Loss of water clarity Macroalgal problems	Loss of SAV Low D.O Nuisance/Toxic blooms	Fish kills Loss of habitat Human health risks Loss of tourism Closed fishing grounds





These assessment methods will be compared:
US NOAA NEEA/ASSETS – Natl. Est. Eutro. Assessment/Assessment Est. Trophic Status
USEPA NCA – National Coastal Assessment
OSPAR COMPP – Comprehensive Procedure

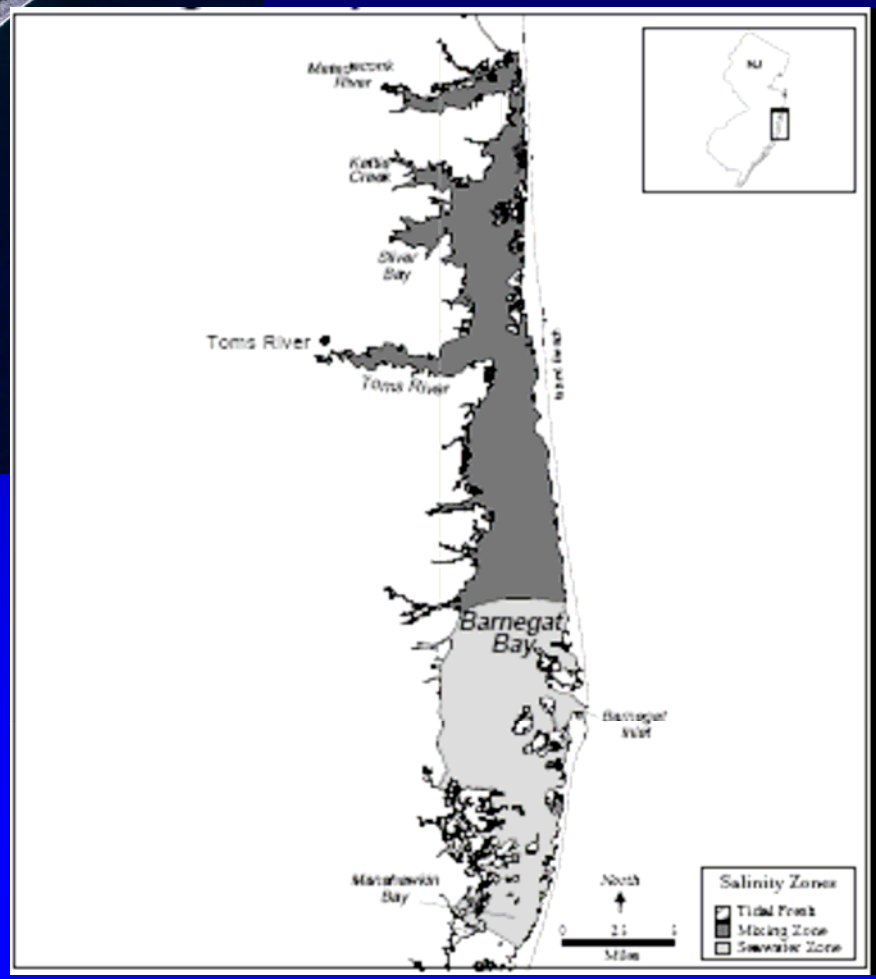
Comparison of assesment method indicators

	NEEA ASSETS	EPA NCA	OSPAR COMPP
Nutrient concentration		X	X
Nutrient loads	X		X
Chlorophyll *a*	X	X	X
Dissolved Oxygen	X	X	X
Water Clarity		X	
HABs/Algal toxins	X		X
Phytoplankton Indicator spp			X
Macroalgal abundance	X		X
Submerged Aquatic Veg.	X		X
Zoobenthos/fish kills			X

Comparison of assesment method details

		NEEA ASSETS	EPA NCA	OSPAR COMPP
Grouping of variables	Pressures Influencing Factors	nutrient load		DIN, DIP conc. nutrient load
	Primary Symptoms Direct Effects	Chl a (90th percentile) macroalgae		Chl a, PP indicator spp, macroalgae phytobenthos
	Secondary Symptoms Indirect Effects	HABs, SAV loss D.O. (10th percentile)		D.O., zoobenthos fish kills
	Other or No grouping		DIN, DIP, Turbidity Chl a, D.O.	
	Temporal focus	Annual	Index period (summer)	Mean growing season Chl a winter N & P, annual D.O.
	Indicator threshold criteria	Determined from national studies	Determined from national studies	Comparison to reference site (+50%)
	Combination Method	Average primary highest secondary combine by matrix secondary has > weight	Ratio of indicators no weighting	One out all out for group ratio of group results no weighting

