Three Region Water-Quality Workshop Summary

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Date: January 25-26, 2010

Participants: Scientists and water-quality managers (total of 52) from MACOORA, NERACOOS, SECOORA, IOOS, USGS, EPA, NOAA, USACE, and the National Water-Quality Monitoring Network (see complete list in Appendix).

Purpose: To explore integrated science-based solutions to address major water-quality issues and management in regions supported by the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA), the Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS), and the Southeast Coastal Ocean Observing Regional Association (SECOORA).

Workshop Outcomes and Actions:

- Outcome: Development of individual storyboards and overall summary that highlight success stories, within each of the three IOOS regions, on how science-monitoring, assessments, and analysis tools are brought together with policy and management needs to improve water quality within watersheds, estuaries, near- shore environments, and the coasts. (Individual presentations and documents available at: http://acwi.gov/monitoring/network/three-region_workshop/presentations/index.html)

- Outcome: Compilation of break-out summaries, which followed a common template, for three high priority issues, including (1) beach health, (2) nutrient enrichment/oxygen depletion, and (3) harmful algal blooms. Each summary highlights:
  - Current successes and tools available for information and assessment transfer to other regions across the Nation;
  - Gaps and common needs, as well as, priorities related to science, research, and management;
  - Actions to enhance monitoring, integrated assessments, data infrastructure and management, assessment and decision-making tools, and observational assets.

- Outcome: Planning and implementation of a three-region demonstration project that promotes data integration among diverse sources. The project will build upon current efforts by Tom Shyka and others with the Gulf of Maine Partnership and by Nate Booth with national integration of diverse data from USGS, EPA, and USDA-ARS.

  Action: Ru Morrison, Executive Director of NERACOOS, will convene a small working group (including Tom Shyka and Nate Booth) to delineate next steps.

- Outcome: Development of a short (4-page) communication document and companion PowerPoint presentation that summarizes workshop successes, gaps, actions, and the demonstration project. These are envisioned as communication and marketing tools to be shared by workshop participants with colleagues and stakeholders within and outside participating organizations. The intent is to distribute the materials using available organizational forums (such as newsletters, Internet sites) and through presentations at meetings and conferences.

  Action: Pixie Hamilton, Tracy Hancock, Heath Kelsey, and Gabrielle Canonico will develop a DRAFT for input and review by workshop participants.

- Outcome: Exploration of increased leveraging and new funding possibilities, such as through NOAA's National Oceanographic Partnership Program, EPA Office of Environmental Information ($14M intended to improve data management for State governments), EPA Beaches Grant Program, EPA 106 State monitoring program, EPA National Estuary Program, Coastal Action monies, and marine and coastal spatial planning efforts.

  Action: Pixie Hamilton, Gabrielle Canonico, and Chuck Spooner will follow-up with discussions on exploring funding opportunities.

Storyboard Highlights—Management Outcomes, Available Tools, and Challenges:

Management outcomes:

- Development of eel-based nutrient criteria for New Hampshire's Great Bay Estuary using diverse sources of data and multiple lines of evidence. Findings are guiding management of point source discharges (Paul Currier, Ru Morrison).
- Improved tertiary treatment in Rhode Island and Massachusetts as a result of a multi-organizational assessment on sources, transport, and effects of nutrients and dissolved oxygen in Narragansett Bay (Hal Walker)
- Timely and efficient public beach health warning/forecasting (Shannon Barry, Heath Kelsey,)
- Red tide tracking with internet accessibility (Bob Weisberg, West Florida)
- Improved targeting of harmful algal blooms in NJ through aircraft remote sensing (Bob Connell)
- Improved management of dissolved oxygen in the Delaware River through automated software and e-mail notification of real-time measurements in the context of state water-quality criteria by zone (John Yagacic, BobTudor)
- Improved combined sewer overflow and nonpoint source controls through the Green Cities Clean Waters Program of the City of Philadelphia (Eric Vowinkel)

Available tools and advances in technology: (Note: These could scale-up across regions and be part of a dynamic "federal" tool box for monitoring and assessment.)

