Workshop Summary
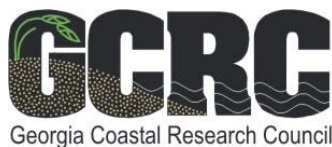
SE Coastal Water Quality Monitoring Metadata Workshop

held June 5, 2008

Hollings Marine Laboratory
Charleston, SC

October 2008

GCRC
Georgia Coastal Research Council

Background

The National Park Service (NPS) Inventory and Monitoring Program (http://science.nature.nps.gov/im/) conducts long-term monitoring for key indicators, or "vital signs." These "vital signs" are measurable, early indicators of changes that could impair the long-term health of natural ecosystems. In the southeast region, the Southeast Coast Network (SECN, http://science.nature.nps.gov/im/units/secn/) has identified "Marine Water Quality" as a key vital sign and begun monitoring water quality in parks within the network.

In addition to the Park Service, numerous other agencies and institutions collect water quality data in the southeast coast region. The SECN identified the need to collect and consolidate this information so that coastal managers, researchers and other users can readily locate sampling efforts by location and methods. The Georgia Coastal Research Council (GCRC, http://www.gcrc.uga.edu/) is working with NPS to address this need. The project involves compiling a database of long-term monitoring program metadata and summarizing long-term monitoring efforts in the region. This metadata will be available through an interactive web portal.

As part of this project, a workshop was organized in order to bring together representatives from various agencies and institutions involved in coastal water quality monitoring in the southeast. This report describes the workshop, which was held on June 5, 2008 at Hollings Marine Laboratory in Charleston, SC.

The goals of the workshop were:

- To provide an overview of the project
- To present a straw-man monitoring program survey, database design and map-based interface.
- To solicit feedback on the scope and functionality of the database
- To explore ways in which this effort can link with existing and planned data coordination efforts.

A total of 28 participants representing 19 programs and organizations from within the geographic scope of the project (NC, SC, GA and east coast of FL) attended the workshop. A complete list of participants and contact information can be found in Appendix A.

Agenda

8:30   Welcome and Introductions
        Merryl Alber, Georgia Coastal Research Council, Marine Sciences, University of
        Georgia

8:50   SE Coastal Water Quality Monitoring
        Joe DeVivo, National Park Service SE Coast Network Coordinator
        Eva DiDonato, National Park Service Water Quality Specialist, NPS Inventory
        and Monitoring Program

9:15   National Water Quality Monitoring Council: Pilot Regional Projects
        Eric Vowinkel, USGS and National Water Quality Monitoring Council,
        *"The Design, Pilot Inventory, and Demonstration Phases of the National Water
        Quality Monitoring Network for U.S. Coastal Waters and Their Tributaries"*.

9:45   SE Coastal Water Quality Monitoring: Metadatabase Design and Map-based
        Interface
        Wade Sheldon, Information Manager, Georgia Coastal Research Council and
        Georgia Coastal Ecosystems Long Term Ecological Research Site

10:15   Break: Refreshments

10:30   Scope of the Project- Meet the Strawman
        Breakout groups will evaluate:
        - Ease of input (getting metadata into the system)
        - What features will make this portal most useful to users (products out of
          system)

12:00   Lunch – Deli lunch on site

1:00   Discussion:
        - Critique Strawman
        - Roles and Authentication
        - Input and Output priorities
        - Addressing user's high priority questions with ease

2:30   Break: Refreshments

2:45   Conclusions and Next Steps

3:30   Adjourn

Presentation Summaries

National Park Service SE Coastal Network Monitoring Program
NPS representatives Joe DeVivo (Director, SECN) and Eva DiDonato (SECN Aquatic
Ecologist/Water Quality Specialist) presented an overview of the NPS monitoring
program. SECN currently monitors water quality at fixed stations in six coastal parks
(Cape Hatteras National Seashore, Cape Lookout National Seashore, Fort Pulaski
National Monument, Cumberland Island National Seashore, Timucuan Ecological and
Historic Preserve and Canaveral National Seashore). The goal is to maintain two or three
sampling sites per park. Automatic data loggers are used to collect semi-continuous data
on pH, dissolved oxygen, temperature, salinity / conductivity, depth, and turbidity. In
addition, monthly grab samples are analyzed for total dissolved nitrogen, total dissolved
phosphorus, chlorophyll a, and clarity. The program uses National Estuarine Research
Reserve protocols (http://www.nerrs.noaa.gov/pdf/SWMPPlan.pdf). The SECN has also set up
probabilistic surveys in five of the Parks (all the ones with fixed sampling with the
exception of Fort Pulaski National Monument). The goal is thirty stations per park,
sampled on a 5-year rotation, (10-year rotation schedule for sediment quality). This
program uses the same protocols as the Environmental Protection Agency National
Coastal Assessment (http://www.epa.gov/ged/r03_dw.htm). The speakers noted that the Park
service has designed their monitoring effort for a 50-yr time frame, and stressed the
importance of partnerships to achieve viable, shared results.

