Final Report

NOAA COASTAL OCEAN DATA WORKSHOP

Convened at the
Harbor Branch Oceanographic Institution
Fort Pierce, Florida

March 11-13, 1997

Co-Sponsors:
NOAA's National Oceanographic Data Center
NOAA's Coastal Services Center
University of Rhode Island Graduate School of Oceanography

Final Report

NOAA COASTAL OCEAN DATA WORKSHOP

Convened at the
Harbor Branch Oceanographic Institution
Fort Pierce, Florida

March 11-13, 1997

Co-Sponsors:
NOAA's National Oceanographic Data Center
NOAA's Coastal Services Center
University of Rhode Island Graduate School of Oceanography

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The NOAA Coastal Ocean Data Workshop (the Workshop) was held at the Harbor Branch Oceanographic Institution in Fort Pierce, Florida, on March 11 to 13, 1997. The Workshop included seventy-six invited scientists, managers, and decision-makers from Federal, state, and local government agencies; the private sector; academia; and the general public. In addition, thirty NOAA representatives and two members of the sponsoring institutions attended, for a total of 108 participants. Workshop participants represented the U.S. coastal and Great Lakes states, and the Territories.

FINDINGS and RECOMMENDATIONS

Data and Information Management:

- The use of both "carrots" and "sticks" was recommended to promote data submission to NOAA/NODC, or to ensure data availability through a distributed system.

- NOAA/NODC should develop new user-friendly strategies for serving coastal ocean data over the WEB.

- NOAA/NODC should develop on-line catalogs of coastal ocean data and information.

- To facilitate differing data-access requirements, a catalog could be developed which presents users with choices regarding the level of documentation or metadata viewed.

- Software for data base queries should be standardized across platforms (PC, UNIX, or MAC).

- Access to historical hard-copy data is a problem. There is considerable demand for support of the labor-intensive work required for data rescue and digitization. An advisory group should be established to assist NODC with the formulation of policies regarding identification and prioritization of data bases to access and/or rescue and to focus scarce resources upon.

- Considerable support was expressed by the Workshop participants for a central, long-term archive at NODC in addition to, or as a backup for, local archives. All data should be kept in the archive, even poor quality data.

- There was also support for a distributed data system, with NODC archiving national data sets and other "shoebox" data sets which do not have a home.

- Ecological data in coastal ecosystems is far more complex to manage than data from open ocean systems.
- As presently collected and archived, species data must be considered highly suspect, and subject to errors that are potentially large and beyond correction.
- A peer review process for data quality is needed, as well as standard, automated quality control methods.
- NOAA/NODC should conduct periodic workshops on Quality Assurance and Quality Control (QA/QC) for selected data types.
- There is a great deal of demand for training in the Federal Geographic Data Committee (FGDC) standards, and for development of, and training in, the use of metadata documentation tools.
- NODC should coordinate and collaborate with the library community.
- Participants at the Workshop also identified a requirement for production of region-specific bibliographies on selected coastal issues.

Data Products and Integration

- New data bases of analysis and visualization tools need to be created, and training in their access and use should be provided.
- The data modeling community can cooperate with NOAA/NODC to fill in the gaps in spatial and temporal coverage of coastal data.
- NOAA data bases should establish and use a single consistent definition or reference system for the shoreline.
- Information and data should be provided on spatial and temporal scales useful for addressing issues at the local, state and regional levels; not just the national level.

Partnerships, Coordination, Cooperation, and Infrastructure

- NOAA/NODC should explore the creation of regional nodes, formed by partnerships among universities, libraries, NOAA, and the military sector in order to leverage outreach activities to the various user and data-contributor communities.

- There are some U.S. coastal regions and Territories with connectivity problems. We must ensure that these areas are brought on line, and not left in a data vacuum due lack of resources, poor system design, or a lack of user-friendly tools and training.

- NODC should establish a Liaison Office in the Great Lakes, and should coordinate with the International Joint Commission, the Great Lakes Fisheries Commission, and the Great Lakes Commission.

- The appropriate NODC Liaison Officers should include the U.S. Territories in their data collection programs.

- Better coordination and cooperation is needed at all levels among agencies and organizations at the Federal, state, and local levels, as well as among regions and among disciplinary experts and managers. NOAA/NODC should establish links within these sectors and make their data resources more accessible to the various coastal user communities.

- Understanding coastal issues in the Gulf of Mexico is a complex challenge, involving diverse nations, issues, and habitats.

- The multi-state, multi-institution Gulf-Wide Geographic Information System (GWIS) under development by the Minerals Management Service may serve as a good model of a coastal data system.

- A number of opportunities for partnering between NOAA/NODC and the Department of Defense (especially the Navy) were identified during the course of this Workshop.

- NODC should pursue opportunities to coordinate and collaborate with the Sea Grant Institutions.

- As a community, we will have to work "smarter" and in concert if we are going to prepare systems and protocols to utilize anticipated data streams from the exciting new observation and data collection instruments.

Training, Education, and Outreach

- Periodic regional workshops following the model of this national one should be conducted.
- A "Swat Team," perhaps jointly created by NODC, CSC, and Sea Grant, could be

developed to travel to various scientific meetings to provide training workshops on metadata, quality control, and data access tools.

- Other training needs, identified in the Workshop included: Geographic Information Systems (GIS), working with remote sensing data, electronic data retrieval, digitization, data interpretation, photo interpretation, and WEB use.

- U.S. Territory-based agencies, in particular, expressed needs for technical training and equipment to enable them to participate in this effort at the same level as agencies in other regions and sectors.

- NOAA/NODC should establish rotational positions to provide training for staff from other agencies and organizations.

- As we enhance management of coastal ocean data, conceptualize new architectures, and develop new products, we must ensure that the requirements of educators and students are considered.

- NOAA/NODC should seek out opportunities for cooperation with minority institutions in securing, processing and rescuing coastal ocean data.

- Although NOAA/NODC should initially focus its coastal ocean data management activities on the U.S., strategies for global coastal ocean data management should also be pursued in the near future.

NOAA
COASTAL OCEAN DATA
WORKSHOP

INTRODUCTION

The NOAA Coastal Ocean Data Workshop (the Workshop) was held at the Harbor Branch Oceanographic Institution in Fort Pierce, Florida, on March 11 to 13, 1997. The workshop was co-sponsored by NOAA's National Oceanographic Data Center (NODC), NOAA's Coastal Services Center (CSC), and the Graduate School of Oceanography of the University of Rhode Island (GSO). Its primary goals were to increase NOAA's responsiveness to customers in the coastal ocean community, and to encourage the formation of additional partnerships and joint ventures.

The Workshop included seventy-six invited scientists, managers, and decision-makers from Federal, state, and local government agencies; the private sector; academia; and the general public. In addition, thirty NOAA representatives and two members of the sponsoring institutions attended, for a total of 108 participants (Appendix A). The regional distribution of the invited participants was as follows:

- East Coast 23
- Great Lakes 9
- Gulf of Mexico 19
- Islands 10
- West Coast 14

The results of the workshop will be used to:

- Increase NODC's responsiveness to coastal ocean customer requirements in the area of data and information management, including customers within other NOAA programs;
- Provide additional opportunities for NOAA to form partnerships and joint ventures with stakeholders in the coastal ocean community;
- Increase the knowledge and awareness of NOAA's activities within the coastal ocean community; and
- Be responsive to the new National Oceanographic Partnership Program.

The major areas addressed were:

- Identification of data NOAA should acquire, which can be useful to address major regional and national coastal ocean issues and scientific research priorities;

- Identification of specific data management requirements: data types, levels of precision, national and international standards, levels of quality control, metadata and documentation, formats, accessibility, timeliness, synthesis products, etc.; and

- Identification of potential partnerships, joint ventures, and networking to implement the recommendations.

The next section describes the workshop organization and structure.

WORKSHOP STRUCTURE

After an initial introductory plenary session (Appendix B), the Workshop was divided into five working groups for the *Identification of Data Required to Address National and Regional Coastal Ocean Issues and Scientific Research Priorities.* The five working groups were organized by geographic region:

- East Coast;
- Great Lakes;
- Gulf of Mexico;
- Islands (including U.S. Virgin Islands, Puerto Rico, American Samoa, Guam, Commonwealth of the Northern Mariana Islands [CNMI], and Hawaii); and
- West Coast (including Alaska).

Each group was asked to briefly review, and modify if necessary, the listings of major national and regional coastal issues/problems, and scientific research priorities which address these issues/problems. These subjects were already addressed by the National Research Council Committee to Identify High-Priority Science to Meet National Coastal Needs; the Subcommittee on U.S. Coastal Ocean Science; and the Regional Marine Research Program Boards. The report, *Priorities for Coastal Ecosystem Science* (NRC, 1994), identified nine important coastal issues:

- Eutrophication
- Habitat Modification
- Hydrologic and Hydrodynamic Disruption
- Exploitation of Resources
- Toxic Effects
- Introduction of Nonindigenous Species
- Global Climate Change and Variability
- Shoreline Erosion and Hazardous Storms
- Pathogens and Toxins Affecting Human Health

A background package of additional reports on this topic was mailed to participants prior to the workshop, and hot links were established to relevant material available on line from the workshop home page (Appendix C). Tables summarizing the issues and scientific research priorities were posted in each of the breakout rooms used by the working groups.

Participants were then asked to identify historical and contemporary data and information which NODC should acquire to support research, management, and decision-making addressing these issues and priority research areas. The coastal data sets already archived by NODC were identified in the NODC report, *Inventory of U.S. Coastal Ocean Data*, in the package of

background material.

Cross-cutting issues (e.g., data quality and format standards, data sharing and accessibility, data integration and product development) were covered in the next working group session.

At the end of the first day, in a second plenary session, a representative selected by each group provided a ten-minute summary of the group's discussions.

On the second day, the Workshop was divided into five new working groups. The focus of these discussions was on *Specific Data and Information Requirements*. Four of the groups were divided up along scientific disciplinary lines: biological, chemical, geological, and physical. The fifth group was composed of managers and decision-makers. The technical data and information specialists in attendance were distributed among all of the groups.

Each of the four disciplinary groups discussed data and information requirements regarding:

- data/parameter types, units, levels of precision and accuracy, levels and types of quality control;
- metadata and supporting documentation;
- national and international data and metadata format, content, exchange standards;
- search and retrieval capabilities of the data and metadata systems; and
- means of access to data and information systems, platforms, media.

The fifth group discussed data and information requirements from a management perspective, regarding:

- search and retrieval requirements for systems;
- means of access to data and information systems, platforms, media;
- turnaround time for requests;
- visualization/display, analytical, and conversion tools; and
- data, information, and synthesis products.

On the afternoon of the second day, each working group reported on its discussions and recommendations to all of the Workshop participants during a plenary session.

The final working group session, *Implementation of the Recommendations through Partnerships and Cooperative Ventures*, was organized by stakeholders' sectors: Data and Information Systems Management; State, Territory and Local Governments; Military, Classified or Proprietary, and Industrial Data bases; and Sea Grant, Universities, and "Shoebox" Data Set Creators/Custodians.

These four groups were tasked to:

- Share information about existing coastal data and information management activities, since a number of efforts in this area have been initiated;
- Propose potential partnerships, joint projects, and cooperative efforts to implement projects growing out of the requirements and recommendations developed in the first two working sessions;
- Identify potential sources of resources to support the activities, responsible parties, organizations, other project details, etc.; and
- Present and discuss any written proposals prepared in advance (Appendix D).

A final plenary session on the last day provided the opportunity for the selected representatives of the latter working groups to report on their findings and recommendations. Then, the entire Workshop participated in a discussion leading to a set of recommendations and concerns for communication to NOAA.

The next section summarizes the major findings and recommendations from all the workshop sessions. The lists of data sets addressing the major coastal ocean science issues and research priorities can be found in Appendix E, within the individual working group reports.

FINDINGS AND RECOMMENDATIONS

Data and Information Management

Data Submission

- **The use of both "carrots" and "sticks" was recommended to promote data submission to NOAA/NODC, or to ensure data availability through a distributed system.** Most Federal funding agencies already have a requirement within their grants and contracts that all data be forwarded in a timely fashion to the appropriate National Data Centers. We need to ensure that the spirit as well as the letter of this requirement is widely adhered to in the scientific community. Prior to transmittal to a Data Center, data must be formatted, labeled, and supplied with metadata consistent with practice and standards. These activities all cost investigators precious time and money. A number of straw-man strategies for encouraging this process were offered:

    - Credit for submission of high quality data sets, akin to peer-reviewed publications, should be given to the author(s). The credit should carry sufficient significance to encourage others to cooperate in the same fashion.
    - A dialogue with the funding agencies (e.g., NOAA, National Science Foundation, Office of Naval Research, Minerals Management Service, Department of Energy, etc.) should be initiated regarding augmentation of overhead support already included in grants, so that it reflects the costs of data processing and quality control required for submission to the National Data Centers.
    - The idea of "sunset" grants to senior retiring faculty and researchers should be considered, to encourage their participation in quality-assurance, labeling, and packaging their private data sets for inclusion in the National Data Center archives.
    - Data-exchange credits should be provided by NOAA/NODC for submissions.

Access, Search, Retrieval

- **NOAA/NODC should develop new user-friendly strategies for serving coastal ocean data over the WEB.** Strong support was expressed for the proposed National Virtual Data System, a seamless, distributed ocean/coastal data network system with regional, state and local nodes. Access systems should enable the user to browse the data before downloading them.

- **NOAA/NODC should develop on-line catalogs of coastal ocean data and information.** There should be user-friendly ways to query data bases and catalogs.

Controlled vocabularies should be developed to facilitate search and retrieval of data, in coordination with the library community. Participants recommended development of an issue-driven catalog of coastal data sets, as well as the inclusion of hot links from NODC's home page to other sites which serve coastal data. Additional access requirements, included the capability to search and retrieve data by:

- geographic area;
- biological genus and/or species;
- level of precision; and
- instrument type.

- **To facilitate differing data-access requirements, users should be presented with choices regarding the level of documentation or metadata viewed from a catalog or data base system.** Different users may require different levels of metadata. For example, the highly knowledgeable user may need only to view a project name or a geographic area in order to select desired data, while a K thru 12 student may require a full suite of metadata in order to make his or her selection.

- **Software for data base queries should be standardized across platforms (PC, UNIX, or MAC).** A gap exists between the tools available for UNIX systems compared to those available for the PC and MAC machines. There is a similar need to make software tools for data visualization and modeling available for these platforms.

- **Access to historical hard-copy data is a problem. There is considerable demand for support of the labor-intensive work required for data rescue and digitization. An advisory group should be established to assist NODC with the formulation of policies regarding identification and prioritization of data bases to access and/or rescue and to focus scarce resources upon.** In many cases historical data require digitization; quality control, including addition of metadata and format/unit conversions; and loading into standard data bases with on-line access. The Workshop participants expressed a concern for the fate of data sets thirty, fifty, or a hundred years after their collection. Global climate change research and studies of the changing coastline resulting from anthropogenic activities are two examples of research which have a critical need for historical data.

Archive Issues

- **Considerable support was expressed by the Workshop participants for a central, long-term archive at NODC in addition to, or as a backup for, local archives. All data should be kept in the archive, even poor quality data.** Raw data used to generate

integrated data sets and other valued added products should always be accessible from the deep archives for reference purposes. Novel unanticipated uses or new analysis tools may make these original data sets valuable to future investigators. Finding the resources to support updating and maintenance of the deep archives presents a significant challenge. Perhaps internships and partnerships can be arranged among the Data Centers, Sea Grant, other agencies, and the academic community to provide the necessary support. Long-term archiving of data may present special problems for islands, polar regions, and other areas subject to natural disasters and severe weather.

- **There was also support for a distributed data system, with NODC archiving national data sets and other "shoebox" data sets which do not have a home.**

Quality Control

- **Ecological data in coastal ecosystems is far more complex to manage than data from open ocean systems.** For example, in addition to offshore production measurements employing carbon isotopes and pigments, coastal data may include leaf lengths, root biomass, tree girth, and leaf litter fall.

- **As presently collected and archived, species data must be considered highly suspect, and subject to errors that are potentially large and beyond correction.** There are no agreed upon international standards for the attributes necessary for the recognition of particular species, and all species are subject to redefinition based on further study. In addition, there are no agreed upon standards of quality assurance for species identification, even if the species have been carefully defined by a competent taxonomist. The new Interagency Taxonomic Information System (ITIS) which is replacing the old NODC Taxonomic Code system is an improvement. However, it makes the error of assuming that species is a well-defined category, and that there is no error in assignment to category.

- **A peer review process for data quality is needed, as well as standard, automated quality control methods.**

- **NOAA/NODC should conduct periodic workshops on Quality Assurance and Quality Control (QA/QC) for selected data types.**

Information Management, Documentation, Metadata

- **There is a great deal of demand for training in the Federal Geographic Data Committee (FGDC) standards, and for development of, and training in, the use of**

metadata documentation tools. There was much discussion of metadata, and participants recognized the requirement for metadata standards such as FGDC. Participants noted that metadata should include, at a minimum:

- identity of data source;
- level of QA/QC; and
- extent of data set, with linkages to subsets so it is always possible to reassemble project data.

- **NODC should coordinate and collaborate with the library community.** There should be discussions, clarification, and recognition of the potential role of libraries in coastal ocean data management. Librarians are evolving into guides and navigators of multi-media information and data sources. Libraries could become additional sources for NOAA and other governmental data products. Through bibliographies of data sets, catalogs of extensive grey literature holdings, and utilization of the new generation of metadata search and recovery systems, the libraries have tremendous potential to contribute to data management and utilization. Future regional workshops that follow up upon this effort should encourage the participation of university and research institute librarians in the mix of stakeholders.

