GULF OF MEXICO COASTAL OCEAN OBSERVING SYSTEM

GCOOS

GCOOS Workshop with Non-Governmental Organizations
June 10-11, 2014
Houston, Texas

The GCOOS-RA hosted a workshop for non-governmental organizations engaged in the collection and/or use of ocean observing information in the Gulf of Mexico. The objectives were to understand the capabilities and needs for environmental information of the organizations and to determine how the individual needs fit together in order to attempt to provide necessary products and services through the GCOOS-RA and partners. Participant names and affiliations are given in Appendix 1. The workshop agenda is given in Appendix 2.

Introduction
Dr. Chris Simoniello, GCOOS-RA, welcomed participants, thanked the workshop steering committee (see Appendix 1), provided an overview of the meeting objectives, and introduced the meeting facilitator, Ann Weaver with the NOAA Coastal Services Center. Weaver led a Line Dance activity designed to familiarize participants with each other and the range of NGO activities taking place in the Gulf of Mexico.

Overview of the GOOS, IOOS and the GCOOS-RA
Dr. Worth Nowlin, GCOOS-RA Board, presented on the history of the Global Ocean Observing System (GOOS), the U.S. Integrated Ocean Observing System (IOOS) and establishment of the GCOOS-RA (LINK TO PRESENTATION), stating that the U.S. pays for approximately 30-40% of the GOOS, most of this in support of a global climate and marine meteorological network. When asked whether GCOOS is engaged in ecosystem modeling, Nowlin summarized activities of the GCOOS Modeling Task Team and the distribution of model products via the GCOOS Data Portal. A summary was given of the $1.54 M Gulf of Mexico Pilot Prediction Project, sponsored by the Research Partnership to Secure Energy for America, which is the first Gulf circulation model consisting of output from an ensemble of individual prediction model runs and shows real promise for predicting major ocean features several months in the future. It is hoped that this model will become the principal operational Gulf circulation model. Russ Beard, NOAA National Coastal Data Development Center (NCDDC), offered assistance regarding working with the Naval Research Lab, where the model is now being run, to post model results.

Following Nowlin's overview, Dr. Matt Howard, GCOOS Data Management and Communications (DMAC) lead, summarized GCOOS DMAC activities (LINK TO PRESENTATION), including the purpose of the data portal, a summary of non-federal data providers, and the importance of data from industry partners. He provided updates on development of the water quality geo-portal and enhancements to the lionfish map tool, stating that the next steps are to continue working with The Nature Conservancy, the United States Geological Survey and the Fish and Wildlife Service to document prey species and to expand information to include Mexico and Cuba. The NGO community expressed interest in similar products for migratory birds, and marine species of concern to identify hotspots for conservation. Simoniello wrapped up the GCOOS-RA overview with a summary of outreach and education (O/E) activities (LINK TO PRESENTATION), emphasizing that a goal of the workshop is to identify new partners for O/E collaborations.

Understanding NGO Activities
Weaver moderated a session where each participant presented a four-minute, timed talk about their organization. Prior to the workshop, Simoniello sent participants a template with specific questions to be addressed and requested these be sent in advance of the meeting. She had merged all talks into one presentation to maximize efficiency during the workshop (LINK TO PRESENTATIONS). The questions addressed by each were: 1) Organization name and presenter contact information; 2) Mission and spatial extent of organization's work; 3) Data product and information needs; 4) Information about the source(s) of data and products used; and 5) Workshop goals.

Weaver explained that the goal of the presentations was to gain a broad understanding of what participants are doing and to identify synergies.

Beard set the stage for discussion, summarizing that a process is underway to reach consensus on a virtual data infrastructure serving all ocean monitoring and observing activities in the Gulf of Mexico. He stated that GCOOS is critical to building the coastal data record, NCDDC is a critical RESTORE infrastructure data node, and that there will be mandated data management requirements, including archival, linked to projects funded with RESTORE money.

Andy Shepard, Gulf of Mexico University Research Collaborative (GOMURC), focused on the role of academia in Gulf restoration. GOMURC is partially funded through the Walton Family Foundation, which currently provides salary support for Shepard and a travel budget. Two program goals are advocacy for ecosystem monitoring and coordination to get their 80 member institutions involved in management-related activities. GOMURC seeks to ensure that Gulf restoration is based on the best science, implemented and evaluated on proper scales, and that restoration outcomes are accessible—archived, integrated and synthesized across various programs. GOMURC supports development of an operational system that is co-managed, transparent and open to all stakeholders.