National Water Quality Council's National Monitoring Network
Eric Vowinkel, of the United States Geologic Survey, New Jersey Science Center,
presented an overview of the National Water Quality Council's efforts toward regional
scale monitoring. This program is in the design phase, linking monitoring in watersheds,
estuaries and coastal waters. There are three pilot projects: San Francisco Bay, Lake
Michigan and Delaware Bay (http://acwi.gov/monitoring/network/pilots/). Dr. Vowinkel's
presentation focused specifically on the Delaware River Basin Pilot Project. He
described how data on nutrients, temperature, dissolved oxygen, specific conductance,
and turbidity are collected in real time and made available on the internet. The goal is "1-
stop shopping" for data from the four data platform types: long-term fixed station,
research-specific (sometimes short-term), "Lagrangian" (e.g. from ferries), and gridded,
remotely sensed data.

SECN Water Quality Inventory & Monitoring Program Database Development
Wade Sheldon of the GCRC gave a presentation describing the work that has been done
to design and implement a metadata database for the project. The initial steps included a
review of other environmental monitoring database efforts (international, national and
regional) as well as monitoring program/observation metadata standards (including but
not limited to Marine Metadata Interoperability, EPA STORET, National Environmental
Information Exchange Network, and National Water Quality Monitoring Council).
Although the various programs take different approaches, common variables include the
use of geospatial query or visualization and thematic searches at varying granularity (e.g.
topics, programs, parameter types).

Strawman Survey

Wade Sheldon then provided a walk-through of the provisional web-based framework he developed as a strawman metadata survey. Following the presentation, workshop participants were able to log onto a fully functional replica of the project website (http://www.gcrc.uga.edu/wqmeta/) hosted on a local wireless network to perform a hands-on review of the survey forms.

The strawman survey was organized hierarchically, with names, brief descriptions and logos of Organizations and associated Monitoring Program(s), at the top, and "more information" links allowing users to drill down to details including Program purpose, data website URL, data access information, data access policy, points of contact and other fields. Prior to the workshop Mr. Sheldon harvested metadata for coastal water quality monitoring programs operated by USGS and NERR to include in the database for participants to explore. Participants were also provided with a spreadsheet containing parameters measured by these programs (hierarchically organized into common terms at several levels of detail) to spur discussion of how parameters should be stored and searched within this framework.

Breakout Groups

The participants were organized into four breakout groups tasked with discussing and making recommendations regarding the strawman design and functionality. Specifically they were asked to discuss the two primary goals of this effort which are 1) to help identify monitoring gaps and 2) to prevent duplication in terms of limited monitoring resources throughout the region. To that end, participants were encouraged to make recommendations regarding the ease of input (getting metadata into the system) and to identify features that will make the portal most useful to users (getting products out of the system).

There was lively discussion in all the groups. General feedback was positive and optimistic that this project would serve a useful regional function for agencies as well as municipalities and non-government organizations involved in coastal water quality monitoring.

There was general consensus that the viability of the strawman survey and its portal will depend in large part on active long term maintenance. For example, it was suggested that the portal rely on web links to data that are updated regularly, so that the user is not provided with outdated information.

The ease of finding specific monitoring locations, along with attendant parameters, was highlighted as an important feature. The groups concurred that the metadata portal should list basic parameters while directing the user to the monitoring program's website for more detailed information about parameters and methodology. Another general theme

that arose during the breakout groups included expanding the time-frame, originally proposed by NPS as a 5 year minimum of data collection, to prevent missing potentially useful information from programs with different time-frames.

A specialized group comprised of the Informatics professionals delivered more detailed technical items for consideration. These are included in the complete list of comments and recommendations, found in Appendix B.

Future Steps

As a result of workshop input, the GCRC is revising the approach to metadata storage regarding measurement parameters. We are designing a system with more flexibility that will support tagging parameters using multiple terms (from broad to specific) rather than using a strict hierarchical vocabulary as presented in the workshop. This approach will allow the parameter classifications to be expanded or refined more easily based on user needs.

The geographical boundaries that we created in the earlier phase of the project received no critical feedback at the workshop and we will continue to work within those (see map page 15).

In order to facilitate user appeal and efficiency, GCRC will enter the initial "front page" information for each "Monitoring Group" (i.e. agency or program) that was invited to the workshop. Additionally, STORET metadata for stations and parameters for those programs that use STORET will be imported into our database. Workshop participants will be contacted with this draft "entry" to ensure accuracy.

We will continue to solicit, and conduct follow up contact with, programs or individuals who may have professional interest in this metadata.

Finally, GCRC will begin working with personnel identified by NPS to ensure a smooth transition of the product back to the National Park service for their use and maintenance.