- **Participants at the Workshop also identified a requirement for production of region-specific bibliographies on selected coastal issues.**

Data Products and Integration

- **New data bases of analysis and visualization tools need to be created, and training in their access and use should be provided**. As new analysis and visualization tools become available, a data base of these and other decision-making aids should be made available on line. Archives of digital images from satellites; archives of aerial photographs of the coast; recently de-classified military and national reconnaissance assets; and historical photographic archives such as that held by the National Marine Fisheries Service (and currently undergoing digitization) should be created. They should then be integrated with existing data already archived by the Data Centers. Next Generation Weather Radar (NEXRAD) generates gigabytes of meteorological data (not yet widely available) that can be of great value to coastal researchers seeking to link atmospheric forcing to coastal problems.

- **The data modeling community can cooperate with NOAA/NODC to fill in the gaps in spatial and temporal coverage of coastal data.** Model data and model validation through dual use programs such as the Navy Oceanographic Data Distribution System

(NODDS) will enhance understanding of coastal processes.

- **NOAA data bases should establish and use a single consistent definition or reference system for the shoreline.**

- **Information and data should be provided on spatial and temporal scales useful for addressing issues at the local, state and regional levels; not just the national level.** Most habitat issues deal with a complex ocean-land interface where coastal problems are increasingly seen as connected to watershed processes. NOAA should determine the types and geographic scales of watershed data which should be included in its coastal ocean data management efforts.

Partnerships, Coordination, Cooperation, and Infrastructure

- **NOAA/NODC should explore the creation of regional nodes, formed by partnerships among universities, libraries, NOAA, and the military sector in order to leverage outreach activities to the various user and data-contributor communities.**

- **There are some U.S. coastal regions and Territories with connectivity problems. We must ensure that these areas are brought on line, and not left in a data vacuum due lack of resources, poor system design, or a lack of user-friendly tools and training.** Some geographic areas have been neglected by the Data Centers, including the Great Lakes and Territories. Emerging technologies hold out the promise of more rapid and effective access to global ocean data archives. Sectors of our society that have previously had poor access to libraries, data, and information will soon be able to search for and utilize data products from even the most remote locations.

- **NODC should establish a Liaison Office in the Great Lakes, and should coordinate with the International Joint Commission, the Great Lakes Fisheries Commission, and the Great Lakes Commission.** Detailed lake level records exist, which together with the meteorological and physical lake data, serve as a powerful tool by which to examine possible effects that would result from perturbations in the hydrologic cycle such as those related to global climate change. The Great Lakes are a basically closed system, with hydraulic residence times ranging from 3 to 109 years. This topological configuration permits mass-balance approaches as an aid in the study of water flow and the fate of human-introduced chemicals.

- **The appropriate NODC Liaison Officers should include the U.S. Territories in their data collection programs.** Several opportunities for collaboration were identified at this

Workshop. For example, there is a unique historical collection of aerial photographs tracking shoreline change in the Virgin Islands, shared by the Island Resources Foundation, the Eastern Caribbean Center, and the University of the Virgin Islands. NODC could collaborate with CNMI in developing data management systems for its coral reef data. There are also data for some of the islands which, it was pointed out, are not readily available from the Department of Defense. NOAA/NODC may be able to play a facilitation role in archiving and providing these data sets to the Territories.

- **Better coordination and cooperation is needed at all levels among agencies and organizations at the Federal, state, and local levels, as well as among regions and among disciplinary experts and managers. NOAA/NODC should establish links within these sectors and make their data resources more accessible to the various coastal user communities.** Examples cited during the Workshop included: the Environmental Protection Agency's Storage and Retrieval System (STORET), National Estuary Program, and Environmental Monitoring and Assessment Program (E-MAP); NOAA's National Estuarine Research Reserve and National Status and Trends Programs; and the US Geological Survey's online data on nutrient flux. NODC should actively, but selectively, seek out university and private sector data sets as well. As noted previously, an advisory committee could help in identifying these desirable "shoebox" data sets.

- **Understanding coastal issues in the Gulf of Mexico is a complex challenge, involving diverse nations, issues, and habitats.** In addition to the U.S. states and Territories, there are a number of other nations and island nations which should be taken into consideration in establishing any regional centers or nodes for coastal ocean data management. The Gulf region includes extensive reef tracts, mangrove stands, estuaries, hypersaline lagoons, and many other habitats.

- **The multi-state, multi-institution Gulf-Wide Geographic Information System (GWIS) under development by the Minerals Management (MMS) Service may serve as a good model of a coastal data system.** NOAA/NODC should work closely with MMS both nationally and in the Gulf of Mexico region. MMS has traditionally depended on NODC for archiving data from the extensive studies of actual and potential impacts of oil and gas industry development on the U.S. outer continental shelf.

- **A number of opportunities for partnering between NOAA/NODC and the Department of Defense (especially the Navy) were identified during the course of this Workshop.** NODC should prepare a listing of data submitted to NODC by the Navy. A number of useful model products are now de-classified and available to the community from the Fleet Numerical Oceanography Center (FNOC) and other Naval facilities. Archiving of FNOC model data output, once models have been standardized so

that their products can be used as a proxy for data, will involve major storage requirements. An index to the bathymetric data available from DOD would also be useful to coastal oceanographers. NOAA/NODC will have to review the data products becoming available from DOD sources and determine which are appropriate to archive.

- **NODC should pursue opportunities to coordinate and collaborate with the Sea Grant Institutions.** Sea Grant Marine Advisory Service agents may provide a bridge to the holders of "shoebox" data sets. Sea Grant communicates effectively with its constituents in the academic, state and local government, and private sector communities. This connection may provide a gateway to data sets in these communities. Also, NODC should partner with the Sea Grant Program Directors to gain access to the funds provided to the Directors for coastal data and information management.

- **As a community, we will have to work "smarter" and in concert to prepare systems and protocols to utilize the anticipated data streams from the exciting new observation and data collection instruments being developed.** Satellite photogammetry, ocean color remote sensing, NEXRAD data, and real-time output from hundreds of future coastal observation buoys may provide an overwhelming cascade of data by early in the next century. Future data needs will also include some non-traditional data types such as new, improved, proxy indicators of coastal ocean ecosystem health. New technologies should be employed in developing our national systems to address the requirements created by these emerging technologies.

Training, Education, and Outreach

- **Periodic regional workshops following the model of this national one should be conducted.** Topics for future workshops included: identification of priority coastal issues; addressing multi-institutional issues; further discussion on the roles of libraries; obtaining user feedback on formats and QA/QC; and focusing on applications addressing specific high priority issues.

- **A "Swat Team," perhaps jointly created by NODC, CSC, and Sea Grant, could be developed to travel to various scientific meetings to provide training workshops on metadata, quality control, and data access tools.** As many as seven or eight thousand scientists, graduate students, and technicians attend the annual American Geophysical Union meetings. Thousands of other investigators come to the American Society of Limnology and Oceanography, The Oceanography Society, Coastal Zone, and Marine Technology Society meetings. These gatherings would present an ideal opportunity for outreach by the National Data Centers, and for communication with coastal communities regarding a common set of protocols for metadata (tools, standards, FGDC), QA/QC,

vocabulary, and new access tools.

- **Other training needs, identified in the Workshop included: Geographic Information Systems (GIS), working with remote sensing data, electronic data retrieval, digitization, data interpretation, photo interpretation, and WEB use.**

- **U.S. Territory-based agencies, in particular, expressed needs for technical training and equipment to enable them to participate in this effort at the same level as agencies in other regions and sectors.**

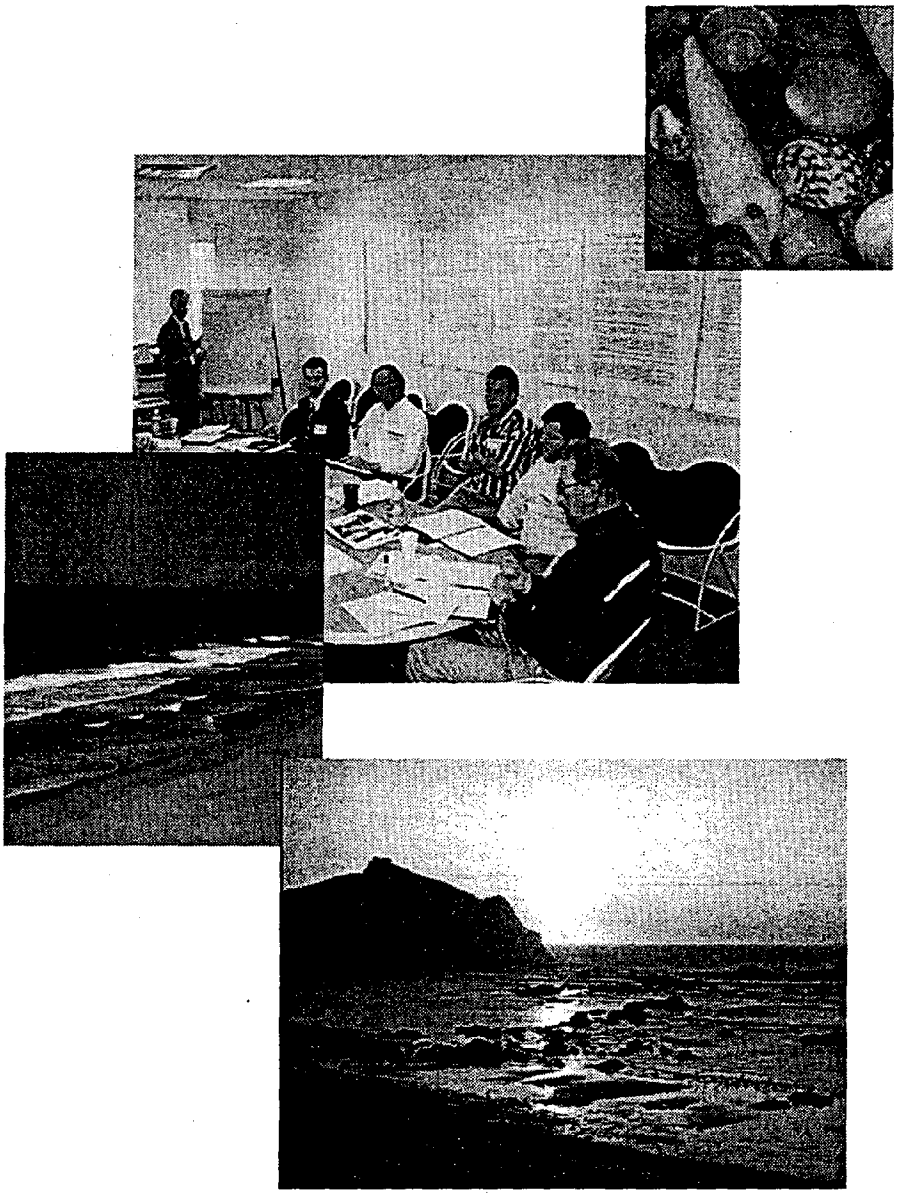
- **NOAA/NODC should establish rotational positions to provide training for staff from other agencies and organizations.**

- **As we enhance management of coastal ocean data, conceptualize new architectures, and develop new products, we must ensure that the requirements of educators and students are considered.** Undergraduate science education is evolving away from the use of textbooks, and toward challenging young students with actual applications and problem-solving assignments utilizing real-world data. This revolution in education is also being extended into the K-12 curricula, as school systems take advantage of the new access to information provided by the Internet. Workshop participants pointed out that study of the ocean environment lends itself exceptionally well to this sort of educational approach. Young oceanographers should be made aware of the resources available at the National Data Centers.

- **NOAA/NODC should seek out opportunities for cooperation with minority institutions in securing, processing and rescuing coastal ocean data.** The Historically Black Colleges and Universities/MIA program could serve as a platform for this effort.

- **Although NOAA/NODC should initially focus its coastal ocean data management activities on the U.S., strategies for global coastal ocean data management should also be pursued in the near future.**

APPENDICES



APPENDIX A

LIST OF WORKSHOP PARTICIPANTS

5/30/97 ADDRESSES

NODC Coastal Ocean Data Workshop

REGION	STATE	SECTOR	LAST NAME	FIRST NAME	MI	TITLE/AFFILIATION	ADDRESS	CITY	ZIP CODE	PHONE	FAX	E-MAIL
East	CT	Academia	Monahan	Edward		Director, Connecticut Sea Grant, University of Connecticut	1084 Shennecossett Road	Groton	06340	860-405-9110	860-405-9109	stoadm01@uconndm.uconn.edu
East	DE	Academia	Price	Kent		MAS Leader, Delaware Sea Grant College	700 Pilottown Road	Lewes	19958	302-645-4256	302-645-4007	kent.price@mvs.udel.edu
East	FL	Academia	Collins	John		University of Miami, Electrical and Computer Engineering	406 McArthur Bldg., Code 0640	Coral Gables	33124-0640	305-284-5566		collins@hercules.eng.miami.edu
East	FL	Federal/NOAA	Hendee	Jim		NOAA/AOML, R/E/AO/OCD	4301 Rickenbaker Cswy	Miami	33149-1026	305-361-4396	305-361-4392	hendee@aoml.noaa.gov
East	FL	Federal/Navy	Venezia	William		Senior Technical Representative, Naval Surface Warfare Ctr. South FL Testing Facility	8010 North Ocean Drive	Dania	33004-3033	954-926-4009		venezia@sftf.dt.navy.mil
East	GA	Academia	Marshall	Livingston		Professor, Clarke Atlanta University, Department of Biology		Atlanta	30314	404-880-8853	404-880-8181	lmarshall@cau.edu
East	GA	State	Stevens	Stuart		Georgia Dept. of Natural Resources, Coastal Zone Management Program	1 Conservation Way, Suite 300	Brunswick	31520-8687	912-264-7218	912-262-3143	stuart@dnrcrd.state.ga.us
East	GA	Federal/NOAA	Bohne	Reed		Manager, Gray's Reef National Marine Sanctuary	10 Ocean Science Circle	Savannah	31411	912-598-2345		rbohne@ocean.nos.noaa.gov
East	MA	Academia	Pederson	Judith		MIT Sea Grant College Program	292 Main Street, E38-300	Cambridge	02139	617-252-1741	617-252-1615	jpederso@mit.edu
East	MA	Federal/USGS	Signell	Richard		USGS Woods Hole	384 Woods Hole Road	Woods Hole	02543-1598	508-457-2229		rsignell@usgs.gov
East	MA	Federal/USGS	Butman	Brad		USGS Woods Hole, Branch of Atlantic Marine Geology	384 Woods Hole Road	Woods Hole	02543-1598	508-457-2212		bbutman@usgs.gov
East	MA	Private	Remsen	David		Marine Biological Laboratory	7 MBL Street	Woods Hole	02543	508-289-7441		
East	MD	Academia	D'Elia	Christopher	F.	Director, Maryland Sea Grant College Program; also affil. with Chesapeake Biological Laboratory		College Park	20742	301-405-6371	301-314-9581	delia@cbl.umd.edu
East	MD	Academia	Boesch	Donald	F	University of Maryland	P.O. Box 775, 0122 Skinner Hall	Cambridge	21613	410-228-9250	410-228-3843	boesch@hpel.umd.edu
East	NC	Academia	Shepard	Andrew		Science Director, Natl. Undersea Research Center, University of North Carolina - Wilmington	7205 Wrightsville Ave.	Wilmington	28403-7224	1-800-862-9872	910-256-8856	shepard@nurc.cmsr.uncwil.edu
East	NC	Private	Waddell	Van		SAIC	615 Oberlin Road, Ste 300	Raleigh	27605	919-832-7242	919-832-7243	vwaddell@raleigh.saic.com
East	NC	State	Nagy	Zsolt		NC Ctr. Geographic Information & Analysis	115 Hillsborough Street	Raleigh	27603	919-733-2090	919-733-2090	zsolt@cgia.state.nc.us
East	NH	Academia	Brown	Wendell	E	Director, Ocean Process Analysis Laboratory, University of New Hampshire	Institute for the Study of Earth, Oceans and Space, Morse Hall	Durham	03824	603-862-3505	603-862-0243	wsbrown@kevin.sr.unh.edu
East	NJ	Academia	Grassle	J. Frederick		Inst. of Marine and Coastal Sciences, Cook College Campus, Rutgers Univ.	P.O. Box 231, Old Blake Hall	New Brunswick	08903-0231	908-932-6555 x540	908-932-8578	grassle@ahab.rutgers.edu
East	RI	Academia	Cornillon	Peter		University of Rhode Island, Graduate School of Oceanography	South Ferry Road	Narragansett	02882	401-874-6283		pcornillon@gso.uri.edu
East	RI	Private	Anderson	Eric		Applied Science Associates and Graduate School of Oceanography, URI	70 Dean Knauss Drive	Narragansett	02882-1143	401-789-6224	4010789-1932	ela@appsci.com
East	SC	Academia	Porter	Dwayne		Director, Geographic Information Processing Lab. and Research Assistant Professor, Belle W. Baruch Institute for Marine Biology and Coastal Research and the Marine Science Program, University of South Carolina		Columbia	29208	803-7774615	803-7778769	dporter@hugo.geol.sc.edu
East	SC	State	Van Dolah	Bob		Assistant Director, Marine Resources Research Institute	P.O. Box 12559	Charleston	29422	803-762-5048	803-762-5110	vandolahr@mrd.dnr.state.sc.us

