

A.18 Decision Support Through Earth Science Research Results

Satellite Earth Image Products Applied to the Development of Regulatory Water Quality Standards (FY 2010 to 2013)

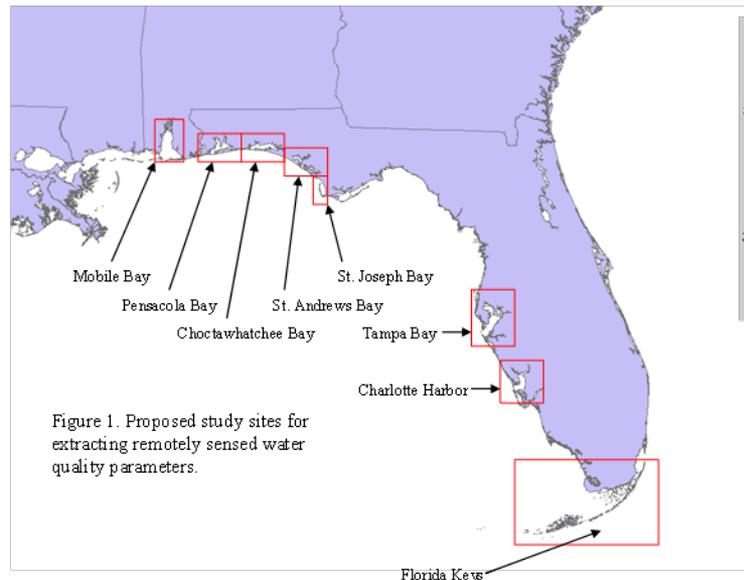
Goal: Develop retrospective time-series (mid-1980s to the present) of light attenuation and determine contributions of phytoplankton, suspended sediment, and dissolved organic matter to light attenuation

Decision Support: Work with partners within EPA and the Florida Department of Environmental Protection to utilize remote sensing products for developing water quality criteria protective of coastal ecosystems

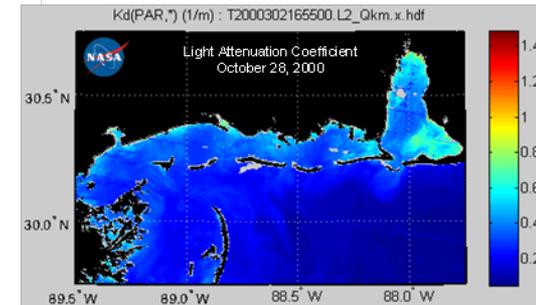
MODIS



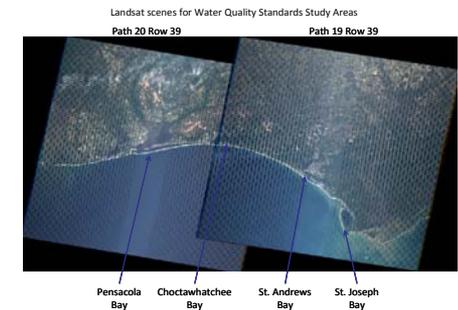
Sites



Products



Landsat



Our Team

EPA GED

John Lehrter
Blake Schaeffer
Robyn Conmy
Jim Hagy
William Fisher
Marc Russell

FDEP

Russ Frydenborg

FWRI

David Palandro

NOAA CSC

Chris Ellis

NASA SSC

Bruce Spiering
(NASA)
Slawek Blonski
(SSAI)
Kenton Ross (SSAI)

