GULF RESTORATION SCIENCE WORKSHOP:

Actions to Promote Coordinated, Science-based Restoration

WORKSHOP REPORT

August 12-13, 2013, Long Beach, MS**;** Hardy Hall, University of Southern Mississippi, Gulf Park Campus, 730 East Beach Boulevard, Long Beach, MS 39560

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EXECUTIVE SUMMARY

The Deepwater Horizon Oil Spill (DWHOS) in 2010 was an ecological and economic disaster adding to decades-long degradation of the Gulf of Mexico coastal and marine environment. Restoration efforts must be founded on sound science or risk failure, waste of investment, and even further damages. Accordingly, the RESTORE Act directs that 80% of the civil penalties under the Clean Water Act settlement of damages from DWHOS be spent on Gulf ecosystem and economic recovery, and as a corollary, requires that ecosystem restoration efforts be based on "the best available science." While the Act's definition of "best available science" is more explicit than similar legislative mandates, it does not provide a roadmap for how the many programs funded to do restoration can and should implement "best available science."

With support from the Walton Family Foundation, the Gulf of Mexico University Research Collaborative coordinated a workshop in August 2013 entitled, *Gulf Restoration Science Workshop: Actions to Promote Coordinated, Science-based Restoration*. Participants from DWHOS-funded restoration programs engaged with scientists and managers to generate outputs intended to inform a Gulf-wide restoration effort that is based on the "best available science" (BAS), and promote program coordination and engagement with constituents. Specific objectives of the workshop included:

1) Identify rationale and guiding principles that define BAS relevant to Gulf ecosystem restoration programs;
2) Identify priority short (1-5 years) and long-term (6-30 years) actions to support sustained BAS integration at required stages of Gulf ecosystem restoration; and
3) Identify engagement actions and strategies to foster collaboration among restoration programs and with their constituents (defined for this workshop as restoration practitioners, scientists, managers and decision-makers).

Deliverables were developed for each of the above objectives through plenary information exchange and discussions, working groups to develop consensus, a prioritization exercise, and networking.

Discussions within the working groups identified a rationale for ensuring BAS is built into all DWHOS ecosystem restoration strategies and implementation plans. This rationale consists of the following:

- ***BAS develops and utilizes a coordinated science-based framework for decision-making*** that integrates the science process and associated resources into restoration planning, implementation, and adaptive management;
- ***BAS provides scientific support for successful implementation of restoration projects***, including data, research, analysis, and interpretation, and science-based recommendations for design, construction, operation, monitoring, and performance assessment phases;
- ***BAS develops tools, models, methodologies, and protocols*** in support of restoration decision-making; and
- ***BAS documents and communicates risks and uncertainties*** as the scientific basis for ecosystem restoration decisions (as mandated in the RESTORE Act).

Workshop participants identified priority short-term actions for implementing and integrating BAS into DWHOS ecosystem restoration program plans included actions related to science organization, research and technology, and information management:

- Establish science advisory bodies to advise and guide management
- Develop key components for science-based project proposals

- Utilize peer review for strategy development, project selection and performance evaluation at project, program and regional levels
- Establish coordination mechanisms that encourage communications and collaborations among all restoration science programs
- Jointly develop a suite of conceptual models for Gulf ecosystem restoration that help identify knowledge gaps and promote integration of program roles
- Develop science plans at several levels (project to Gulf-wide) to guide restoration planning, implementation and evaluation
- Establish and sustain funding for a Gulf-wide, long-term, coastal and ocean monitoring and observing system at appropriate scales (project- specific to ecosystem scale)
- Establish unified information gateway for restoration programs, with elements targeted to stakeholder groups
- Develop a unified data management plan, including use of common standards and quality assessment for data collection and formatting.

Further actions were identified by workshop participants to promote coordination and engagement among restoration programs and with constituents (for this workshop, identified as restoration practitioners, scientists, managers and decision-makers), including: support for dedicated organizational elements and plans; and support for face-to-face, virtual, and printed materials that explain clearly the importance of science to successful Gulf-wide restoration and communicate results to constituents.

Participants noted that Gulf restoration efforts should take advantage of the lessons learned and best practices of other national and regional restoration programs. Previous and on-going regional programs with elements common to the DWHOS recovery effort, for example, the Exxon Valdez and Greater Everglades restoration programs learned much from trial and error. The Gulf will improve its success if it builds on these and many other regional efforts that sustain dedicated science organizations and plans, invest in the observations and modeling required for local to ecosystem scale monitoring, wisely manage their investments and outputs, and engage constituents in support of adaptive management.

INTRODUCTION

SITUATION AND NEED

The Deepwater Horizon Oil Spill (DWHOS) in 2010 was both an ecological and economic disaster adding to decades-long degradation of the Gulf of Mexico coastal and marine environment. The National Commission on the Deepwater Horizon Oil Spill and Offshore Drilling viewed assessment of the environmental, economic, and human health damages resulting from the spill as a "*threshold challenge. . . the spill itself is a regional issue, but the slow-motion decimation of the Gulf of Mexico's coastal and marine environment—created by federal and state policies, and exacerbated by energy infrastructure and pollution—is an unmet national challenge*" (Oil Spill Commission 2011). In response to the spill, Gulf citizens overwhelmingly support focusing the majority of DWHOS civil and criminal penalties levied under the federal Clean Water Act on ecosystem restoration (Weigel and Metz 2013). The success of Gulf ecosystem restoration and sustainability depends on sound science (Van Cleve et al. 2004, Walker et al. 2012).

The ''Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012" (RESTORE Act) deposits 80% of the DWHOS civil penalties to a Gulf Coast Restoration Trust Fund to be spent "*to restore the ecosystem and economy of the Gulf coast states*" (PL112-141, 2012). The Act tasks the Gulf Coast Ecosystem Restoration Council (GCERC) with development of a comprehensive restoration plan to guide ecosystem restoration efforts representing at least 60% of the Trust Fund; plan guiding principles include, "*decisions made pursuant to the Plan will be based on the* ***best available science*** *and this Plan will evolve over time to incorporate new science, information, and changing conditions. The Council will coordinate with the scientific community to improve decision-making*" (GCERC, 2013). This principle and intent should apply to the entire Gulf ecosystem restoration effort (**Table 1**). The Act specifically defines "best available science" (BAS) as science that 1) maximizes the quality, objectivity, and integrity of information, including statistical information, 2) uses peer-reviewed and publicly available data, and 3) clearly documents and communicates risks and uncertainties in the scientific basis for such projects. While this definition is more detailed than definitions provided by other legislative mandates (Doremus 1997), it does not provide mechanisms for integrating BAS into DWHOS restoration programs throughout their life spans.

The Gulf of Mexico University Research Collaborative (GOMURC; http://www.gomurc.org) is a consortium of 78 research institutions across the five Gulf states, with a mission to support science and education required to sustain a healthy Gulf ecosystem and economy. In 2013, GOMURC's grant from the Walton Family Foundation is supporting several outcomes including: increasing science capacity in the Gulf region for research, monitoring, observing, and modeling required for long-term, sustained health of Gulf ecosystems; ensuring Deepwater Horizon oil spill (DWHOS) restoration programs are science-based; and facilitating coordination of DWHOS restoration planning and implementation efforts to include all stakeholders, including universities, NGOs, and businesses that rely on healthy Gulf ecosystem functions and services. A key element of this work plan is a cooperative workshop in 2013, with the regional restoration science and management communities, intended to inform a Gulf-wide restoration effort that is based on the "best available science" (BAS) and emphasizes program coordination and engagement with constituents.

Table 1. Ecosystem restoration programs funded by DWHOS penalties as of August 2013. More penalties will derive from pending cases or settlements, e.g., NRDA and CWA cases. * -- RESTORE Act components adopted from Treasury Regulations for RESTORE Act (https://www.federalregister.gov/articles/2013/09/06/2013-21595/gulf-coast-restoration-trust-fund).

Program	Elements	Ecosystem Objectives	Funding (Aug 2013)	Source
GOMRI-- Gulf of Mexico Research Initiative (GOMRI)	8 major consortia each supporting dozens of projects; plus dozens of small team projects	http://gulfresearchinitiative.org; Defined by Master Agreement with BP; generally oil spill assessment and impacts research and technology development, some with ecosystem restoration applications	$500M	BP early restoration
NAS-- National Academy of Science	TBD-- primarily competition for grant funding	http://www.nationalacademies.org/gulf/gulfprogram.html; Strategies and technologies for monitoring and protecting human and environmental health (Gulf or other areas); oil/gas exploration safety	$500M	BP and Transocean criminal settlements
NAWCF- North American Wetlands Conservation Fund	TBD—land acquisition projects and competition for grants and contracts	wetlands restoration and conservation projects located in Gulf States or otherwise designed to benefit migratory bird species and other wildlife and habitat affected by oil spill	$100M	BP settlement
NFWF-- National Fish and Wildlife Foundation	TBD—competition for grant and contracts	http://www.nfwf.org/Pages/gulf/Gulf-Environmental-Benefit-Fund.aspx; natural resource restoration in AL, FL, MS and TX; resilient coastal ecosystems and barrier island restoration/creation in LA, per LA Coastal Master Plan	$2.6B	BP and Transocean settlements
NRDA- Natural Resources Damage Assessment, Early Restoration	10 major projects from ERP Phase I and II funding; 28 more in Phase III pending review/approval; many more likely after final litigation	http://www.gulfspillrestoration.noaa.gov/oil-spill/gulf-spill-data/ and http://www.gulfspillrestoration.noaa.gov/restoration/early-restoration/; restoration activities aimed at returning natural resources or services to pre-spill baseline condition and compensate for interim losses, per NRDA findings	$1.54B	BP early restoration
RESTORE Act Section 1603, Direct Component*	TBD – 5 state programs	*Gulf Coast Natural Resources Restoration and Economic Recovery Act of 2012* (RESTORE Act), subsection entitled *Gulf Coast Restoration and Recovery* directs 35% of Trust Fund to the Gulf Coast States in equal shares for expenditure "for ecological and economic restoration of the Gulf Coast region"	$280M	Transocean settlement
RA1603, Comprehensive Plan Component*	TBD	http://www.restorethegulf.gov/task-force; 30% of Trust Fund to be managed by the Gulf coast Restoration Council in accordance with Comprehensive Restoration Plan "to restore and protect the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region."	$240M	Transocean settlement
RA1603, Spill Component*	TBD- 5 state programs	30% of Trust fund disbursed pursuant to the formula in clause (ii) (e.g., based on factors such as distance from well site, and amount of oiled shoreline) to the Gulf Coast States subject to the condition that each Gulf Coast State submits a plan for the expenditure of amounts disbursed under this paragraph that meets the following criteria: projects, programs, and activities included in the plan contribute to the overall economic and ecological recovery of the Gulf Coast; and each state plan takes into consideration the Council's Comprehensive Plan and is consistent with its goals and objectives.	$240M	Transocean settlement
RA1604, NOAA Restoration Science Program Component*	TBD—likely combination of internal federal agency projects, and external grants and contracts	http://restoreactscienceprogram.noaa.gov; 2.5% of Trust Fund "to carry out research, observation, and monitoring to support, to the maximum extent practicable, the long-term sustainability of the ecosystem, fish stocks, fish habitat, and the recreational, commercial, and charter fishing industry in the Gulf of Mexico."	$20M	Transocean settlement
RA1605, Centers of Excellence Component*	TBD—5 state CEs	2.5% of Trust Fund for centers focused on science, technology, and monitoring in Gulf Coast Region; university-based consortia with cross-section of participants with expertise in at least one of prescribed disciplines including: 1) Coastal and deltaic sustainability, restoration and protection; 2) Coastal fisheries and wildlife ecosystem research and monitoring; 3) Offshore energy development, including research and technology to improve sustainable and safe development of energy resources; 4) Sustainable and resilient growth, economic and commercial development; 5) Comprehensive observation, monitoring, and mapping.	$20M	Transocean settlement

GOALS AND OBJECTIVES

Workshop goals included: Collaborate with DWHOS restoration program leads, scientists and managers to identify actions that promote integration of the "best available science" (BAS) into ecosystem restoration and adaptive management, and engagement of Gulf restoration science programs (Table 1) with stakeholders (restoration practitioners, resource managers, scientists, and decision-makers).

