

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



Barnegat Bay, New Jersey

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NOAA

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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

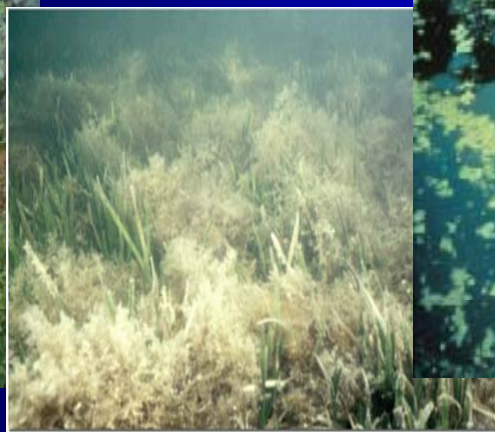
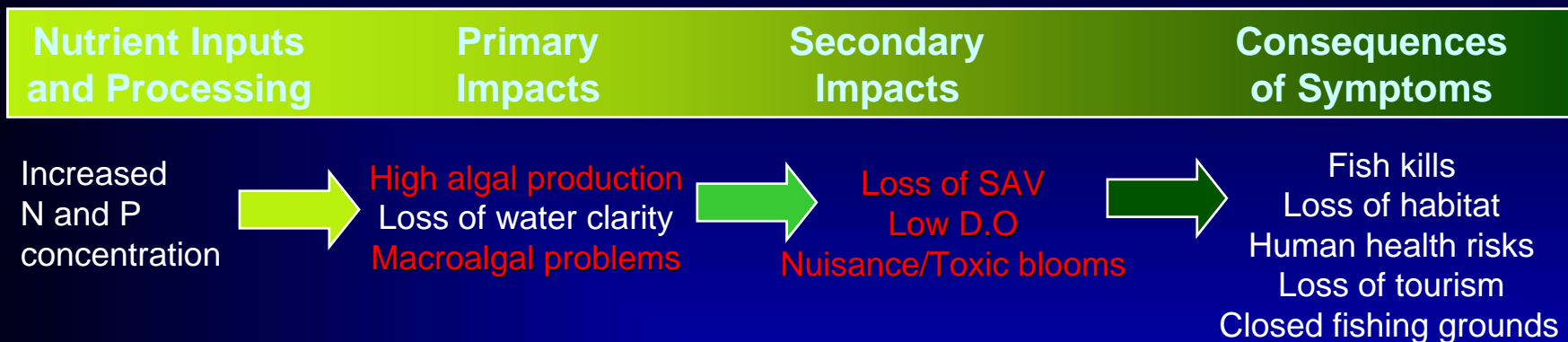
Air Pollution Prevention and Control Act of 1977

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



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

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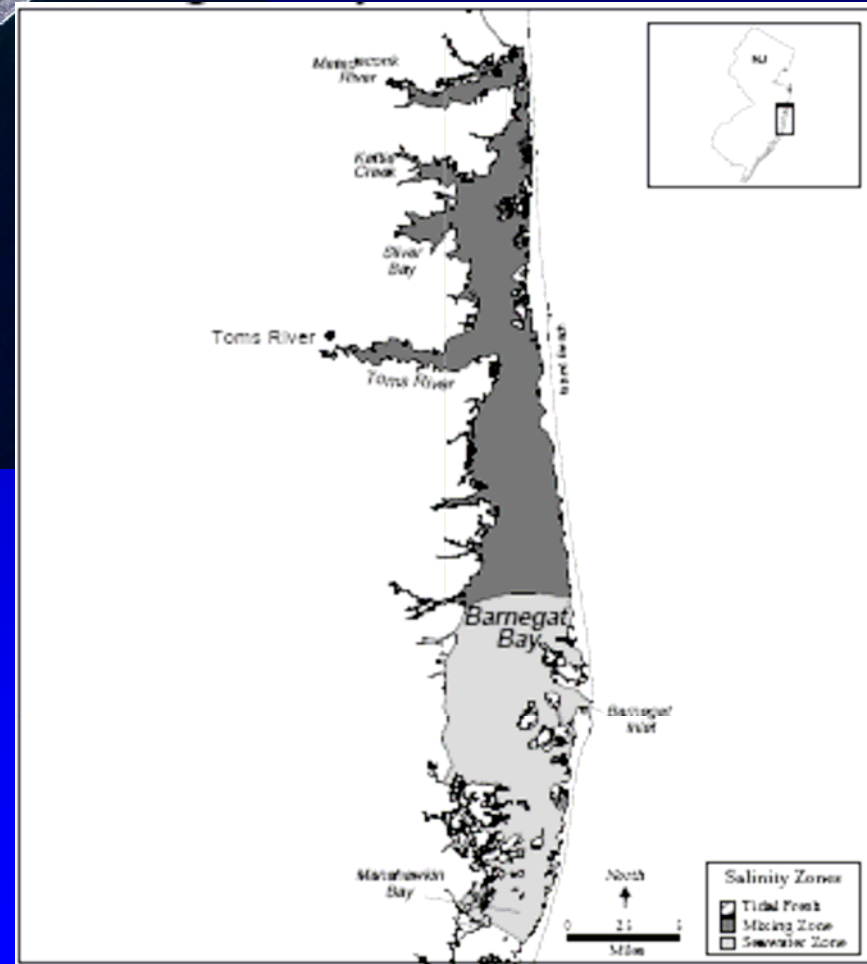
	NEEA ASSETS	EPA NCA	OSPAR COMPP
<b>Nutrient concentration</b>		X	X
<b>Nutrient loads</b>	X		X
<b>Chlorophyll a</b>	X	X	X
<b>Dissolved Oxygen</b>	X	X	X
<b>Water Clarity</b>		X	
<b>HABs/Algal toxins</b>	X		X
<b>Phytoplankton Indicator spp</b>			X
<b>Macroalgal abundance</b>	X		X
<b>Submerged Aquatic Veg.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