Jorge Brenner, The Nature Conservancy (TNC), said TNC has chapters in every state, as well as Gulf and Caribbean programs. TNC views the Gulf as a whole system, crossing international boundaries. Included in his presentation was an example of the collaborative lionfish map product he developed with GCOOS in support of TNCs invasive species work. Other areas of interest are migratory species mapping of marine mammals, sea turtles, birds and fish to help identify conservation areas and priorities for fisheries resources. Among TNCs needs are coastal hazards information for communities and products that communicate the complexities of marine ecosystems for conservation work. Brenner said TNC does not have a lot of resources to process raw data into products and used remote sensing data as an example.

Jordan Diamond, Environmental Law Institute (ELI), spoke of the ELI's education and outreach focus and work to get the best science information into policy and practice. Although "Law" is in the name, ELI neither litigates nor handles lawsuits. Recent work has focused on effective communication following the *Deepwater Horizon* (DWH) oil spill, specifically clarifying information on various processes (e.g., from the Natural Resource Damage Assessment and RESTORE), so that stakeholders know if, how, where and when to engage. The ELI website offers many resources and fact sheets containing information communities need to engage. They also gather information about selected restoration projects. Among ELIs needs are products that relay how to design restoration and recovery projects, methods to evaluate and monitor the effectiveness of the implemented projects, and information on how best to coordinate their database with others, for example the Gulf of Mexico Alliance and the Trust for Public Land.

Katelyn Costanza, The Water Institute of the Gulf, was formerly with the NOAA National Weather Service and the Army Corps of Engineers. She has been developing a forecasting system to predict ecological and land-building processes that she shared with the group on Day 2 of the workshop. The Water Institute of the Gulf's needs include data products that relay real time water level and water quality information, and discrete and continuous salinity. They collect their own data, use that of others and develop products.

Scott Eustis, Gulf Restoration Network (GRN), explained how the organization has its history in the Clean Water Act and is focused on healthy wetlands and sustainable fisheries. Following the DWH, GRN started working with the Gulf Monitoring Consortium to integrate remotely sensed and *in situ* monitoring data for response activities. The Consortium collects, analyzes and publishes images acquired from space, the air, and surface to investigate and expose industry pollution incidents. Their constituency includes a volunteer pilot network. GRN is interested in learning more about companies operating in the Gulf, real-time pollution reporting and compliance information. They are also interested in low cost monitoring technologies. With funding from Patagonia, they have commercial grade cameras with a web platform that can turn snapshots from the air into usable maps. They serve this via open source software in Google Earth.

Alexis Baldera and Matt Love, Ocean Conservancy (OC), gave a joint presentation. The OC is a national organization with four offices in the Gulf of Mexico—St. Petersburg, FL, Austin, TX, and Baton Rouge and New Orleans, LA. The latter is focused on Gulf restoration issues. Communication efforts are focused on getting the best science in the hands of decision makers for restoration and fisheries conservation. In order to assess potential user conflicts with the natural environment, the OC needs data on long-term population trends, abundance, distribution and drivers of marine animal communities and their habitats, the status of fisheries and fish populations, fishery independent and dependent monitoring data, and tropic interactions. The OC uses data collected by others and develops products from these data. Love reported that the OC

has nearly completed its inventory of long-term ecosystem monitoring programs in the Gulf to develop a gap analysis, identify priorities for additional monitoring, and to make more obvious areas of potential collaboration. The report is anticipated to be released in Fall 2014.

Ryan Fikes, National Wildlife Federation (NWF), was unable to attend. Tyson Broad, Sierra Club, presented on his behalf. The NWF has Gulf-wide interests, collects some of its own data, but mainly uses data from others. They develop products from these data and sometimes fund others to conduct work (e.g., clam and bay salinity work).

Following the NWF summary, Broad gave an overview of the Texas Living Waters Project, a partnership between the Sierra Club, NWF and the Galveston Bay Foundation (GBF). The project is primarily an OE effort: Water for Texas and Texans, in the Sabine Lake and Galveston Bay areas. Prior to the workshop, Broad solicited input from colleagues in different Gulf chapters of the Sierra Club. Three major data needs were identified: 1) Resolve gaps in models where estuaries meet the Gulf. The context for this is the need to monitor the movements of white shrimp, blue crabs and other species into the bays. Data are needed to understand estuary salinity responses due to tidal exchange, offshore salinity, and groundwater. The latter is particularly important during droughts because Texas has little regulation of groundwater pumping; 2) Site-specific information on the diversity of species responses to stressors is needed. It is unknown whether flora and fauna of the same species in various parts of the Gulf respond the same to a given stressor. There is interest in using the clam *Rangia cuneata* as an indicator species; and 3) Site-specific continuous monitoring is needed to understand wildlife trends. Texas Parks and Wildlife has a good data collection network. However, they lack biological data at fixed sites and salinity sondes up in the estuaries are needed to calibrate information.