Objectives intended to serve these goals included:

1) Identify rationale and guiding principles that define BAS relevant to Gulf ecosystem restoration programs
2) Identify priority short-term (1-5 years; may continue beyond 5 years) and long-term (6-30 years) actions to support sustained BAS integration at required stages of Gulf ecosystem restoration
3) Identify engagement actions and strategies to foster collaboration among restoration programs and with their constituents (defined for workshop as restoration practitioners, scientists, managers and decision-makers).

APPROACH

PARTICIPANTS

The thirty-seven workshop participants included a workshop coordination team and invited experts (**Appendix A**). Funding for the workshop came from the Walton Family Foundation from a grant to GOMURC to support this activity. The Foundation sponsors the Gulf Renewal Project, a coalition of NGOs committed to Gulf restoration. In addition to GOMURC and Gulf Renewal Project partners, invitees represented the Gulf ecosystem restoration programs (Table 1).

WORKSHOP PROCESSES

The agenda (**Appendix B**, Table B-1) supported several processes to accomplish workshop objectives including:

- **Plenary:** Sessions with all participants served several purposes including: setting the stage for group activities; providing context and background information (e.g., talks with lessons learned, example outputs); and soliciting feedback and encourage dialog in response to group reports and presentations.
- **Consensus building:** Facilitated working group discussions were used to identify and "comfortably" agree on list of recommendations (e.g., principles or actions). Facilitators stated the group's objective, gave examples of potential output recommendations, and kept discussions focused. Volunteers from groups served as a reporter, including working with facilitator and recorder to compile outputs for report-out.
- **Priority setting:** Short term (1-5y) BAS actions identified in the working groups were prioritized in a plenary session. Participants had 10 votes to allocate to their top recommended actions, with a maximum of 2 votes for any one action (32 actions and 30 participants resulted in total of ~900 votes). Participants also used post-it notes to add content to actions (e.g., partners, elaboration, and other sub-activities).
- **Networking:** A key objective of the workshop was to engage participants in informal activities that encourage ideation and collaboration—breaks, meals, and an evening reception enabled this interaction.

Invited speakers led off the workshop with presentations intended to inform subsequent working groups. (**Appendix B**, Table B-2). All presentations are posted at the workshop web page. Dr. Larry McKinney's (GOMURC Board Chair and Harte Research Institution) opening presentation reaffirmed workshop purpose and goals. Other speakers were selected based on their expertise in restoration science. Dr, Greg Steyer, US Geological Survey, led development of the Gulf Coast Ecosystem Restoration Task Force's science plan section (Walker et al. 2012), and focused on importance of science for DWHOS restoration and adaptive management. Dr. Pete Peterson, University of North Carolina-Chapel Hill, provided an overview of the Exxon Valdez restoration science programs, and summarized recommendations from DWHOS restoration plan documents. Dr. Robert Johnson, National Park Service, provided guidance and lessons learned from the regional coastal restoration program for the Greater Everglades Ecosystem.

Pre-workshop materials provided background to inform breakout group discussions and outputs (**Appendix C**). Three breakout sessions provided targeted discussions and outputs for each workshop objective:

1) Identify BAS rationale and guiding principles;
   Output = rationale and principles for a science-based Gulf regional restoration effort
2) Identify priority short (1-5 years) and long-term (6-30 years) actions for BAS integration
   Output = prioritized short-term and long-term (not prioritized) actions for implementing BAS integration
3) Identify engagement actions and strategies
   Output = actions for promoting engagement of restoration science programs.

RESULTS

Rationale and Principles of Best Available Science (BAS) for Ecosystem Restoration

Participants reviewed definitions and principles for implementing "best available science" (BAS) prior to the workshop (**Appendix C**) and the first breakout session (B1) focused on identifying key principles that should define BAS for Gulf ecosystem restoration. Based on B1 discussion (notes in **Appendix D**), the following objectives provide more context and justification for integration of BAS in Gulf ecosystem restoration efforts. All Gulf ecosystem restoration programs should consider supporting the following activities:

1. ***Develop and utilize a coordinated science-based framework for decision-making*** that integrates the science process and associated resources into restoration planning, implementation, and adaptive management, considering the following:
   - BAS "is an engine, not the caboose;" it should not be an afterthought to be funded after plans are in place or only if funds are available; it is not the sole responsibility of one restoration science program; and it is a foundational process critical to all successful restoration efforts;
   - BAS improves the validity, credibility and integrity of ecosystem restoration; it is unbiased and independent, driven by critical, relevant, specific, and timely questions rather than politics or sector agendas;
   - BAS emphasizes and improves the timely flow of information and knowledge from restoration programs to and from stakeholders, partners and end users;
   - BAS is supported by dedicated organizational elements, including science advisory groups composed of experts from in and outside the region, and led by a chief scientist and program science staff; and

- BAS engages scientists and managers during planning and implementation to develop, for example, an evaluative process and criteria for project funding, and reliable feedback for adaptive management.

2. ***Provide scientific support for successful implementation of restoration projects***, including data, research, analysis, and interpretation, and science-based recommendations for design, construction, operation, monitoring, and performance assessment phases:
   - BAS identifies and prioritizes knowledge gaps and builds on both historical data and new information to fill gaps;
   - BAS assimilates existing and new data and information from all possible sources, identifies gaps in understanding, and conducts new studies as needed to fill gaps;
   - BAS includes interdisciplinary research, observations, monitoring and modeling required to determine ecological indicators, define baseline conditions, assess effectiveness of restoration management actions, and forecast changes in ecosystem conditions and community resiliency; and
   - BAS consists of research, observations, monitoring and modeling that are integrated across temporal and spatial scales, as appropriate, to consider many drivers including scale of environmental forcing factors (stressors) and complexity of ecosystem functions, goods and services.
3. ***Develop tools, models, methodologies, and protocols*** in support of restoration decision-making:
   - BAS employs independent peer review as an essential and proven decision support tool at many levels, including for program strategy development, project selection and progress assessment, merit of synthesis reports, and periodic program-wide performance evaluation at regular intervals;
   - BAS results, findings and discoveries are synthesized, translated, and communicated for all constituents;
   - BAS outputs are available at the appropriate scope and pace required to support decision-makers' needs, ranging from short-term validated data sets and reports, to longer-term refereed scientific literature;
   - BAS programs implement policies and effort to ensure scientific findings and technological innovations transition from experimental phase to operational applications for ecosystem managers;
   - BAS provides data and information that are transparent and accessible to constituents, utilizing state-of-the art information technologies and best practices for archiving and dissemination; and
   - BAS for regional restoration employs conceptual models that integrate different program goals, show cause-and-effect relationships among ecosystem components, and build on existing science capabilities.
4. ***Document and communicate risks and uncertainties*** in the scientific basis for ecosystem restoration decisions:
   - BAS contributes to conceptual models and information needed for assessment of the state of knowledge (uncertainties) and chances of project and program success (risk assessments) in all project and program stages, from planning to adaptive management responses; and
   - BAS provides data and related derived products that inform targeted stakeholders, are reliable and based on best practices for standards and quality, and are developed and shared by BAS programs to promote inter-operability.

Integrating BAS into Restoration Programs

Short Term Actions

The Day 1 B2 breakout groups identified 22 short-term actions to promote integration and implementation of BAS by Gulf ecosystem restoration programs (**Appendix E**). These actions were then posted on day two for prioritization; results of voting and additional comments from post-it notes added to actions are in Appendix E, Table E-1. The top ten (by votes) short-term actions grouped into general categories include:

- **Science Organization**: actions to infuse scientific capacity into program organizations and governance
    - Establish science advisory bodies
    - Develop key components for science-based project proposals
    - Utilize peer review for developing programs and assessing performance at project and program levels
    - Establish coordination mechanisms that integrate all restoration science programs
    - Develop key components for science-based project proposals
    - Jointly develop a suite of conceptual models for Gulf ecosystem restoration
    - Develop science plans at several levels (program to Gulf-wide) to guide restoration planning, implementation and evaluation
- **Research & Technology**: actions to generate the science-based knowledge and tools required to support decision-makers
    - Establish and sustain funding for a Gulf-wide, long-term, coastal and ocean monitoring and observing system at appropriate scales (project specific to ecosystem level)
- **Information Management**: actions to support efficient, transparent sharing of quality-controlled data and information.
    - Establish unified information portal for restoration programs, with elements targeted to stakeholder groups
    - Develop unified data collection and management plan, including use of common standards and quality assessment for data collection and formatting.

The final section of this report, *Conclusions and Priority Recommendations*, further elaborates on these top ten priority short-term actions. Actions to promote engagement, communications and outreach that arose during the B1 working group discussions are included in the section below*, Actions for Ensuring Restoration Science Program Engagement.*

Long-Term Actions

Most of the short term actions (1-5 years) continue to be required actions in subsequent years as well. Long-term monitoring and observing efforts, for example, need to begin right away and be sustained for decades, both to detect long-term trends , and to establish ecosystem baselines. Other long-term actions may be more relevant beyond the first five years of the regional restoration effort, such as initial programmatic reviews and adaptive response efforts. Some activities need time to develop, such as large, complex (meso-scale, ecosystem-level) habitat restoration efforts. Examples of long-term (>5-30 years) actions identified include:

- Conduct five-year comprehensive reviews of all restoration programs and projects

- Synthesize (e.g., create report cards) research results from across programs for a variety of ecosystem functions, goods and services
- Revisit conceptual models to create hypotheses and guide research & adaptive management; program review every 5 years to guide future project implementation.
- Identify and consider impacts of future events (e.g., hurricanes and spills) when assessing and managing DWHOS restoration.
- Identify and quantify the benefits of restoration efforts and lessons learned from DWHOS programs.
- Identify potential legislative changes based on lessons learned from DWHOS assessment, response, and restoration, for example:
    - Amend Oil Pollution Act (OPA) including: to provide credit to responsible parties for support of ecosystem-wide monitoring after the incident; and re-write to strengthen actions to include local communities in response and restoration.
- Invest in regional resources and capacity required for science-based ecosystem restoration (e.g., to support re-opening studies for future possible damage claims) and sustainability of ecosystem goods and services, for example:
    - Sustain funding for ecosystem monitoring operations and technologies based on a long-term plan that is science-based and developed with stakeholders (this was a challenge during and after the *Exxon Valdez* oil spill, due partly to language in the settlement).
- Convene regular (at least annual) regional meetings to broadly share restoration science results and technologies; partners may include Gulf of Mexico Research Initiative annual science conference, Gulf of Mexico Alliance all-hands meeting, and Annual State of the Gulf Summit (adds international partners and focus).

