



## Water Quality Monitoring in NOAA

Jawed Hameedi

Center for Coastal Monitoring and Assessment

NOAA, NOS, NCCOS

Silver Spring, MD

Ocean Observing Sub-Panel  
ORRAP  
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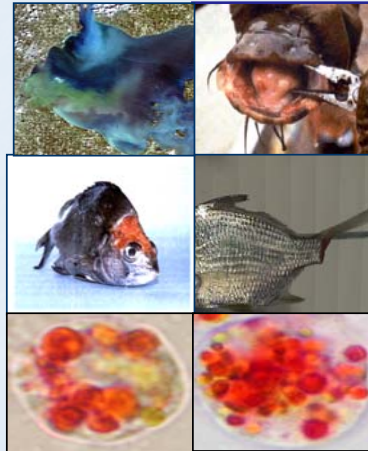
NOAA's legislative mandates:  
derived from more than a dozen specific statutes (examples in Handout A)

- **Programmatic responsibility**
- **Institutional authority**
  - Allow for a large variety of water quality measurements on different environmental constituents and matrices, i.e., atmosphere, water, sediment, species and ecosystems
  - Programs and activities in all line offices
  - *Note that the issue of water quality impairment and its impacts is sufficiently complex that no single federal agency is responsible for addressing and resolving this issue; NOAA's responsibilities are very often complementary and shared.*

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## Water Quality Data Needs

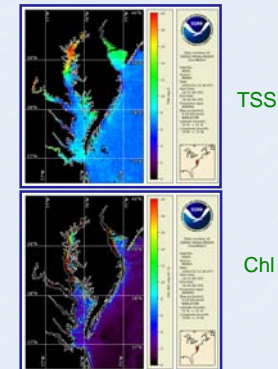
Establishing connections between water [and air] quality and undesirable ecosystem conditions or outcomes (e.g., nuisance or harmful algal blooms, eutrophication, fish diseases and deformities, hypoxic conditions, and loss of species and biodiversity)



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## Water Quality Data Needs – contd.

Understanding the role of physical processes (including episodic events, decadal changes, and global warming) on coastal and Great Lakes ecosystems.

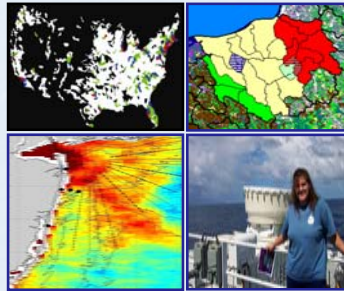


Loading from a Runoff Event in Chesapeake Bay, March 2008  
(High-Resolution Ocean Color Satellite Data)  
<http://coastwatch.noaa.gov/>

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## Water Quality Data Needs – contd.

- Fostering collaboration between NOAA, universities, and states
- Enhancing environmental literacy (through education, outreach and training)



Impervious surface area; ISAT;  
Rutgers COOL; Teachers at Sea

<http://www.csc.noaa.gov>

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## Program Support and Cross-Cutting Infrastructure

- Observational assets (*in situ*, remote sensing, IOOS, US GEO, etc.)
  - 99 observing systems and monitoring programs (2004 review)
- Data Quality (“Data Quality Act”)
- Data Management Systems
- Education, outreach and technology transfer



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## NOAA's Mussel Watch Project

<http://ccma.nos.noaa.gov/about/coast/welcome.html>

(also see Handout B)

- Longest running, nationwide monitoring of contaminants in bivalves in US coastal waters
- Over 100 analytes
- Produced a 20-year assessment report (2008) based on data from 300 sites



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## NERRS System-Wide Monitoring Program (SWMP)

27 Weather and 108 Water Quality Monitoring Stations:

Sentinel Sites for Monitoring Climate Change

### Water Quality

temperature  
conductivity  
salinity  
DO (mg/L)  
DO (%)  
depth  
chlorophyll *a*  
turbidity



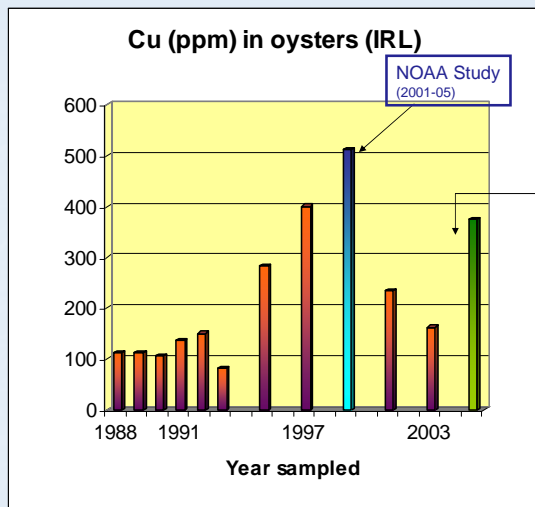
### Weather

air temperature  
pressure  
relative humidity  
precipitation  
wind speed  
wind direction  
photosynthetically active radiation  
total incoming radiation