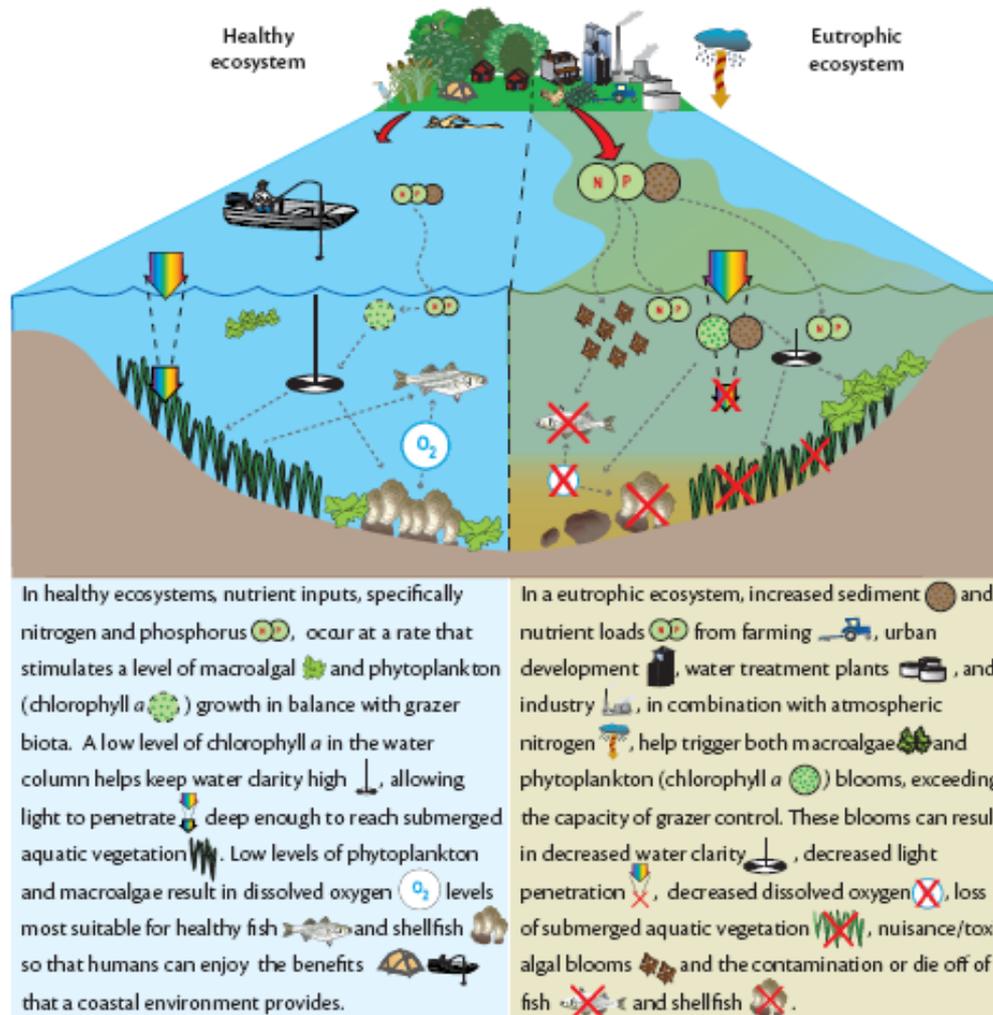


The Decision Landscape

- The Clean Water Act provides for the use of water quality standards to protect the physical, chemical, and biological integrity of aquatic resources
 - CWA Section 303 - development of numeric water quality standards
 - FDEP Chapter 62-302, Florida Administrative Code (FAC) and in the Impaired Waters Rule (IWR, Chapter 62-303, FAC)
- Components of a water quality standard include
 - Designated uses (e.g. drinking water supply, fishable/swimmable)
 - Numeric and narrative numeric water quality criteria
 - Anti-degradation
- Water quality standards are reviewed triennially