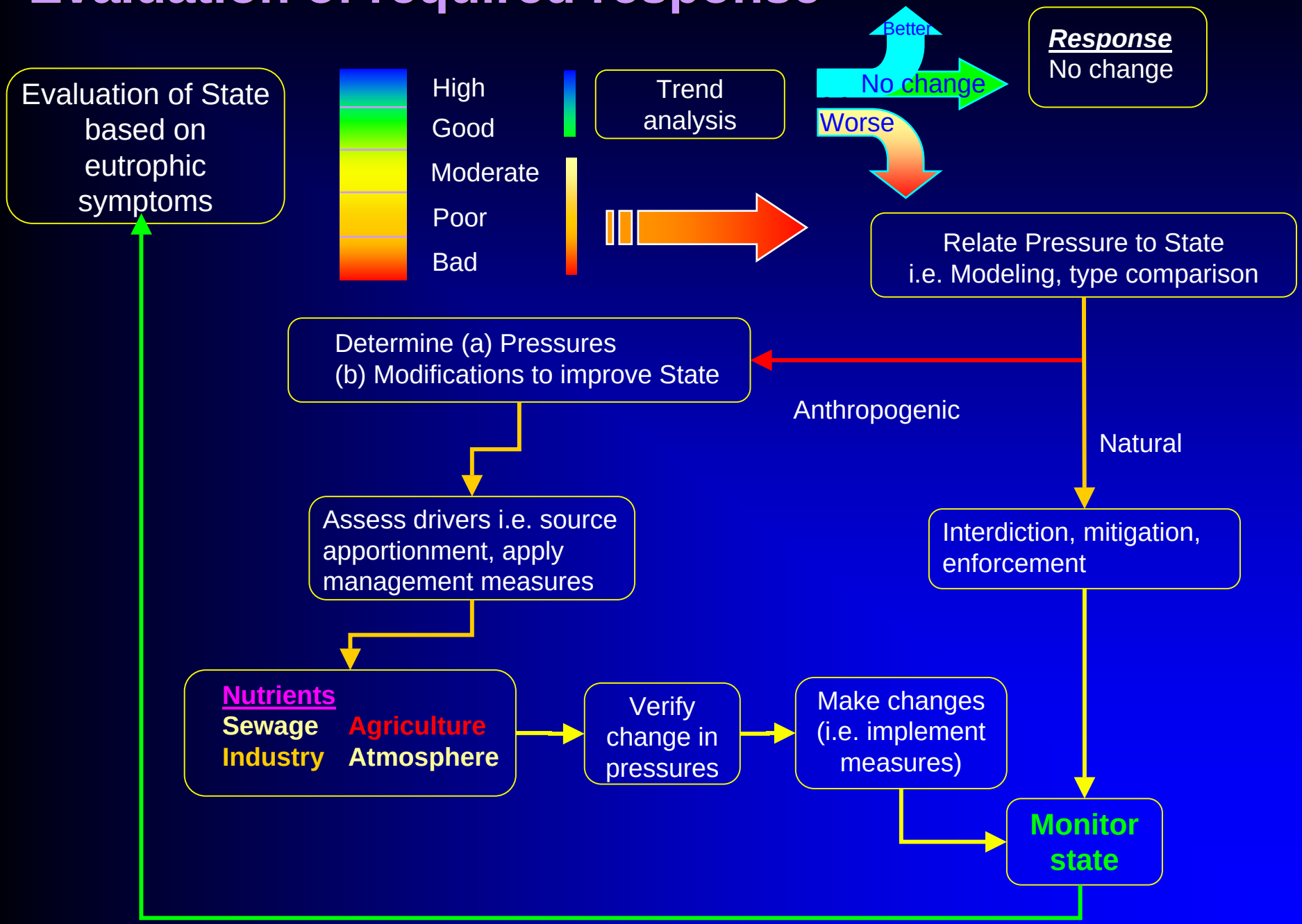
Barnegat Bay, New Jersey



Comparison of assessment results

(2002-2003)	NEEA ASSETS	EPA NCA	OSPAR COMPP
Nutrient Load	High		Problem
DIN Concentration		Fair	No Problem
DIP Concentration		Fair	No Problem
DIN:DIP ratio			No Problem
Chlorophyll *a*	High	Good	No Problem
	(9.67 ug/l)	(4.74 ug/l)	(3.64 ug/l)
Macroalgae	Problem		Problem
Submerged Aquatic Vegetation (SAV)	Problem		Problem
HABs	Problem		Problem
Dissolved Oxygen	No Problem	Good	No Problem
	(5.8 mg/l)	(6.3 mg/l)	(3.5 mg/l)
Water Clarity		Poor	
Overall Classification	Bad	Fair	Problem

Evaluation of required response



Concluding remarks

- The US and EU have parallel legislation designed to evaluate and manage coastal water quality

- Eutrophication assessment methods have been developed in the US and EU to fulfil legislative requirements

- Comparison of three methods (NEEA/ASSETS, EPA NCA and OSPAR COMPP) shows:
  - A similar suite of indicators is used for evaluation
  - Methods of combining indicator results is different
  - Results for two methods are comparable, one is different

- It is important that the evaluation is accurate since appropriate response and associated resource expenditure are dependent on results

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