<http://cdmo.baruch.sc.edu> <http://www.nerrs.noaa.gov>

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**NOAA's National Coastal Data Development Center:  
Gateway to Coastal and Ocean Data Resources  
([www.ncddc.noaa.gov](http://www.ncddc.noaa.gov))**

- SIMoN – Sanctuary Integrated Monitoring Program
- West Coast Observations (WCO) Portal
- Gulf of Mexico hypoxia update
- NRL MODIS Imagery access
- Environmental Data Management Report to Congress (2007; every two years)



Hypoxia Watch: 2008 Fall Season  
Barents Sea: August 2007 (NASA)

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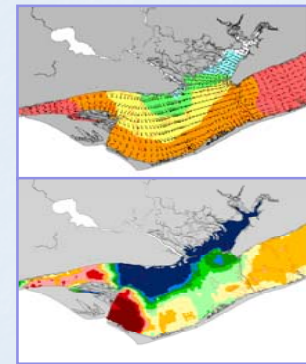
*In the end, we can't rely on observations alone; need to know causes and consequences of change*

- *"Policy-relevant evaluative research"*
  - *Factually correct, reproducible data*
  - *Accurate representation of technical issues; multi-dimensional questions cannot be solved by one-dimensional data*
  - *Balanced analysis and interpretation; exceptions are important*
  - *Pass the muster – peer review*

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*Also, at the most basic level we want to say something about the future: Forecasting*

- Forecasting impacts on oyster mortality under reduced freshwater availability
- Integration of a suite of hydrodynamic and biological models
- Simulations under normal, flood, drought and future (Year 2050) flow conditions
- Collaborative work: NOAA, ACOE, State of Florida



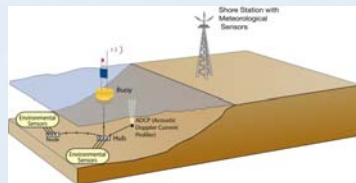
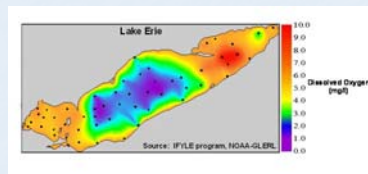
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## Forecasting onset of hypoxic conditions – Lake Erie

Early warning system for  
Cleveland Water District to  
adjust water intake,  
storage and processing due  
to low-oxygen water

- Lower temperature
- Lower pH
- Possible manganese precipitation

Monitoring by Real Time  
Coastal Observation  
Network (ReCON) with  
automated, multiple sensor  
data



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## Coverage Changes – 20 years

- MW sampling frequency has been reduced (every two years)
- Engaging regional / state partners in sampling to reduce cost
- Expanding coverage through partnerships (AK, Southern CA); adding “contaminants of emerging concern” to MW (engage Fisheries and OHHI labs).
- Loss of a dedicated QA/QC program
- Inability to do “Bioeffects assessment surveys”
- Curtailed methods / biomarker development (e.g., HRGS)

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## Evolving Expectations from Monitoring Programs

- New users; increasing number of stakeholders and interested parties
- Increased number of environmental parameters
- Higher burden of proof for data integrity
- Application of new and emerging technologies
- Fast-response data streams and documented methods
- Results-oriented data displays (maps, trends, land-use change, etc.)
- Improved public access to data and instant products (available on a website)

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## Plans for the future: examples

- Maintain existing programs
  - Fill spatial and temporal gaps
  - Address emerging issues – carbon dioxide, iron, climate change, etc.
  - Emerging hypoxia issue -- Olympic Coast NMS; NJ coast
  - Expand HABS forecasting capability (West Coast FL, Lake Erie, northeast)
  - Link monitoring, research, and forecasting – Integrated Environmental Assessment
- ### An Integrated Assessment

  - Documents S&T; defines change
  - Describes causes and consequences of change
  - Forecasts conditions with no management action
  - Forecasts conditions under different management scenarios
  - Evaluates success of selected management action

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## NOAA's Role in Developing NWQMN

- Co-chair of the Steering Committee (NOAA, USGS and EPA)
- Member Interagency Working Group (NOAA, USGS, EPA and OSTP) to select and guide Pilot Studies
- Lead role in network refinements (biology, nutrients, contaminants, etc.)
- The Network design is built on 138 "NOAA-defined estuaries" (1999)
- Establishing linkages:
  - Monitoring and modeling
  - Atmospheric, watershed and coastal monitoring (notable example, Hg)
  - Discrete and IOOS-type measurement
  - Freshwater availability and integrity of estuarine ecosystems
  - NS&T analytical protocols
- Evaluation and assessment of new monitoring methods and instruments -- ACT

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# Thank You

Jawed.Hameedi@noaa.gov

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