Actions for Ensuring Restoration Science Program Engagement

Engagement actions were discussed throughout the two-day conference; however, on the morning of day two a specific breakout session (B3) was exclusively devoted to engagement. The focus was on identifying mechanisms for fostering engagement among restoration science programs, restoration practitioners, resource managers, scientists, and decision. Numerous actions and suggestions were made to foster engagement, including related actions identified during the first day discussions (**Appendix F**). A priority action for DWHOS restoration programs is the immediate and sustained exchange of program priorities through a "macro-coordination" (across programs and the region) engagement process. Awareness of common and unique program priorities prior to implementing restoration work is required in order to enable leveraged, efficient use of resources and reduce duplication of effort. Specific recommendations included: using outside groups to assist with establishing best process for sharing and integrating priorities; examining other regional models (e.g., Puget Sound Partnership, Southeast Florida Coral project, European model, and the Mercury Forum); and establishing a related "Community of Practice."

CONCLUSION AND PRIORITY RECOMMENDATIONS

BAS Rationale

A workshop goal was to engage leadership from DWHOS ecosystem restoration programs in providing a roadmap for how their programs may incorporate and implement BAS information and policies. All the restoration programs now funded by plea agreements, or likely to be funded by pending civil or criminal penalties, participated in the workshop, and based on evaluations considered the workshop a success (**Appendix G**). Although best available science (BAS) is mandated by the RESTORE Act, the legislated definition is short on rationale and details of how to integrate BAS into ecosystem restoration programs.

The first working session identified key roles and reasons for integrating BAS in DWHOS ecosystem restoration program strategies and implementation including:

- ***BAS develops and utilizes a coordinated science-based framework for decision-making*** that integrates the science process and associated resources into restoration planning, implementation, and adaptive management;
- ***BAS provides scientific support for successful implementation of restoration projects***, including data, research, analysis, and interpretation; and science-based recommendations for design, construction, operation, monitoring, and performance assessment phases;
- ***BAS develops tools, models, methodologies, and protocols*** in support of restoration decision-making; and
- ***BAS documents and communicates risks and uncertainties*** in the scientific basis for ecosystem restoration decisions (as mandated in the RESTORE Act).

BAS Implementation

The Gulf Coast Ecosystem Restoration Council's Initial Comprehensive Plan requires that projects included in state expenditure plans for the RESTORE Act Spill Impact Component (section 1603, 30% to States that must mesh with the Council's plan) be based on BAS (GCERC 2013); the plan, however, does not prescribe how to accomplish this mandate. This general requirement and recommended actions apply to projects supported by all programs funded for ecosystem restoration.

The workshop's second working session recommended short-term action items (**Appendix E**, Table E-1) intended to inform all ecosystem restoration programs, not just RESTORE Act programs. While all the recommended actions have value for implementing BAS, highest priority actions (scores greater than 14 votes in Table E-1) are described further.

Science Organization

<u>Establish science advisory bodies:</u>

This action applies to all restoration programs. The NOAA Restoration Science Program component of the RESTORE Act (Section 1604) has instituted a Restoration Science Program Advisory Working Group under the NOAA Science Advisory Board to provide "*independent guidance and review of the NOAA RESTORE Act Science Program, offering advice and recommendations to NOAA on the types of projects the Program should support*" as well as providing a mechanism for coordination with the other RESTORE-related science programs (NOAA 2013). Advisory groups should be based on a charter that defines specific objectives and business practices (e.g., dealing with conflicts of interest, terms of membership and service).

Develop key components for science-based project proposals:

This is an immediate high priority task required by restoration program managers, decision- and policymakers, and restoration practitioners. Criteria to ensure that BAS is implemented need to be included in funding opportunities, and prioritized in both proposal review and project performance evaluations (basis for continued funding). They may include, for example, expectations regarding project feasibility, scientific and technical merit, relevance to program goals, and project team qualifications.

Utilize peer review for developing programs and assessing performance at project and program levels:

Independent peer review is a proven and reliable procedure for ensuring quality and productivity of science-based outputs and outcomes (OMB 2004). Not every program activity need be selected by the same review process. NSF employs useful models for review processes, both for annual work plans and rapid response activities (NSF 2013). Expeditious review of plans may require internal reviews, which in turn may necessitate programs to employ science staff. Program reviews are also valuable opportunities for the creation of outreach and education materials, when reported in language comprehendible by decision-makers and the public.

Establish coordination mechanisms that integrate all restoration science programs:

This action was identified by both the science and engagement working groups as an immediate priority. The restoration programs in Table 1 (column 2) represent at least 38 different management entities, overseen by a range of authorities including federal, state, academic, and NGO institutions. They may support hundreds to thousands of grants, contracts and projects over the next 30 years. While some coordination is mandated by the RESTORE Act, there is no over-arching structure or mechanisms now in place to unite the recovery effort. Efficiency and effectiveness of the Gulf restoration effort depends on communication and coordination through, for example, shared objectives, metrics, and assets.

Jointly develop a suite of conceptual models for Gulf ecosystem restoration:

The entire regional restoration effort should jointly develop a conceptual model for assessing regional restoration needs and progress (e.g., see Simenstad et al. 2006). Conceptual models are also useful assessment and planning tools for many of the specific restoration program applications identified during the workshop, including: providing a template for science-based projects; addressing uncertainty and risk; answering specific research questions; identifying and integrating program goals; showing cause-and-effect relationships among ecosystem components; identifying and building on existing science capabilities; creating hypotheses and guiding related research and adaptive management efforts; identifying data gaps and coordinating data collection; and understanding incentives, motivations, and constraints of stakeholders.

Develop science plans at several levels (program to Gulf-wide) to guide restoration planning, implementation and evaluation:

Immediately after the DWHOS, the Gulf Coast Ecosystem Restoration Task Force developed a strategy for Gulf-wide restoration (GCERTF 2011) and a *Science Assessment and Needs* document, including a Science Plan (chapter 6, Walker et al. 2012). All ecosystem restoration programs should be based on similar strategic and science plans, which describe how science is integrated and implemented in restoration, not as a stand-alone effort but engrained into decision-making. Specifically, the Gulf Coast Ecosystem Restoration Council should consider adopting the Task Force's Science Plan and convening a science working group to revise and update Walker et al. (2012) to address the Comprehensive Plan goals, which are based on the Task Force strategy (GCERC 2013). Missing elements from the Task Force plan noted by workshop participants include dealing with risk and uncertainty, and latest climate change assessment and predictions (e.g., Intergovernmental Panel on Climate Change's Fifth Assessment due out in late 2013 or 2014).

Research & Technology

<u>Establish and sustain funding for a Gulf-wide, long-term, coastal and ocean monitoring and observing system at appropriate scales (project specific to ecosystem level):</u>

Monitoring is a critical activity for ensuring success of Gulf recovery. Observations are the data that inform ecosystem monitoring. Monitoring must be implemented at both ecosystem and site-specific scales with support from every ecosystem restoration program. Project work plans should specify: how effectiveness monitoring will be conducted; how project monitoring will integrate with and support ecosystem-scale monitoring; and investments that are proportional to the scale and complexity of the project. Ecosystem-level observing and monitoring provides the framework for project efforts. It is required to understand meso-scale processes that impact local conditions. Gulf-wide monitoring system must be based on multiple indicators, integrated and long-term, from blue-water to inland. This scope will require many partners to work together to operate and maintain such a monitoring system. Additionally, it will require long-term, sustained support, perhaps funded by an endowment cost shared by all programs that benefit. A first step is to inventory existing monitoring programs to identify key gaps in environmental, taxonomic, spatial, and temporal coverage, and determine how to integrate (e.g., goals, assessment end-points, and standards) new with existing efforts.

Information Management

<u>Establish unified information portal for restoration programs, with elements targeted to stakeholder groups</u>:

All restoration programs should strive to be transparent and informative by providing access as early as possible to quality controlled data and derivative products. The restoration programs should collaborate to establish a web site to serve several purposes including: distributed system with central access point that incorporates information about different programs, state and federal agencies, and organizations who maintain and manage their own databases; access to visual aids for decision-makers and the public to help them understand restoration project outcomes, demonstrate program effectiveness, and identify program priorities. The user interface should be intuitive for the public. Several existing Gulf-wide efforts exist and should be assessed as possible portals by a cross-program team composed of Information Technology and Management experts, communications specialists, scientists and managers.

<u>Develop unified data collection and management plan, including use of common standards and quality assessment for data collection and formatting</u>:

Similar to developing a science plan or as a component of a science plan, all programs should develop and maintain information management plans. Again, these should build on models from existing Gulf efforts (e.g., GCOOS 2013) and other regional restoration programs.

Engagement Actions

The final breakout group recommended both reasons and ways to coordinate and engage the vast array of Gulf restoration efforts, both among the programs and with constituents. For this workshop, constituents were defined as restoration practitioners, scientists, managers and decision-makers. Many of the proposed activities will serve all constituents including the public. Major actions proposed include: development of engagement plans and inclusion of programmatic support for related activities; support for face-to-face, virtual, and printed materials; and immediate dedication to macro-coordination of all restoration programs to share plans and policies.

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APPENDIX A: Workshop Participants

Table A-1. Workshop Participants. **Roles**: C = coordination team; IS = invited speaker; all others are discussion participants.

Surname	Affil.	State	Prog	Role	email
Beard, Russ	NOAA/NCDDC	Reg	1604		russ.beard@noaa.gov
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Virmani, Jyotika	FIO	FL	GOMURC		Jyotika@usf.edu
Walker, Shelby	NOAA/NOS	Reg	1604	C	shelby.walker@noaa.gov
Whittle, Amber	FL FWC	FL	FWC		amber.whittle@myfwc.com

*- not at workshop; gave plenary presentation via webinar on 8/12

APPENDIX B: Agenda

Table B-1. Workshop agenda.