Great Lakes	MI	Federal/COE	Thieme	Scott		Hydrologic Engineer, U.S. Army Corps of Engineers, Detroit District	477 Michigan Ave.	Detroit	48226	313-226-4886	313-226-2398	Scott.J.Thieme@nce01.usace.army.mil
Great Lakes	MI	Federal/GLERL	Reid	Dave		NOAA/GLERL	2205 Commonwealth Blvd.	Ann Arbor	48105-2945	313-741-2019	313-741-2003	reid@glerl.noaa.gov
Great Lakes	MI	Federal/USGS	Frank	Tony		USGS, BRD, Great Lakes Science Center	1451 Green Road	Ann Arbor	48105	313-994-3331 x263	313-994-8780	anthony_frank@nbs.gov
Great Lakes	MI	Private	Leonard	Dennis		Principal Engineer, Detroit Edison Company	2000 2nd Avenue	Detroit	48226	313-235-8714		
Great Lakes	NY	Academia	Brandt	Steve		Director, Great Lakes Center, Buffalo State College	HC 215 Classroom Bldg., 1300 Elmwood Ave.	Buffalo	14222	716-878-4329	716-878-4009	BRANDTSB@snybufaa.cs.snybuf.edu
Great Lakes	OH	State	Rupert	John		Coastal Management Section, Ohio Department of Natural Resources	1952 Belcher Dr., Fountain Square, Bldg C-4	Columbus	43224	614-265-6415	614-267-4764	john.rupert@dnr.state.oh.us
Great Lakes	WI	Academia	Andren	Anders		Director, Wisconsin Sea Grant College Program, University of Wisconsin - Madison	1800 University Avenue	Madison	53705	608-262-0905	608-263-2063	awandern@seagrant.wisc.edu
Great Lakes	WI	Academia	Edgington	David	N	Center for Great Lakes Studies, Great Lakes Research Facility, University of Wisconsin, Milwaukee	Box 413	Milwaukee	53201	414-382-1708	414-382-1705	
Great Lakes	WI	State	Pohlman	John		Wisconsin Natural Heritage Inventory, Wisconsin Department of Natural Resources	P.O. Box 7921	Madison	53707	608-264-6263		pohlmj@dnr.state.wi.us
Gulf	AL	Academia	Schroeder	William	W	Marine Science Program, University of Alabama	P.O. Box 369	Dauphin Island	36528	334-861-7528	334-861-7540	wschroder@jagwar1.usouthal
Gulf	AL	Federal/FWS	Goldman	Larry		Federal Co-Chair, Habitat Degradation Issue Committee, Gulf of Mexico Program, U.S. Fish and Wildlife Service	P.O. Box 1190	Daphne	36526	334-441-5181	334-441-6222	
Gulf	AL	State	Gilder	Gil		ADECA, Coastal Programs Office	401 Adams Avenue, Box 5690	Montgomery	36203	334-242-5502	334-242-0552	
Gulf	AL	State	Hinesley	Philip		Alabama Coastal Zone Manager	1208 Main Street	Daphne	36526	334-626-0042	334-626-3503	PHinesley@surf.nos.noaa.gov
Gulf	FL	Academia	Luther	Mark		University of South Florida, Department of Marine Science, Knight Oceanographic Research Center	140 7th Avenue South	St. Petersburg	33701			
Gulf	FL	Academia	Ogden	John		Florida Institute of Oceanography	830 First Street, South	St. Petersburg	33701	813-893-9100	813-893-9109	jogden@marine.usf.edu
Gulf	FL	Federal/NOAA	Edmiston	Lee		Apalachicola NERR	261 Seventh Street	Apalachicola	32320	904-653-8063	904-653-2297	
Gulf	FL	State	Henderson	George		Florida Marine Research Institute, Dept. of Environmental Protection	100 Eighth Ave., SE	St. Petersburg	33701-5095	813-896-8626	813-823-0166	
Gulf	FL	State	Stage	David	T	State Co-Chair, Data and Information Transfer Committee, Gulf of Mexico Program, Information Resources Commission	112 Bloxham Building, 725 S. Calhoun St.	Tallahassee	32399-0001	904-488-7986	904-922-5929	
Gulf	FL	Academia	Clarke	Marion	L.	Leader, Florida Sea Grant Extension, University of Florida	P.O. Box 110405, Building 803	Gainesville	32611-0405	352-392-1837	352-392-5113	MLC@GNV.IFAS.UFL.EDU
Gulf	FL	Academia	Antonini	Gustavo		Geography Department, University of Florida	305 Grinter Hall	Gainesville	32611	352-393-6233		
Gulf	LA	Academia	Carney	Robert	S	Louisiana State University, Director, Coastal Marine Institute		Baton Rouge	70803-7503	504-388-6511		CARNEY@wr3600.cwr.lsu.edu
Gulf	LA	Academia	Wiseman	William	J	Louisiana State University, Director, Coastal Studies Institute	331 Howe-Russell	Baton Rouge	70808-1082	504-388-2395		bill@merlin.csi.lsu.edu
Gulf	LA	Federal/MMS	Froomer	Norman		Minerals Management Service, co-chair Gulf of Mexico Program Data and Information Transfer Committee	1201 Elmwood Park Blvd.	New Orleans	70123	504-736-2782 x2782	504-736-2631	norman_froomer@smtp.mms.gov
Gulf	MS	Academia	Felton	Mack		Coordinator HBCU/MIA, Gulf of Mexico Program	Building 1103, Room 202	Stennis Space Center	39529-6000	601-688-7121	601-688-2109	Felton.Mac@EPAMAIL.EPA.gov
Gulf	MS	Federal/Navy	Waterreus	J.J.		N3C, Naval Meteorology and Oceanography Command	1020 Balch Blvd.	Stennis Space Center	39528-5005	601-688-5159	601-688-5332	n3c%n3%cnmoc@comis.cnmoc.navy.mil
Gulf	MS	Federal/Navy	Haeger	Steve		Naval Oceanographic Office, OTT		Stennis Space Center	39522-5001	601-688-4457		
Gulf	MS	Federal	Herron	Rex		Gulf of Mexico Program	Building 1103	Stennis Space Center	39529	601-688-7008	601-688-2709	herron.rex@epamail.epa.gov

Gulf	TX	Federal/NOAA	Gittings	Steve		Flower Garden Banks NMS	216 West 26 Street, Ste 104	Bryan	77803	409-779-2705	409-779-2334	sgittings@ocean.nos.noaa.gov
Island	AS	Territorial	Peau	Lelei		Government of American Samoa, Office of Development Planning, Coastal Program Manager		Pago Pago	96799	011-684-633-5155	684-633-4195	lpeau@ocean.nos.noaa.gov
Island	CNMI	Territorial	Gilman	Eric	L	CNMI Office of the Governor	PPP 171, Box 10000	Saipan	96950-9505	011-670-664-2238	011-670-664-2390	eric.gilman@saipan.com
Island	CNMI	Territorial	Burr	Susan		Division of Environmental Quality, CNMI	PPP 171, Box 10000	Saipan	96950-9505	011-670-234-1011	011-670-234-1003	susan.burr@saipan.com
Island	GU	Academia	Matson	Ernest	A	University of Guam Station		Mangilao	96923	011-671-735-2178	011-671-734-6767	eamatson@uog.edu
Island	GU	Territorial	Lujan	Evangeline		Bureau of Planning, Geographic Information Systems Manager	P.O. Box 2590	Agana	96932	671-472-4201	671-477-1812	vange@ns.gu
Island	PR	Academia	Grove	Kurt		University of Puerto Rico, Sea Grant College Program	P.O. Box 5000	Mayaguez	00681-5000	787-832-3585		k.grove@rumac.upr.clu.edu
Island	PR	Territorial	Gonzalez	Carmen		Manager, Jobos Bay NERR	Cell Box B	Aquirre	00704	787-853-4617	787-853-4618	cgonzalez@ocean.nos.noaa.gov
Island	USVI	Academia	Watlington	Roy		Eastern Caribbean Center, University of the Virgin Islands		St. Thomas	00802	809-693-1026	809-693-1025	rwatlin@uvi.edu
Island	USVI	Territorial	Kojis	Barbara		Division of Fish and Wildlife. Dept. Planning and Natural Resources	6291 Estate Nazareth 101	St. Thomas	00802-1104	809-775-6762	809-775-3792	
Island	USVI	NGO	Towle	Ed		Island Resources Foundation	6296 Estate Nazareth No. 11	St. Thomas	00802-1104	809-775-6225		etowle@irs.net
West	AK	Academia	Hills	Susan		School of Fisheries and Ocean Sciences, University of Alaska - Fairbanks		Fairbanks	99775-7220			shines@ims.alaska.edu
West	CA	Academia	Sherman	Douglas		Director, University of Southern California Sea Grant Program, Hancock Institute of Marine Studies	University Park	Los Angeles	90089-0373	213-740-1961	213-740-5936	seagrant@mizar.usc.edu
West	CA	State	DiPietro	Deanne		California Environmental Resources Evaluation System (CERES), California Resources Agency	900 N. St. Suite 250	Sacramento	95814	916-653-8614	916-654-5829	deanne@larkspur.ceres.ca.gov
West	CA	State	Yap	Jason		California Coastal Commission	45 Fremont Street, Suite 1940	San Francisco	94105-2219	415-904-5468	415-904-5400	
West	CA	Academia	Harms	Sabine		Center for Coastal Studies, 0209, Scripps Institute of Oceanography, University of California, San Diego		La Jolla	92093-0209	619-534-2143	619-534-0300	sabine@coast.ucsd.edu
West	CA	Academic	Helly	John		San Diego Super Computing Center, University of California, San Diego	9500 Gilman Dr.	La Jolla	92093-0505	619-534-0505		
West	CA	Federal/NMFS	Boehlert	George		NMFS Southwest Fisheries Science Center, Pacific Environmental Group	1352 Lighthouse Ave.	Pacific Grove	93950-2097	408-648-8447		gboehlert@pfeg.noaa.gov
West	OR	State	Dana	Randy		Oregon Department of Land Conservation and Development	800 NE Oregon Street #18	Portland	97232	503-731-4065 x31	503-731-4068	randy.dana@state.or.us
West	WA	Federal/NOAA	Bowlby	Edward		Olympic Coast National Marine Sanctuary	138 West First Street	Port Angeles	98362	206-526-4147		
West	WA	Federal/NOAA	Megrey	Bernard		NOAA, National Marine Fisheries Service, Alaska Fisheries Science Center	7600 Sand Point Way, NE	Seattle	98115	360-457-6622	360-457-8496	ebowlby@ocean.nos.noaa.gov
West	WA	Private	Crecelius	Eric		Technical Group Manager, Marine Chemistry and Ocean Processes, Battelle Pacific Northwest Division, Marine Sciences Laboratory	1529 West Sequim Bay Road	Sequim	98382-9099	360-681-3604	360-681-3699	ea_crecelius@pnl.gov
West	WA	State	Dzinbal	Ken		Manager, Ambient Monitoring Section, Washington Dept. of Ecology	300 Desmond Dr., P.O. Box 47710	Olympia	98504	360-407-6672		KDZI461@ecy.wa.gov
West	WA	State	Newton	Jan		Washington Dept. of Ecology	300 Desmond Dr., P.O. Box 47710	Olympia	98504	360-407-6675		jnew461@ecy.wa.gov
West	WA	Federal/NOAA	Small	Jane		NOAA Alaska Fisheries Science Center	4000 SW Holgate	Seattle	98116	206-933-6662	206-933-8741	jsmall@worldnet.att.net
	NOAA	Folks:										
	MD		Scavia	Don		Director, NOAA Coastal Ocean Program, 'NCOP, SSMC3, Rm. 15147	1315 East West Highway	Silver Spring	20910	301-713-3338		
	MD		Cammen	Leon		NOAA National Sea Grant Program, R/OR1, SSMC3, Rm. 11805	1315 East West Highway	Silver Spring	20910	301-713-2435		

MD	Crosby	Michael	Chief Scientist, NOAA Office of Ocean and Coastal Resources Management, N/ORM, SSMC4, Rm. 11936	1305 East West Highway	Silver Spring	20910	301-713-3155 x144		mcrosby@coast.nos.noaa.gov
MD	Monaco	Mark	NOAA Office of Ocean Resources, Conservation and Assessment, N/ORCA14, SSMC4, Rm. 9409	1305 East West Highway	Silver Spring	20910	301-713-3000 x189		
SC	Davidson	Margaret	Director, NOAA Coastal Services Center	2234 South Hobson Avenue	Charleston	29405-2413	803-974-6220		mdavidson@csc.noaa.gov
SC	Alterman-Robinson	Jennet	NOAA Coastal Services Center	2234 South Hobson Avenue	Charleston	29405-2413	803-974-6210		jrobinson@csc.noaa.gov
SC	Miglarese	Anne	NOAA Coastal Services Center	2234 South Hobson Avenue	Charleston	29405-2413	803-974-6230		amiglarese@csc.noaa.gov
SC	Ball	Anne	NOAA Coastal Services Center	2234 South Hobson Avenue	Charleston	29405-2413	803-974-6229		aball@csc.noaa.gov
MD	Reeves	Robert	NOAA, NWS, Office of Meteorology	W/OM21, SSMC2, Rm. 13148	Silver Spring	20910	301-713-1970 x119		
MD	Winokur	Robert S.	NOAA, Assistant Administrator for Satellite and Information Services	NOAA Federal Bldg. 4, Rm. 2069, 4401 Suitland Road	Suitland	20233	301-457-5115		
NC	Quayle	Robert	Chief, Global Climate Laboratory, NOAA National Climatic Data Center	151 Patton Ave.	Asheville	28801-5001	704-271-4245		rquayle@ncdc.noaa.gov
MD	Miller	Chris	NOAA, Environmental Information Service, E/EI1, Rm. 15531	1315 East West Highway	Silver Spring	20910	301-713-1264		
MD	Stone	Robert	E/SP, NOAA Science Center - WWB, Rm. 510	5200 Auth Road	Camp Springs	20746-4304	301-763-8142 x134		
MD	Barrientos	Celso	E/RA3, NOAA Science Center - WWB, Rm. 711D	5200 Auth Road	Camp Springs	20746-4304	301-763-8102		
CO	Hittelman	Allen	NOAA, National Geophysical Data Center, E/GC	325 Broadway	Boulder	80303-3328	303-497-6215	303-497-6513	ahittelman@ngdc.noaa.gov
CO	Sharman	George	NOAA, National Geophysical Data Center, E/GC	325 Broadway	Boulder	80303-3328	303-497-6345	303-497-6513	
CO	Holcombe	Troy	NOAA, National Geophysical Data Center, E/GC	325 Broadway	Boulder	80303-3328	303-497-6390		
MD	Frey	Henry	Director, NOAA National Oceanographic Data Center, E/OC, SSMC3, 4th Floor	1315 East West Highway	Silver Spring	20910	301-713-3270		hfrey@nodc.noaa.gov
MD	Fauquet	Ronald	Deputy Director, NOAA, National Oceanographic Data Center	1315 East West Highway	Silver Spring	20910	301-713-3267 x198		rfauquet@nodc.noaa.gov
MD	Hamilton	Douglas	NOAA, National Oceanographic Data Center	1315 East West Highway	Silver Spring	20910	301-713-3272 x119		dhamilton@nodc.noaa.gov
MD	Abram	Richard	NOAA, National Oceanographic Data Center	1315 East West Highway	Silver Spring	20910	301-713-3279 x159		rabram@nodc.noaa.gov
MD	Conkright	Margarita	NOAA, National Oceanographic Data Center	1315 East West Highway	Silver Spring	20910	301-713-3290 x193		mconkright@nodc.noaa.gov
MD	Grimes	Doria	NOAA, National Oceanographic Data Center	1315 East West Highway	Silver Spring	20910	301-713-2607		dgrimes@nodc.noaa.gov
MD	Cohen	Roz	NOAA, National Oceanographic Data Center	1315 East West Highway	Silver Spring	20910	301-713-3267 x146	301-713-3300	rcohen@nodc.noaa.gov
MD	Sun	Charles	NOAA, National Oceanographic Data Center	1315 East West Highway	Silver Spring	20910	301-713-3272		csun@nodc.noaa.gov
HI	Caldwell	Pat	NOAA, National Oceanographic Data Center, Hawaii Liaison Office, University of Hawaii, Marine Science Branch	1000 Pope Road, Rm. 316	Honolulu	96816	808-956-4105		caldwell@kapau.soest.hawaii.edu
FL	Crane	Mike	NOAA, National Oceanographic Data Center, Southeast Liaison Office, AOML	4301 Rickenbaker Causeway	Miami	33149	305-361-4305		crane@aoml.noaa.gov
CA	Hall	Norm	NOAA, National Oceanographic Data Center, Southwest Liaison Office	8604 La Jolla Shores Drive, P.O. Box 271	La Jolla	92037	619-546-7110		hall@nemo.ucsd.edu
MA	Heimerdinger	George	NOAA, National Oceanographic Data Center, Northeast Liaison Office, McLean Laboratory, Woods Hole Oceanographic Institution		Woods Hole	02543	508-289-2497		gheimerdinger@whoi.edu

	WA	Stillwaugh	Sid	NOAA, National Oceanographic Data Center, Northwest and Alaska Liaison Office	Bldg. 3, Rm. 2094, 7600 Sand Point Way	Seattle	98115	206-526-6263		sstillwaugh@nodc.noaa.gov
Others:										
	FL	Schwartz	Daniel	Harbor Branch Oceanographic Institution (on assignment at CORE in Washington DC)	5600 U.S. 1 North	Fort Pierce	34946	561-465-2400 x654		dschwartz@hboi.edu
	FL	Shephard	Robert J.	Senior Consultant, Harbor Branch Oceanographic Institution	20823 Nettleton Street	Orlando	32833	407-568-8157		rsheph8886@aol.com
	RI	Leinen	Margaret	Dean, Graduate School of Oceanography, University of Rhode Island	South Ferry Road	Narragansett	02882	401-874-6222		
	RI	Hinga	Ken	Assistant Dean, Graduate School of Oceanography, University of Rhode Island	South Ferry Road	Narragansett	02882	401-874-6888	401-874-6889	khinga@gsoson1.gso.uri.edu
	NJ	Abel	Robert		55 Queen Anne Drive	Shrewsbury	07702	908-842-3551		

APPENDIX B

WORKSHOP AGENDA

NOAA Coastal Ocean Data Workshop
Harbor Branch Oceanographic Institution (HBOI)
Fort Pierce, Florida
March 11-13, 1997

Sponsored by: NOAA/NESDIS National Oceanographic Data Center (NODC); NOAA/NOS Coastal Services Center (CSC); NOAA Coastal Ocean Program (COP), and the University of Rhode Island Graduate School of Oceanography (GSO)

1. Preparation and Background for the Workshop

- Participants will receive a package of background material and a detailed agenda at least two weeks prior to the workshop.

- Participants are encouraged to prepare written concepts for discussion in Working Session 3 on joint ventures.