Appendix A
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Appendix B
Summary of Comments and Recommendations from Breakout Groups

General Considerations
- Time frame: 5 year minimum too rigorous and it might miss useful information. "Data are data"; Users can decide for themselves what is useful.
- To whom is the call for data going to be issued?
- Participation issue: are we using carrots, sticks or ..?
- Municipalities and counties have a lot of data but not much incentive to participate (City of Jacksonville, FL is a NPS partner and an exception to this).
- What is the plan for long-term maintenance? Wherever possible, rely on web links to data that get updated frequently because it will be hard to get updated input regularly otherwise.
- Mapping: what are the boundaries of this project? Define the boundaries.
- Technical challenges: Use nationally recognized standards? Unfortunately there is not just one good comprehensive standard set available.
- Be flexible, e.g. use NOAA metadata tools such as MERMaid (Metadata Enterprise Resource Management Aid) and other pre-existing tools that allow inter-operability with different metadata standards.
- Consider making tools developed available for community efforts.
- One of NPS's top priorities is contact information, not getting all possible information out of the metadatabase, i.e. "who is doing what where, and how do I contact them" is a good start.

Recommendations for potential relevant contacts:
- US Army Corps of Engineers, Private Industry, Ports Authorities, SE Ocean Data Partnership
- Florida: additional east coast Water Districts, South Florida Information Access (SOFIA), Comprehensive Everglades Restoration Plan (CERP).
- Georgia: Georgia Water Information Network, Ossabaw Island Observatory
- North Carolina: University of North Carolina at Wilmington.

Input /parameters
1. List of individual parameters too granular (unless easy to get). Suggested parameters list: Station location, Hydrological regime (discrete, continuous), Meteorology (discrete, continuous) and Water quality (bacteria, nutrients, contaminants, physical).
2. Avoid manual input design as much as possible. When used, have user-friendly drop-down boxes.
3. Use an "alias" design element for sites in order to group nearby stations
4. When mining STORET, important to distinguish "program" vs. "project" data sets.
5. About ten of the participants noted that their programs use STORET for data storage, and it was noted that IOOS and STORET are not connected.
6. Tag data sets as "long term" or "short term".
7. Include atmospheric data (wet deposition) and distinguish between cumulative and instantaneous precipitation.

8. Will it have IOOS buoys stations in it?
9. Identify collection and/or monitoring protocols.
10. Include station elevation- re: sea level as parameter
11. Include type of data collection (volunteer, etc.).
12. Interactiveness, flexibility in hierarchy (parameters may need to move up or down relative to where they are now)
13. Seasonality, monthly parameter option.
14. Include Total vs. Dissolved columns
15. Include calculated vs. measured tags
16. Disclaimer

Output
1. Scales of Query:
   - Bounding box, methods, flexible by data type, quality, elevation, tags, single points can give valuable info
   - Place-based
   - Also at any given site, what measured and by whom
2. Site information is more important than parameters.
3. Program description polygon showing area covered by probabilistic surveys.
4. Feature that allows overlaying water quality and other data (e.g. where are nitrogen values and where collected)
5. Feature that links with location information and water quality data elements being built by other agencies (weather stations, waste water treatment plants, essential fish habitat).
6. Data quality issues: Separate out data types (more applicable to actual data?):
   - Realtime
   - Provisional
   - Quality-Controlled data. Devise a way to flag or tag certified protocols (federal program) so users can decide if it is worth following up to get the data.
7. Query with
   - "and", e.g. "NH3 and NO2 and NO3 and dates"
   - "or", e.g. " TN or its components measured at site".
8. Some FL and SC agencies cannot use Google because of licensing issue. USGS buys a couple licenses to deal with this.
9. Consider non-traditional users: Chambers of Commerce, Non-governmental organizations like The Nature Conservancy, etc.

Comments and Recommendations from the Informatics break-out group:
1. Metadata (xml) issues:
   - Metadata standard: use combinations or adopt one?
     - FGDC/Dublin Core most common, supported by NOAA MERMaid
     - EML (NCEAS/LTER) also available and supported by MERMaid, but best for describing data, not programs and parameters.
     - EPA EDSC standard most applicable, but not supported outside of the NEIEN/WQX information system, so availability of tools uncertain

- Best strategy for now is probably to continue development of generalized schema and support import/export of metadata with field mapping for targeted schemas as defined by use cases, future needs.
- Data exchange and accessibility of raw xml
- Best way to handle data exchange with other portals
  - No standards yet – should stay in touch with SECOORA, Gulf of Mexico WQ metadata project.
- Use of cryptic codes not desirable.
- Often, metadata either too generic or too specific.