Ellis Pickett, Surfrider Foundation, has the mission of preserving public beach access. The organization currently has three lawsuits in progress. Surfrider's informational needs are related to data to combat projects that would hinder public access, and to influence local legislation and ordinances. The range of data products needed includes erosion, storm surge, projected development, flood insurance, water quality, hypoxia, funding sources and resilience best practices. Pickett specifically stated the need to return to operations four NDBC buoys in the western Gulf of Mexico ((42001, 42002, 42019, and 42035). Beard replied there is currently no money to get these buoys operational.

Amanda Hackney, Audubon Texas Coastal Program (ATCP), is engaged in monitoring colonial water birds, rookery island management, restoration of rookery habitat, and management of a water bird database and GIS information, with records since 1973. ATCP recently hired an OE person to lead their citizen scientist effort to support this mission. Information needs include current orthophotos and base maps to keep pace with erosion, fine-scale basin details, vegetation changes and elevation data. ATCP received a Coastal Management Program grant to build a spatial model on the longevity of Sundown Island in Matagorda Bay, TX, to determine its usefulness for nesting. The model includes erosion, subsidence, ship traffic and geomorphological changes over time. Data for the model is from LIDAR and historic orthophotos and base maps. ATCP collects and uses some of its own data and is hand-drawing polygons for the modeling effort.

Kathy Goodin, NatureServe, shared a handout of her program's Coastal and Marine Strategy, which is also available on the NatureServe website. Goodin works to provide a scientific basis for effective conservation action in support of Natural Heritage programs in the U.S., Canada and Latin America. NatureServe runs and manages an Ecosystem Based Management (EBM) tools consortia, focused on decision makers and anyone who needs biodiversity data to make conservation decisions. They have also helped develop the Coastal and Marine Ecological Classification Standard (CMECS). Data needed to support their mission includes rate information on substrates, geomorphic features/bathymetry, species distribution maps, data to support ecosystem models, and information to support the assessments of ecosystem threats. NatureServe has developed a framework, methodology and metrics to assess restoration success. They collect their own and use data from others to develop products to meet their needs.

Theryn Henkel, Lake Pontchartrain Basin Foundation (LPBF), began by clarifying that the lake is an estuary and she is focused on the LA portion of the Mississippi River basin. The group needs more coverage of water quality parameters for their bi-weekly Hydrocast mapping products and more fisheries data, especially in light of proposed river diversions related to restoration. LPBF needs additional data for other bi-weekly maps that provide snapshots of the estuary. These include maps of salinity, habitat/land change, and weather (primarily wind and rain). Information is gathered from a variety of sources, including real-time data from free online sites such as GCOOS and University of New Orleans modelers, and is also collected from ship-based sampling (e.g., salinity, dissolved oxygen, sediment plumes).

Dorothy Howard, Alabama Coastal Foundation, had a flight cancellation and was unable to give her presentation. Simoniello shared her slides with the group and her presentation is included in the ==Merged Presentation link==.

Dianne Wassenich, San Marcos River Foundation (SMRF), surprised the group by stating her organization has a board-elected staff of one! The organization is very grass roots, working to influence state leaders to make decisions in support of adaptive management for Texas river basins. Similar to the Sierra Club objectives presented by Broad, the SMRF is concerned with inflows to Texas bays and works with the Texas Commission on Environmental Quality for data dissemination about recommend rates and volumes. Although small, SMRF engages in a variety of activities, ranging from collecting information, to buying land around head of springs to ensure flow to the Gulf, to filing protests and litigating.

Emily Seldomridge, Galveston Bay Foundation (GBF), provided information about GBFs advocacy, conservation and education mission targeting the five immediate counties bordering Galveston Bay, TX. GBF is particularly interested in public health issues. They have invested resources in advisory products related to swimming/recreational activities and seafood consumption. There is interest in user-friendly public health information, similar to the Texas Beach Watch product that uses easy stoplight markers (e.g., red, yellow, green) to communicate conditions to the general public. GBF has an interactive map for water quality, but there are limited monitoring sites. Through the Texas Living Waters project, they are seeking to identify an indicator species that tracks with freshwater inflows. GBF has partnered with GCOOS on their citizen scientist work and has contributed story maps showcasing the work of their volunteer water quality data collectors. They use their own and data from others to develop products. Because they have a diverse stakeholder base, including many non-English speaking and non-internet users, they strive to reach their audiences in both traditional (web-based/cell phone applications) and non-web-based ways.