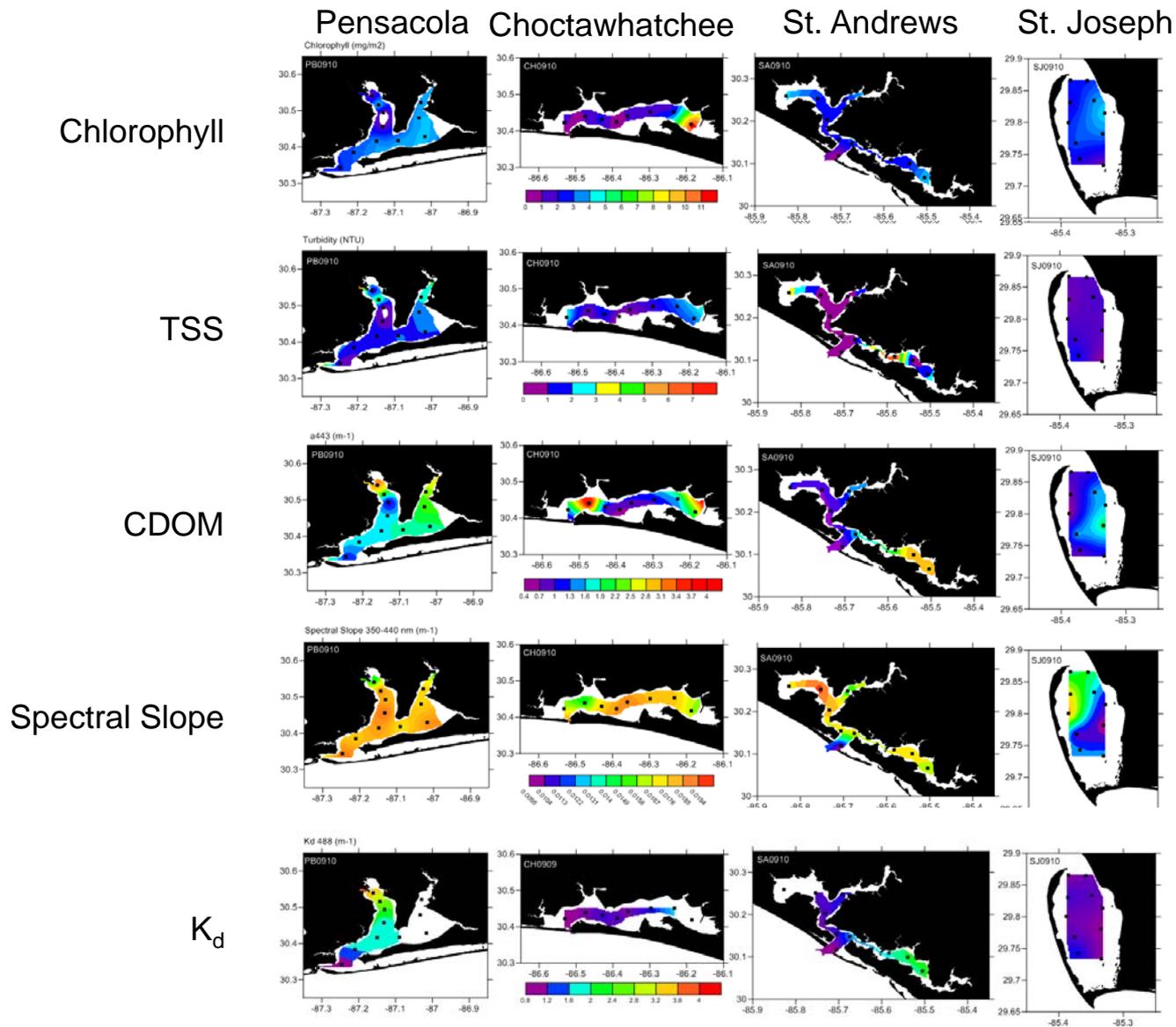
How can optical measurements and remote sensing imagery be used to develop water quality standards?

Figure 1.1. Conceptual diagram comparing a healthy system with no or low eutrophic condition to an unhealthy system exhibiting eutrophic symptoms.

