NATIONAL WATER QUALITY MONITORING COUNCIL

*Working Together for Clean Water*

NWQMC

# National Monitoring Network Work Group
# Breakout Session

## Nutrient flux model linkage to estuarine waters and eutrophication


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# National Estuarine Eutrophication Assessment

Figure 3.7. Factors influencing eutrophication on a national scale.

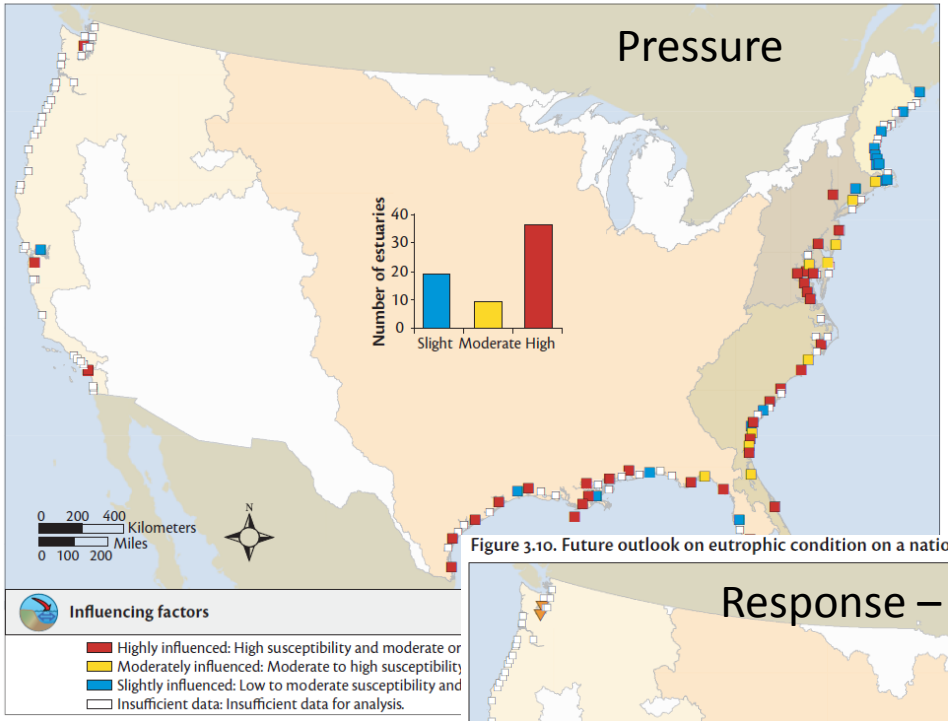



Figure 3.9. Overall eutrophic condition on a national scale.