Time	Activity/Objs.	Process	Output(s)
AUG 12:			
0830-0900	Registration: network	Network	
0900-1030	Opening talks (**Table B-2**) and Q/A discussion	Plenary	Presentations
1030-1040	Break	Network	
1040-noon	**B1- BAS definition and principles**: • Identify key principles that define BAS for Gulf ecosystem restoration • Recommend when and how should BAS be integrated into restoration process	Consensus	Group notes
noon-1300	Lunch	Network	
1300-1330	B1 group reports	Plenary	List of principles
1330-1530	**B2 – BAS actions:** Recommend short-term (first five years) and long-term actions (6-30 years) required to integrate BAS into Gulf restoration	Consensus	Group notes
1530-1600	Break	Network	
1600-1645	B2 group reports	Plenary	list of BAS actions
1645-1700	Review Day 2 plan	Plenary	
1730-1900	Reception	Network	
Aug 13			
0830-0900	Breakfast	Network	
0900-0940	Prioritize B2 short-term actions: • dot voting • post-it note comments, e.g., action partners, clarify, elaborate or add sub-activities	Prioritize	revised/priori-tized list of short term BAS actions
0940-1130	**B3 engagement actions:** Identify mechanisms for fostering engagement among restoration science programs and constituents (restoration practitioners, resource managers, scientists, and decision-makers): • Informed by seven characteristics that define engagement (Kellogg Commission Report[1]), recommend best approaches to engaging constituents in restoration program planning and implementation • Identify challenges and obstacles to engagement • Recommend approaches to enhance exchange of priorities and activities among managers of restoration programs	Consensus	Group notes
1130-noon	Plenary discussion: • results of morning priorities session • next steps for distribution of workshop outputs	Plenary	Revised list of short-term BAS action priorities
noon-1230	B3 group reports	Plenary	list of engagement actions
1230-1330	Lunch; evaluation forms; adjourn	Network	workshop evaluations

[1] Kellogg Commission. 2001. Returning to Our Roots: Executive Summaries of the Reports of the Kellogg Commission on the Future of State and Land-Grant Universities. National Association of State Universities and Land-Grant Colleges, 1307 New York Avenue, NW, Suite 400, Washington, DC 20005. 48 pp. http://www.nasulgc.org

Table B-2. Plenary presentations: presenters are linked to their home pages. Pdf versions of all presentations are available at http://bit.ly/gomurcrestoreworkshop.

Speaker	Title	Content
Dr. Larry McKinney, Harte Research Institute	*Gulf Restoration Science Workshop: Principles and Actions for Implementing Best Available Science*	GOMURC and Walton Family Foundation objectives-science-based restoration and coordination; workshop objectives, expected outcomes and actions; focus on how BAS is implemented in regional restoration science programs, **not** identification of specific projects or requests for funding.
Dr. Greg Steyer, US Geological Survey	*Gulf Coast Ecosystem Restoration Task Force Science for Restoration and Adaptive Management*	Summary of GCER Task Force Science Assessment and Needs; what is science-based restoration and adaptive management?; recommended actions and potential obstacles to integration of a Science Plan in support of GCERC Comprehensive Plan and other restoration programs.
Dr. Charles "Pete" Peterson, Univ. of North Carolina-Chapel Hill	*Science-Based Restoration of the Gulf of Mexico*	Lessons learned and role of science in Exxon Valdez restoration programs; dealing with the DWH Type I/II blowout spill; transformative opportunities for restoring Gulf ecosystems
Dr. Robert Johnson, National Park Service, South Florida Natural Resources Center	*Science-Based Restoration in the Greater Everglades Ecosystem*	Everglades Ecosystem stressors and changes; restoration strategy; science role, e.g., planning and implementation applications, conceptual models, ecosystem indicators and report cards; lessons learned and recommended Science Coordination organizational elements

APPENDIX C: Background Materials

PRE-WORKSHOP REVIEW MATERIALS

EXAMPLES:

- BREAKOUT 1—DEFINITION AND PRINCIPLES OF "BEST AVAILABLE SCIENCE" (BAS)
- BREAKOUT 2-- BAS ACTIONS
- BREAKOUT 3-- ENGAGEMENT PLAN ACTIONS

APPENDIX A REFERENCES

PRE-WORKSHOP REVIEW MATERIALS:

Prior to the workshop, participants received review materials including:

GCERC (Gulf Coast Ecosystem Restoration Council). 2013. Draft Initial Comprehensive Plan: Restoring the Gulf Coast's Ecosystem and Economy. 20 pp. Available on-line at http://ww.restorethegulf.gov/release/2013/05/23/gulf-coast-ecosystem-restoration-council-releases-draft-initial-comprehensive-pla.

Summary of Chapter 6, Gulf Restoration *Science Plan,* from: Walker, S., Dausman, A., and Lavoie, D. (eds.). 2012, Gulf of Mexico Ecosystem Science Assessment and Needs—A Product of the Gulf Coast Ecosystem Restoration Task Force Science Coordination Team, 72 p. On-line at http://www.epa.gov/gcertf/pdfs/GCERTF-Book-Final-042712.pdf.

P. 11-13, *Discussion- Best Available Science and Restoration Policy*, in: Van Cleve, FB, C Simenstad, F Goetz and T Mumford. 2004. Application of the "Best Available Science" in Ecosystem Restoration: Lessons Learned from Large-Scale Restoration Project Efforts in the USA. Tech. Rept. 2004-01. Puget Sound Partnership, Olympia Washington. 37 pp. Available at http://www.pugetsoundnearshore.org/technical_papers/lessonslearned.pdf.

P. 16, *A Seven Part Test*, guiding characteristics that define an engaged institution from: Kellogg Commission. 2001. Returning to Our Roots: Executive Summaries of the Reports of the Kellogg Commission on the Future of State and Land-Grant Universities. National Association of State Universities and Land-Grant Colleges, 1307 New York Avenue, NW, Suite 400, Washington, DC 20005. 48 pp. http://www.aplu.org/NetCommunity/Document.Doc?id=187.

BREAKOUT 1—DEFINITION AND PRINCIPLES OF "BEST AVAILABLE SCIENCE" (BAS):

Gulf Coast Ecosystem Restoration Council (2013) initial comprehensive restoration plan, p. 6: "*Commitment to Science-Based Decision-Making:* The decisions made pursuant to the Plan will be based on the *best available science* and this Plan will evolve over time to incorporate new science, information, and changing conditions. The Council will coordinate with the scientific community to improve decision-making."

BAS, or a close variant phrase, occurs in many environmental regulation statutes: the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, the Salmon and Steelhead Conservation & Enhancement Act of 1980, the Pacific Salmon Treaty Act of 1985, the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, the Wild Bird Conservation Act of 1992, the Atlantic Coastal Fisheries Cooperative Management Act, and the National Fishing Enhancement Act of 1984. However, rarely is it defined in law (Doremus, 1997).

Definition/Principle	Source
RESTORE Act-- '**best available science**' (BAS) means science that: • maximizes the quality, objectivity, and integrity of information, including statistical	PL112-141 (2012), subtitle f

information; • uses peer-reviewed and publicly available data; and • clearly documents and communicates risks and uncertainties in the scientific basis for such projects.	
GCER Task Force strategy requires process that allows for restoration efforts to move ahead in a **scientifically defensible manner**, including to: • Increase fundamental scientific certainty necessary for successful restoration and expanding current knowledge of the state of the system • Integrate science process, and associated resources, into restoration planning and projects to ensure that the science is appropriately considered and sufficiently supported. • Determine the efficacy of the restoration actions through a focused effort of monitoring, modeling and research to support effective management and decision-making.	GCERTF (2011)
Role of scientists in restoration may include: • Report—scientific results for use in decision-making • Interpret—scientific results for others involved in decision-making • Educate—professionals and workforce of tomorrow in tools required for management • Integrate—results into management decisions, working closely with managers • Advocate—for specific management decisions • Decision maker—make decisions about management and policy.	Lach et al. (2003)
"Adaptive management"-- method for testing decisions regarding planned activities and adjusting the course of action if those activities are not achieving their intended purposes; approach is critical to any long-term restoration plan because of underlying uncertainty regarding ecological processes, and the high likelihood that natural or human-caused activities will change the circumstances affecting restoration while the plan is underway. Adaptive management requires: • Establish clear *measurable restoration goals*, • Identify *indicators* of whether goals are being achieved, monitor those indicators, and based on information gained, consider new courses of action. • Offer a *means to proceed iteratively to reduce uncertainty* through the refinement of management actions, and avoid investing in projects that do not ultimately promote restoration goals.	Milkman (2010)
• ESA requirement for BAS "merely prohibits the Secretary from disregarding available scientific evidence that is in some way better than the evidence he relies on."[2] • In deciding whether scientific information is the "best available," substantial deference is accorded to the Agency's assessment of the quality of what is available.[3]	Case law (**see footnotes**; examples provided by Ocean Conservancy)
• Safe Drinking Water Amendments of 1996 require that the Environmental Protection Agency use "the *best available, peer-reviewed science*" • Clinton Administration executive order detailing general procedures for internal executive branch review of proposed regulations requires that agencies base regulatory decisions on the "*best reasonably obtainable scientific and other information*."	Doremus (1997)
Although Congress has never defined the term "best available science" in any of the environmental statutes in which that term is used, it has explicitly *recognized that, in directing that agencies make decisions on that basis, the optimal amount of scientific evidence for making the decision involved may not be available*	Glicksman (2008)
• "best available science" mandate may serve multiple purposes: ensuring that an agency's decisions accurately reflect known scientific information; imposing a mandate on the agency to make its best efforts to ferret out available information; placing an imprimatur of objectivity on agency decisions to increase public trust and enhance the agency's	Doremus (2004)

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[2] *Friends of Blackwater v. Salazar*, 691 F.3d 428, 435 (D.C. Cir. 2012) (citing *Southwest Center for Biological Diversity v. Babbitt*, 215 F.3d 58, 60–61 (D.C. Cir. 2000) (internal quotation marks and citation omitted).