- Each workshop session will include a facilitator, an NODC rapporteur/resource person, and an NODC regional Liaison Officer.

2. The Workshop

Day 0 - March 10, 1997

9:00 - 4:30	**Meeting of Workshop Facilitators and Conveners**
Open	**Arrival of Participants and Check-in at Hotels**
5:00 - 7:00 P.M.	**Registration for Workshop at Hotel Desks**
7:00 - 9:00 P.M.	**Dinner meeting for all NESDIS participants, facilitators, and HBOI coordinators - Convene in the lobby of the Vero Beach Inn**

Day 1 - March 11, 1997

7:30 - 8:30 AM	**Continental Breakfast and Registration at HBOI**
8:30 - 10:10 AM	**Plenary 1**
1. 8:30 - 8:40 A.M.	Welcome and Introduction: Dr. Henry R. Frey, Director, NODC
2. 8:40 - 9:00 A.M.	Welcome Address: Mr. Robert S. Winokur, Assistant Administrator for Satellite and Information Services, NOAA
3. 9:00 - 9:20 A.M.	Coastal Ocean Data - Setting the Agenda: Dr. Henry R. Frey
4. 9:20 - 9:50 A.M.	*Priorities for Coastal Ecosystem Science*: Dr. Donald F. Boesch, President, University of Maryland Center for Environmental and Estuarine Studies
5. 9:50 - 10:10 A.M.	Instructions and Questions: Captain Daniel S. Schwartz, HBOI
10:10 - 10:30 A.M.	**Break**
10:30 - 12:30 P.M.	**Working Group Session 1- Identification of Data Required to Address National and Regional Coastal Ocean Issues and Scientific Research Priorities**

Five working groups will form: East Coast, Islands (including U.S. Virgin Islands, Puerto Rico, American Samoa, Guam, Northern Mariana Islands, and Hawaii), West Coast (including Alaska), Gulf of Mexico, and the Great Lakes.

Each regional group will:

1. Briefly review the major national and regional coastal issues/problems already identified by National Research Council, Subcommittee on U.S. Coastal Ocean Science, Regional Marine Research Program Boards, etc.; and the major scientific priority research areas which address these issues (refer to NRC report in package of background material).

2. Identify historical and contemporary data and information (those coastal data sets already archived by NODC are summarized in the NODC report in package of background material) which NODC should acquire to support research, management, and decision-making addressing these issues and priority research areas.

Note: Cross-cutting issues (e.g., data quality and format standards, data sharing and

accessibility, data integration and product development) will be covered in the next working group session.

12:30 - 1:30 PM **Lunch - Speaker and Topic**
Margaret A. Davidson, Director, NOAA Coastal Services Center; Coastal Ocean Data - Information for Decision Making

1:30 - 2:40 PM **Working Group Session 1 (continued)**

2:40 - 3:00 PM **Break**

3:00 - 4:20 PM **Plenary 2**

A representative from each group will provide a 10-minute summary of the group's report; and about 30 minutes of general discussion and questions will follow.

4:30 - TBD P.M. **Debrief (Executive Board Room)**

Sponsors, facilitators, rapporteurs will review the results of Day 1.

5:00 - 8:00 P.M. **Social Hour and Dinner - Speaker and Topic**
Dr. Robert B. Abel - Data Handling from Ante Diluvian Times to the Year 2010

<u>Day 2 - March 12, 1997</u>

7:30 - 8:30 A.M. **Continental Breakfast at HBOI**

8:30 - 10:15 A.M. **Working Group Session 2 - Specific Data and Information Requirements**

Five working groups will be formed. Four of the groups will include scientists, divided up along disciplinary lines - biological, chemical, geological, and physical. The fifth group will include managers and decision-makers. The technical data and information specialists will be distributed among all of the groups.

Each of the four disciplinary groups will discuss data and information requirements regarding:

- data/parameter types, units, levels of precision and accuracy, levels and types of quality control;
- metadata and supporting documentation;
- national and international data and metadata format, content, exchange standards;
- search and retrieval capabilities of the data and metadata systems; and
- means of access to data and information systems, platforms, media.

The fifth group will discuss data and information requirements regarding:

- search and retrieval requirements for systems
- means of access to data and information systems, platforms, media;
- turnaround time for requests;
- visualization/display, analytical, and conversion tools; and
- data, information, and synthesis products.

10:15 - 10:35 A.M. **Break**

10:35 - 12:00 Noon **Working Group Session 2 (continued)**

12:00 - 1:00 P.M. **Lunch - Speaker and Topic**
Dr. Margaret Leinen, Dean of the Graduate School of Oceanography and Vice Provost for Marine Programs at the University of Rhode Island; Coastal Ocean Data - the University Perspective

1:00 - 2:20 P.M. **Plenary 3**

Summary report from each Working Group on requirements - 10 minutes per group, plus 30 minutes for general discussion and questions.

2:20 - 2:40 P.M. **Break**

2:40 - 4:40 P.M. **Working Group Session 3 - Implementation of the Recommendations through Partnerships and Cooperative Ventures**

Four new working groups were convened by sector with respect the stakeholders' data capabilities and needs. These are Data and Information Systems; State, Territory and Local Governments; Military, Classified or Proprietary and Industrial Databases; and

Sea Grant, Universities, and the "Shoebox" Data Set Creators / Custodians.

These final four groups are to: Share information about existing coastal data and information management activities, since a number of efforts in this area have been initiated. Then propose potential partnerships, joint projects, cooperative efforts, and modifications to existing programs to implement the requirements and recommendations developed in the first two working sessions. Identify potential sources of resources to support the activities, responsible parties, organizations, other project details, etc. If any participants prepared written proposals, this session is the place to present and discuss them.

4:45 - TBD P.M. **Debrief (Executive Board Room)**

Sponsors, facilitators, rapporteurs will review the results of Day 2.

5:00 - 8:00 PM **Social Hour and Working Dinner - Speaker and Topic TBD**

Day 3 - March 13, 1997

7:30 - 8:30 A.M. **Continental Breakfast at HBOI**

8:30 - 10:00 A.M. **Plenary 4**

Reports from each working group - 10 minutes each, plus 20 minutes for discussion and questions.

10:00 - 10:20 A.M. **Break**

10:20 - 12:00 Noon **Plenary 5 - Wrap-up and Action Items**

Adjourn

APPENDIX C

LIST OF BACKGROUND AND REFERENCE MATERIALS

1. Biological Resources Division (U.S. Geological Survey) - National Biological Information Infrastructure Biological Metadata Standard - hot link from workshop home page.

2. Collins, E., Woods, M., Sheifer, I.C., and Beattie, J., 1994, *Bibliography of Selected Synthesis Documents on Selected Coastal Ocean Topics*, NOAA Coastal Ocean Program Decision Analysis Series No. 3 - copies mailed to participants; hot link from workshop home page.

3. Committee on Environment and Natural Resources Research, 1996, *Our Changing Planet - The FY 1997 U.S. Global Change Research Program.* - hot link from workshop home page.

4. Federal Geographic Data Committee Home Page - Information on development of national standards for selected types of data and metadata - hot link from workshop home page.

5. Interagency Taxonomic Information System - on-line database of taxonomic information on flora and fauna from terrestrial and aquatic habitats - hot link from workshop home page.

6. International Coral Reef Initiative - hot link from workshop home page.

7. National Oceanographic Data Center Data Submission Guidelines - hot link from workshop home page.

8. National Oceanographic Data Center Data, 1997, *Inventory of U.S. Coastal Ocean Data - Summaries of Data Sets available from the U.S. National Oceanographic Data Center* - copies mailed to participants.

9. National Research Council, 1994, *Priorities for Coastal Ecosystem Science* - copies mailed to participants; hot link from the workshop home page.

10. National Research Council, 1995, *Understanding Marine Biodiversity* - hot link from workshop home page.

11. Subcommittee on U.S. Coastal Ocean Science, 1995, *Setting a New Course for U.S. Coastal Ocean Science*, Final Report - hot link from workshop home page.

APPENDIX D

LIST OF PROPOSALS SUBMITTED

1. Rescuing selected historical Puget Sound hydrographic data - Washington Department of Ecology

2. Combining ocean color data and discrete chlorophyll *a* data to assess eutrophication in Washington State marine waters - Washington Department of Ecology

3. Characterization of oceanic input to Puget Sound for use in assessing water quality - Washington Department of Ecology

4. Physical circulation measurements to support a Puget Sound regional synthesis model - Washington Department of Ecology

5. NODC rotational program in coastal oceanography - NOAA National Marine Fisheries Service, Pacific Fisheries Environmental Group

APPENDIX E

NOTES FROM WORKING GROUP SESSIONS

GEOGRAPHICAL WORKING GROUP SESSION NOTES

REPORT FROM THE EAST COAST WORKING GROUP

PARTICIPANTS:

Facilitator: D. S. Schwartz
Rapporteurs: M. Conkright and G. Heimerdinger

Edward Monahan, Kent Price, John Collins, William Venezia, Livingston Marshall, Stuart Stevens, Reed Bohne, Judith Pederson, Richard Signell, Brad Butman, David Remsen, Christopher D'Elia, Donald Boesch, Van Waddell, Zsolt Nagy, Wendell Brown, J. Frederick Grassle, Peter Cornillon, Bob Van Dolah, John Ogden, Steve Haeger

I. INTRODUCTION

The working group began by identifying all the members in the group, their affiliations, and their specific interests and background related to coastal oceanography. This group represented a cross section of federal, state, and private interests around the East Coast of the United States.

II. GENERAL ISSUES

Several issues of general interests were immediately identified such as:

1. Identify non-traditional data types such as:

    a. data needed for predictive systems (model validation) meteorology, historical data, ocean color
    b. proxy indicators - how do you measure health?
    c. surf zone/nearshore fluxes - critical for coastal models

2. Identify international coastal data with an emphasis on US coastal waters first, then as an eventual component of GOOS - albeit with a coastal data emphasis.

3. Even though this would anticipate discussions in a subsequent session, the group felt the identification of user needs was not as critical as the quality of the data. For example, when studying non-indigenous species, data quality is important in identifying the absence of species. Related to this is a need for a taxa census. In addition, there is also a statistical need to filter outliers in such data sets as STORET to make them useful..

4. The need to distinguish between historical and real time data.

5. There is a need to identify sources of information - e.g. location of Gulf Stream.

III. MAJOR DATA TYPES

The group identified the following data types as important for coastal studies:

bathymetry (need for precise bathymetric data - e.g. for the Gulf of Maine)
sediment issues (sediment texture and contaminants)
shoreline definition
suspended particles
circulation (currents)
fishery dependent and independent (fishery data)
hydrography (temperature/salinity/oxygen/nutrients)
productivity/chlorophyll
marine mammals/endangered species
geo-referenced human use patterns (shipping lanes, coastal use)
habitats (fisheries, benthic, nursery grounds)
coastal atmospheric components (deposition, forcing)

IV. PROBLEMS ASSOCIATED WITH COASTAL DATA

The group identified the following problems associated with existing data sets:

1. incomplete work on characteristics of the sediments (e.g. sediment texture)
2. many bathymetry sources and formats - there is a need to make NOAA databases consistent, e.g. single definition or reference point for demarking coastline
3. different government definitions of "shoreline"
4. flexibility of data management, metadata inclusion
5. scalar problem - local vs regional vs larger scale studies need partnerships to resolve local to regional issues

V. SUMMARY OF DATA NEEDS

1. Basic/fundamental datasets
   bathymetry, shoreline, sediment texture
   land use cover
2. Datasets for model forcing and validation
   meteorology, ocean color

3. Long term and historical datasets
4. Sources, loadings, point discharge, atmospheric deposition
5. The need for real time data in studying coastal issues
6. Resource needs: territorial boundaries/lease blocks
   demographic/economic projections
   geo-referenced human use patterns
7. Merged databases which are GIS compliant.

VI. RECOMMENDATIONS

1. Data identification and availability with an emphasis on local/state data
   - manuscript data - "shoebox" data.

2. NOAA should index datasets - researchers should know what is available at federal, state and local agencies - make data useful such as putting it in geographical context to make it useful. Where do you go to find all East Coast data?

3. Applications - identify needs for the data taking into account the educational community - current focus in education is problem solving, issue oriented - need to use data in classroom
4. Identify long term datasets and make these a priority
5. NODC link with local/state estuary programs - use these efforts to develop national picture (e.g. National Estuary Program - most have some kind of monitoring program). Need to make these data more available - provide them with technology, benefits of sharing data. Other links are NEP, NEERS, and the USGS online data on nutrient flux entering the coasts
6. There is a need to understand how, who, and why coastal data are collected - local, private, state agencies - (politics of who, why gathers data).
7. Any new data should be available for rapid access (e.g. satellite altimeter data) - suggestion for linking the data rather than providing the satellite data.

DATASETS/East Coast Group - Related to the NRC Coastal Issues List

I. EUTROPHICATION

A. EUTROPHICATION EXISTING DATASETS

South Fla. Ecosystem and Monitoring System - EPA
USGS Water Quality assessment - nutrient loading
State Monitoring programs/- water quality -
STORET - EPA
Chesapeake Bay Program
All NEP's
Long term (LTER)

LMER
NERR - National Estuarine
ORCA - NOAA - eutrophication assessment - Mid Atlantic - regional data pathway to individual institutions
NC Corporate Geographic Database - sources
EMAP - EPA
NOAA OLLD - tide level - NOS
NADP - national acid deposition
NMFS trawl data -
Citizen/State Volunteer Programs - Baywatch
Aerial remote sensing - CSC
ODAS
Mid Atlantic Lidar
Permit discharge data - NPDES
Continuous observation systems
Rutgers/UMd./FIO - Chesapeake Bay
Submerged aquatic vegetation surveys
Biscayne Bay, Chesapeake Bay

B. EUTROPHICATION DATA DEVELOPMENT NEEDS

International eutrophication data (global)
Atmospheric deposition
In-situ monitoring
East Coast Data modeling forcing/validation data
Inventory of "shoe box" data sets by individual PI's and institutes

II. HABITAT MODIFICATION

A. EXISTING

National Wetland Inventory - NMFW
C-CAP - coastal change analysis center (CSC)
SPOT - satellite remote sensing
Individual state wetland
NAP - DOQQ
404 permits - core of engineers
submerged aquatic vegetation surveys (SAV)
Habitat mapping and dynamics -
South Florida Ecosystem and Sanctuary Monitoring System

NMFS trawl data
Maps of shellfish closure -
Sediment texture - USGS and state agencies
Environmental sensitivity maps - CSC
Bathymetry - NOS/Navy/COE/USGS
COE/EPA/DAMOS dredge disposal
Endangered species habitats
MMS OCS studies of habitat modification

B. NEEDED

Nursery areas - fishery natural resources
Regional sea floor characterization
COE EIS statements for past/future projects
Fine scale bathymetry
Obstacles to natural migration

III. HYDROLOGIC AND HYDRODYNAMIC

A. EXISTING

local project permit data
river flow data
COE EIS data
competing uses data
state temperature/salinity/DO data
rainfall data - NOS/NCDC
coastal structures (inlet changes, jetty structure)
NMFS/state fishery data
NFWS water fowl data

B. NEEDED

high resolution aerial photography - state/counties/private

IV. EXPLOITATION OF RESOURCES

A. EXISTING

NMFS trawl surveys
state fisheries surveys

catch and landing data
fishing effect data
coastal mining - mineral resources
    beach re-nourishment
Seamap/MMS data
USGS side scan
MMS/OCS
Virtual population data - NMFS
State shellfish survey
human use data (recreation, onshore/offshore boating activities)

B. NEEDED

NMFS trawl surveys - difficult to access
State fisheries surveys - difficult to access

V. TOXIC EFFECTS

A. EXISTING

NST - NOS national status and trends
EMAP - EPA/NOAA
Corps permit data (COE)
STORET - EPA
Toxic substances library
NEP
Basic sediment quality/texture - state, federal
    OC, %fine grain material
State monitoring programs
NPDES
TOXNET - toxic release inventory (Nat. Library of Medicine)
    SARA -

B. NEEDED

Pesticide uses inventory - USDA/EPA
Atmospheric loading
    EPA Great Waters program
Regional Sediment quality
Real-time

"coastal canaries"

VI. INTRODUCTION OF NONINDIGENOUS SPECIES

A. EXISTING

ballast water studies
circulation/hydrodynamic data

B. NEEDED

species inventory data

VII. GLOBAL CLIMATE CHANGE AND VARIABILITY

A. EXISTING

historical archives
paleo data

B. NEEDED

ice core gases data - NSF
data sets for modeling
inventory of "shoebox" data

VIII. SHORELINE EROSION

A. EXISTING

hydrologic/hydrodynamic data
datasets associated with particular events
shoreline erosion data
    NBS continuous beach surveys
    COE databases
NOS tide gauge data
storm track data - Nat. hurricane center
wave data - NDBC

B. NEEDED

shoreline definition time-series
now casting data
Lidar

IX. PATHOGENS

A. EXISTING

health departments
boards of health/state agencies
shellfish monitoring at state level

REPORT FROM THE GREAT LAKES WORKING GROUP

PARTICIPANTS:

Facilitator: A. Andren
Rapporteurs: R. Abram and S. Stillwaugh

Scott Thieme, Dave Reid, Tony Frank, Dennis Leonard, Steve Brandt, John Rupert, David Edgington, John Pohlman.

Summary:

- All of the issues in the NRC report are important in the Great Lakes region, although the relative priority varies from region to region and lake to lake.
- Because of the "Water Quality Agreement" between the United States and Canada, a number of coordinated efforts have addressed issues focussed on water levels, water quality, and ecological effects. These effects have in large measure been recommended by the International Joint Commission (IJC), which recommends action to the two parties. The Great Lakes Fisheries Commission and Great Lakes Commission are also responsible for the coordination of efforts regarding environmental resources.
- Detailed lake level records exist, which together with meteorological and physical lake data, serve as a powerful tool by which to examine possible effects that would result from perturbations in the hydrologic cycle (i.e., global climate issues).
- The Great Lakes are basically enclosed systems with hydraulic residence times ranging from 3 years to 1809 years. This topological configuration permits mass balance approaches as an aid in studying the flow of water and chemicals.
- As an observation by the Great Lakes group, it was noted that there would be tremendous benefits if more databases were available for integration into metadata.