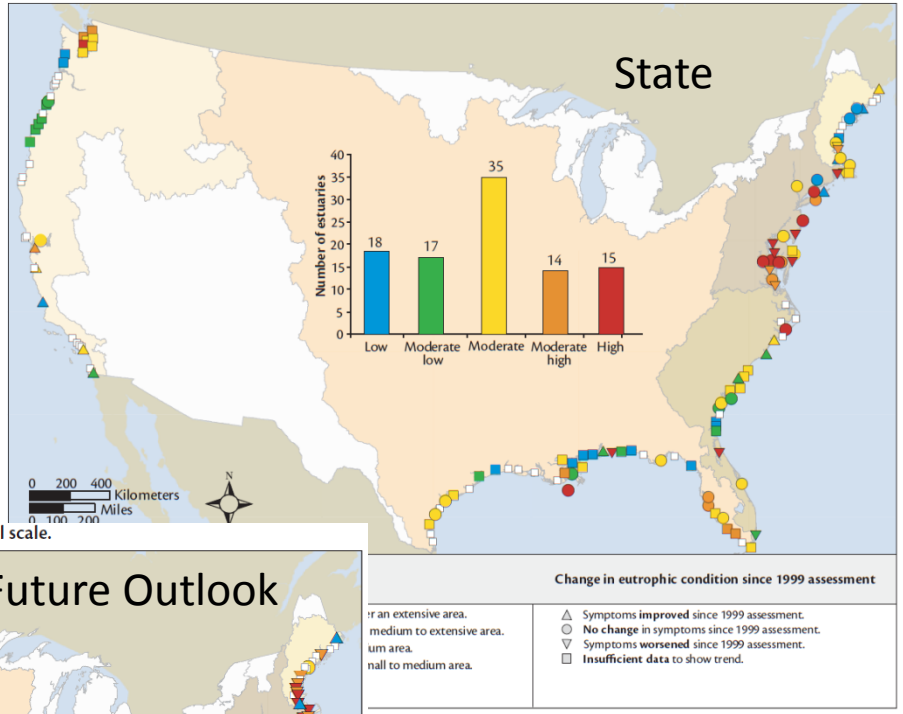
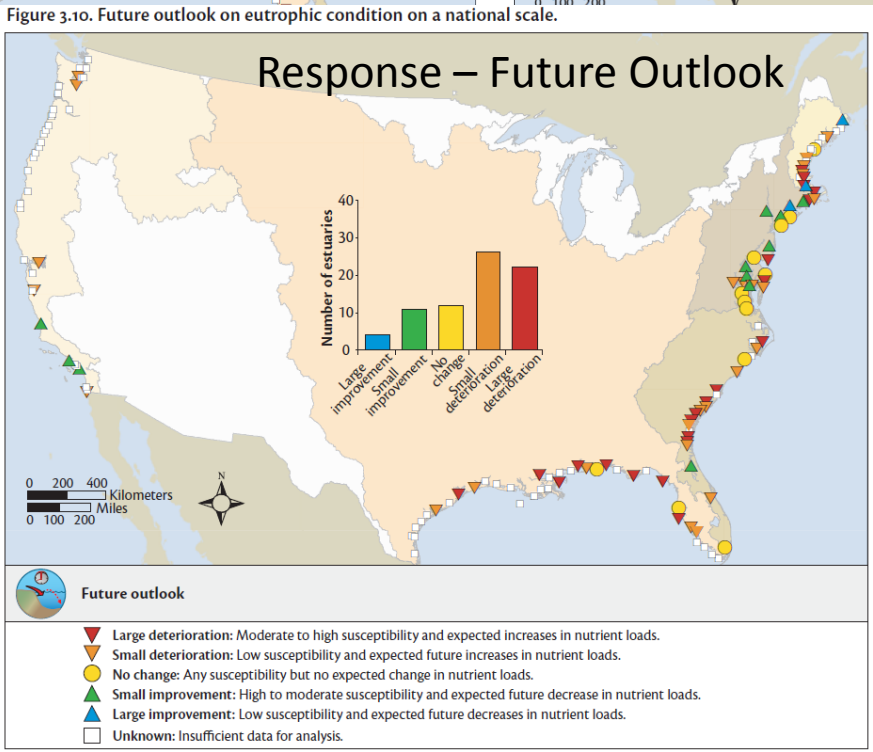



Figure 3.10. Future outlook on eutrophic condition on a national scale.



# Key Aspects of NEEA/ASSETS approach

**The NEEA approach may be divided into three parts:**

- ✓ **Division of estuaries into homogeneous areas**
  - **Tidal freshwater (<0.5 psu)**
  - **Mixing zone (0.5-25 psu)**
  - **Seawater zone (>25 psu)**
- ✓ **Evaluation of data completeness and reliability**
  - Spatial and temporal quality of datasets (completeness)
  - Confidence in results (sampling and analytical reliability)
- ✓ **Application of indices**

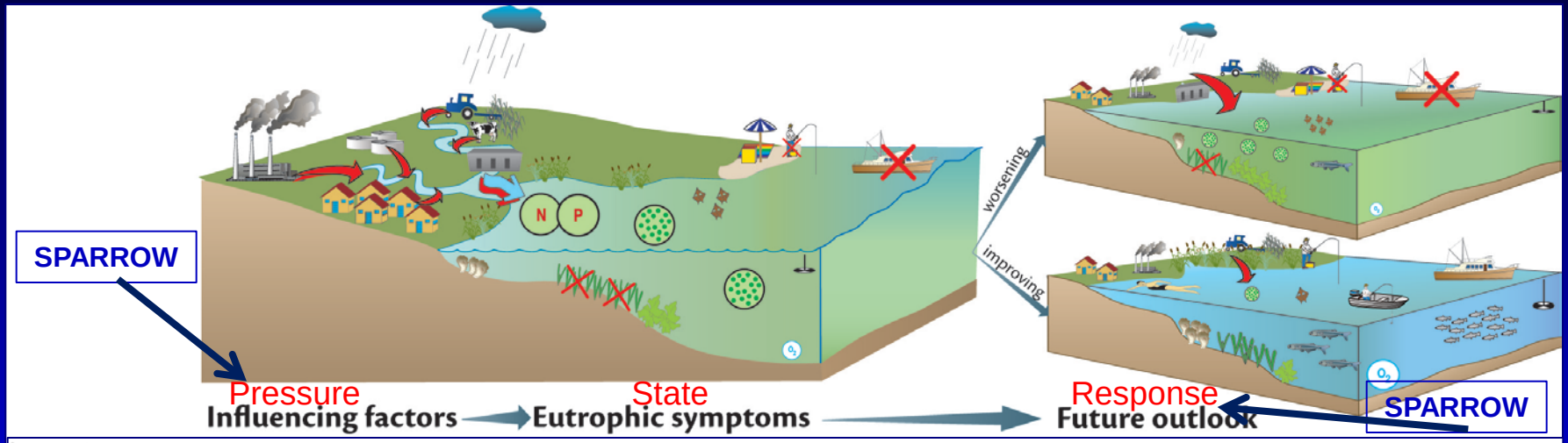
*State:* Eutrophic Condition index (Chl, macroalgae, HABs, DO, SAV loss)