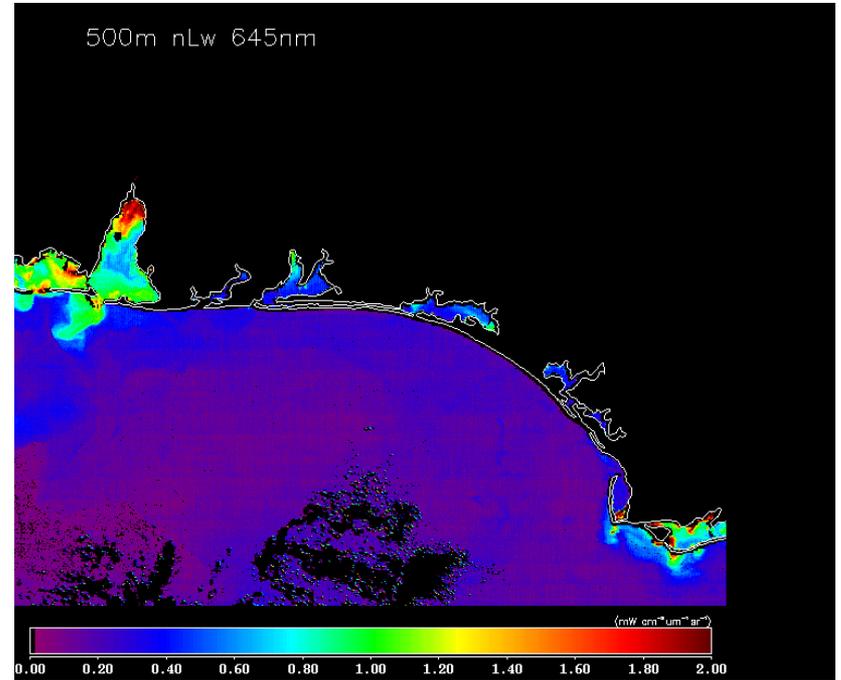
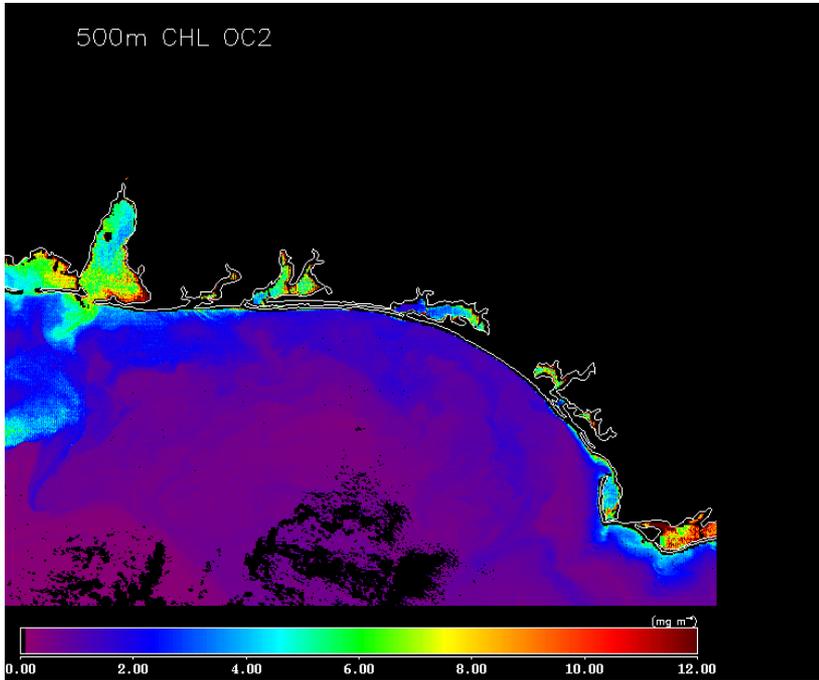


Bricker et al. (2007)