[3] *General Category Scallop Fishermen v. Secretary, U.S. Dept. of Commerce*, 635 F.3d 106, 115 (3rd Cir. 2011); *Washington Crab Producers, Inc. v. Mosbacher*, 924 F.2d 1438, 1448–1449 (9th Cir. 1990); *C & W Fish Co., Inc. v. Fox*, 931 F.2d 1556, 1562 (D.C. Cir. 1991)

credibility; and creating a basis for resolving judicial challenges to agency decisions. • In terms of improving decision making, the ESA's best available science mandate might impose at least one thing that the APA and other background requirements do not--an affirmative obligation to find data, rather than to simply evaluate what others present. • Congressional report on 1978 amendments to the ESA explained that the best available science mandate requires that biological opinions prepared under section 7 be based on the best evidence "*that is available or can be developed during consultation*" • More recent decision, however, rejects the claim that the best available science mandate requires development of new information. In *Southwest Center for Biological Diversity v. Babbitt*, the D.C. Circuit overturned a trial court's requirement that FWS conduct a population census before deciding whether or not to list the Queen Charlotte goshawk. According to the appellate court, "The 'best available data' requirement makes it clear that the Secretary has no obligation to conduct independent studies."	
Unlike stand-alone "best scientific data available" standard in the ESA, the Safe Drinking Water Act (SDWA) standard attempts to impose objective criteria on utilized BAS requiring that the science be *"peer reviewed" and "in accordance with sound and objective scientific practices."*	Brennan et al. (2003)

BREAKOUT 2-- BAS ACTIONS:

Action	Source	1-5y	5-30y
Science organization: • GCERC hire chief scientist and support staff and establish Science Advisory Committee composed of non-government partners; • All restoration science programs establish Joint Advisory Group to promote coordination of plans and implementation • GCERC (2013) Coordination Review: "In order to avoid duplication and maximize benefits from collaboration, the Council will review eligible proposals for potential coordination opportunities, both within other RESTORE Act components and across the other Gulf Coast restoration efforts."	OC (2013); GCERC (2013)	X	
Peer Review: • External, independent peer review should be incorporated at program and project levels, including development of a science plan. • Science must be developed and conducted independently of policy pressures and integrated in ways that transcend agency turf and agendas.	OC (2013); Walker et al (2012)	X	X
Science Plans: All restoration should be guided by a **science plan** that is critically reviewed and periodically updated by science staff and advisory groups. Plan objectives: • Provide a *framework for decision-making*, requiring issues to be clearly and technically defined; • Provide long-term, continuous *scientific data, analysis, interpretation, and recommendations* that are critical to the design, construction, operation, and monitoring of restoration projects; • Develop *enabling tools, methodologies, and protocols* for system-level restoration planning and assessment; • *Resolve uncertainties* about the system that limit restoration planning; • *Assess the immediate and long-term effectiveness* of restoration actions in meeting program goals.	Walker et al. (2012); OC (2013)	X	
Long-term monitoring program: Long-term monitoring is required to support BAS performance evaluation and adaptive management: • All projects should be monitored for performance and results using standard methods and as much integration and efficiency as possible. • Status of the entire Gulf ecosystem should be monitored and synthesized. • Monitoring results should inform restoration actions and priorities at both	Walker et al. (2012); OC (2013)	X	X

programmatic and project levels.			

BREAKOUT 3-- ENGAGEMENT PLAN ACTIONS:

GCERC (2013) initial comprehensive plan, p. 7: *Commitment to Engagement, Inclusion, and Transparency:* It is the Council's intent to seek broad participation and input from the diverse stakeholders who live, work, and play in the Gulf Coast region in both the development of this Plan and the ultimate selection and funding of ecosystem restoration activities.

The Council intends to provide opportunities to facilitate the formation of strategic partnerships and collaboration on innovative ecosystem restoration projects, programs, and approaches that might ultimately form the basis of a proposal to the Council.

Action	Source
Communications and coordination among restoration science programs: • GCERC (2013) Objective 7 (p. 13): *Improve Science-Based Decision-Making Processes* – Improve science-based decision-making processes used by the Council; science advisory board, support for events (e.g., symposia) • Work plans and other documents, meeting schedules, opportunities for engagement, budgets, audit results, and other information and materials easily available on-line. • Results of scientific studies and restoration projects synthesized and widely shared.	GCERC (2013); OC (2013); PL112-141 (2012)
Public engagement and education: • GCERC (2013)-- Council is committed to engaging the public and tribes, and will use its website, www.restorethegulf.gov, to collect comments, questions, and suggestions for Council consideration. • GCERC (2013) objective 6 (p. 13): *Promote Natural Resource Stewardship and Environmental Education* – Promote and enhance natural resource stewardship through environmental education efforts that include formal and informal educational opportunities, professional development and training, communication, and actions for all ages. • GCERC (2013) Next steps (p. 20): GCERC establish Citizen's Advisory Committee composed of non-government partners.Meaningful public input is critical to long-term success. This must include advance public notice and open meetings, regular opportunities for public comment, and public citizen's advisory committees.	OC (2013); GCERC (2013)
Synthesis and decision-support activities: • Providing decision support: central component of a strong adaptive management strategy is articulating and conveying results in a compelling and clearly understood format that can help inform effective decision-making and improve public understanding. Effective decision-support must also include a clear articulation of uncertainties and assumptions to help inform planning, assessment and trade-off analysis. • Developing integrated decision-support tools and systems, including expansion and enhancement of predictive, simulation, and risk assessment models and ecological forecasting capabilities. • Developing decision-making visualization and data aids that overlay the myriad uses of the Gulf that can potentially interact with energy and mineral development, such as Virtual Louisiana, Virtual Alabama and Gulf Data Atlas. • Expanding ecosystem services and benefits analysis tools and capabilities to determine the socioeconomic benefits that ecosystems provide throughout the Gulf region. • Establishing indicators of success and monitoring assessments to evaluate how well program elements meet their stated goals. The performance measures must be quantifiable and understandable to the public, have outcomes or targets specified for the desired Gulf condition, be sensitive to ecosystem change as a result of the Strategy implementation, and verify restoration and protection effectiveness and answer hypotheses. • Developing a Gulf-wide progress report. This report should provide summary status information on ecosystem endpoints and communicate progress of management in improving ecosystem function (including ecosystem services). It should reflect trends over time to judge progress in an easy-to-understand format for the public and decision-makers, providing	Walker et al (2012)

information on both how the ecosystem is functioning and why.	
Seven guiding characteristics to define an "engaged" institution: **1. Responsiveness.** We need to ask ourselves periodically if we are listening to the communities, regions, and states we serve. Are we asking the right questions? Do we offer our services in the right way at the right time? Are our communications clear? Do we provide space and, if need be, resources for preliminary community-university discussions of the public problem to be addressed. Above all, do we really understand that in reaching out, we are also obtaining valuable information for our own purposes? **2. Respect for partners.** Throughout this report we have tried to emphasize that the purpose of engagement is not to provide the university's superior expertise to the community but to encourage joint academic-community definitions of problems, solutions, and definitions of success. Here we need to ask ourselves if our institutions genuinely respect the skills and capacities of our partners in collaborative projects. In a sense we are asking that we recognize fully that we have almost as much to learn in these efforts as we have to offer. **3. Academic neutrality.** Of necessity, some of our engagement activities will involve contentious issues— whether they draw on our science and technology, social science expertise, or strengths in the visual and performing arts. Do pesticides contribute to fish kills? If so, how? How does access to high quality public schools relate to economic development in minority communities? Is student "guerrilla theater" justified in local landlordtenant disputes. These questions often have profound social, economic, and political consequences. The question we need to ask ourselves here is whether outreach maintains the university in the role of neutral facilitator and source of information when public policy issues, particularly contentious ones, are at stake. **4. Accessibility.** Our institutions are confusing to outsiders. We need to find ways to help inexperienced potential partners negotiate this complex structure so that what we have to offer is more readily available. Do we properly publicize our activities and resources? Have we made a concentrated effort to increase community awareness of the resources and programs available from us that might be useful? Above all, can we honestly say that our expertise is equally accessible to all the constituencies of concern within our states and communities, including minority constituents? **5. Integration.** Our institutions need to find way to integrate their service mission with their responsibilities for developing intellectual capital and trained intelligence. Engagement offers new opportunities for integrating institutional scholarship with the service and teaching missions of the university. Here we need to worry about whether the institutional climate fosters outreach, service, and engagement. A commitment to interdisciplinary work is probably indispensable to an integrated approach. In particular we need to examine what kinds of incentives are useful in encouraging faculty and student commitment to engagement. Will respected faculty and student leaders not only participate but also serve as advocates for the program? **6. Coordination.** A corollary to integration, the coordination issue involves making sure the left hand knows what the right hand is doing. The task of coordinating service activities—whether through a senior advisor to the president, faculty councils, or thematic structures such as the Great Cities Project or "capstone" courses—clearly requires a lot of attention. Are academic units dealing with each other productively? Do the communications and government relations offices understand the engagement agenda? Do faculty, staff, and students need help in developing the skills of translating expert knowledge into something the public can appreciate. **7. Resource partnerships.** The final test asks whether the resources committed to the task are sufficient. Engagement is not free; it costs. The most obvious costs are those associated with the time and effort of staff, faculty, and students. But they also include curriculum and program costs, and possible limitations on institutional choices. All of these have to be considered. Where will these funds be found? In special state allocations? Corporate sponsorship and investment? Alliances and strategic partnerships of various kinds with government and industry? Or from new fee structures for services delivered? The most successful engagement efforts appear to be those associated with strong and healthy relationships with partners in government, business, and the non-profit world.	Kellogg Commission (2001)

APPENDIX C REFERENCES:

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Walker, Shelby, Dausman, Alyssa, and Lavoie, Dawn, eds., 2012, Gulf of Mexico Ecosystem Science Assessment and Needs—A Product of the Gulf Coast Ecosystem Restoration Task Force Science Coordination Team, 72 p. On-line at http://www.epa.gov/gcertf/pdfs/GCERTF-Book-Final-042712.pdf.

APPENDIX D: Workshop Notes

Following are the notes as recorded on computer by the workshop recorders, with only minor edits for grammar. Sessions recorded included plenaries and breakout group discussions (Table B-1).

Table B-1. Recorders notes from workshop sessions. Note that session names are linked to bookmarks where notes begin below.

Date	Time	Session
8/12	0900-1030	Opening talks and panel discussion
	1040-noon	B1- BAS definition and principles • Group A notes • Group B notes
	1300-1330	B1 Reports: • Group A • Group B • Q/A Discussion
	1330-1530	B2- Best Available Science Actions • Group A notes • Group B notes
	1600-1645	B2 Reports: • Group A • Group B • Q/A Discussion
8/13	0940-1130	B3- Engagement Actions • Group A notes • Group B notes
	1200-1230	B3 Reports: • Group A • Group B

Monday, August 12

OPENING TALKS AND PANEL

Greg Steyer - USGS

- What is science-based restoration?
  - Data driven
  - Grounded in science
  - Lessons learned
  - Assumptions and limitations
  - Peer-review
- Good examples of long-term monitoring and adaptive mgmt. on smaller scales, i.e. USACE, LA CWPRA & state master plan
- Recommended actions
  - Establish data standards
  - Establish science governance
  - Establish organizational structure that supports communications & coordination

Pete Peterson – UNC-Chapel Hill

- Best available science means:
  - Science as planned process, not afterthought
  - Science plan should include roles for science in injury assessment, restoration reviews, syntheses of results

  - Hire a chief scientist, contract w panel of core reviews, and solicit ad hoc peer reviews by experts. Should all be independent of trustee agencies.
  - Core reviewers should include experts on physical oceanography, fisheries science, plankton & estuary ecology, marine mammals, conservation biology
- Citizen involvement
  - Website for meeting announcements, results, people involved, reports on injured species
  - Collaboration w/ aquarium, universities, museums
  - Public participated in EVOS annual science meeting

Q&A

- Powerpoints will be made available afterwards
- Science assessment & needs doc went through LRM public review process
- No one yet authorized to be central coordinating body. Reduce redundancy. Conversation should be coordinated, but science can be redundant.
- 1 person should be aware of what each group is doing & share w/ everyone to avoid missing something
- NRDA injuries research group is constrained
- What are we restoring to? What is our baseline that we want to achieve?
  - Resilient ecosystem & communities.

BREAKOUT 1 (B1)-- BAS DEFINITION AND PRINCIPLES:

B1 Group A Notes:

How can you integrate best available science into restoration planning?