EUTROPHICATION

EXISTING:

Inputs (Rivers)
- State DNRs (e.g., Ohio EPA)
- IJC (D. Dolan)
- USGS/NAWQA
- Canada: Database (STAR)
  CCIW (Ontario, Erie)
- Metro sewage districts

Inputs (Atmosphere):
- Great Lakes National Program Office (GLNPO)
- Environment Canada (Integrated Atmospheric Deposition Network - Ray Hoff)
- EPA (Natl. Atmospheric Deposition Network)

In-Lake:

- GLNPO (Glenn Warren)
- IJC (D. Dolan)
- Canada Center for Inland Waters (CCIW - Ora Johansen)
- NOAA/GLERL
- COE (Dave Reid, Data Rescue)
- Nearshore municipal water intakes (Al Beeton - Report)
- Other intakes
- Remote sensing (e.g., CZCS, AVHRR, ADEOS, SEAWIFS)

NEEDS:

- New models, review loading, e.g., Lake Erie)
- Remote sensing (need for better interpretation)
- In situ high resolution
- Lake surveys

HABITAT MODIFICATION

EXISTING:

- Lake levels (COE, NOS, Canada)
- Wetlands (state DNRs, aerial, remote sensing, GIS): need better classification/quality assessment
  NOAA Hazmat RPI, Nature Conservancy (Sue Crispin), USFWS Natl. Wetlands Inventory (Herman Robinson)
- Submerged aquatic vegetation mapping/inventory (now mostly project specific)
- Land use/construction (Landsat, SPOT)
- State DNRs (GIS)

NEEDS:

- Better remote sensing
- Change in biodiversity/quality change

- Water clarity, SAV, effects of non-indigenous species

HYDROLOGIC/HYDRODYNAMIC DISRUPTION

EXISTING:

- Lake circulation
    - Localized effects
    - Model data (derived)
    - In situ (NOAA/GLERL, only long term data NDBC buoys)
    - Lake Michigan nearshore (GLERL - Milwaukee, U Wisconsin GLERF)
- Watersheds, inflow (USGS, COE)
- Episodic events
- Water levels

NEEDS:

- More buoys (in situ needed for ground truth of models)
- ADCP data

EXPLOITATION OF RESOURCES

EXISTING:

- Catch statistics (state DNRs, Canada - Tony Frank)
- Creel census/sport catch (state DNRs, Canada - Interior)
- Research trawls (T. Frank - GL Science Center)
- Stocking databases (DNRs, USFWS, GL Fisheries Commission)
- Sand/gravel/minerals
    - Removal records (state geologic surveys, e.g., Ohio)
    - Lake Erie (Gas - Canada)

NEEDS:

- Acoustic trawls (extend work in Lake Michigan to other lakes)
- Predator assessment

TOXIC EFFECTS

EXISTING:

Levels:

- EPA STORET
- GLNPO/EPA
- Canada
- IJC (42 areas of concern)
- NOAA Status & Trends
- State DNRs
- USFWS
- COE (sediment)

Effects:

- USFWS (e.g., reproduction effects, cross bill, tumors)
- PCBs (Ongoing Jacobson study of mothers & children)
- EPA "Great Waters" report (connect levels and effects)
- Saginaw River (Rutherford & Ludwig bird study)
- Endocrine disruption (Theo Colborn - birds)

Sources:

- IJC (Dolan toxic release inventory)
- EPA (release vs. deposition)
- GLNPO (rivers & atmosphere)
- Environment Canada

NEEDS:

- Data on water changes and concentrations (Lake Michigan work needs to be extended to the other Lakes)
- Mercury loadings
- Mercury in birds (3 target species)
- Bioactive concentration measurements
- Mass balance (evasion)

NON-INDIGENOUS SPECIES

EXISTING:

- USFWS
- USGS/BRD - Gainesville, FL
- Great Lakes Center

- State DNRs (fish, e.g., goby)
- Canada - Ontario Hydro
- Purdue University (Web site, Sea Grant)
- NY Brockport (Zebra mussel Clearinghouse)
- GLERL (Saginaw Bay, Lake St. Clair)
- USCG (Ballast water, national database - Smithsonian)
- Great Lakes Fish Commission (sea lamprey)

NEEDS:

- Systematic survey, better overall approach
- Early warning system
- More emphasis on near-shore, adjacent wetlands
- Ecosystem impacts/predictive models

GLOBAL CLIMATE CHANGE

EXISTING:

- GLERL - thermal structure with thermistor strings (in works)
- Meteorological data (NCDC - temperature, precip., ice cover, buoy data)
- Lake levels
- Paleoclimate/proxy data
- Satellite data (SPOT, Landsat, etc.)

NEEDS:

- Better coordination
- Basin wide measurement grid

SHORELINE EROSION & SEVERE STORMS

EXISTING:

- Shoreline survey data (NOS, satellite, aerial surveys)
- Property/cadastral survey data/land records
- Storm intensity/frequency (NCDC)
- Dredge records (COE)

NEEDS:

- Shoreline change analysis (via satellite)
- Predictive ability

REPORT FROM THE GULF OF MEXICO WORKING GROUP

PARTICIPANTS

Facilitator: R. Carney
Rapporteurs: D. Hamilton and M. Crane

Steve Gittings, Dave Stage, Troy Holcombe, George Henderson, Larry Goldman, Bob Wiseman, J. J. Waterreus, Lee Edmiston, William Schroeder, Mack Felton, Rex Herron, Eric Anderson, Gus Antonini, Mark Monaco, Norman Froomer, Phillip Hinesley, Mark Luther, Doug Hamilton, Mike Crane.

Introductions of members in the room

Issues:

General issue Boundaries Tidal lands to shelf break

The topic of where is the shore=ward boundary and the ocean boundary was discussed.

1. Habitat Use	Loss Assessment Restoration Enhancement
Highest category	Concern-monitoring not mentioned Identification of habitat
2. Nutrient Inputs	Includes contaminants
High category	
3. Freshwater input	Discharge
High category	

4. Break apart and distribute to Issue 2 and Issue 8.

Low category

. Population stability	Commercial species and ecosystem scale

low category

6. Trophic dynamics	Links in ecosystem

low category

7. Physical modifications	Florida doubles survey, recreational boating late 80's NOS to resurvey deep water harbors
Highest category	Concern - qc of data

Data bases: local gov contracts for data collection Source USACE and local

8. Toxic materials	Chronic

High category

9. Coastal Erosion

High category

10. Saltwater intrusion	aquifer

Low category

11. Catastrophic events	all

High category

12. Global change	sea level, rainfall storminess

Low Category

13. Nuisance/exotic species	shrimp virus, range extensions

Absolute lowest category

Additional data needs Local currents and winds ADCP is possible with met.data

Facilitator's Observations on Gulf of Mexico Coastal Data

Due to the location of the meeting, the Gulf Coast of Florida was heavily represented, with attendance diminishing rapidly westward. A single Texan was present. When reviewing the NRC coastal priorities, it was evident that habitat change caused the greatest concern. Since the Gulf of Mexico contains a great diversity of habitats, it was to be expected that specific regional interests would vary. The details and data sets identified are given in the session report. It is the purpose of this section to point to three Gulf-wide concerns.

1. Geographic Range of Inter-Region Similarities

In many respects the Gulf and Caribbean form a single unit encompassing both the mainland states and islands. Between those states and the islands are a host of nations, island nations, and colonial outposts making this a geopolitically complex region. If NODC chooses to organize regionally, it should be prepared for a multinational effort in the Gulf. The Gulf is also a complex region with extensive reef tracts, mangrove stands, expansive estuaries, the Mississippi-Atchafalaya delta complex, hypersaline lagoons, and many other habitat types either regionally unique or shared with some other regions. In establishing regional centers, NODC bears an obligation of assuring no single habitat or single issue myopia. Understanding coastal issues and coastal habitats in the Gulf and elsewhere is going to be a complex challenge. Simple regional autonomy is actually unlikely to meet complex regional needs.

2. Issue-Based Database Development Can Not Stop at an Arbitrary Shoreline

Most habitat change issues deal with a complex ocean-land interface where coastal problems are increasingly seen as connected to watershed processes. For example, canals associated with coastal development are an issue on the Florida coast. Massive land loss is an issue in Louisiana's delta regions. The Gulf of Mexico coast in Louisiana experiences the most rapid apparent sea level rise on Earth. And, Texas has concerns over its extensive barrier islands. NODC would be well served by an effort to determine what types and geographic scales of watershed data should be included.

3. Do Not Ignore Offshore Oil and Gas

NOAA is, in some respects, an agency with a peculiar partial mandate. Its focus is the ocean, but it has no mandate for, and only minimal connection to, the offshore oil industry. Minerals Management Service (MMS) in Interior has that resource mandate, but neither MMS or Interior has a particularly strong ocean interests, and have

traditionally depended upon NODC for archiving of extensive offshore studies. In this situation one can see signs of both cooperation and diluted effort. With more than 4000 offshore structures off Louisiana and Texas oil and gas issues are extremely important in the Gulf of Mexico. NODC would be well advised to work closely with MMS nationally and within the Gulf. The multi-state, multi-institution Gulf-Wide Geographic Information System (GWIS) under development by MMS might serve as a good model of coastal data systems.

REPORT FROM THE WEST COAST WORKING GROUP

PARTICIPANTS:

Facilitator: M. Davidson
Rapporteurs: R. Fauquet and N. Hall

Participants: Susan Hills, Douglas Sherman, Deanne DiPietro, Jason Yap, Sabine Harms, John Helly, George Boehlert, Randy Dana, Edward Bowlby, Bernard Megrey, Eric Crecelius, Ken Dzinbal, Jan Newton, Jane Small.

10:44 AM Tuesday

Review priority issues
Identify existing and historical data sets

Doug Sherman (U.S.C. Sea grant Director) Will be the group's "mouthpiece" for reports)

Introductions & expectations
Review West Coast priorities from NRC report

Problem - Addition to priority list:

> Coast is more than wetside - watershed, landside, pollution, hazards (seismic & volcanoes)

Issues:

> Eutrophication
> Habitat modification
> Hydrodynamic
> Hazards
> The above need to be defined in terms of the range of natural variability

Is eutrophication a problem? Yes, especially in some local areas.

WHAT DATA SETS EXIST and are important to your interests:

A. Habitat

Shore Birds survey (a NOAA data set of nesting sites) (NOS/SEA Betsy Archer)
Hydrographic Surveys, NOAA/NGDC available "Base layer"
WA State Dept. of Natural Resources Tom Mumford

Tidal, subtidal

AK DNR -- Emily Vinion
Moss Landing (for Washington data) Rikk Kavitek
UAF -- Sid Stillwaugh
Washington UW Bob Paine
USGS Subtidal BRD Ron Jameson (Corvallis)

Pelagic

Jan Newton WA DE
UW Historical

Outer Continental Self

SCCWRP Jim Allen (So Cal Coast Water Resources Program)
Rita Horner UW
Jack Wekell NMFS Seattle
U WA Miriam Guichard

B. "Critters"

Sea birds

Ulrich Wilson (WA)
Vivian Mendenhall (AK)
Roy Lows (OR)
Point Reys Bird Observatory
Wash. Dept Fish and Wildlife
Cris Thom??

Salmon & Steelhead Inventory
Washington Dept. Fish and Wildlife
Salmon Genetics -- Population Databases
Alaska Fish and Wildlife(Also Mammals)
Marine Laboratory, Seattle
CRIS -- flow. Population

Sea Otters USFWS Jim Estes, UC Santa Cruz

US Fish and Wildlife, Marine Life Management, Anchorage
WA State Dept of Ecology
Marine Mammals Management, US Fish/Wildlife

Fish

Washington F& WL Steve Jeffries
OR ODFW Robin Brown
CA DFG -- Pete Bonidelli (unsure of spelling)
The Nature Conservancy Endangered List
Marine Mammals, Smithsonian, James Mead
Will Daspit, NMFS, Seattle (Sand Point)
International Pac. Halibut Commission . Don McCochran

Benthic/invertebrates at State FWS

Plankton CALCOFI
Any NMFSC
WA Dept of Ecology
UW Megan Dethier
U. AK Fairbanks -- Chirk Chu
Los Angeles County Museum of Natural History

Shellfish

OR Dept. Agriculture
WA Dept. Agriculture -- Ray Jandl
Bovines

HAZARDS

SIO Coastal DATA Zoo
USC of E -- CA Storm Surge Model
Tsunami Warning Kodiak, PMEL
USGS Seismic
Palo Alto, USGS Seismic
CA State Div Mines &U Geol (Sacramento)
DOGeology and Mineral Industries OR George Priest
AK Geophysical Inst UAF Sherrie George

UW Dept of Geophysics
CA Dept. Boating and Waterways -- Ron Flick at SIO
So. CA Earthquake Center, U. So. Cal
Sea Ice -- Sherrie George & Martin Jeffries UAF

Man -caused problems -- Spills, etc.

State Spill Response
Office of Marine Safety
Coast Guard
HaZmAT
Exxon Valdez Trustee Council
Santa Barbara Channel Study -- SIO
MMS Lease Sale Environment Study

Eutrophication

Wa Dept Ecology Fresh, Costal
AK Dept. of Environment
Harmful algal blooms UW Rita Homer
NMFS Jack Wekell
WA Dept of Health Guichard

Toxics

WA Dept Ecology -- Ken Dzinbal
SCCWRP Jim Allen
Amer. Marine Mammal Tissue Archive Program - Paul Becker at NIST (see Susan Hill for Identification)
EPA Superfund Data
NOAA Damage Assessment Center
DOD Coastal Military Site -- (Environment study data) (Records of former dumps)
USGS CNG Tom Chase
US Army Corps of Engineers Dredge spoils data

Hydrological (Water Cycle)

USGS "NA Stream Flow & Water Quality A" and Stream Flow Data
US Army Corps of Engineers, Flow: Civil Engineering Res. Ctr., Dredge

PACCLIM Dan Cayan at SIO
Div. Of Water Resources -- All coastal states
NWS: Flow data -- Office of Hydrology
Oregon Water Resources Dept. Mike Ciscell

Climate

Joint Institute for study of Atmos & Ocean UW Ed Miles
PICES Doug McCone Sydney BC (& Sid Stillwaugh)
McCone is at: Inst. Ocean Science

Global Climate Change
Retro numerical model output -- Future Will have time and scale
Reanalysis Project / CD Rom NOAA/NCEP Larry Breaker

IF I COULD HAVE ONE DATA SET CREATED:

Current and Historical wave characteristics and near shore profiles and sediment characteristics
Current and Historical spatial and temporal flow patterns of California and Alaska currents
Current and Historical records of patterns of exploited fish populations (fish scale deposits,
Fish remains in archeological midden data)
Integrative analysis tools for Information products -- integrated together, spatially referenced (Data sets expressed as GIS images)
Ocean Color -- Processed imaging / digital format
Buoy array (TOGA style) for near shore coast of Washington including Puget Sound and Strait of Juan de Fuca
Coastline change and land use change
One "true" shoreline

TIE into State Data Centers

One aim of increase of diversity in NODC data should be to allow documentation of variability
Old data sets are important, even if not accurate, to provide information on range of variability
Remember the value of historical data sets - for what they reveal about natural variability

Acronyms

AK - Alaska
DE - Dept. Of Ecology
DFG - Dept. Of Fish and Game
DNR - Dept. Of Natural Resources
F&WL - Fish and Wildlife
FWS - Fish and Wildlife Services
HAZMAT - Hazardous Materials (NOAA)
MMS - Minerals Management Service
NIST - National Institute of Standards and Technology
NWS - National Weather Service
ODFW - Oregon Dept. Of Fish and Wildlife
OR - Oregon
PACCLIM - Pacific Climate Program
SIO - Scripps Institution of Oceanography
UAF - University of Alaska Fairbanks
USCoE - US Army Corps of Engineers
Wa - Washington

REPORT FROM THE ISLANDS WORKING GROUP

PARTICIPANTS:

Facilitator: A. Miglarese
Rapporteur: P. Caldwell and D. Grimes

Lelei Peau, Eric Gilman, Susan Burr, Ernest Matson, Evangeline Lujan, Kurt Grove, Carmen Gonzalez, Roy Watlington, Barbara Kojis, Ed Towle.

Prioritize listing of issues

Sedimentation was added to the NRC priorities and was ranked as #1.
The group also agreed that population increases is an over-riding issue.

Ranking priorities

1. Sedimentation - 8 votes
2. Habitat modification - 7 votes
3 & 4 Eutrophication and Shoreline erosion and hazardous storms (**changed to coastal hazards**) - 5 votes each
5 Exploitation of resources - 3
6 Hydrologic and hydrodynamic disruption - 1
7 Toxic Effects - 0
8 Introduction of nonindigenous species - 0
9 Global climate change - 0
10 Pathogens & toxins affecting human health - 0

Issue #1 - SEDIMENTATION

Listing of data sets available: 14 data sets identified
1) USGS gauging station information (Matson) - This is a needed data set for Guam & Saipan.
2) CCAP/NSDI/FGDC for collecting metadata; also USGS sponsored state and territorial Metadata Coordinating Councils (Towle)
3) Land use data from satellite (Gonzales)
4)Bathymetric surveys taken from different years can be intercom pared (Grove)
5)V.I. aerial photography (source=Island Resources Foundation, Univ. Of Virgin Islands) (Watlington)
6) AVHRR data maintained at NODC (Hendee);CSC did retro 1 km AVHRR data; runs

on PC, Sea view
7) Ocean Color Thermal Scanner (OCTS) Data - NESDIS/OSDPD
8) Well drilling records (permit files from regional zoning/land use dept. For alluvial plains geology "cores") (Towle)
9) Sediment data in Puerto Rico (contact Kathy Scadler of Woods Hole Oceanographic Institute (Grove)
10) National Technical Means - source military (Crosby)
11) Miscellaneous data sets taken by commercial companies, for example, cable settings by AT&T, offshore surveys by oil companies - Exxon, Puerto Rican Power, MTC & Sprint for CNMI.
12) Directional wave data (current, pressure) Univ. Puerto Rico, (Grove)
13) Natural Resources Conservation Service (NRCS) - Soil data maps
14) Status of US EPA old STORET database

There is a lot out there. Need to pull disparate data together. The group had a difficult time identifying know data sets, demonstrating that a primary need of the island is to have these data sets made available.