Preliminary Field Data for the Panhandle Estuaries



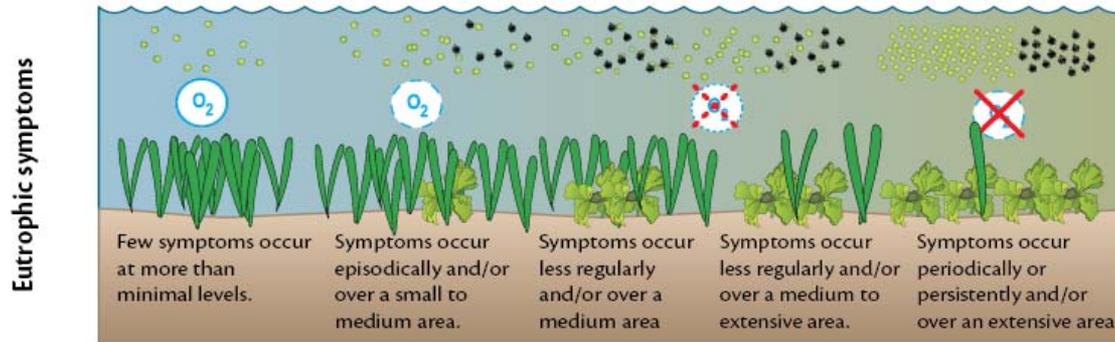
Preliminary Satellite Products



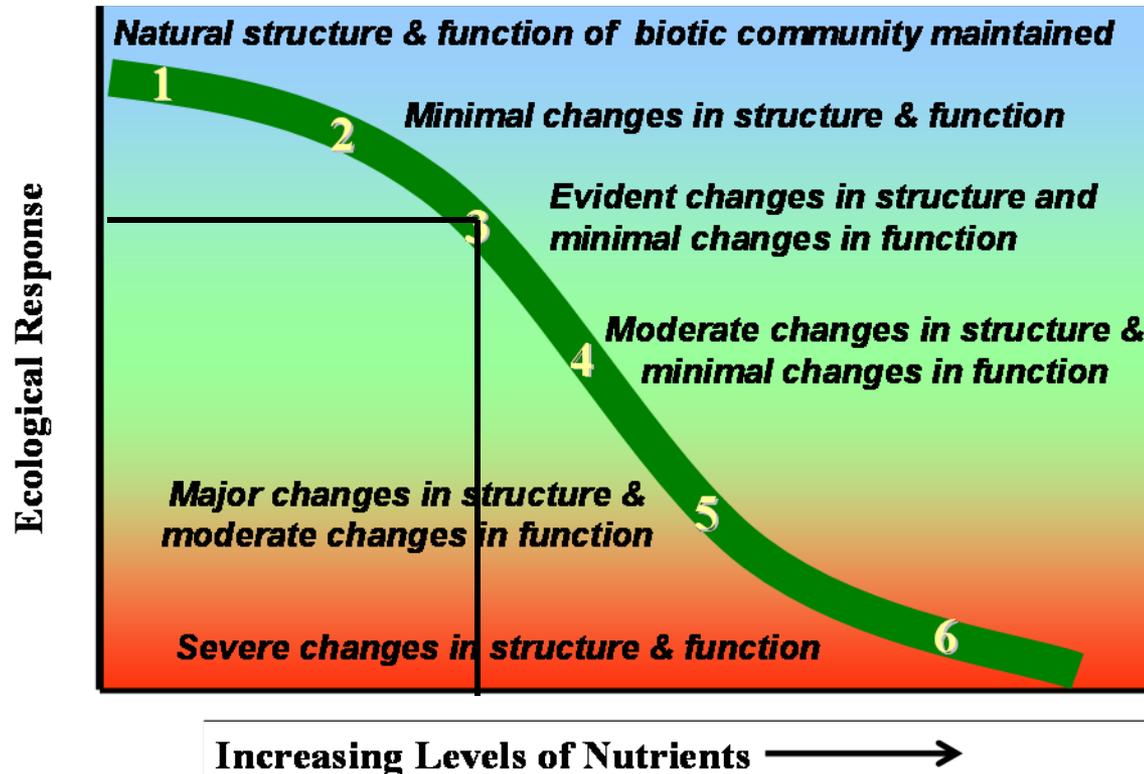
Thank You NASA!



Conceptual example of how numeric nutrient criteria may be developed



Bricker et al. (2007)



Adapted from
Davies and Jackson
(2006)

Water Resources: Water Quality Assessment (PI: Lehrter)

Earth System Measures

Water-column:

- Light attenuation
- Chlorophyll *a* (chl_a), total suspended matter (TSM), and colored dissolved organic matter (CDOM) concentrations

Benthic:

- Benthic habitat: submerged aquatic vegetation (SAV) and coral reefs

Earth Observations

- **chl_a**: MODIS, Landsat, EPA field programs
- **TSM**: MODIS, Landsat, EPA field programs
- **CDOM**: MODIS, EPA field programs
- **Inherent optical properties**: EPA and other field programs
- **SAV condition**: USGS
- **Coral condition**: Landsat, EPA and other field programs
- **Bathymetry**: NOAA

Predictions/Forecasts

Historical time-series (1980s –present)

- Light attenuation
- Chl_a, TSM, and CDOM

Water quality stressor-response relationships

- Chl_a, TSM, and CDOM effect on light attenuation
- Light attenuation effects on SAV condition
- Light attenuation effects on coral condition

Products

- Data and approaches for developing water quality standards
- Geospatial database of spatio-temporal field and remote sensing data

Observations, Parameters & Products

Decision Support Systems, Assessments, Management Actions

Clean Water Act (CWA)– water quality standards development

Specific analyses to support the decision making

- Assessments of historical light attenuation, chl_a, TSM, and CDOM
- Assessment of light requirements to support healthy communities of SAV and corals
- Technical guidance on the use of remote sensing imagery in the development of water quality standards

Specific Decisions / Actions

- CWA Section 303 - development of numeric water quality standards.
- FDEP is developing numeric nutrient criteria for adoption in Chapter 62-302, Florida Administrative Code (FAC) and in the Impaired Waters Rule (IWR, Chapter 62-303, FAC)

Value & Benefits to Society

Improvements in the decision-making, decisions, and actions

- Improved data availability through provision of under utilized remote sensing data
- Improved capability for assessment of impaired waters
- Improved decision-support products for development of water quality standards by EPA and states.

Quantitative and qualitative benefits from the improved decisions

- Improved environmental protection and stewardship of estuarine and coastal waters
- Improved health of estuarine and coastal ecosystems
- Improved quality of life for both coastal residents and tourists