- Monitoring/observing program
  - Need observing system for not only what we can see but what we cannot see, i.e. the deep waters of the Gulf.
  - Mandate a required monitoring program for individual projects.
  - Universal metrics for monitoring. Sustained monitoring. More than 5 years. Must be interpreted to inform future projects.
  - Should occur at project level and program level.
  - May need a body to help coordinate those efforts- no one entity will be able to do this. Must be an inter-disciplinary system. Must be forward looking using new technologies.
  - Observing systems need to be kept in place over the long term of the project.
- Coordination
  - Coordination among various entities that are delivering the info.
  - Coordination- science advisory panel. Must be well defined. Part of restoration effort.
  - Must have a chief scientist who also serves as a translator with the policy work. Over seeing coordination of science advisory board.
  - Best available science must be apolitical. Must be the engine driving this ship.
- Data
  - Data must have a paradigm shift. Established data protocols and standards.
  - Common language for data collection so everyone is on the same page and date can be utilized by all. Communicators must be experts at public communication. Like SeaMAX or DataOne.
  - Quality data and data availability. Make data available more quickly so decisions can be made in a timely manner.
  - Integrated GIS is a good tool to utilize for using most current data.
  - Utilize existing science
- Risk
  - Dan Simberlough papers should be a resource. NRC Council report on Drake in Marine County, CA. it does a good job of putting science in a context of risk.

- Justify investment in science with community leaders by pointing out risk to that community. Performance measures need to address changes in risk at community level.
- There is a gap between science data and management. We must fill the gap between science and risk. Define process to transition science results to application.

- Communication
  - A one pager or website devoted to different habitats that points out what we know about the science of these areas and what we don't know. Must be comprehensive and all inclusive. Transparent and updated/synthesized information.
  - Need to translate best available science into lay terms. Effective public communication.
  - Communicating lessons learned. How would science program inform itself. How do you deliver that to the practitioners? Effective delivery of info to EVERYONE, i.e. scientists, government. The public needs to be more informed with the science.
- Components of best available science & implementation
  - Watch-dog group that could provide feedback to determine if best available science is being used.
  - Must include human component to restoration. Integrated into practitioners' toolbox –well trained workforce who is versed on the science.
  - Must think about small projects on the large scale impact they will have on the GOM. Utilize existing data.
  - Advisory board to oversee the program to give independent feedback to the programs to ensure a non-biased opinion. Peer review of projects is very important.
  - Criteria for selecting projects that are grounded in science taking into account things like climate change.

B1 Group B Notes:

Key elements needed for BAS for decision-makers

- Literature review should be included, use to build out conceptual model
- Science advisory body must review projects
- Programs must talk to each other
- Look at how project fits into current & historical science in region
- What measurements are & how measurements will reduce uncertainties in conceptual model, thus evaluation will be more effective
- Third party must evaluate credibility of project proposals
- Data collection must be specifically coordinated to project conceptual model
- Science is appropriate to scale, money, investment, time, ecosystem complexity
- Must apply to ecological restoration, community resilience, economic recovery
- Checks throughout the process
- Manage expectations
- Monitoring & adaptive management for each project
- Project proposals must include same elements to judge each one by same criteria

Overarching principles

- Projects should be prioritized that are more likely to succeed based on what you know
- Development of agreed-upon conceptual models for whole ecosystem, funded by 1604 or NAS?
- Council needs science advisory body
- Need ocean observing system
- Can't invest in data without investing in modeling
- Project proposals should include is feasibility & risk assessment
- Develop common metrics for restoration decision-makers and implementers to agree on
- Establish long-term monitoring & ocean observing program to feed models

  - Must be a budget (i.e., endowed fund) to do long-term monitoring, not just rely on 1604

B1 REPORTS:
B1 Group A Report:

- Apolitical
- Coordination w/in science groups, resource manager groups, ensure feedback & adaptive mgmt.
- Effective delivery & use of information. Communicating with public & practitioners
- Consider scale, project to program, state to region
- Observation & monitoring
- Incorporate multiple disciplines
- Consistency of data, data standards & quality. Ability to share data asap to incorporate into project decisions
- Quick Peer review of data at project level of program itself
- Make use of existing info already gone thru independent peer review process
- Science transition, go from results to application.
- Address risks & uncertainties
- Science as engine, not caboose

B1 Group B Report:
Attributes of best available science:

- public access to databases, with transparent & easy to understand science
- Engage end users in decision-making on front end
- must be focused on critical underlying problems
- science must be scalable, integrated up & down scales
- Communicate best available science to project mgrs so they can use it to implement projects
- Science must be credible
- make interim results of scientific research useful for decision-makers
- Find answers to specific, relevant & timely questions
- data must meet quality standards

Overall principles of best available science:

- Joint development of a set of conceptual models, discussion of cause/effect relationship that builds on existing science
- Science is conducted appropriate to scale, time, money, ecosystem complexity
- Best available science incorporates wide variety of disciplines including economics & community resiliency
- Establish evaluative process/criteria for decision-makers to fund projects
- Establish science advisory body to incorporate BAS into decision-making

Projects:

- Programs & projects contain feasibility assessments/risk evaluation on front end, monitoring & adaptive mgmt on back end.

B1 Q/A Discussion:
What's missing?

- How will science program adapt to future disasters, i.e. hurricanes, sea level rise, oil spills?
- Science program intended to support restoration & not to encroach on restoration dollars

B2- BAS ACTIONS:
B2 Group A Notes:

What needs to be started in the short term? What will lay the foundation for efforts to come?

- For each habitat, conduct a review of previously conducted restoration projects on that habitat that were impacted by DWOS.
- Macro-coordination committee – share information, avoid dup, charter to x-change info. Get as granular as possible on that recommendation. Make sure all restoration efforts are coordinated.
- Inventory of existing relevant data- knowledge gaps,
- Unified, joint, coordinated info gateway to targeted stakeholders
- Development of data standards to address consistency issues
- Best available science needs an elevator speech.
- Major infrastructure development for science- OOS, research vessels. May start with an inventory or needs assessment.
- Data policy is critical to our success- Quality MNG plan
- Gulf report card is needed to say where we are starting from. From now on take science info and put it into lay terms.
- An assessment on how to determine if a project meets best available science.
- A model certification process- some kind of approval process. A risk register for information gaps. To know the level of risk before moving forward- at large and project specific.
- Develop Outreach strategy for lessons learned (Prof dev)
- Develop a one-pager on how science is vital to both economy and environment.
- Independent science advisory boards for both science and restoration programs
- Science advisory committee- there is a collective desire for entities to collaborate but hard to get it started and implemented. How do identify where there are common interests within the states.
- Identify common interests and unique interests state by state (centers of excellence)
- Need to find common ground because it is not in the treasury regulations. Maybe a suite of priorities? Find the things that are most important and find where leveraging can occur. Maybe use environmental indicators to narrow priorities.
- Having science side-boards in place enhances legitimacy of the programs.
- Review of previous efforts for data standards and data management
- Should be a requirement for timely data delivery
- 5 years out- a symposium that brings together the public along with the scientists who did the restoration work. What have they learned, what does this mean for restoration moving forward? Model is the Alaska Marine Science Symposium. Maybe add to GOMRI symposium. Traveling road show for the public to learn about the science restoration efforts in the GOM. Maybe use GOMA as a model? We need to build trust back with public and science.
- Develop website for outreach to the public (risks, unknowns, knowns for each different habitat)-updated with new info regularly. GOMA is developing a new website that shows the geographic location of projects in the Gulf.
- Develop conceptual models
- Assessing blue ocean restoration- Pilot program for new restoration projects; e.g, initiate the EIS process for culturing onshore and adding sargassum to the loop current, micro nutrient iron fertilization of the blue ocean, placing limestone slabs on the ocean floor where deep water corals were harmed.
- Where does this get plugged into adaptive management? How is new science plugged in?
- Integrate steps in process to assess current research
- Develop a science plan that articulates what supporting science is needed to support a particular program- define science with restoration planning, implementation and evaluation
- Need a mechanism to say what worked and what didn't if another oil spill occurs
- Socio-economic tracking of science investments. Also further literature on how environmental restoration is economic development.
- Evaluate impact of land/habitat acquisition. Evaluation of ecosystem services.

- Look at what universities are offering in terms of PhD and master's programs to determine science capacity to implement research
- Gulf-wide coastal and marine spatial planning- Understanding where critical habitats are located.

Overall themes:

1. Traveling Expo to educate people around the GOM- also one pager
2. Website and or Web Portal- Central clearing house for best available science
3. Data policy must be agreed upon. 1604 is an example
4. Chief scientist- immediate next step . Someone who works in all pots of money. And independent outside voice. This may be a group of scientists.
5. Strong need for more In-reach instead of outreach. In-reach to those who have restoration funding. A mechanism for reaching the people who make the policy decisions.
6. Development of the Science Plan is a critical first step
7. One-pager that outlines why science is important to restoration – to be used for NFWF, RESTORE, NAS, Congress, ETC. SeaGrant committed $10,000 to achieve this goal.
8. Need a definition of what best available science is and why it's important to lay-people.
9. Need a metric for outcomes. A way to measure success for achieving best available science and restoration.
10. Begin work on the conceptual models

Long Term Actions (6-30 yrs):

- Comprehensive Review of restoration projects
- How do we deal with hurricanes disrupting the restoration process?
- Long-term investments in resources/capacity
- Need an active industrial piece to our science plan- including shrimpers, shippers, etc
- Legislative changes from lessons learned from DWHOS.
    - Under OPA –find a way to give responsible party credit for ecosystem wide monitoring after the incident.
    - Under OPA- re-write to include local communities.
- Monitoring/observing program
    - Continued monitoring of the ecosystem is vital (this was a challenge during Exxon Valdez- bc of the language in the settlement)
    - need to engage the public
    - Make sure monitoring plan is detailed and based on best available science. Need to make sure we can evaluate the assessment/risk
    - Endowed funding source for long term monitoring

Obstacles:

- Funding for monitoring, because it's not directly "restoration "
- defining roles for science coordinator
- perception of overly bureaucratic science advisory boards
- intersection between new ideas and planning efforts
- Pace of science relative to restoration planning

B2 Group B Notes:

Short-term actions (started in next 5 years)

- Establish science advisory body for 1603
    - Science advisory body should integrate w/ ad hoc working group of GOMRI, NAS, NOAA, NFWF, NRDA convened by GOMURC
    - Need fed-only subgroup