- Improved water-quality and physical modeling and hypoxia analysis tools in Long Island Sound (Jim O'Donnell)
- Stream Stats (effective for estimating low flow – in tributaries and delivery to the estuaries) (Bob Tudor)
- NOWCAST hazard prediction and model and timely information dissemination (Bob Tudor, John Yagecic)
- Recreational Beach Bacteria Modeling through ensembled approach – Classification and Regression Trees (CART) (Shannon Barry, Heath Kelsey, Dwayne Porter)
- Improved extraction of precipitation data (NEXRAD); SQL database development and automated data, seamless feeds (Shannon Barry, Heath Kelsey, Dwayne Porter)
- Internet-based red-tide tracking tool (Bob Weisberg)
- SPARROW models for assessment of nutrient loadings to estuaries; key sources and priority watersheds (USGS)
- Advanced buoy deployment and remote sensing (NH group, Ru Morrison)
- Bottom stationed ocean profiler for use with gliders for sustained synoptic mapping (Florida) (Bob Weisberg)
- Aircraft remote sensing to enhance public health protection and assessment of HABs (Bob Connell)
- AUV glider collecting dissolved oxygen offshore of the New Jersey Coast (Josh Kohut)
- Remote access to data sources and maps (through the network and telemetry) (examples, South Carolina, Dwayne Porter; New Jersey, Bob Connell; Delaware, John Yagecic) and new instrument delivery systems with real-time telemetry (Bob Weisberg)
- Integration of data through common standards – OGC, SOS (Nate Booth, Tom Shyka)

Challenges:

- Outcomes must be emphasized, with less focus on "output"
- How do we effectively integrate probabilistic, discrete, continuous, and remotely sensed data to assess the status and trends in water quality from the watersheds to the estuaries and coastal areas
- How do we get data observation and modeling applications to affect management?
- How do we get data collection and assessment efforts to more effectively lead to forecasting (short- and long-term)?
- How do we better connect regional associations to government alliances (MARCO, for example)?
- What is the value-added to new technology? How much data is too much? What additional questions do more data answer?
- How do we minimize gaps in the number of observations? How do we sustain adequate monitoring to ground-truth models?

- How do we communicate common data standards (OGC, SOS) to others?
- How do we think in both “short term” (i.e. hazard warning, real-time warnings) and long-term (hypoxia over decades; decline of shad; decline of eel grass)?
- How do we quality-assure/quality-control continuous and real-time data?
- How do we make better connections, such as linking ocean circulation to ecosystem based management?

Nutrient Enrichment/Dissolved Oxygen Depletion Breakout Group

Issue(s) and desired outcomes: Nutrient loadings and dissolved oxygen depletion (hypoxia) are resulting in the loss of diversity and sustainability of living marine and coastal resources (i.e. fin fish, shell fish, shad, and native species such as eel grass and other sea grasses), and in economic losses (i.e. property value, tourism, shrimp, crabs, and recreation) of the estuaries and oceans. A "consistent and complete enough process and toolbox" that incorporates continuous observations [in-situ and langrangian], models, assessment, and communication tools to address natural effects (climate) and anthropogenic sources (lawns, agriculture, discharge) on nutrient loadings, and that links terrestrial, estuarine, and coastal environments for holistic and adaptive ecosystem management..

