A 3-region workshop, held in Baltimore, Maryland in January 2010, explored 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).

Key issues:
- **Dissolved oxygen depletion (hypoxia) and nutrient enrichment**: Nutrient loadings and dissolved oxygen depletion (hypoxia) are resulting in the loss of diversity and sustainability of living marine and coastal resources (i.e. finfish, shellfish, and habitat, such as eel grass and other sea grasses), and in economic losses (i.e. property values, tourism, commercial fisheries, and recreation) of the estuaries and oceans. A consistent process and comprehensive toolbox are needed that (1) incorporate continuous observations [in-situ and langrangian], and models, assessments, and communication tools; (2) address natural effects (climate) and anthropogenic sources (developed areas, agriculture, and point source discharge) on nutrient loadings; and, (3) that link terrestrial, estuarine, and coastal environments for holistic and adaptive ecosystem management.
- **Beach health**: Issues relate to the timeliness of beach advisories and lack of consistent approaches for identifying sources, issuing advisories, and determining driving factors contributing to bacterial contamination. Development of decision support tools is needed for timely issuing of advisories/closures and identification of bacterial sources.
- **Harmful algal blooms**: Blooms of algae can impact human health, fisheries, and various habitats. Advancements are needed in the development of criteria for species identification; understanding underlying causes of blooms; monitoring (such as with sensors and buoys); forecasting to protect public health; and communication among researchers, managers, and the public.

**Workshop Outcomes**: Discussions among more than 50 scientists, managers, and policy makers associated with the Integrated Ocean Observing System (IOOS), regional observing associations (MACOORA, SECOORA and NERACOOS), and from Federal, State, and regional governmental agencies, non-governmental organizations, and universities resulted in:
- Success stories on how monitoring, assessments, research, and analysis tools are brought together to address policy and management needs and improve water quality within watersheds, estuaries, near-shore environments, and the coasts. (Individual presentations and documents are available at: [http://acwi.gov/monitoring/network/three-region_workshop/presentations/](http://acwi.gov/monitoring/network/three-region_workshop/presentations/)
- A listing of available tools and services currently available for information and assessment transfer to other regions across the Nation (see back).
- Gaps, common needs, as well as future challenges and opportunities for monitoring, research, data infrastructure and management, assessment and decision-making tools, and observational assets.
- Short and long term actions (by issue) to address common needs and priorities (science, research, and management) across regions.
- Planning and implementation of a three-region demonstration project that builds a common infrastructure and standards for data integration and management of information from diverse sources. The project will build upon current efforts associated with the Northeast Coastal and Ocean Data Partnership and the national water-quality exchange (WQX).

Selected successes and management outcomes cited in workshop presentations:

- Development of eel grass-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.
- 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.
- Timely and efficient public beach health warning/forecasting in parts of the Southeast
- Red tide tracking in western Florida with internet accessibility.
- Improved targeting of harmful algal blooms in New Jersey through aircraft remote sensing.
- 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.
- Improved combined sewer overflow and nonpoint source controls through the Green Cities Clean Waters Program of the City of Philadelphia.

Selected 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.
- Stream Stats (effective for estimating low flow – in tributaries and delivery to the estuaries).
- NOWCAST hazard prediction and model and timely information dissemination.
- 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.
- Internet-based red-tide tracking tool.
- USGS SPARROW models for assessment of nutrient loadings to estuaries; key sources and priority watersheds.
- 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 are available in common formats for a common set of observations that feed into models.
- Advancements in sensor technology.
- Advanced buoy deployment and remote sensing.
- Bottom stationed ocean profiler for use with gliders for sustained synoptic mapping.
- Aircraft remote sensing to enhance public health protection and assessment of HABs.
- AUV glider collecting dissolved oxygen offshore of the New Jersey Coast.
- Remote access to data sources and maps (through the network and telemetry) and new instrument delivery systems with real-time telemetry.
- Integration of data through common standards – such as associated with the Open Geospatial Consortium, Sensor Observation Service, and World Meteorological Organization.