  - Convene meeting of decision-making bodies to lay out science vision
  - No requirement for 1603 to have science advisory body, just a suggestion
  - Members of science advisory body must have specific expertise & external & internal knowledge
  - In charge of science-based assessment of comprehensive restoration (i.e. ensuring projects are implemented in correct sequence)
  - Should provide guidance for individual state science advisory bodies
- Key components for project proposals
  - White paper format
- Establish long-term monitoring & ocean observing system
  - Need dedicated funding
  - Scale: watershed to EEZ
- Joint development of conceptual models
  - Set up framework on how to revisit conceptual models to create hypotheses and guide research & adaptive management
- Establish information/data warehouse
  - Start w/ GoMRI & GOMA's database
  - Incorporate preexisting literature into science plan
  - Inventory of data assets (i.e. GCOOS), as well as expertise of regional scientists
  - Results coming out of project performance measures so that public can access info
  - Investment information comes from research sponsors
  - Identify & require common format, collection methods, & quality standards for data
  - Identify current & projected infrastructure needs, i.e. ships
- Develop science framework for decision-makers to agree to
  - Include assumptions that all decision-makers must include in restoration plans, i.e. sea level rise?
  - Be consistent in objective setting, performance metrics, coordinate on regular basis, id opportunities to leverage funding, identify gaps
- Establish overall restoration governance structure that includes science & how to communicate horizontally & vertically
  - Define metrics for success & create structure around that

Long-term actions:

- Continue: Establish long-term monitoring & coastal/ocean observing system
  - Identify funding for projects after 5-7 years
- Continue: revisit conceptual models to create hypotheses and guide research & adaptive management
  - Program review every 5 years to guide future project implementation
- Regular meetings to share intel across agencies, funding bodies, states
  - GoMRI meeting in January may evolve into annual science meeting
  - GOMA all-hands meeting every 2 years serves as Gulf-wide policy meeting
  - Communicate w/ permitting agencies
- Synthesis of all research conducted on variety of areas

B2 Group A Report:

Short term

- Outreach/in-reach
  - i.e. certification, BMPs, etc.
  - website, including data clearing house and why you should care about BAS
  - road shows, expos, symposiums
  - report card
- Review of previous efforts

  - Literature review
  - Spatial plans, data mgmt.
- Development of science plan
  - Measures of success
- Conceptual models
  - PMs
  - Outcomes
- Infrastructure
  - Ships, workforce
- Coordination
  - Chief scientist, advisory board
- Restoration assessment
  - Pilot programs
  - Impact of land acquisition
  - Ecosystem services, including socio-economic
  - Evaluate proposals for BAS
  - ROI on science investment at community level

Long term

- Comprehensive review of restoration
- Competitive program a la Aldo Leopold Institute for restoration
- Long-term investment in resources
- Comprehensive ocean observing system
  - Endowed funding source
- Active industry partnerships
- Legislative changes using lessons learned

B2 Group B Report:

Structural recommendations

- Identify key characteristics of effective science advisory body
  - Identify expertise, external & internal knowledge
  - Provide guidance & support to state science advisory bodies
- Establish Restore Council science advisory body
  - Integrate into existing ad hoc working groups for coordination
  - Science working groups feed into advisory board
- Bring decision makers together to agree at high level to extent they can to:
  - be consistent w/ their objectives, coordinate across funding bodies, set consistent performance metrics, identify best opportunities for leveraging funding, develop consistent science frameworks, communicate about permitting issues
- Identify attributes of & establish overall restoration governance structure that includes science & how to communicate horizontally & vertically
  - Maintain objectivity & responsiveness of science program generally

Data recommendations

- Create inventory of Gulf assets, including datasets not publicly available
- Establish information & data clearing house (build on existing resources)
- Identify consistent framework for data sharing (research results feed into common accessible system)
- Establish and require use of common standards & QA/QC for data collection & formatting

Reporting recommendations

- Long term: Create regular opportunities for science sharing on large scale (maybe existing, maybe new)
  - Ensure we're communicating what we're learning to related programs

    - Import good ideas & export good ideas
- Conduct periodic review of what's working & what's not, and what course corrections are needed. Conduct outreach & education around reviews.

Other recommendations

- Joint development of conceptual models
    - Set up framework on how to revisit conceptual models to develop hypotheses and guide research & adaptive management
    - Long Term: Periodically revisit & refine conceptual models
- Short & long term: Establish and fund long-term monitoring & coastal and ocean observing system
- Develop key components for science-based project proposals, possibly in white paper format
- Project-level monitoring feeds into broader ecosystem-level monitoring
- Identify current & projected infrastructure needs, i.e. satellites, ships

B2 Q/A Discussion:

What's missing?

- How do we present this to decision-makers in way that's persuasive & logical?
    - Give decision-maker products they can use, for example, a template for science-based project proposals, i.e. conceptual model, resilience of project output under extreme events & environmental factor
    - Lay out process for how science is integrated in restoration, to ensure projects are successful. Who would endorse this?
    - Integrate this group w/ policy leaders with experience setting up governance structure/ institutional design
    - GOMURC plans to put forth report from this workshop & send to decision-makers with GOMURC's endorsement. Hope that entities present would endorse as well.
    - Need communications plan for releasing workshop report

Tuesday, August 13

B3 ENGAGEMENT ACTIONS:

B3 Group A Notes:

Best Engagement Practices:

- Must effectively communicate the science to the practitioners when you have something coherent to release. Deliver to the whole host of folks. Lessons learned. Marketing is an important piece of this too. The private sector is effective at marketing things. How do you infiltrate the community of practitioners to influence the way they do things. Effective marketing of ideas and info.
- Short term-utilizing existing relationships such as GOMA that are already working together in the GOM. Coordination of the various outreach efforts that are already in the works. Resource partnerships- help existing outreach programs to adapt to immersing programs and needs
- Be sensitive to the states and the council's lack of funding at this time. Sensitive to decision makers lack of funding- still in planning mode. They are resource challenged.
- Accessibility. Passive outreach vs active outreach. Where are those underserved populations? Must balance what we are presenting-is it something new? Meeting fatigue can happen. Must direct our meetings to our audience. Targeted messages and targeted audiences are critical.
- Respect for partners: Each discipline had its own language. Writing in a clear and plain manner helps everyone understand. It shows respect for people that are outside of your usual circle.
- Communicating with practitioners: non-typical meetings with scientists are very informative. Intimate and relaxed retreats that are less formal are very helpful. Marketing must be at the forefront of science/restoration projects to include the public. Comms specialists must be present.

- Symposiums that invite scientists from across all aspects of the GOM. Provide an informal forum for discussion.
- Challenge of communicating within: scientists are in the weeds of info gaps. Cross pollination of ideas across disciplines. Esp in the diverse world of project types now. Better communication across different lines of science/restoration. Sometimes a third party is needed for translation of technical science.
- Road shows on topical issues. Ex. LA- moving from project monitoring to comprehensive monitoring. Engaged local and federal stakeholders/practitioners. Road shows get buy in from land owners, public citizens. Done on an annual basis and on a one on one scale.
- Ability to communicate is more than just the language barrier of science. Understanding incentives that drive the different user groups and where there is common ground. Develop an incentive matrix of what drives the different user groups as a starting point. What is their motivation?
- Are there any faith based initiatives that have similar goals to ours that we could partner with? Get CERF to meet in one of the Gulf states (include field trips for folks to get out into the community).
- Fishers Resource Grant that combined commercial fishermen and agency scientists to work on an issue. The fishermen have knowledge of the resources that aren't in text books. Utilize their knowledge on restoration and BAS. Utilize and move traditional knowledge into a more mechanized form for resource protection or habitat restoration. Seek those out with a formal opportunity. Fishermen and engineers involved in the restoration process. Collaborative research. A joint research initiative. (Fisheries partnerships).
- Spokes people that the public can relate to. Someone to engage the public to trump what BP is delivering via their commercials. Use visible and credible experts in messaging issues and priorities.
- Conceptual model of what true engagement would look like.
- Research scientists do not engage with resource managers. Why? Door to door discussion is important. Increase scientists and resource manager engagement and communication.
- Getting practitioners together on field trips viewing restoration projects- one on one. More informal setting creates engagement. Visiting sites in person also makes it more personal and people tend to own it and see the human side.
- Foster professionalism in academia. The chase for dollars supersedes the goal at hand of restoration. Need to have a formal evaluation of academia so passions are allowed to be pursued. Foster innovation and credibility within academia with restoration dollars. There is a frustration with scientists – they cannot get the funding they need to disperse info to the community
- Understanding constraints of academia- Money is one of those
- Marketing and Outreach is usually built into restoration. But it should not just be advertising. Studying your market- what drives people-understand your audience. Marketing and communications must be connected to the data. Marketing needs to start at the initial project level. Speakers bureau can be utilized. Those who deliver messages the best. Deploy speakers who will articulate the message well through speakers bureau.
- Community colleges- USM talks to honors program to begin to train. Larger colleges and scientists need to educate the younger generation and develop the interest in science programs (esp two-year colleges). Engaging the youth. Share knowledge with smaller colleges. Also educate them about EPA, NOAA.

Obstacles

- Public has to be a part of equation on outreach
- Difficult to unwrap public from effective engagement
- Existing programs are very busy- how do we allow them to easily engage?
- Recognize that the states and the council do not have resources right now to do very much. They are working on a volunteer basis now. So their responsiveness may have a lag time.
- It is a challenge to make blue water projects hit home for people.
- Institutional barriers that are a higher level. Maybe congressional mandated or maybe a governor isn't receptive to restoration.
- Lack of $$ is a constraint

B3 Group B Notes:

- What are best approaches to engage restoration practitioners, resource managers, scientists, and decision-makers in restoration planning & implementation?
  - Workshops w/ breakout sessions & dot voting (with dynamic agenda that adapts to results of decisions made during workshop)
  - Respect institutions & people who are tasked with doing the work
  - 1-on-1 conversations (preferably in person)
  - Responsive to needs their expressing to us
  - Don't assume conversations are no happening between groups
  - Have realistic expectations
  - Consider political will for dedicating resources & look for efficiencies across institutions
  - Agree on vision & make it implicit (and explicit) in everything we do
  - Integrate groups and brief decision-makers on progress
  - Form partnerships, starting by bringing together individuals
  - Ensure leadership of communities is present, and give advanced notice of meetings
  - Establish appropriate contact points for each group
  - Open up regular meetings (i.e. GoMRI annual meeting) to public
  - Commit to engage in small groups on front end, rather than create report and ask for feedback afterwards
  - Ensure decision-maker is invited to meetings
  - Brief decision-maker's staff on big issues
  - Create space to be accessible between meetings, i.e. virtual meetings, websites, some avenue for active conversation. Would need moderator.
- Best approaches to interaction among managers of restoration programs
  - Communities of practice. Water Environment Federation is example of institution that uses this.
  - NEPs do good job of bringing groups together
  - Create common vision for what successful restoration looks like. Puget Sound Partnership used public scoping phase to create common vision.
  - Have realistic expectations: we won't get *everyone* on same page

B3 Group A Report:

- Provide Forums for Informal Interactions (retreats, field trips)
- Create conceptual model of engagement to understand incentives, motivations, constraints of each stakeholder (matrix)
- Involve communication specialists from the beginning of program development to make sure messages are effectively delivered
- Hold symposia across agencies and disciplines
- Communicate clearly including no acronyms, translation of technical science for increased understanding, lessons learned to practitioners
- Understanding needs and financial constraints of decision makers and partner programs
- Create a mechanism to integrate traditional knowledge into science (e.g. fishermen observations)
- Facilitation czar that coordinates cross pollination of scientists for identifying priority issues
- Identify audiences that are traditionally not reached by scientists
- Tailor message appropriately to each audience
- Identifying and deploying effective communicators within the science community (e.g. speakers bureau)
- Utilize and assist existing partnerships including outreach programs
- Use credible and visible experts in messaging (celebrity spokespeople)
- Door to door program for scientists to get them to interact with decision makers

- Road show on topical issues to increase buy in workshops w/ breakout sessions & dot voting (with dynamic agenda that adapts to results of decisions made during workshop)

B3 Group B Report:

- 1-on-1 conversations (preferably in person)
- Consider political will for dedicating resources & look for efficiencies across institutions
- Integrate groups and brief decision-makers on progress
- Form partnerships, starting by bringing together individuals
- Ensure leadership of communities is present, and give advanced notice of meetings
- Open up regular meetings (i.e. GoMRI annual meeting) to public
- Commit to engage in small groups on front end, rather than create report and ask for feedback afterwards
- Ensure decision-maker is invited to meetings and brief decision-maker's staff on big issues
- Create space to be accessible between meetings, i.e. virtual meetings, websites, some avenue for active conversation. Would need moderator.