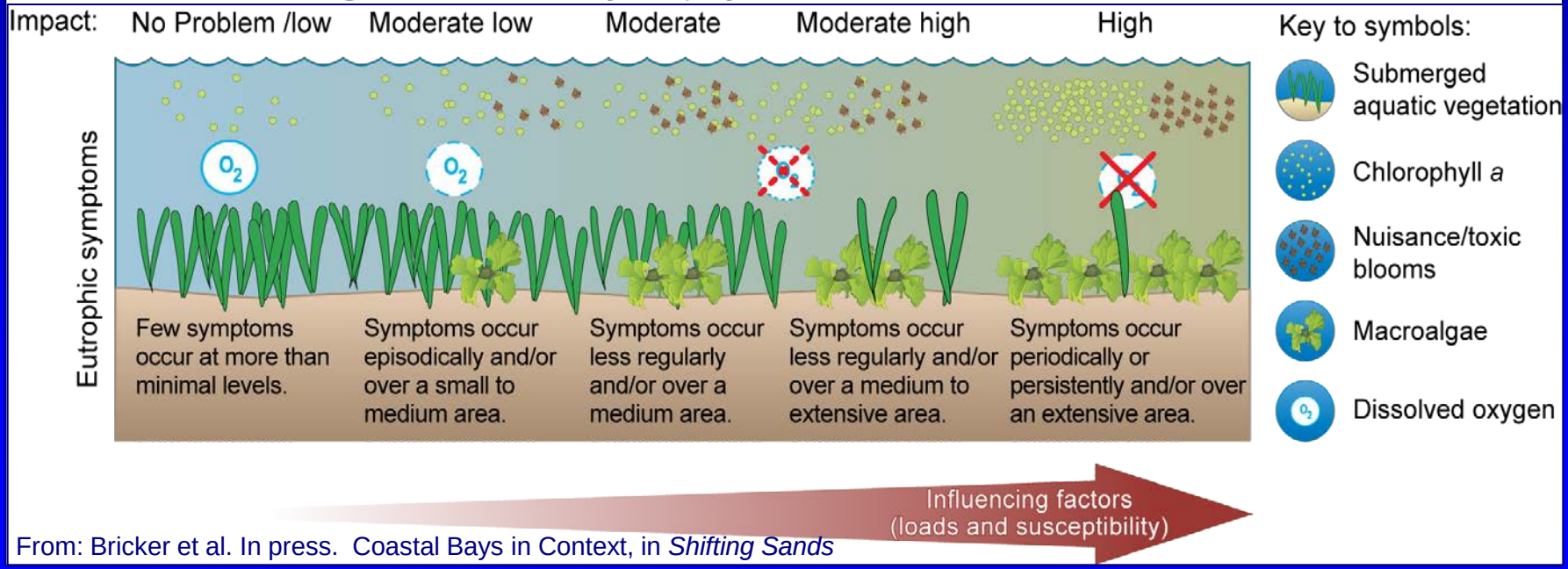
*Pressure:* Influencing Factors index (susceptibility + nutrient load)

*Response:* Future Outlook index (susceptibility + future nutrient load)