John Wilson, National Aeronautics and Space Administration Infinity Center, was unable to attend and Beard presented on his behalf. The Infinity Center seeks participation from regional constituents to collaborate on outreach and education projects, especially the development of kiosks and web-based activities. State and NGO partners are especially desired.

Ed Sherwood, Tampa Bay Estuary Program (TBEP), provided an overview of the six-staff-member TBEP. Their mission is a combination of science, outreach and education in three urbanized counties bordering Tampa Bay, FL. The organization has its own management plan and needs data on watershed nutrient loading and hydrology, water and sediment quality, habitat extent and trends, fish and wildlife population trends, and community behavior (e.g., fertilizer application rates, bay use, economic valuation). Sherwood shared an example of a user-friendly 'stoplight' graph to relay annual water quality conditions for sea grass health, which is generally improving. TBEP collects and uses its own data, the data of others and develops products from these. They also fund others to conduct work. Sherwood seeks to learn more about regional real time data products, Gulf modeling efforts, and avenues of collaboration.

Gulf of Mexico Alliance and Logic Model Overview
Following lunch provided by GCOOS, Weaver gave an overview of the vision and mission of GOMA (==Link to presentation==). She introduced the concept of a logic model, an approach to achieving objectives by working backwards and looking at short-term, mid-term and long-term outcomes. The logic model presented was a vision of a coordinated and sustained ecosystem monitoring and analysis system that supports an economically and ecologically healthy and sustainable Gulf of Mexico region. Three major goals of the system were identified: 1) Cultivate a collaborative effort to share data (e.g., local, state, and federal government, academia, NGOs, private business); 2) Develop an inventory of current data collection and analysis capacity; and 3) Understand the connection of ecosystems and the value of services provided by them.

The logic model presented was based on information gathered at the March 2014 Logic Model Workshop hosted by GOMA and the Ocean Conservancy, Mobile, AL. There will be a second meeting 8-9 July 2014 to build on the model. Information from the GCOOS NGO workshop will be used to inform participants at the July meeting, and to make sure NGO efforts are connected to ecosystem monitoring plans written by several regional groups (e.g., GCOOS Build-out Plan, NOAA white paper, Gulf of Mexico Research Initiative (GOMRI) report, Ocean Conservancy report, Bureau of Ocean Energy Management (BOEM) report). It will also be important to identify parallels to connect with efforts such as those of NASA, NSF, and the national biodiversity observation network. Gabrielle Canonico, NOAA IOOS, might be a good resource for the latter.

General Needs Discussion
During the participant talks, people were asked to take notes and be prepared to identify common data and product needs. Weaver worked with the group to generate a list of common needs reported by participants and provided instructions on how to flesh out the highest priorities of those needs. The top three priorities were selected as focus areas for more detailed discussions in three smaller workgroups: 1) Biological Information, facilitated by Weaver; 2) Continuous models, facilitated by Stephanie Watson, GCOOS consultant; and 3) High-resolution ecosystem distribution /habitat maps, facilitated by Simoniello. The complete list of identified needs can be found in Appendix 3.

Participants were asked to consider the following questions while in the smaller groups: 1) What do we need to understand about the focus area?; 2) What do we already know?; 3) What else do we need to know?; 4) How can we collect that information?; 5) Did we hear from anyone that is collecting similar information or developing similar products?; and 6) What information products do we need?

GCOOS Banner Stories and Membership
Before adjourning for the day, participants regrouped after the small workgroup session. Watson provided an overview of GCOOS communications, demonstrating with the banner stories how the RA works to highlight the activities and successes of its members. She provided instructions on how to submit stories online via the GCOOS story submission form. Simoniello shared information about GCOOS-RA membership and followed up by sending participants the GCOOS Memorandum of Agreement.

Reports from Focus Area Teams
Each of the three focus area teams were asked to report on their discussions and include the following information: 1) Define the focus area; 2) What information is needed; and 3) How might that information be obtained?

Group 1: Biological Information
Theryn Henkel provided the summary and said a major issue identified by the group is that biological data for the Gulf is disparate and collected in many different ways, particularly for fisheries data.