APPENDIX E: Short-term Actions for Implementing BAS

Table E-1. Short term action items identified by participants in B2 breakout groups. Votes were result of dot-voting during prioritization session on Day 2. Comments are from post-it notes placed with actions during same session.

Category	Action items	# of votes	Comments
Science Organization	Establish Restore Council science advisory body (SAB)	24	• Begin with charter defining characteristics of independent, effective SAB • Try not to create entirely new entity; co-opt existing groups • Use advisors from both within and outside Gulf region to mix expertise and new and different perspectives
Science Organization	Develop key components for science-based project proposals	24	This is high priority task that is needed right away by restoration program managers, decision and policy makers, and PIs/practitioners
Science Organization	Utilize peer review for developing programs and assessing performance at project to regional level	22	• Assess project proposals for best available science via peer review • Conduct periodic program review of what's working & what's not, and what course corrections are needed; accompany with outreach & education with program reviews; review reports should be issued in language useful for decision-makers and the public; consider use of NAS/NRC to promote independence and objectivity.
Science Organization	Establish macro-coordination committee for all restoration science programs	19	• Bring program leaders together to agree, for example, to have integrate objectives, set consistent performance metrics, identify opportunities for leveraging funding, develop consistent science frameworks, and communicate about permitting issues. • Coordination committee can consist of several tiers including funders of DWH-related science and restoration to coordinate funding priorities; broader coordination group with open participation to coordinate with all science being done in the Gulf
Science Organization	Joint development of suite of conceptual models for Gulf ecosystem restoration	19	Required to address uncertainty and risk, and answer specific research questions
Science Organization	Develop science plans at several levels (Gulf-wide to program) to guide restoration planning, implementation & evaluation	15	• Comprehensive Plan should define process by which science is integrated and implemented in restoration, not a stand-alone effort but entrained into decision-making; • Council may consider adopting current Task Force Science Plan and having science working group revise and update; modify to address missing elements (e.g., risk, climate change)
Science Organization	Hire chief scientist to integrate across programs	7	Each pot of funding should retain chief scientist who then engages in "Ministry of Chief Scientists" to do macro-coordination
Science Organization	Identify attributes of & establish overall restoration governance structure that includes science & how to communicate horizontally & vertically	5	
Research & Technology	Establish and sustain funding for a Gulf-wide, long-term, coastal and ocean monitoring &observing system at appropriate scales (small restoration project to ecosystem-scale modeling)	21	• Proposal/project work plans should specify amount of budget and effort dedicated to effectiveness monitoring and amount should be proportional to scale and complexity of project; projects should specify how long independent monitoring will be conducted and when "other body" (e.g., Center of Excellence, state, universities, agency) monitoring should engage • Need funds for both phases of monitoring applied for and provided by grant recipient/project implementer; first step is to inventory existing programs to identify key gaps in environmental, taxonomic, spatial, and temporal coverage; second step is to determine how to integrate (in relation to goals and standards) existing efforts and address gaps; • Program must be driven by common goals and cannot be all things to all people; • system must be multi-disciplinary, integrated and long-term, including blue-water to inland; will require many partners to pull together, operate and maintain; • Long-term sustained effort should be funded by an endowment cost shared by all programs that benefit
Research & Technology	Identify blue water restoration options	4	

Category	Action items	# of votes	Comments
Research & Technology	Assess and value ecosystem services, including new socio-economic studies	4	Every person's cost is another person's paycheck; restoration and conservation are typically viewed as a cost, however, those activities generate paychecks directly and indirectly that most people do not know about; just as with traditional economic development, need to build direct economic impact metrics, e.g., jobs, into restoration programs at the project level along with related communication/outreach deliverables
Research & Technology	Determine return on investment (cost-benefit) for science at community level	3	
Research & Technology	Establish pilot program initiative for new restoration efforts	2	
Research & Technology	Identify current & projected infrastructure needs, e.g., satellites, ships, in situ sampling and sensing equipment, workforce	1	Combine with gulf-wide monitoring program as it is critical to sustained operations
Research & Technology	Assess impact and success of land & habitat acquisition	0	
Information Management	Establish unified information gateway for restoration programs, with elements targeted to stakeholder groups	17	• Establish information & data clearing house (build on existing resources) • Distributed system with central access point that incorporates different state, agencies and organizations, who maintain/manage their own databases • Develop visual aids for decision-makers and public to help them understand project results, demonstrate program effectiveness, identify program priorities
Information Management	Develop unified data management plan, including use of common standards & quality assessment for data collection & formatting	14	
Information Management	Create inventory of Gulf assets, including datasets not publicly available	7	• Define Gulf assets, pertinent scientific databases, information on existing restoration projects and programs, and access to resources; • Information to include literature, contacts for non-publically available data/databases, and organizational information
Information Management	Identify consistent framework for data sharing (research results feed into common accessible system)	7	
Information Management	Review previous restoration efforts and create inventory of existing relevant information	6	Compile and access via web site with bullet points on existing state-of-the-art science that is easy to search, e.g., by research categories (e.g., oyster reefs, fisheries)
Information Management	Develop & implement model certification process	0	
Information Management	Develop risk register for information gaps at project & program scale	0	

APPENDIX F: Engagement Actions

Develop Engagement Plan and Organization

- Create a conceptual model of engagement to understand incentives, motivations, and constraints of each stakeholder
  - Be responsive to needs
  - Identify the incentives of each group and identify overlapping incentives and constraints
- Identify early what is to be accomplished and identify actions to accomplish the goals
  - Find common issues and develop a common vision/goal within the context of the best available science
  - Integrate disparate ideas into the process
  - Create a mechanism to integrate traditional knowledge into science (e.g. fishermen observations)
- In the prioritization and planning process, engage with the groups early and often but also build off of existing work that has been completed by groups throughout the region
- Respect all institutions and individuals of their time and their ongoing efforts
  - Ensure meetings clearly define purpose and outputs- how the solicited input will be used
  - Be wary of single points of contact who state that they represent a larger group, as they may or may not be speaking on behalf of that group
  - Interact with both decision-makers and their representatives who may be as productive as meeting directly with the "decision maker"
- Utilize existing partnerships and relationships
  - Between and among managers, restoration practitioners and scientists who often attend or participate in the same meetings, workshops, and symposium
- Utilize resources efficiently and recognize financial constraints of decision makers and partner programs
- Involve communication specialists from the beginning of the process
  - Communicate clearly including no acronyms, translation of technical science for increased understanding, lessons learned to practitioners
  - Use credible and visible experts in messaging (celebrity spokespeople)
  - The need for information is great, if you don't provide it someone else will
- Identify your audience
  - Identify audiences that are traditionally not reached by scientists
  - Tailor message appropriately to each audience
- Due to the resources being invested in the Gulf, funding restraints are temporarily relieved, therefore managers should provide opportunities with some of these additional resources to: enhance communications capacity of staff (e.g. attend trainings, workshops); support academics in improving outreach and application activities; and enhance extension activities regarding fisheries and habitat issues.

Methods of Engagement

- Face-to-Face:
  - Workshops and Symposia
    - both large-scale, broad workshops and topical workshops
    - multi-disciplinary

        - leverage existing conferences and meetings
        - allows for dynamic agenda that adapts to results of decisions made during the workshop
    - One-on-one or small group interactions
    - Forums for informal interactions (retreats, field trips)
    - Door-to-door program for scientists to interact with decision makers
    - Identify and deploy effective communicators within the science community (e.g. speakers bureau)
    - Road show on topical issues to educate stakeholders and increase public buy-in; focus on getting to under-represented groups in coastal communities.
- Virtual:
    - Unified restoration Web portal (also priority action for BAS integration)
        - Links to program pages
        - One-stop access to restoration "toolbox"
        - Access to data sets and derivative products
    - Community of Practice
        - Social network to engage topical working groups addressing areas of mutual interest
        - In addition to supporting dialog, provides access to program outputs (plans, reports, publications)
        - Occasional face-to-face meetings complement virtual meetings and web-based sharing between face-to-face meetings
    - Develop e-learning opportunities for education and professional development.
- Outreach materials:
    - Report card for state of Gulf ecosystem, targeted for public, that assimilates science results and assimilates results from all restoration programs
        - Easy to understand rating system e.g., grades or color codes;
        - Enhance market value by releasing new report cards with major symposia when other project results are discussed
    - Each program needs informational brochures that summarize program goals and fit within entire restoration effort—perception of unified effort is critical
    - 1-pager (elevator pitch) that defines best available science for restoration and why science is important in ecosystem restoration.

APPENDIX G: Participant Evaluations

Participants were asked to fill out an evaluation form developed based on NOAA Coastal Services Center guidance for planning and facilitating meetings (NOAA, 2010). Based on 9 surveys returned from 30 participants not part of coordinating team, the workshop succeeded in term of its objectives and logistics (Table F-1).

Table F-1. Results for workshop evaluation forms.

Statement – "Workshop . . .	Strongly disagree	Disagree	Not sure	Agree	Strongly Agree
Was valued use of my time				4	5
Purpose, objectives and expected outputs were clear				6	3
Was the right length of time Too long?__ Too short?__				2	7
Results will be useful in support of Gulf restoration programs			1	5	3
Breakout group format was appropriate for producing desired outputs				4	5
Rate following aspects of workshop:	**Very Poor**	**Poor**	**Average**	**Good**	**Excellent**
Location/venue					9
Facilitation				1	8
Materials				3	6

Comments in answer to queries as to the most and least useful activities were also received: Comments supported the mix of networking with facilitated discussions and presentations, and commended the organization, rigor and support of the coordinating teams. Most significant recommendations for improvement included: participants should be able to consider recommendation lists overnight if they are to be prioritized; and outreach specialists should have been included in the meeting. The latter was done intentionally by the organizing committee, in the realization that outreach to all possible stakeholders was beyond the intended scope of this workshop. The Committee and workshop participants recognize a significant priority action that should happen in the near term is to work with specialists and constituents to develop a communications plan for marketing, outreach and education in support of Gulf-wide restoration.