**Guide for management, research, monitoring**

# ASSETS Eutrophication Assessment Components



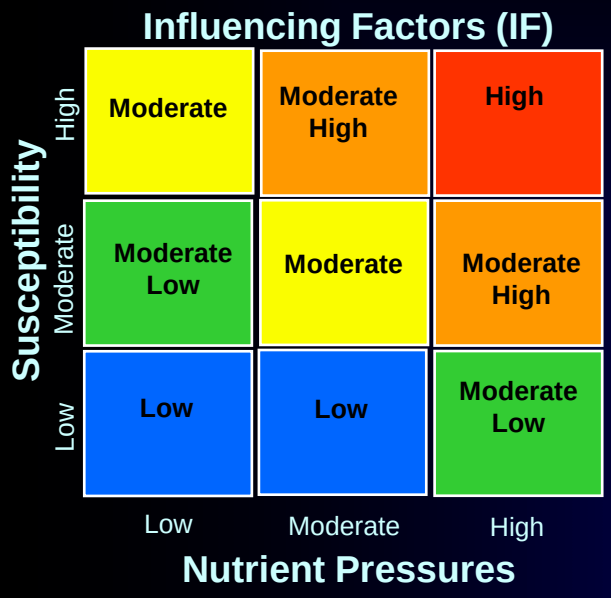



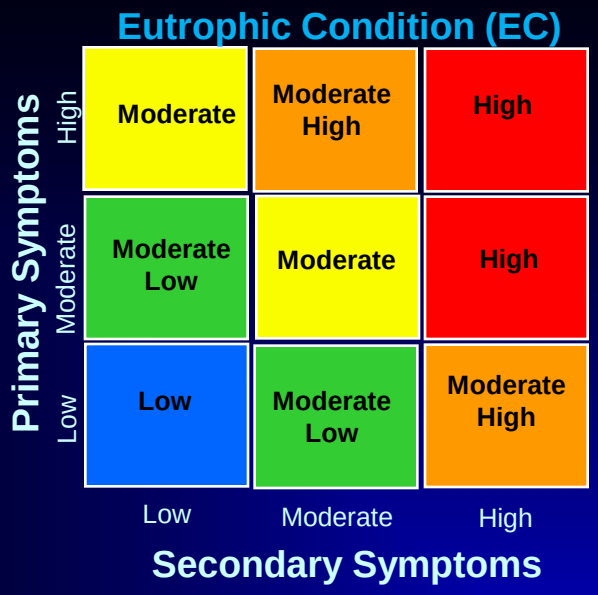

From: Bricker et al. In press. Coastal Bays in Context, in *Shifting Sands*

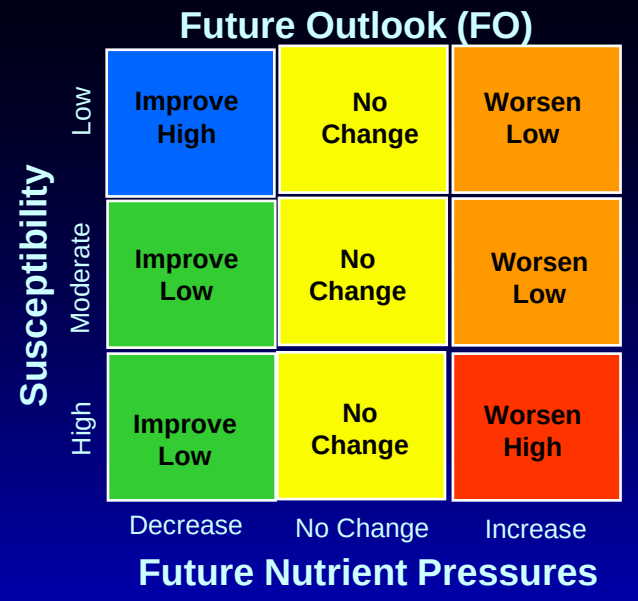
http://www.eutro.us http://www.eutro.org/register

# *Pressure - State - Response*:

## Influencing Factors + Eutrophic Condition + Future Outlook → ASSETS




Susceptibility
dilution & flushing

\+

Nutrient Inputs
land based or oceanic

SPARROW

Primary Symptoms
Chloropyll a
Macroalgae

\+

Secondary Symptoms
Dissolved Oxygen
Nuisance/toxic blooms
SAV change in spatial coverage

Susceptibility natural processing

Nutrient pressure expected changes in load

SPARROW?

**IF + EC + FO = ASSETS**

# A few questions about nutrient load data - Answers from NEEA group

## Roadblocks for a national network?

- Funding - monitoring is not sexy but there is no substitute
- Human vision i.e. new monitoring systems should leverage/link to existing systems.
- Interagency collaboration – NOAA, EPA, USGS should work together, joint funding.
- The political will to ensure that adequate water quality and load monitoring is funded, conducted and reported.