Examples of information needs included the following:
- There is abundant fisheries dependent and independent data, but it is difficult to access and it is not integrated Gulf-wide. SEAMAP was given as an example of good data, but with limited coverage;
- Monitoring of hypoxia/dead zones is decreasing because sensors are note being funded;
- Automate the taxonomy classification process. Not enough taxonomists are being trained to replace those leaving the field;
- Map the Gulf genome to have indices of all species;
- Invasive species monitoring--apple snail into LA was given as an example;
- Better understanding between nearshore and offshore productivity exchange. For example, tracking fish/other species migrations once they leave the estuary;
- Coordinate trawl/fisheries data across states and integrate to make useful to scientists;
- Data to understand biodiversity of offshore pelagic species (e.g., phytoplankton, zooplankton);
- Need data on inland and marsh bird species. Entraining citizen science data into the network can drastically increase spatial coverage; and
- Need an operational framework to study biology and chemistry.

Examples of how data might be obtained included the following:
- Use of optical sensors and cytobots for water quality and automated identification of plankton;
- Partnerships with Coast Watch/Beach Watch programs;
- Use of non-destructive trawls for sampling;
- New methods and sensors that increase resolution while decreasing costs;
- Economic analysis to show return on investment of new technologies;
- Create a network across the Gulf of long-term ecological stations, especially on the shelf, and coordinate consistent sampling (e.g., for core parameters mutually agreed upon);
- Standardize the way states do water quality monitoring and report information so that information is seamless;
- Increased use of AUVs;
- Fly-overs and mapping;

- Coordinated plan to transition to new technologies without losing historical information and maintain ability to compare data sets; and
- Consider the LTER approach for big picture questions in the Gulf. There are 12 of these theme-focused programs. The Gulf has never won an award for this and NSF is no longer funding. Is this something that can be leveraged with RESTORE and NSF funds?

Group 2: Continuous Physical and Biological Models
Jorge Brenner provided the summary for this group which focused discussions on the need for continuous and discrete model output to bridge the gap between oceanographic and land-based types of products and information. The group described a two-tiered approach to the task. Tier one is to fill gaps for existing products (e.g., bathymetry, climatology products) via interpolation or more complex solutions. Tier two is to develop seamless models. It is possible that GOMRI-funded groups are already developing these. Howard mentioned that one solution might be a finite element model integration approach, but this is computationally expensive. The role of GCOOS in developing seamless models would be to help make information available, merge products and identify existing data.

Examples of information needs include the following:
- Understanding of the connectivity between inshore/offshore environments
  - A way for models to integrate across land-coast-offshore using existing data
  - Ability to merge continuous models with local data to refine for particular areas;
- Seamless products from the estuary to the bay and near-shore to offshore;
- Products to help with decision support tools regarding impacts to the coast, public health, oil spills, and other natural and anthropogenic threats to the coastal environment.
  - Water quality data, contaminants, pollution;
- Systemic management products for natural resources (e.g., fisheries);
- Species niche and distribution continuum along the coast;
- Salinity fluctuations and drivers of fluctuation (e.g., groundwater input);
- Coastal Marine Spatial Planning tools; and
- Many data sets are needed to understand a variety of systems
  - Physical and biological data (e.g., temperature, salinity, wind, tides, total suspended solids, precipitation, elevation, chlorophyll, contaminants, dissolved oxygen, circulation, nutrients, etc.)
  - Appropriate spatial and temporal scales for products (meters to kilometers depending on questions, area of interest, particular variable)
  - Sampling cycles appropriate to questions.

Examples of how data might be obtained included the following:
- Existing models can be of great value
  - Climatology models from NOAA and the Navy
  - Texas blend model and USGS Sparrow model for salinity in bays
  - Mission-Aransas NERR is developing an integrated model; The Water Institute of the Gulf is developing a tool (CE-Gaps) to forecast ecological and geomorphological conditions; Tampa Bay integrated models; Atlantis;
- Create a plan for how often continuous products could be updated and the associated cost;
- Widespread HFR applications;
- More use of gliders as platforms, including sensors for hyperspectral data;
- Achieve economies of scale by making existing data more broadly usable.
  - Resolve technical issues due to differences in spatial and temporal scales, file formats, metadata, data quality, mission purposes, etc.
  - Make continuous products more compatible with locally available products (e.g., especially true for water quality monitoring data);
- Better integration of existing observations from different platforms
  - Satellite remote sensing, buoys, fixed platforms, LIDAR, HFR, AUVs; and
- Develop model output that provides information for typical conditions, showing trends and averages, vs. comparative data for extreme/anomalous conditions.

Group 3: Ecosystem Distribution and High Resolution Habitat Maps
Alexis Baldera summarized results of the group, stating a Gulf-wide base map from which a nested approach to different spatial scales of information could be obtained should be a priority. Hierarchical planning would allow users to seamlessly drill down to the level of map resolution needed.