2. Schema mapping:
   - Transform schema and export generic product that can be used by many users.
   - Needs to be flexible.
   - WQX schema not very good for this purpose
     - Context metadata very program-specific
     - Details all left to proprietary binary formats
   - We should define xml schema and demonstrate a structured way to share data.
   - Controlled vocabulary important (makes querying easy but can't be too limiting and exclude vocabulary from other programs).
   - Use of MERMaid tool should be explored.

3. Latitude/Longitude position information:
   - Should store as projection-free decimal degrees in international convention (+/- 90, +/-180)
   - Need to support many end-user formats for importing, web entry, and convert as necessary
   - Should support but not necessarily require GIS details (datum, horizontal and vertical accuracy, etc)

4. Limits to detail of maps
   - Too many placemarks will slow down Google Earth (GE) – may need to limit the number.
   - Regionalize layers in GE.
   - Use of open source library with JavaScript could be explored.

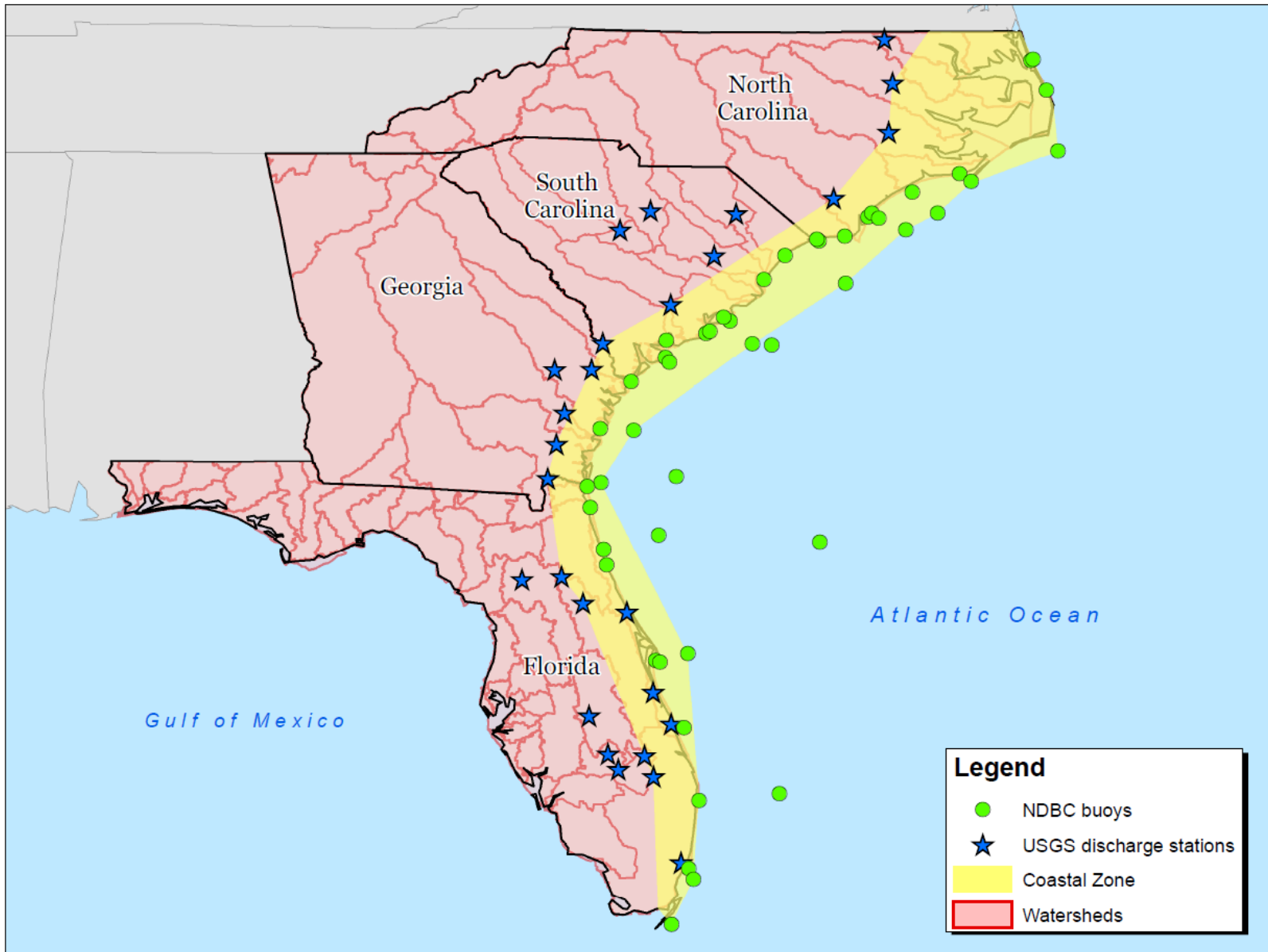5. Different levels of use:
   - Dump out spreadsheet.
   - Point level vs. state level interactive views.

Figure 1. Map of project area