**Answers to other questions follow the ability to support long-term monitoring**

## Data gaps?

- Resolving human vs. natural loads of nutrients, also requires physics of the system, temporal dynamics, and source fluxes
- Uninterrupted high-resolution (sensor) timeseries that reveal temporal variation to help determine system perturbations
- Understanding of all sources, all pathways of delivery and delivery efficiency needed to develop criteria and set cost effective management goals/plans that can withstand scrutiny ,including regulatory mechanisms such as trading programs.
- Linkage of nutrient loading to biological impact so criteria and management goals can be set (e.g. Is eelgrass the right indicator? The most sensitive indicator? what load is truly protective of not only eelgrass, but ecosystem integrity as a whole)
- The role of multiple stressors on the selected endpoint, or the suite of ecosystem services desired. Think climate change and how that affects nutrient impacts.

**What kind of data are need for better nutrient assessment in coastal environments?**

Sources and amounts, efficiencies of delivery, physics of the system, temporal dynamics. This requires not only intensive monitoring, but good modeling of hydrology, hydrodynamics, water chemistry, and biological effects.

**What data quality is need?**

Has to be appropriate and high quality but, not much problem meeting data quality objectives (DQO) with today's technologies, so there's much promise and a lot of good things with ocean observing, and probes.

**Data availability?**

Accessibility is getting better with online data servers, but there are few systems that have adequate chemical, physical and biological monitoring in a multimedia source context (air-land-water).

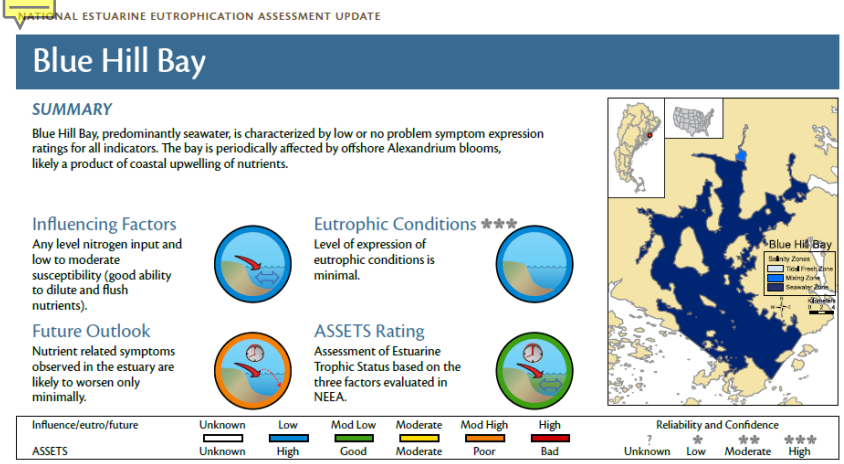
## There is no substitute for long-term monitoring

**Additional comments:**

- Monitoring - tells us what a natural system looked like, used to develop management goal end points and to negotiate management compromises with a realistic look at recovery potential.
- Management - should include consideration of environment, society, and economics.
- Indicator development – what is the 'right' indicator? The most sensitive indicator? How to be truly protective of the indicator, (e.g. seagrass) and ecosystem integrity as a whole.
- Intensive monitoring required - also modeling (hydrology, hydrodynamics, water chemistry, and biological effects) to evaluate the role of multiple stressors on endpoints, or desired ecosystem services E.g. climate change and how that affects nutrient impacts.
- Single number criteria - worked well for toxic chemicals, is poor model for nutrients.
- IOOS can help - there are 11 national regional associations all have data serving capacity. Investment in this system is efficient since the data will be added to current capacity / capability, and once so, it is available nationally.

# NOAA - USGS Collaboration

From: Anne Hoos and Craig Johnston
Coastline segments in National Hydrography Dataset Plus are manually selected (highlighted yellow below) to best represent the estuary delineation from the NOAA summary PDF map.
SPARROW: riverine load from watershed to estuary


NATIONAL ESTUARINE EUTROPHICATION ASSESSMENT UPDATE

Blue Hill Bay

SUMMARY

Blue Hill Bay, predominantly seawater, is characterized by low or no problem symptom expression ratings for all indicators. The bay is periodically affected by offshore Alexandrium blooms, likely a product of coastal upwelling of nutrients.

Influencing Factors
Any level nitrogen input and low to moderate susceptibility (good ability to dilute and flush nutrients).

Eutrophic Conditions ***
Level of expression of eutrophic conditions is minimal.

Future Outlook
Nutrient related symptoms observed in the estuary are likely to worsen only minimally.

ASSETS Rating
Assessment of Estuarine Trophic Status based on the three factors evaluated in NEEA.

Blue Hill Bay

Influence/eutro/future: Unknown | Low | Mod Low | Moderate | Mod High | High
ASSETS: Unknown | High | Good | Moderate | Poor | Bad

Reliability and Confidence: ? Unknown | * Low | ** Moderate | *** High