Successes – Available tools and existing capabilities for transfer value and scaling up to national scale:

- Watershed models (SPARROW) that provide information on loadings to estuaries, point and non-point sources, and transport from upland to estuaries.
- Estuary circulation models that are open source, large network of community users (ROMS, FVCOM, ECOM). Note: Circulation models need to recognize ocean inputs, inland inputs, physical processes (flushing by wind, currents, tides) and biological interpretation.
- Data quality requirements in common formats for a common set of observations that feed into models.
- Advancements in sensor technology: U of RI lab experts partner with users for improved sensor development, testing of nutrient analyzers, and adequate monitoring and measurements of nutrients, and scientists in Delaware Bay (Eric Vowinkel and others) are testing effectiveness of automated nitrate sensors.,

Gaps and challenges:

- Data starved for the right data and quality data at (1) boundary of estuary and ocean; (2) shallow part of estuary, not just channel; (3) groundwater inputs to estuary; and (4) atmospheric contributions
- Models all require parameterizations that may be locally specific. This demands sufficient data for calibration and for quantitative hypothesis testing.
- Adequate monitoring of and measurements of nutrients, sensor development. Support for nutrient monitoring and testing of nutrient analyzers.
- Standard and good quality data set for spatial and temporal observations.
- True effects on biota via quantitative tests of hypotheses based on adequate data.
- Clear communication of findings to managers. However, communications must be two-way (i.e. the scientific community must be responsive to management needs and managers must be responsive to the needs of the scientific method).
- Data interoperability

Actions:

- Develop and assemble a regional list of parameters that influence nutrient enrichment and models / techniques that are being used
- Identify a standard set of basic variables (discrete and in continuous-real time) that need to be consistently monitored over time (e.g. DO, temp, pH, salinity, turbidity, total N and P and species, chlorophyll, light, wind, velocity, sea level, biological components such as sea grass beds and diversity).
- Share observations and data streams among regional associations and watersheds (e.g. nutrient data, wind, remote sensing) for scientific interpretation and geophysical modeling purposes
- Compile regional measurements of nutrients and dissolved oxygen on a regional scale
- Develop a good experimental design that incorporates data needed to support models, including, for example, metabolic rates (primary production, respiration, nitrification), and natural variability and major climatic events (NAO).
- Determine data interoperability needs and capabilities
- Develop common formats for communication of results and capabilities (to scientists and managers)
- Determine the cost effectiveness of probabilistic, discrete, and continuous data collection platforms for monitoring

Beach Water Quality Breakout Group

Issues: Timeliness of beach advisories, and inconsistent approaches for identifying sources, issuing advisories, and determining driving factors contributing to bacterial contamination.

Desired outcomes:

1. Advisories / closures are issued when they should be, being cognizant of type I and type II errors
2. Source(s) of bacterial contamination is (are) identified

Note: Decision support tools are required to achieve both outcomes.

General Issues by Region

Southeast

- stormwater runoff (such as on beaches in Horry County)
- timeliness of advisories
- consistent approaches; ensemble modeling approach works best
- episodic; many beaches don't have significant, regular problems

Great Lakes

- municipal overflows
- economic issues
- type I and type II errors associated with decisions made
- decisions are made county-by-county, highlighting need for geographically consistent tools
  (Note: up to 20 different models / tools were being used for beach water quality assessment; EPA has developed a CD containing all models (Virtual Beach)

Northeast

- sources of contamination (overflows, stormwater) unrelated to beach closures
- economic and political concerns can override public health concerns

Mid-Atlantic

- freshwater ponds / lakes drain directly to nearshore waters, contributing to bacterial loadings
- need for IOOS decision support in issuance of advisories
- rainfall does not always lead to high bacterial loadings (such as along portions of NJ shore)
- circulation can be an important driving factor (such as in NJ)

Successes – Available tools and existing capabilities for transfer value and scaling up to national scale:

- Demonstration of Recreational Beach Bacteria Modeling through ensembled approach – Classification and Regression Trees (CART)
- Improved extraction of precipitation data (NEXRAD); SQL database development and automated data, seamless feeds
- Remote access to data sources and maps; new instrument delivery systems with real-time telemetry

Gaps and Challenges

- Beaches, and hence modeling approaches and driving variables, are variable; i.e. one model does not fit all; but a consistent modeling approach can be transferrable.
- More research needed on source tracking and rapid assessment
- Probes for rapid assessment are a long way off as the number of bacterial types and pathogens is numerous
- Lack of funding / sustained funding
- Need for additional near-real-time data