Examples of information needs include the following:
- Gulf-wide base map
  - Once created, add data for various parameters (e.g., species distributions, jurisdiction, sensitive habitat, critical bird habitat);
- Classification standards for habitats (e.g., CMECS);
- Classification standards for sediments;
- Data standards and reporting requirements for ecosystem projects;
- Baseline data for monitoring changes in Gulf ecosystems
  - Habitat types and bathymetry needed to assess change and understand habitat use
  - Water quality monitoring and pollution tracking;
- Identification of specific areas, habitats and species for protection
  - Prioritize for each state; and
- Gap analysis from head of tide to offshore to prioritize gaps that need to be filled.

Examples of how data might be obtained included the following:
- Data mining of existing information
  - MARFIN, SEAMAP, CAGES, Sunrise, NOAA Data Atlas, GOMA Data Atlas, Ocean Conservancy Data Atlas, Ocean Conservancy gap analysis, information from the oil and gas industry, GOMA Water Quality information, NOAA Habitat Blueprint, Gulf Geospatial Assessment of Marine Ecosystems, MMS (BOEM) legacy data;
- Create data standards and mandate in report requirements going forward;
- Identify needed products and identify collaborators with similar needs;
- Make acquiring certain data sets in desired formats a part of project proposal requirements; and
- Facilitate data discovery on various portals (e.g., tutorials on how to access and use information).

Discussion of Identified Data and Product Needs
Following the reports by representatives from each of the three focus area teams, Howard moderated a discussion on how information from the workshop would be used and the needs the GCOOS-RA could address. First, the identified data and product needs of the NGO community will be included in the future GCOOS Build-out Plan (BOP) and also be shared with participants at the July 2014 Logic Model Workshop hosted by GOMA and the Ocean Conservancy. Second, although the GCOOS-RA does not currently have resources to deploy sensors, there are several actions that can support the various missions of the NGOs. While the ability to pursue these is mainly limited by staff size, many of the needs align with the three-year GCOOS DMAC plan. Possible areas of engagement include:
- Communicating information to the GCOOS Modeling Task Team;
- Data mining by collaboration with partners to access needed data sets and subject matter experts. If shape files can be located, GCOOS can aggregate in one place and make easy to use
  - NOAA NCDDC and NODC have access to many data sets
  - TAMU-CC has many shape files for land use/habitat maps
  - Naval Research Lab has model products (but these do not extend into bays)
  - Data sets and maps from Gulf Atlas, MONA satellite data, World Atlas, MARSPEC.org;
- Polygon and irregular shaped maps were requested by TNC. Howard said these maps exist, usually nested in other models. None are operational, but GCOOS can tap into these. However, these are not sustainable because the products are only produced as long as the project life;
- Investigate the ability of the Model/ Data Viewer tool to overlay model output from various models with observational data.
  - GCOOS will likely be housing a GOMRI-funded model developed by the Deep Sea to Coast Connectivity in the Eastern Gulf of Mexico (Deep-C) Consortium at Florida State University. The 3D Earth System Model includes interfacial exchange processes between sediment, water, and atmosphere; biogeochemical processes, the transport of organisms, and the effects of petroleum hydrocarbons on all of these processes;
- The GCOOS Water Quality/Nutrient portal will soon be online, serving information in easy to use formats, and continuing to bring in new data partners;
- The GCOOS Products and Services Advisory Council and Outreach and Education Council will review the NGO product needs and determine if any can be priorities for their respective teams;
- The GCOOS-RA can make the data easy to use, develop web-based tools if guidance by the end user is provided, and hear stakeholder needs for preferred data formats;
- Climatologies can be created for many topics of interest. NOAA NODC has some of these data

- o Mission Aransas NERR example used—model of San Antonio inland to the coast to determine how land use is affecting the watershed. The model includes sea level rise, but some are skeptical because better climate data are needed; and

- Coastal hazard information linked to coastal development and land use maps
  - o Howard suggested a good place to start is to search the ERDAS cadastre where a lot of geospatial information is available
  - o Weaver said NOAA CSC has many resources for county land use planning, green planning and habitat mapping. GOMA Coastal Resilience group also has resources.

Discussion shifted from immediate product needs to a longer-term (i.e., 30-year) plan for restoration efforts. As part of their inventory, the Ocean Conservancy is identifying the sampling footprint in the Gulf of Mexico. Howard proposed that GCOOS might be a potential place where spatial information about sampling efforts could be housed. It would fit nicely with the GO-Monitor catalog that is housed there, but currently unpopulated with information. A follow-up to the workshop will be sharing information with GOMA partners. As the GOMA PIT teams figure out their next steps, the NGO data and product needs might be included in the next generation Action Plan.