Isolated and unique - Virgin Islands - historical sequence of aerial photos to help track shoreline change do exist; shared between Island Resources Foundation and Eastern Caribbean Center and the Univ. Of the Virgin Islands

NEEDS

Turbidity data needed
Dimension of sediment plumes in coastal waters needed.

Integration - correlation/interpretation needed in user friendly format needed. Data alone are useless.

ISSUE #2 Habitat Modification

Data sets

1) Virgin Islands -All the old aerial photos - Island Resources Foundation/ Army Corps of Engr. (Kojis) (Towle)
Highway Dept./ NOAA has flown all of the islands/but does not have all shorelines of every island
Dept of Natural Resources/Puerto Rico (Gonzalez) - U.S.G.S. - National Wetland Inventory maps. These maps are not very accurate for island because the scale is too

large.
2) CCAP Data - Coastal Change (Miglarese)
New satellites coming on soon - 1 acre min. resolution presently available
SW corner of PR at Univ. of PR (Gonzales)
3) Monumentation - 1st order, latitude, longitude, elevation; source NOS
4)Univ. of Puerto Rico habitat info.- coral reef, time series

5)Building permits - American Samoa, V.I.
Problem of keeping records - destroyed by hurricanes, self-destructing celluloid
NOAA's data rescue effort - possible funding source
Need national data archive; also local archiving
DoD unclassified
6)V.I. - shelf data - reef base CD-ROM (Kojis)
7)St. John, V.I. - benthic map available in digital form from V.I. National Park Service, also CDC/UVI has (Towle)
8)NOAA Harbor charts - these need to be updated for CNMI
9) Army Corps keeps RANS (Gilman)
10) Oil spill sensitivity maps - Research & Planning Institute/ NOAA Hazmat (Towle)
11) Sea bird and turtle nesting; U.S. Fish and Wildlife Service (Gilman), also V.I. N Port Office
12)Habitat digitizing maps at Univ. Of P.R.
13) Conservation Data Center/P.R., V.I. have data /can help to get in touch
14)Nature Conservancy - Christmas bird counts/ Audubon (Miglarese)
15) British Virgin Islands; - Marine Atlas has been digitized; in ArcInfo
contact Louis Potter, Gillian Cambers, Towle

Don't know integrity of the data suggested.
Still needs interpretation of the data; issue driven analysis needed.

Margaret L. (Rhode Island) - Importance of link with the military for some coastal data; NODC needs to establish this link.
There are very little data for the island, especially the Pacific. What data there are is held by the military.
Suggest - resolution accepted by all five regions - for NOAA as a outcome of this meeting -
to demonstrate; to provide a data set available to the islands.

AFTERNOON SESSION

ISSUE #3 Eutrophication

Data sets:

CNMI - No ability to use digitized data. Higher priority for training.
Guam - Situation if you have the data now, you will be ready.

Summarization - there should also be necessity for training and infrastructure development.

1) P.R. - contact Dr. Braulio Jimenez, Dir. Of Grad Environment, Rio Piedras Campus, U. P.R.
Biological Research Division (Gonzales)
2) Guam - Water Resources Institute of Guam (U.S.G.S.)(Matson) contact: Jim Marsh at Univ of Guam
3) Div. of Environmental Quality, Saipan - (Gilman)
4) Jorge Capella, Dept of Marine Sciences, Magueyes, Univ of P.R. - Circulation, temp profiles, cross shelf dispersion, conductivity.
5) BOMEX - contact NODC, Rasmussen
6) National Technical Information Service - technical reports and publications
7)Eutrophication assessment; contact - Mark Monaco

Like to have- wish list

1) V.I. - Instruments that actually record nitrates hourly; to tell you about the change; to monitor the continuous change
2) Guam - diurnal change - biggest problem; Instruments not yet available; not sensitive enough
3)AOML - getting ready to do air sea parameters and fluorescence telemetered via satellite (Hendee)
4)Cman+ buoys in the Caribbean; 1 meter; 3 meter temp salinity
Not just oceanographic data; add coastal

ISSUE #4 - SHORELINE EROSION AND HAZARDOUS STORMS
change to **SHORELINE EROSION AND COASTAL HAZARDS**

Data now have-

1) Navy has - location of submerged ordnance
2) NWS - P.R., Hawaii, Guam - slosh models; contact Aurelio Mercado
3) Corps of Engineers -100 year flood maps, storm surge
4) NOAA HAZMAT - environmental sensitivity

5)FIRM maps - from FEMA

Suggestion methodology behind FIRM maps - asking FEMA; National Flood Insurance Program; useful to know the math and logic behind the FIRM; often not coordinated with slosh.

6) CFRAMP - Caribbean Fisheries Resource Assessment and Management Project - Shoreline/erosion rates for P.R.; CARICOM, Guyana

7) V.I. - Pollution Susceptibility Map for territory; contact Island Resource Foundation(Towle)

8) DNR - CDC, U.S. Army Corps Orthophoto Quads, digital with 5 foot contours - Whole Territory , 1995 (Kojis)

9)NOS Photogrametry

10) Historical storm track frequencies - Army Corps

11) Algae blooms; contacts: Pacific Basin Development Council; World Aquaculture Association AC-A for Aquaculture - at National Agricultural Library, Sherwood Hall, FDA

12) IXTOC - Bottle drifter studies; contact Don Atwood

13) Caribbean Pollution - IOC - mapping for regional pollution

14) Tsunami consultation workshop, May 1996, IOCARIBE; contact: Rafael Steer-Ruiz - Cartagena, Columbia

Would like:

1) Historical Tsumani data - NGDC - for Pacific

P.R. generating data for 1918 tsunami - Workshop in June (A. Mercado)

2)Outfalls

3) El Nino data

4) Landfill areas for housing (Samoa)

ISSUE 5- EXPLOITATION OF RESOURCES

Wish list

1) Altimetry for determining bathymetry- satellite imagery for sea floor -

Known Data

1) Fisheries data

NMFS catch data

Dept. of Aquatic Resources on Guam

P.R. Dept of Natural Resources - fisheries

Caribbean Assess of Fisheries - Canadian funded - Belize - Terracomp Science -

Jorge Garcia, contact: Frank Granger

2) AOML - harvesting coral (Hendee)

3) Corps. of Engineering Mineral Management Service - lease blocks - mining, sand, gravel, oil, etc.

4) Ocean dumping sites - NOAA

OCEANOGRAPHIC DISCIPLINES AND MANAGEMENT WORKING GROUP SESSION NOTES

REPORT FROM THE PHYSICAL OCEANOGRAPHY GROUP

PARTICIPANTS:

Facilitator: V. Waddell
Rapporteurs: R. Fauquet and N. Hall

Steve Haeger, John Collins, Don J. Wiseman, Jr., George Weatherly, Scott Thieme, Sabine Harms, Edward C. Monahan, Eric Anderson, Rob Quayle, Roy Watlington, Van Waddell, Celso S. Barrientos, Christopher Miller, Robert Reeves, Wendell Brown, Richard Signell, Mark Luther.

PHYSICAL DATA GROUP SESSION

Data and Information Requirements

Identify sets, then step through requirements, emphasizing items not usually recorded with data sets.

For example, what model current meter takes the current data

Richard Signell -- Precipitation, insulation, humidity, other types of data needed for heat flux calculation

BATHYMETRY - Grid scale (several resolutions) and original soundings

Depth in meters
Quality control
Spatial continuity, quality control
Horizontal and vertical, projection problems
Geoid datum
Report statistics (max in grid cell, etc)
NODC/NAVO should provide index of what bathy data is available from each source (Steve Haeger & R. Signell)

SHORELINE

Corps of Engineers - Bathy set has shoreline as zero values (or no data) in bathy files
Central repository for data access (perhaps Virtual Data Center covers this)
Gridding algorithm, complete parameters

TS CURRENTS (OBSERVED)

Start and end dates, times, for inventories (not just months)
Current meter data (not just inventory) online access
DODS system, as client for, eg, MatLab (R. Siegnell explains)
Reduces number of steps to access distributed data
Under development, official release end of this month
NOAA SERVER locates data, for DODS, you need to know source
MEL
(Distributed systems and access technology will have its own session
Wednesday PM, says H. Frey)
NODC Assistance in building, implementing distributed servers
Instrument type (metadata)

MOORED ADCP (Fixed Position, Stationary)
Signal strength/ echo amplitude

An NODC format is needed
Include temperature records
Instrument type
Instrument orientation (up or down)
Should vertical velocity be part of data record? (Controversial - is it useful?)
Assumption is that all parameters in header record will be included - what is being
listed should be considered the minimum, or additional items (Eric Anderson)
Ancillary engineering data (Wendell Brown) items taken into consideration when
designing ADCP experiment

SEA SURFACE RADAR (OSCAR /

u, v, quality and x,y quality (Lat, Lon)
Info to understand reduction procedures

LAGRANGIAN DRIFTERS

Method of navigation (Argos, GPS, or other means of positioning)
Raw Fixes should be distinguished from interpolated data

QC info for argos, or other navigation
Online access

PROFILE INFO (XBT, XCTD, AXBT, AXCTD,
Subsetting access and selection (Applies to all data types)
CTD instrument type, processing method
CTD, XBT drop rate
Ron F. describes XBT drop rate problem decision - keep legacy data as is, with info on how to make correction, if desired
NAVO does not include instrument type; A rep of NAVO suggests to Ron F. that NAVO might be able to modify MOODS format to include instrument type
Other profile parameters:
transmissivity
Light / PAR
DO -- Oxygen method
Fluor.

METADATA, (for all data types)

QC, or some measure of data quality, a quality index, or characterization
(Not that NODC should dictate QC methods for all data types, but some indication of what QC or Q Assurance has been done is needed in data record
PI identification for data set (more important than institution)
Instrument type, Data processing procedures

SHIPBOARD ADCP

(Ron F. explains that E. Firing's CODAS system is currently used at NODC)
Ship orientation and detailed ship navigation -- hard to use data from continuously turning ship for example when turning to stay on station
Calibration information, of instrument on vessel (reverse track info, etc)

SEA SURFACE TEMPERATURE

Acronyms

ADCP - Acoustic Doppler Current Profiler
DODS - Distributed Ocean Data System
MEL - Master Environmental Library

REPORT FROM THE BIOLOGICAL OCEANOGRAPHY WORKING GROUP

PARTICIPANTS:

Facilitator: R. Carney
Rapporteurs: S. Stillwaugh and D. Hamilton

Judy Pederson, Tony Frank, George Bohlert, Jane Small, Bob Van Dolah, Mark Monaco, Lee Edmiston, Sue Hills, Stephen Brandt, John Pohlman, Barbara Kojis, George Henderson, John Ogden, Mark Felton, Jim Hendee, Ed Bowlby, Bob Stone, David Remsen, Livingston Marshall, Bernard Megrey, Fred Grassle.

Data Requirements:

A. Primary Production - Chlorophyll, C14, biomass, nitrogen & phosphorous uptake

1. Data types and units
   Chlorophyll (milligrams per liter)
   Carbon14 uptake
   Biomass
   Nitrogen & phosphorous uptake
4. Metadata and documentation*
   Measurement methods are critical
6. Search and retrieval capabilities
   Generic geographic and time
7. Access

B. Species Identification - needed for all other biology data types

1. Data types and units - need to be able to retrieve data by species (content-based searches)
2. Levels of precision and accuracy* - species level
3. Levels and types of quality control* - method of identification; date of taxon list important
6. Search and retrieval capabilities
7. Access - Species-derived indices are useful, but original data should also be available

C. Zooplankton

1. Data types and units - volumes, counts, weights

2. Levels of precision and accuracy*
3. Levels and types of quality control*
4. Metadata and documentation* - collection methods important (gear characteristics)
5. Use of national and international standards for content, format, and data exchange
6. Search and retrieval capabilities
7. Access - related physical data may be needed in estuaries (tide stage, currents)

D. Nekton - fish

1. Data types and units - stock assessments (lengths, ages); species
2. Levels of precision and accuracy*
3. Levels and types of quality control* - spatial location quality not good
4. Metadata and documentation*
5. Use of national and international standards for content, format, and data exchange
6. Search and retrieval capabilities - generic plus species
7. Access

E. Marine Mammals

1. Data types and units - census counts, native harvests, strandings, post-mortems (U ALASKA has Marine Mammal Tissue Bank); image data; genome data(?)
2. Levels of precision and accuracy* - species
3. Levels and types of quality control*
4. Metadata and documentation*- observing conditions
5. Use of national and international standards for content, format, and data exchange
6. Search and retrieval capabilities - generic plus species
7. Access

F. Birds, Turtles

1. Data types and units - census (counts) from platforms, shore; radio track; radar; bands; colony counts; organismal data; habitat, images
2. Levels of precision and accuracy* - low
3. Levels and types of quality control*
4. Metadata and documentation* - collection methods, observing conditions
5. Use of national and international standards for content, format, and data exchange
6. Search and retrieval capabilities - generic plus species
7. Access

G. Bottom Dwellers

1. Data types and units - Trawl, Grab, Images, Transect counts, Video Quadrant Counts
2. Levels of precision and accuracy - gear performance assessment; taxonomy; volume is not recorded, but is critical for derived statistics
3. Levels and types of quality control*
4. Metadata and documentation* - design philosophy is critical
5. Use of national and international standards for content, format, and data exchange
6. Search and retrieval capabilities - generic plus species
7. Access

H. Toxicity

1. Data types and units - Bioassay (e.g. Status & Trends, Mussel Watch)
2. Levels of precision and accuracy*
3. Levels and types of quality control*
4. Metadata and documentation*
5. Use of national and international standards for content, format, and data exchange
6. Search and retrieval capabilities
7. Access

Facilitator's Observations on Biological Coastal Data

Robert S. Carney
Coastal Studies Institute
Louisiana State University

Upon determination of the session attendees' expertise, it was found that there was good representation of experience along ecosystem function and traditional oceanographic lines. Thus we were able to review the discussion topics for primary production, zooplankton, nekton, and benthic consumption. The specifics of this discussion are detailed in the session report. This section is intended as an overview of issues of data type and data usage which may pose new challenges to NODC as it moves into shallow water.

1. Inherent Complexity of Ecological Data from Coastal Systems

One has only to start with primary production to see that ecological data in coastal systems can be far more complex than in open ocean systems. In addition to ubiquitous phytoplankton, there are benthic diatoms, submerged plants, stands of mangrove trees, coral symbiotes, and a changing species complex of plants across the estuarine gradient. In addition to the offshore production measurements employing carbon isotopes and

pigments, coastal data may include leaf lengths, root biomass, tree girth, and leaf litter fall. Even the nature of the traditional oceanographic stations may change. Continuous transects will be more common than discrete stations, and navigation data increasingly suspect.

2. Content-Based Data Retrieval

For many ecological processes the major questions are not "what is happening at point X in the ocean". Rather, it is far more likely that the question will be "where are all the places in the ocean where a specific phenomena is occurring or where a certain species is found. A simple example would be a plot of all locations reporting the presence of the commercial crab *Callinectes sapidus*? The current geographic system employed by NODC does not allow for such a question to be asked.

3. The Unresolved Species Problem

Since the participants in all ecological processes are members of some species, categorization of data under some species identifier will be an inherent aspect of any ecological data set. As unavoidable as this is, it poses very serious questions which will only become worse in shallow water. As presently collected and archived species data must be considered to be highly suspect and subject to errors that are potentially large and beyond correction. This is due to two serious mismatches between how systematics and identification progress and the needs of categorical data. First, there are no agreed upon international standards for what attributes are necessary for the recognition of a particular species, and all species are subject to redefinition in response to additional study. Each species category is, in reality, a tentative classification subject to change. Second, there are no agreed upon standards of quality assurance for species identification even if the species have been carefully defined by a competent taxonomist

It should be noted that replacement of the NODC species codes with a new system is an improvement. The old system's attempt to reproduce the Latin hierarchy of kingdom, phylum, order, class, family, genus, species with a numerical equivalence was plagued with hierarchical inconsistencies across taxa (i.e. subspecies, tribes, suborder, superfamily, etc.). And, tracking changes in hierarchical assignment required a historical synonymy. However, the new system still makes the serious error of assuming that species is a well defined category, and that there is no error in assignment to category.

Possible Courses for NODC

On the whole, biological oceanographers and coastal ecologists are well trained in study

design and statistical analysis. They are not, however, well versed in the rapidly progressing world of large scale data management, database structure, and data retrieval. I would venture to guess that few data experts are well versed in the questions and data problems of biologists either. Perhaps then NODC might take the lead in matching minds and finding innovative solutions. Can the fuzziness of systematics be overcome? Can flexible hierarchies be adopted which accommodate changing methodologies? Can the data be made more useful? Answering these questions prior to a wholesale collection of data sets may be the most productive course.

REPORT FROM THE CHEMICAL OCEANOGRAPHY WORKING GROUP

PARTICIPANTS:

Facilitator: A. Andren
Rapporteurs: M. Conkright and P. Caldwell

Dennis Leonard, David Edgington, Ken Hinga, Eric Crecelius, Kent Price, Jan Newton, Don Boesch, Christopher D'Elia, Ernie Matson.