- Need to understand the needs and capabilities of the users
- Need to identify common ground among beach water quality groups

Actions:

- Identify beaches on East Coast where advisories / closures are frequent
- Identify how decisions are made to issue advisories / closures
- Identify willing partners (federal, state, local, non-government such as Chambers of Commerce)
- Develop and assemble a regional list of parameters that influence beach water quality and models / techniques that are being used in support of issuing beach advisories / closures.
- Establish a regional communication mechanism for beach managers to include the need for an awareness of new technologies in support of source identification, modeling, etc.
  - Engage NGOs like surf rider and NRDC
  - IOOS can bring managers confidence that beaches are open when they should be and closed / advisories issued when they should be
  - tools for supporting pre-emptive advisories / closures
  - support for coordination of monitoring / observing data and associated data management
- Identify IOOS core variables and other parameters collected by regional COOS efforts (not limited to just offshore observations but inclusive of estuarine, riverine, and terrestrial monitoring; i.e. acknowledge the C in ICOOS) that influence beach water quality
- Determine data interoperability issues / needs
- EPA would delegate (or RAs would offer) to peer-review of models (statistical, hydrologic, etc.) for each RA
- Engage NOAA in tool development (i.e. OHH may be an opportunity)
- Package a proposal
  - Investigate federal funding opportunities
  - State beach managers are currently writing next's years grant
  - Investigate Chambers of Commerce, i.e. accommodation tax money
- At least one community in each RA will have an operational statistical models that uses IOOS resources

Future Needs:

- In situ bacteria sensors (but still need to understand drivers)
- Further review of sampling protocols
- Nowcasting
- Determine whether predictive models are acceptable to EPA; i.e. are changes necessary?

Harmful Algal Blooms Breakout Group

Issues: Harmful Algal Bloom impacts on human-health and fisheries (i.e. shellfish) were both identified concerns.

Desired outcomes: Needs and priorities for preventing and mitigating the impacts of harmful algal blooms on human-health and fisheries (i.e. shellfish).

General Issues:

- Human-health effects caused by:
    - Consumption of affected shellfish
    - Inhalation of toxins in vicinity of affected coastlines
    - Impacts from contaminated drinking water supplies
- Economic Impacts:
    - Loss of tourism dollars
    - Shellfish bed closures

Successes – Available tools and existing capabilities for transfer value and scaling up to national scale:

- Improved communication efforts
    - The Northeast Region uses a list serve to exchange communication.
    - In the Northeast, coastal resource managers and scientific researchers meet semi-regularly to stay informed on each communities needs.

Gaps and Challenges

- More effective and timely communication between scientist and managers.
    - Routine channels needed to inform and educate public.
    - Forums needed for information exchange between managers and researchers.
- Model outputs that can be used toward identifying best placement of buoys for more effective monitoring.
    - Mechanism for development of new standards and protocols (e.g. sampling/ data collection) that meet the threshold for regulatory use. Adaptive-management based regulatory guidelines.
        - Need to know whose role it is to validate standards.
    - Standards and protocols for quality assurance/quality control (QA/QC) of sensors; QA/QC tests for data.
    - Sensor technology advancements.
    - Criteria to identify toxic species.
    - Funding support (states concerned about maintaining infrastructure (i.e. buoys pulled from water).

Actions:

- Develop a mechanism to ensure that groups exchange information on a regular or semi-regular basis.
    - Implement notification tools (e.g. list serves) to communicate information.
- Identify mechanisms that will advance development of regulatory standards.
    - Role for academia?
- Work with Alliance for Coastal Technologies to advance sensor technology and validation/verification methods.
- Develop tools that will make data easier to find.
    - IOOS is working on a Registry and Catalog tool to make data search and access easier.
- Work with groups like QARTOD (Quality Assurance Real-Time Oceanographic Data) to establish Quality Assurance/ Quality Control (QA/QC) standards and tests for data.

Future Needs: info needed here.

Appendix

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