Next Steps
The 'next steps' discussion, moderated by Watson, resulted in agreement that participants would work over email to refine and prioritize data and product lists, identify people and programs that may already be generating some of the desired information, and/or determine who can help if the information does not yet exist. Several entities, besides GCOOS, were named (e.g., GOMA, Gulf States Marine Fisheries Council, Harte Research Institute, Digital Coast/NOAA CSC, GOMRI clusters working on continuous products, Gulf of Mexico Data Atlas). Nowlin concluded the session by asking participants to send GCOOS their story ideas and offered assistance to help find collaborators.

Coastal Ecologic and Geomorphologic Analysis and Prediction System (CEGAPS)
Katelyn Costanza requested time to share a tool she is developing for The Water Institute of the Gulf to model coastal ecology and geomorphology. The tool is designed to bridge the gap between inland modeling and offshore modeling of estuaries and is run for a suite of morphology, ecology, and water quality parameters at Caernarvon, LA. The product is being developed to refine National Weather Service models which are adequate for inland areas, but essentially stop at the coast. Costanza wants to expand beyond LA for a Gulf-wide model. It is anticipated the salinity information will guide the discharge schedule for diversion operations.

Closing Remarks
Simoniello reiterated that integration of information from the breakout groups and consensus building would be done electronically following the meeting. She thanked the participants, moderators and facilitator and the meeting was adjourned.

Appendix 1 GCOOS NGO Workshop Participant Names and Affiliations

NAME	AFFILIATION
Alexis Baldera	Ocean Conservancy
Russ Beard *	NOAA National Coastal Data Development Center
Jorge Brenner*	Nature Conservancy of Texas
Tyson Broad	Sierra Club, Lone Star Chapter
Katelyn Costanza	The Water Institute of the Gulf
Jordan Diamond	Environmental Law Institute
Scott Eustis	Gulf Restoration Network
Kathy Goodin	NatureServe
Amanda Hackney	Audubon Texas Coastal Program
Dr. Theryn Henkel	Lake Pontchartrain Basin Foundation
Matt Howard*	GCOOS
Matt Love	Ocean Conservancy
Worth Nowlin*	GCOOS
Ellis Pickett	Surfrider Foundation
Emily Seldomridge	Galveston Bay Foundation
Andy Shepard	Gulf of Mexico University Research Collaborative
Ed Sherwood	Tampa Bay Estuary Program
Chris Simoniello*	GCOOS
Dianne Wassenich	San Marcos River Foundation
Stephanie Watson*	GCOOS
Ann Weaver*	NOAA Coastal Services Center
*Workshop steering committee member	

Appendix 2 GCOOS NGO Workshop Agenda
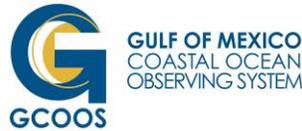
GCOOS Workshop with Non-Governmental Organizations
June 10-11, 2014
Doubletree Hotel
15747 JFK Boulevard, Houston, Texas

Meeting Objective: The non-governmental organizations who are collecting or using ocean observing information in the Gulf of Mexico will understand the capabilities of the other organizations and how the individual pieces fit together in order to leverage necessary products and services.

Agenda
*Tuesday, June 10, 2014*

8:45-9:00	Check-in
9:00-9:30	Welcome, introductions, meeting objectives (Chris Simoniello, Ann Weaver)
9:30-10:15	Overview of IOOS and the GCOOS-RA (Worth Nowlin)
	GCOOS Data and Products Portal (Matt Howard)
	GCOOS Outreach and Education (Simoniello)
	Q&A
10:15-10:40	Understanding NGO Activities (Moderator: Weaver)
	Each presenter will give a four-minute, timed talk
	(Russ Beard, NOAA NCDDC; Andy Shepard, GOMURC; Ken Barbor, GCOOS PSAC; Jorge Brenner, Nature Conservancy)
10:40-10:50	Break
10:50-12:00	Continue NGO Talks
	(Jordan Diamond, Environmental Law Institute; Katelyn Costanza, The Water Institute of the Gulf; Scott Eustis, Gulf Restoration Network; Matt Love, Ocean Conservancy; Alexis Baldera, Ocean Conservancy; Ryan Fikes, National Wildlife Federation; Tyson Broad, Sierra Club; Ellis Pickett, Surfrider Foundation; Amanda Hackney, Audubon TX Coastal Program; Kathy Goodin, NatureServe; Theryn Henkel, Lake Pontchartrain Basin Foundation; Dorothy Howard, AL Coastal Foundation)
12:00-1:00	Lunch provided by GCOOS
1:00-1:25	Continue NGO Talks
	(Dianne Wassenich, San Marcos River Foundation; Emily Seldomridge,

Galveston Bay Foundation; John Wilson, Infinity Science Center; Ed Sherwood, Tampa Bay Estuary Program)

1:25-2:10	Discussion to identify focus areas and prioritize needs (Weaver)
2:10-2:30	Break
2:30-4:00	Breakout groups

Some questions to consider:

a. What do we need to understand about this focus area?
b. What do we already know?
c. What else do we need to know?
d. How can we collect that information?
e. Did we hear from anyone that is collecting similar information or developing similar products?
f. What information products do we need?