I. DATASETS RELEVANT TO CHEMICAL OCEANOGRAPHY

MAJOR DATA TYPES

a. Routine measurements: salinity, pH, eH, oxygen, alkalinity, oxygen, nutrients (phosphate, nitrogen species, chlorophyll a, CTD casts, silicate
b. metals
c. organics
d. Sediments
e. DOC, POC, sulphides
f. organic contaminants

National status and trends - NOAA
EMAP - EPA
STORET - EPA
NOAA should make available on NOAA server in friendly-user way

COE EIS statements - manuscript data
Monitoring programs
ORCA NOAA eutrophication datasets
Alaska deposition datasets
Permit discharge data
International joint commission USGS
NAQUA - USGS
National atmospheric deposition network
COE sediment data
Navy coastal data

Synthesis reports - sometimes better than original datasets
Who are the users who would use these datasets

WATER COLUMN:

1. SALINITY/CONDUCTIVITY

a. identify conductivity, salinity, depth, pressure in database and instrument type
b. Data sources
    STORET
    NODC
    Navy - classified data
c. Precision
    accuracy is not a big issue in coastal data
    user should determine what is useful
    method/technique important
    be able to retrieve data based on precision and instrument
        assign a code to data to identify precision
d. Quality control
    source of the data must be identified
    data should be kept together for projects
e. Metadata
    metadata needs to be a part of the data set
    link data to metadata
f. Format
g. Search and retrieval
    spatial resolution in retrieving data
    user online: browse and search
h. Access
    make EPA data more accessible
    make data access user friendly - STORET
    free and open access
    central vs. distributed data
        "shoe box" data better served by distributed server then turned over for "deep" archive - large project data should be at central server
    online retrieval
    links to other agencies who serve data
    provide data manipulation tools to facilitate people putting the data online
    be able to examine historical data before downloading or ordering and to look at level of precision, quality control

2. NUTRIENTS - chemically determined
    raw measurements and not synthetic

nitrogen, nitrate, nitrite, ammonium, TOC, DOC

Quality control
a. Nutrient quality in state monitoring studies a problem (storage of data, filtering) - same for permit data. This problem applicable to metals, organics. Original report critical to understanding the quality of the data - documentation critical particularly for historical data.
b. Link between documentation and data - methods section only
c. storage is major problem in QC of data

Data sources:
EMAP - modern, well-documented, broad aerial coverage
Great Lakes monitoring by EPA - QA/QC - good quality
STORET

Units
it is difficult to return to original units -
filter type/size information important

Metadata/Documentation
reference to original source - either original report or information about methods and precision
preference for keeping datasets separate and merged by PI's

Will NODC become the central archive for coastal data? Will it raid other agencies? How aggressive will they be in pursuing data-links to other agencies? Will NODC be the sole archive for the data?

Precision/Accuracy
report precision/accuracy

National/International standards/formats

C. METALS AND TRACE METALS

Data Types
Trace metal studies in Puget Sound - PMEL
Great Lakes Program -
Chesapeake Bay

Units

ug vs. nmoles - important to identify units
ppb in US different than ppb in Europe
oxidation states - need to keep information, specially for Iron
allow for entries that speciate metals

Quality control

filter type/filter size
sampling, storing, analysis - identify whether "clean" techniques
"clean" techniques goes beyond EPA methods - need some knowledge about this?
no standard/accepted clean techniques - only guidelines
want to keep all datasets despite techniques used - data can be used for different purposes

Documentation

intercalibration important for low-level metals - need to have this information techniques important
detection level - limit of detection needs to be documented trace - less than detection limit and greater than blank

Question -Can NODC hold meetings about quality control, precision, documentation issues?

Format

none for trace metals

ORGANICS (HC's, pesticides, herbicides, organo-metallics)

Units

should be reported as moles
many PCB's, PAH's - reported as mg
identify in documentation - explicit how it is reported

Data types

National Status Trends
National TVT program - EPA

Documentation

levels of precision, accuracy

identify whether colloidal
Particulate/dissolved -- filtered or not - type of filter

Format
IUPAC system for identifying compounds

RADIONUCLIDES

Accuracy/Precision
same consideration as metals - precision for every measurement
less than should not be reported - precision accurately reported

Units
dpm or becherels

STABLE ISOTOPES

NODC should be encouraged to acquired stable isotope data

PIGMENTS (phaeopigments, chlorophyll a)

Data types
routine measurement of chlorophyll in Puget Sound
Chesapeake Bay -

Quality control
filtering techniques - state data prior to 1994 questionable due to techniques

Documentation
techniques used
sample preservation

Units
nmoles Chlorophyll

ELECTRONIC DATA (probe data, CTD)

information on calibration of instruments -

SEDIMENTS

include interstitial waters

NUTRIENTS

Data types
- National Status and Trends
- EMAP
- COE EIS reports - major data source

Units
- state whether wet or dry weight
- moles/g
- stated explicitly

Metadata
- cores vs. surface grabs -
- coring device - grabbing device
- ancillary data - grain size/porosity
- fraction analyzed
- acid extracted fraction

Documentation
- extraction methods documented

Format
- recommend using international standards
- total numbers should not be part of the data

METALS AND TRACE METALS

Data types
- NS&T
- COE
- Great Lakes National Program Office
- Puget Sound
- USGS - coring attempts around the US Gulf of Maine, Puget Sound, Mass.
- State Geological Survey data
- Navy remediational studies

Units

metric/weight or molar/weight

Metadata
depth in the water, depth in the sediment

Documentation
type of digestion

RECOMMENDATION:

Include as part of documentation, volume extracted - particularly for metals and organics
Units should be reported as moles for organics and metals
"clean" techniques need to be observed for organics and metals
NODC should acquire stable isotope data
Report as many ancillary data as possible for sediment data

REPORT FROM THE GEOLOGICAL OCEANOGRAPHY WORKING GROUP

PARTICIPANTS:

Facilitator: A. Miglarese
Rapporteurs: R. Abram and G. Heimerdinger

Gustavo Antonini, Doug Sherman, Troy Holcombe, George Sharman, Anne Ball, William Schroeder, Kurt Grove, Allen Hittelman, Norman Froomer, Brad Butman.

Data Requirements: EUTROPHICATION

1. Data types and units: Sediment load/sediment flux (standard gravimetric - wt/unit vol/time)
2. Levels of precision and accuracy*: estimates of loads (low-average-high); ideal daily average flux; data from USGS gauging stations
3. Levels and types of quality control*
4. Metadata and documentation*: Standard protocols

5. Use of national and international standards for content, format, and data exchange: None
6. Search and retrieval capabilities: Ideal - online access to retrospective data
7. Access

* special cases only

1. Data types and units: Remote sensing - suspended loads: (1) reflectance, (2) ocean color
2. Levels of precision and accuracy*: Predetermined by satellite system
3. Levels and types of quality control*
4. Metadata and documentation*:
5. Use of national and international standards for content, format, and data exchange: Science needs raw data (quantitative); managers needs products (qualitative)
6. Search and retrieval capabilities: Needs for (1) in situ ground truth (may have regional algorithms) and (2) link to discharge data. Good to be able to view/dissect image
7. Access

* special cases only

Data Requirements: SHORELINE EROSION & COASTAL HAZARDS

1. Data types and units: Shoreline geomorphology (change over time)

2. Levels of precision and accuracy*: Problem of different reference systems; frequency of resurvey
3. Levels and types of quality control*: Problem of pulling together data from numerous smaller surveys; questions of GPS accuracy (need to reference to benchmarks)
4. Metadata and documentation*: Need for directional wind/wave climatology
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities:
7. Access

* special cases only

1. Data types and units: Earthquakes (magnitude, location, and depth)
2. Levels of precision and accuracy*:
3. Levels and types of quality control*:
4. Metadata and documentation*: Link to geology for risk assessment and hazard maps
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities:
7. Access

* special cases only

1. Data types and units: Tsunamis (also storm surges)
2. Levels of precision and accuracy*: Need higher resolution bathymetry near shore (meters to tenths)
3. Levels and types of quality control*:
4. Metadata and documentation*: Need for post-event data (requires contingency plans for deploying survey teams); need bathymetry and topography for run-up models (similar for storm surges); travel time curves and marigrams.
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities:
7. Access

* special cases only

Data Requirements: HABITAT MODIFICATION

1. Data types and units: Geophysical data - bathymetry (profiles or swaths; gridded products. Special needs for shallow water in-shore profiles.)
2. Levels of precision and accuracy*:
3. Levels and types of quality control*: Need for QC when integrating data from

different sources (e.g., COE, MMS); also need mechanism to account for seasonal variation.
4. Metadata and documentation*: "Time stamp data"; problem of assembling data collected at different times.
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities: Recognize that science and management needs differ
7. Access
* special cases only

1. Data types and units: Side scan sonar (mosaic of back scatter; product - drape geo-referenced back scatter over bathymetry)
2. Levels of precision and accuracy*:
3. Levels and types of quality control*: Problem of pulling together data from numerous smaller surveys; questions of GPS accuracy (need to reference to benchmarks). Ground truth, if possible and link to sediment map)
4. Metadata and documentation*: Standard metadata (e.g., instrument, processing method)
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities: Geo-browse
7. Access
* special cases only

1. Data types and units: Seismic data (high resolution profiles - horizon data, need raw data)
2. Levels of precision and accuracy*:
3. Levels and types of quality control*:
4. Metadata and documentation*: Standard metadata (accepted protocols)
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities: Need product to preview to determine usefulness of data
7. Access
* special cases only

1. Data types and units: Sediment characteristics (surface and subsurface): grain size (phi class), composition (including toxics), description
2. Levels of precision and accuracy*:
3. Levels and types of quality control*:
4. Metadata and documentation*: Methodology (may be region dependent); grain size method

5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities:
7. Access: Long term goal: complete mapping of the EEZ. Problem of access to historical hard copy data (logistical problem; raster scan if good navigation available).
* special cases only

1. Data types and units: Bottom modification data - COE permit data (dredge records), borehole data, and NMFS trawl surveys (where and for what time period)
2. Levels of precision and accuracy*:
3. Levels and types of quality control*:
4. Metadata and documentation*:
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities:
7. Access
* special cases only

1. Data types and units: Shoreline structures, etc. (via municipal, county records or state/local permits)
2. Levels of precision and accuracy*:
3. Levels and types of quality control*:
4. Metadata and documentation*: Need to know materials
5. Use of national and international standards for content, format, and data exchange:
6. Search and retrieval capabilities:
7. Access
* special cases only

Data Requirements: HYDROLOGIC AND HYDRODYNAMIC DISRUPTIONS

1. Data types and units: Hydrologic/hydrodynamic data (important for transport of sediment)
2. Levels of precision and accuracy*:
3. Levels and types of quality control*:
4. Metadata and documentation*: Important to know if data represent natural conditions or reflect man-made changes (e.g., construction of dam). Human impact versus natural variability
5. Use of national and international standards for content, format, and data exchange:

6. Search and retrieval capabilities:
7. Access

* special cases only

REPORT FROM THE MANAGEMENT WORKING GROUP

PARTICIPANTS:

Facilitator: M. Davidson
Rapporteurs: D. Grimes and M. Crane

Steve Gittings, David Remsen, John Collins, John Towle, Eric Gilman, Larry Goldman, Stuart Stevens, Michael Crane, Carmen Gonzalez, Michael Crosby, Evangeline Lujan, J. J. Waterreus, Ken Dzinbal, Norman Froomer, Jennet Alterman, Phillip Hinesley, Lelei Peau, Marion Clarke, Robert Shephard, Randy Dana, Dave Reid, Reed Bohne, Zsolt Nagy, Rex Herron, David Stage, John Rupert, Charles Sun, Jason Yap, Robert Reeves, Dwayne Porter.

Part 1: Taking nine issues from yesterday, what data sets that you would like/wish as a manager?
Part 2: What tools/formats/assistance from technical experts? How do we share it?

Part 1 - WISH LIST

EUTROPHICATION

1) Synoptic ocean color data - processed image/ digital pxl
2) Historical and current biological data sets - on fauna; spacial and temporal distribution
3) Database on nutrient applications, i.e., Ag. Extension Service, nutrients on golf courses
4) Signature from the sediment plums; turbidity for Caribbean Island Basin rendering data in different ways
5) **Land use data**
6) NPDES permit location

Customized/ tie into coastal and land use data sets; work out regional requirements; focus on direct targets; more focused like the islands

Discussion - repeating yesterday; desire planning tools for the future
Discussion - synthesis; how are we going to do; application to politicals; pull it together
Discussion - have to know what data you have/ before building systems
Land data sets are critical to understanding the ocean problem.
Suggestion - Listing of data sets; need time to prioritize; provide a mail out ballot to rank

order.
Comment - three groups here - scientists, managers, educators

HABITAT

1) Land use and habitat - trends over time/ temporal/spatial trends/ species, vegetation, water quality

Ability to make projections

2) Change detection maps
3) Can data provide info on functional capacity?
4) Human patterns of use; demographic info. overlay
5) The Nature Conservancy and other special area information

Integrated into capacity models; sustainable

HYDROLOGIC

1) Ground water capacity; stream flow/ allocations
2) Shoreline protection devices; locations; riverine/ ocean front
3) Catalog of modeling tools
4) Reservoir capacity issues
5) Wetlands/ NWI and recharge areas/ relationship to storage capacity
6) Soil types

EXPLOITATION OF RESOURCES

1) Ditto the HABITAT list
2) Catch/effect data for reef, pelagics and bottoms - All classes of fish
3) Marine Management Service (MMS) surveys: also state mineral surveys
4) Shallow bathy in area of jurisdiction

TOXICS

1) Ditto the HABITAT list
2) Toxic Release Inventory - SARA (EPA database and law)
3) Historical records of industrial uses of near shore
4) Groundwater movement and air movement patterns - downstream - U.S.G.S.
5) EMAP
6) Spill information - HAZMAT/Damage Assessment Center - online

7) FDA action level guidelines

Permit, monitoring
Storm water volumes
Spill trajectory models regionally

EXOTICS - NONINDIGENOUS SPECIES

1) Emerging issues
2) Invasive Species Act of 1996 - $
3) Historical and contemporary aerial photos - plants
4) Catalog of eradication methodologies - successful and unsuccessful
5) Habitat maps for marine species
6) catalog of invasive species - current, potential distrib - What are pathways
7)Ballast H2O exchange sites
8) Disease distribution

How long before exotics become endemic?
Epidemiological maps of the environment

COASTAL HAZARDS

1) Shoreline maps - FEMA
2) Demographic change/use
3) Risk assessment models
4) Impacts of sea level rise - wetlands/groundwater - Local scale (especially islands)
5) CCAP type maps
6) Catalog of shore line protection devices - success measurements
7) Elevation - U.S.G.S. topo maps not helpful at 5 ft. contours

PATHOGENS + TOXINS - HUMAN

1) ISC - fecal coliform data
2) Beach closure data - NRDC + state health
3) Records of incidence associated with waterborne staff: CDC/state health
4) Sediment/water quality characteristics; EPA
5) Livestock

GIS
Suitability of siting industrial septic tanks, package plants
Support regulatory

Part 2 HOW DO YOU WANT THE DATA AVAILABLE TO YOU?

Comment - NOAA is establishing one stop capability for data
Need critical environmental factors/ driving factors in the military
Need to seek and retrieve
Customer base - customer driven

From customer surveys - there is a greater commonality between users than expected - ArcView for GIS. CSC did a customer user survey - 60% return rate; moving towards commonality in hardware/software. Delivery system is here with Internet. Tied to the software available in the market.

Data Centers moving toward more transparent service feature. NODC has not been large on radar screen. Little connection with other agencies. Avoid duplication with other agencies.

Saipan - multiple formats - GIS - need maps now
product in hard copy/digital
U.K./coral reef data
Islands perspective - **need technical assistance** for photo interpretation; need training
Flower Banks
use hard copy from MMS
hard copy bibliographies of research/data
GIS
California
major effort to develop data integration system
regionally based, issue driven
Georgia
Everything digital, INTERNET
want tools over INTERNET - ex.- descriptive statistics to GIS
Apalachicola 14400 baud rate
same as GA
want display tools - maps
Puerto Rico - Jobos Bay
Internet access

take hardcopy maps to GIS

California

WEB utilities - catalog/access points
Metadata/keywords

Guam

have T1 line
want data digital and hardcopy/ access on INTERNET or CD-ROM
with state's coordinate system - which is not utm
smaller scale 1:4800; not in ArcInfo-ArcView

Washington

on-line GIS; a la U.S.G.S.
data available on CD-ROM form
Web search tools - standard for keywords
post-processed remote sensing images
greater use of hot links on web
meta data standards - assurance for data quality

Alabama

grant management; starting from beginning; more technical assistance to use new technology

American Samoa

same as Guam
digital, hardcopy
need easy to use web browser
need analysis/ modeling tools
regional NODC center - for the islands

Oregon

same as previously stated

Grays Reef

digitizing is a problem
two-way street on data flow
synthesis of trends information

North Carolina

packaged databases - plug & play
derivative data bases; synthesized, trends analysis with functionality, visualization

Gulf of Mexico

everything has been previously said

Ohio

digitally with Metadata
INTERNET, CD-ROM

regionalization of data - Great Lakes
catalog of data, types, scales, format

WHAT IS A CATALOG THAT WOULD REALLY BE USEFUL - IAMSLIC included

Involve library community
Can we do an issue driven data base/catalog? California is doing this.
Develop catalog of web access points/ keywords

NEED TECH ASSISTANCE/TRAINING

Photo interpretation
GIS usage
Electronic reporting to OCRM
office automation
find and use WEB utilities

IMPLEMENTATION THROUGH PARTNERSHIPS WORKING GROUP SESSION NOTES

REPORT FROM THE SEA GRANT, UNIVERSITIES, AND "SHOEBOX" DATA SET CREATORS/CUSTODIANS WORKING GROUP

PARTICIPANTS:

Facilitator: A. Andren
Rapporteurs: R. Abram, P. Caldwell, D. Hamilton, S Stillwaugh

Margaret Leinen, Kurt Grove, Ray Watlington, Mark Luther, Ken Hinga, Edward Monahan, Andy Shepard, Dennis Leonard, Judith Pederson, Douglas Sherman, Kent Price, Marion Clarke, David Edgington, Steve Brandt.