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# 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 (90 <sup>th</sup> percentile) macroalgae	Chl a, PP indicator spp, macroalgae phyto <b>ben</b> thos
	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

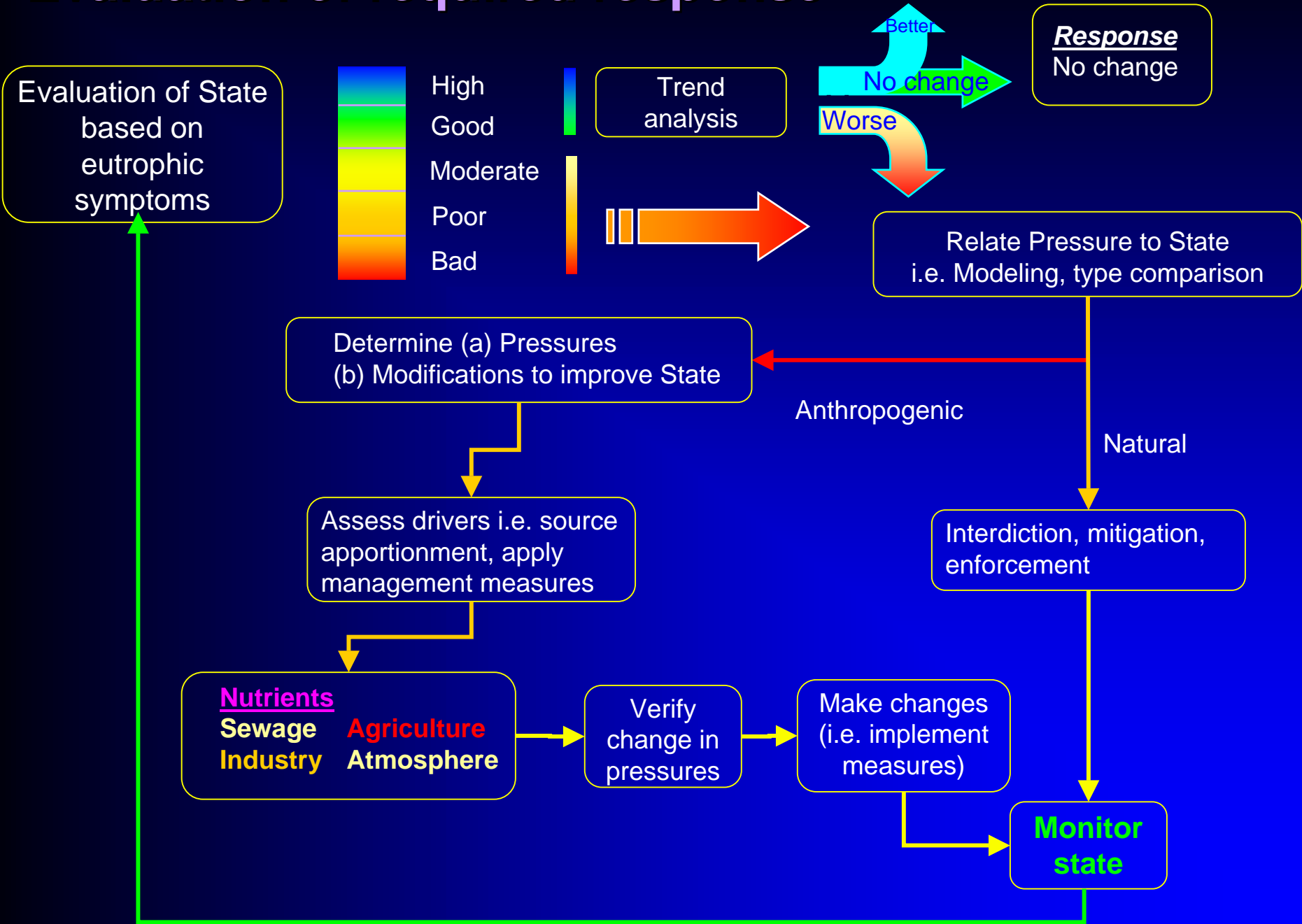
# Barnegat Bay, New Jersey



# Comparison of assessment results

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

# 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