4:00-4:10   Wrap up and adjourn for the evening

Wednesday, June 11, 2014

9:00-9:05   Welcome back, review goals for the day (Simoniello)

9:05-9:20   Highlighting GCOOS member successes (Stephanie Watson)

9:20-10:20   Report out by breakout teams (Weaver)
15 minutes for each of the four teams. Report should include:
a. Define the focus area.
b. What information is needed?
c. How might that information be obtained?

10:20-10:30   Break

10:30-11:10   Discussion of the needs the GCOOS-RA can address (Howard, Weaver)

11:10-11:55   Next steps (Ken Barbor, Nowlin, Watson)

11:55   Thanks and meeting adjourned (Simoniello)
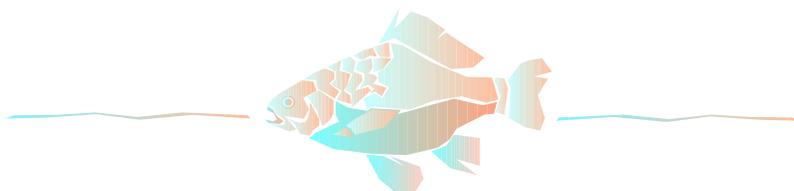
Data and Product Needs Identified During the General Needs Discussion

(WORK IN PROGRESS!—reorganizing this into a table)

(*Top three categories selected for small work groups; note, this is not a prioritized list.)

Bathymetry at appropriate spatial and temporal resolution
    Coastal information primarily for transportation and hazards
    Fresh water inflows

Biological information on many levels – from the seafloor to the surface, from land to the
       deep-sea
Circulation information that links estuaries to the Gulf
Elevation data

    Environmental flow/nutrient inflow
    Full water column parameters
    Groundwater influence on coastal waters
    Public health issues
        Data
        Consistent, user-friendly 'stoplight' map products (beach WQ, fish consumption)

    Sediment loads
    Species Information
        Habitat
        Distribution
        Presence or absence data
    Subsidence data

    Turbidity
    Total Suspended Solids

    Fine scale data land cover, wetland habitat (1 m square minimum)
    Greater spatial and temporal resolution data
    Ecosystem distribution
    Real-time water level
    Data that is in accessible (part of point of GCOOS and data management
    requirements of NOAA RESTORE) – data discovery/accessibility
    Background levels for natural oil/background (Richard Geyer did a number of studies
    on these – Worth; Ian McDonald)
    Paucity of data on the W. Florida Shelf data - $ goes to Weisburg, Luther, and
    Chunmin – for data, not for equipment
    Climatology – legacy or historical data – ocean color (Russ notes this will go into
    GOM Atlas and Frank Muller-Karger has some), productivity, ocean acidification
    (NOAA GOM Atlas)

Land use/land cover/parcel status – biological or public access or storm surge protection (Mobile Bay, USCG sensitivity index)

Projected insurance costs under different land use scenarios

Human uses – barge traffic, human disturbance, (see TGLO and NOAA GOM Atlas)

Non-market values for ecosystem services

Useful links and additional resources page

LIDAR information – linking species to shoreline information. Convey this information. TGLO and Digital Coast

Good reference sites for different ecosystems on a map (e.g., best example of Mangrove, oyster bed)

Shoreline data – easy access to most recent and best (or will have to make it – Audubon, linking to Harte)

Continuous data from inshore (head of tide) to nearshore to offshore; continuous modeling for circulation, etc. For fisheries, this information could help justify LA restoration projects to broader Gulf and nationwide fisheries.

Higher resolution mapping of habitat in the marine environment

Food web or other trophic interactions. Critical to recovery and restoration.

An operational need for continuous data is a network for coastal HF radar in the Gulf and other mobile platforms.

Tracking data – iTag integration

[any opportunity to look at sensors or other studies through energy industry- maybe old rigs with rigs]

trends in HABs/pathogens/shorelines with climate change

lionfish – ROV video (Serpeant)