The facilitator opened the session by posing the following question - and sub-questions - for discussion:

Q: How can NODC acquire university (or other) generated data sets?
- What is the "carrot" or motivation for researchers to submit data?
- What types of data sets are best suited for submission to NODC?
- How should these data sets be made available to NODC?

Participants in the session addressed these question with the following comments and observations:

Because of the large number of such data sets, the NODC could perhaps serve as a node to help people find them.

One motivator would be provision of a software tool to help enable information about data sets to be more easily captured.

Data collection efforts funded by NSF and Navy include the requirement that data be submitted to the appropriate national data center. Perhaps other extramural funding agencies need to include this requirement.

Many institution are protective of their data (there is typically a two-year delay in data release to allow for publication). It was later pointed out that for students using data in their theses, data release may often exceed two years. Perhaps there needs to be a change in the academic culture that provides rewards (e.g., through the tenure process) for

publication of data. And indeed data availability may need to be a pre-condition for publication of results.

There are practical problems in implementing a program to ensure submission of appropriate data sets. There may need to be a change in culture to recognize data publication as a legitimate activity. Some journals are already taking steps in this direction.

Problem of rescuing data that may be lost when a PI retires. Perhaps small grants could be awarded in these cases to enable individuals to prepare their data at the ends of their careers.

NGDC provides one of their Paleoclimate data sets in exchange for contributors who submit additional data. This incentive of getting a "credit" for submission of data needs to be fostered and advertised.

Grey literature is a subset of the shoebox problem. Efforts need to be made (e.g, OCR scanning of publications) to capture these reports and ensure their availability through facilities such as the NOAA Library or Sea Grant Depository.

Sea Grant can make a valuable contribution to the effort to locate and preserve shoebox data sets. Sea Grant serves as a two-way link between Federal data resources and data resources at the state and local levels. Marine Advisory Service personnel have the particular talents needed to provide this link.

Summary:

Promote the "soft option" of requiring submission of standard data types for which formats or systems exist. Catalog or index other data sets to be available on local servers.

Use both carrots and sticks to promote data submission to NODC or data availability through a distributed system. Carrots include incentives to submit data (e.g., data exchange credit, "sunset" grants to pre-retirees). Sticks are the data submission requirements built into grant such as those from ONR and NSF.

Provide incentives to the library/information science community to promote input of grey literature.

Sea Grant programs can serve as "ports of access" to state-held data.

Encourage NODC to actively--but selectively--seek out university and private data sets. An advisory body might help in this selection process.

REPORT FROM THE MILITARY, CLASSIFIED OR PROPRIETARY, AND INDUSTRIAL DATA BASES WORKING GROUP

PARTICIPANTS:

Facilitator: D. Schwartz
Rapporteurs: M. Conkright and M. Crane

Cdr. J. J. Waterreus U.S.N., Troy Holcombe, George Sharman, Reed Bohne, Steve Haeger, Bill Venezia, Celso Barrientos, George Bohlert, Evangeline Lujan, Ernie Matson, William Wiseman, Edie Widder, Michael P. Crosby.

PURPOSE: JOINT PROJECTS AND PARTNERSHIPS

navy is working to declassify much of its data
critical environmental parameters being distributed

BACKGROUND

Navy uses many sources of data to gather information
- satellites
- Data collected by deployed fleet (e.g. AXBT) - continuous data assimilation, aircraft sampling, helicopter sampling, buoys
- low frequency radar examining back scatter - analyze wind speed, current measurements
- navy working on releasing many products associated with data such as:
    a. program Whales 94 - examined historical archive to identify whale species and individuals
    b. SST data in North Atlantic
    c. Sonar range prediction products of use for geophysical community
    d. Aircraft study (AXBT) of currents in warm/cold core rings

Data being made available as part of the Gore and Congressional initiatives - *dual use* of data

Naval Meteorology and Oceanography Command:
approx 90% of the data held by Navy is unclassified -

NODDS developed from FNMOC - This is a pc based system where you dial into

FNMOC and retrieve 3-D and 4-D grids of atmospheric and ocean model output. Working with NOAA for linkage between NOAA and NAVY - access for users through NOAA to directly access FNMOC model with 12 hour data update. NOS office responsible was "riffed" (reduction-in-force) and contracted out. Rich source of navy upper atmospheric data (NOGAPS) - T, S, wind fields, atmos. temp., grid point data for 36 levels, can ingest NECEP data, can overlay NICEP fields with FNMOC fields - these are all model gridded data. NODDS does have the capability to download certain observational data.

Prediction models:

Navoceano (operational) vs. R&D sections - data not shared among the groups

Navoceano examining large data sets to determine what to declassify - not yet examining the smaller datasets

EEZ problems - sometimes Navy allowed to sample other coasts and can't release the data.

Navy does not have much coastal data - they receive--and are seeking--data from outside sources.

PDC - Pacific Disaster Center - initiatives for National and International Disaster Centers - wide area network (PREMIS) to link Hawaiian chains and insular islands for disaster issues. Navy wishes to support and populate the data base for Tsunami before and after pictures, bathymetry information, hazardous spill support

RELATED DATA SETS:

1. ADCP - JEDA
2. JPL/NASA data
3. APL data
4. Oil companies - major source of data, particularly in the Gulf of Mexico - very difficult for DOD and other individuals to get data
5. MMS archives information - 20 year proprietary hold on data - oil industry fighting to keep these data proprietary
6. Commercial airlines send atmospheric data to FNOC
7. Data from state agencies

DATA NEEDS:

1. Raw data used to develop the models -
   XBT classified for 90 days - then goes to MOODS database
2. Coastal bathymetry - global and U.S.
   5 minute global bathymetric data
3. Deep water bathymetric data under review
   - not all data needs to be released - for instance in Saipan seamount data is of great concern
   - Provide location of seamounts
   - can provide lower level of resolution
4. Archived information
   satellite imagery and aerial to examine changes over time
   can be provided at lower level of resolution
5. Light measurements correlated to vertical migration patterns
6. Inventory of observational data available
7. Q route surveys (side scans for mine-warfare community) in approaches to ports - NAVOCEANO did baseline study (no methodology and training) but data are in manuscript form, and in some cases still restricted.

PARTNERSHIPS

NOPP - NSWC/NOAA/U.Miami/FAU/HBOI
Defense Hydrographic Initiative
   NOAA and NAVOCEANO and DMA
   Share databases and expertise
   Contract for a distributed ocean floor database
   Contract to look at high resolution bathymetry
Universities and oil companies
NCDC - NAVOCEANO - DBDBV - enhanced coastal bathymetry
NAVY-NOAA - POM model
NOAA-DOD - coupled ocean/ atmospheric model
Wave Action Model - NAVY and Max Planck Institute
UNOLS - Navy and university partnerships

REQUIREMENTS BY NAVY

1. Visualization tools - develop a database of analysis and visualization tools - NAVY needs partners in developing these areas:
2. Bathymetry data at all levels
3. Bioluminescence data
4. Shorelines - need by NAVOCEANO - need low and high tide shorelines

1-80,000 - NOAA has digitized shorelines and are online - 100 m spacing between Lat and Lon. - digitization of NOAA charts

Side scans, cores and grabs, XBT - ETF reports (part of MEDEA) which update reports of unclassified data available, status, and current data being examined.

RECOMMENDATIONS

1. NODC should archive FNOC model output data once models have been standardized so they can be used as proxy for the data. FNOC currently keeps 3 months of selected model output which are then sent to NCDC for archival - atmospheric and selected fields only. Major amounts of data involved.

2. Need to examine data products available from the Navy and select what is most appropriate to archive.

3. Fishing fleets in the Pacific - instrument these with environmental sensors for real-time or near real time telemetry of data to shore databases.

4. NOAA should make available a bibliography of what data are available from the Navy and a contact point for each data type.

5. NODC (or NOAA) should prepare a list of data the Navy has submitted to NODC

REPORT FROM THE STATE, TERRITORY, AND LOCAL GOVERNMENTS WORKING GROUP

PARTICIPANTS:

Facilitator: M. Davidson
Rapporteur: D. Grimes and G. Heimerdinger

Robert Van Dolah, John Rupert, Philip Hinesley, George Henderson, Lelei Peau, Barbara Kojis, Jason Yap, Eric Crecelius, Ken Dzinbal, Jan Newton, Stuart Stevens, Eric Gilman, Susan Burr, Carmen Gonzalez, Lee Edmiston.

DATA IS A 2-WAY STREET

How govt. can be more assessable, responsive to you?
A reciprocal relationship; move towards reciprocity
Doing more with less as federal government reduces funding

GA - important that feds know added cost to states
CNMI - We have great coral reefs out there; invitation
Nationwide standards for monitoring; join the international community

Puerto Rico (Gonzalez)- no problem in sharing; committed
need technical training and some type of proper equipment.
(Lee Edmiston) - Need guidelines. Did survey to locate what type of data P.R.

Do not know what data sets NOAA has that apply to P.R.

A bibliography does not list the data sets.

South Carolina - Bob Van Dolah - more sharing could occur; interactions; feds can help in processing of data; data maintenance; data archive

WA - Eric Crecelius - Battelle - How to get a hold of the data; for data users-sponsors
Ohio. - John Rupert - policy issue to remind to share data; barriers breaking down; more visionary

American Samoa - focus more on Pacific; partnership; need federal team to do assessment and provide; no incentive for local govt.

AL- Phil Hinesley - recently got online; technical assistance needed to access data; level funded next year; no one is connected in the state; to standardize the data

WA - Ken Dzinbal - data catalogs tremendously helpful; want access to more data products; continuation of this dialogue

WA will provide uploading fresh water data to EPA from all water quality stations in the state; respond to 300 data inquiries per year; also online on web page - geo-referenced; would like to be a hot link site to NOAA's home page

WA - Jan Newton - excited with liaison with NODC; partnership

FL - George Henderson - need staffing and hardware;

Complaint with NODC - getting data out - have to ask correctly

V.I. - important that data is put together in manner available to V.I.
there are guidelines as to what kind of data that feds want
No free e-mail system; makes it difficult for states to access

POINTS

Problem is to better use NODC's information on web;

- NOAA has to create better ways to group the data by keywords
- How to access NODC/NOAA -
- need easier ways to query data
- hot links
- expanded keywords

WA - Problem is heightened expectations; beyond capability; technological barrier

Distance between have and have not's will be greater

- Can access data by geographic regions?
Yes, but need to identify instrument

- More ability to search/sort for islands

- Need Issue driven web bibliographies; expand use of "ProCite" software for

bibliographies

- Need bibliography of CD-ROM's of data

- Expand mailing list

- FGDC guidelines - need to be scanned; guidelines are available on-line
  NODC needs to provide hot links to FGDC home page

- Coastal Data Management Office - NERRS- could be better
  need more consistency re templates, data formats,
  metadata guidelines and standard products
  What happens to the support function?
  Apprehension re moving too quickly into monitoring databases

- Have forms to fill out

- National standards - monitoring: coral reefs
  - water quality
  - like to have it available via NODC home page

- Processing of data NOAA-wide (Carmen Gonzalez)

- Data Centers and rest of NOAA - list products/available on-line

Major Issues: Costs to States to acquire and limited modes for payment

COST OF SHARING

- Need $/person to manage "data" to send it to DC
- Burden of metadata format requirements
- Long term commitment
- Cost of technology

INCENTIVES

- Besides $'s
- "tit for tat": states put in data;
  N[C]DC (NOAA) gives back products and training and technical assistance
- regional perspectives series

- transferability of information. to resulting models
- regional data can strengthen the accuracy of NOAA products
- Regional/Pacific Data Center should encompass the islands
- Atlantic/Gulf Regional Data Center should include the islands
- NODC Regional Liaisons - excellent idea

The following improvements are suggested:
- need to travel the regions
- network with those who have the data - beyond the universities
- network with those who need data
- familiar with how data is reached
- priority should be those who have a partnership with NOAA, e.g., CZ, NEERS, SRD, SG
- regional basis of url's; addresses for useful web pages + data centers - hardcopy
- training/demonstrations of how to access

As NOAA looks to regional distributed presence, it should be seamless to the states and synchronized internally to provide more efficient interaction with customers

- more familial partnerships internally & externally

Next time:

Have more folks (i.e. librarians) to understand how to catalog and inventory data.

REPORT FROM THE DATA AND INFORMATION SYSTEMS WORKING GROUP

PARTICIPANTS:

Facilitator: A. Miglarese
Rapporteurs: R. Fauquet and N. Hall

David Stage, Norman Froomer, David Remsen, John Collins, Bernard Megrey, Rich Signell, Allen Hittelman, Tony Frank, John Helly, Rob Quayle, Peter Cornillon, Eric Anderson, Van Waddell, Bob Stone, Deanne DiPietro, Brad Butman, Ed Bowlby, Robert Reeves, Scott Thieme, Randy Dana, Charles Sun, Chris Miller, Jane Small, Livingston S. Marshall Jr., Anne Ball, Wendell Brown, David Reid, Zsolt Nagy.

DATA DISTRIBUTION SYSTEMS with representatives present

OSIMS John Collins, Data distribution over multiple servers (Funded by NOAA. Et al)
Gulf of Main info system -- Rich S. Of USGS
CERES California, 26 related projects (http://ceres.ca.gov)
Olympic Marine Program Washington State
North Carolina Information Highway 70 data layers "EYESIGHT" search engine
Peter Cornillon. -- DODS

BRAINSTORMING SESSION for ideas/ initiatives/ proposals

METADATA

Metadata definition, acceptance, training, toolkits

Two kinds - extractable from data set, and non-extractable
eg, geographic range, versus instruments used
Full documentation unlikely, split into two subset; desc. of what, where, how to get it, quick description with locator
Full documentation
Three categories
"None" for knowledgeable colleague
catalog search information
full documentation

DISTRIBUTED data/ Regional systems

Institutional issues -- how do different sources (libraries, fed, state, local, non-profit)
Work together -- what is motivation?

LIBRARIES

DATA ANOMALY detection and reporting systems
Feedback to data centers and community

CATALOGUES

METADATA

ONLINE APPLICATIONS

NAMING CONVENTIONS to uniquely identify any data or set
controlled vocabulary
accession number, history of changes, audit trail, lineage
licensing

DATA MODEL

R and D., between pure research and application, -- Internet access

DERIVED DATA SETS to be served out
(Peter C. has built one for Atlas station data)

ACCESS METHODS
By application or user request
Ability to subset

INTERFACE ISSUES
Search technology
Flexibility for different data representation, formatting methods

RELIABILITY
Peer review

MULTIPLE STRATEGIES FOR OPEN ENDED PRODUCT DEVELOPMENT

Expect increased use by educational institutions for education
as opposed to research, or management

ONE STOP SHOPPING
Virtual center for data (NOT "Virtual Data Center," which makes it
sound like model output -- the Center, not the Data, is virtual.)
degree of distribution
standardization of formats (eg, NETCDF, others)
Units -- can some variation be allowed
Value-added -- analysis and synthesis, visualization, interpretation

INTEGRATE with what's already being done, awareness of such things
as national / international geospace standards

ARCHIVING
saving for long-term: a library of Congress for data
(Other people have other definitions of "archiving" -- short term)

END OF BRAINSTORM SESSION - Lumping issues

A) ORGANIZATIONAL AND INSTITUTIONAL COORDINATION
Distributed data/ regional system nodes
institutional coordination
Federally funded data collection and archiving
archiving data -- meaning of term
non-federally funded data served out by NODC
Multiple strategies for open ended product design

B) DATA QUALITY
audit trail, data lineage
Data anomaly detection and reporting back to community/ data centers
Peer review

C) OUTREACH & TRAINING
Training, coordination, communication
Meetings or BBS among developers of systems
Metadata training and guidelines
E-mail list
NSF (Digital) Library
Awareness of national geospace activities

D) DATA DISCOVERY AND DESCRIPTION

Catalogues
Libraries
Search technologies
Data Lineage

E) ACCESS AND DELIVERY METHODS

Access methods
Interface technology
On demand custom CD-ROMS
On line subsetting
On line applications
R&D Internet access

F) DATA MODEL (ENV. COASTAL OCEAN)

A) ORGANIZATIONAL AND INSTITUTIONAL COORDINATION

NOAA establish notion that NOAA data archiving YOUR data is a good thing but maintain intellectual property protection
Carrot-type incentives are needed
Continuing sponsorship of forums like this for continued momentum for marine information coordination at a technical level
Deep archive approach
Regional NOAA funded hubs to carry NOAA/ and other data
Can stimulate more local interest to contribute to the archive
Increased coordination between BRD (Biological Resource Div, USGS) and Coastal data Reps
Breakout group high priority data sets be pilot project
Outreach to other institutions and organizations that are stakeholders

B) DATA QUALITY

NODC develop peer review process to evaluate data
(for highest quality assurance level)
develop common quality control methods
Discipline specific
Develop methods to describe data so that quality can be assessed by user
Methods to assess quality and publish (versus assurance of quality
Hold a workshop to establish these methods

Audit trail and lineage functions for derived products
Be able to discover dependencies

C) OUTREACH & TRAINING

NOAA, in cooperation with FGDC and state partners, take a metadata training session on the road to the regions
Tool used online for training in metadata
Involve librarians, use regional NOAA libraries as tool
Develop metadata SWAT team
Annual national and regional meetings
IEEE Digital library community, or in conjunction with national meetings

D) DATA DISCOVERY AND DESCRIPTION

Coordinate Tier 1 data documentation
GILS for Data Locator, or Tier 1 data
Controlled vocabulary be developed in coordination with library community

E) ACCESS AND DELIVERY METHODS

Get high level data (derived products) should be readily subsetted
Support distributed data systems -- Explore options, such as:
NOAA server concept -- distributed access system within NOAA

F) DATA MODEL (ENV. COASTAL OCEAN)

Acronyms

BBS - Electronic Bulletin Boards Server
FGDC - Federal Geographic Data Committee
NETCDF - Network Common Data Format
SWAT - Special Weapons Assault Team