Gulf of Mexico Research Planning Workshop Report

For the workshop held in

Galveston, Texas

on

February 28, 2008

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National Sea Grant College Program to:
Mississippi-Alabama Sea Grant Consortium
Florida Sea Grant College Program
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Background

The purpose of the Gulf of Mexico Research Plan (GMRP) is to identify regional research and information needs and develop a strategy to address these needs through collaboration with agencies and organizations that conduct and use Gulf of Mexico-related research. The project is sponsored by the National Sea Grant College Program and Gulf of Mexico Sea Grant College Programs. The GMRP is rooted in stakeholder input, and workshops were one of the primary methods used to collect this input. Workshops were held in each Gulf of Mexico state and supported by numerous individuals (see acknowledgements section). This report provides the results from the workshop at the **NOAA Fisheries Service Galveston Laboratory, Texas.**

The workshop agenda (appendix A) was designed to identify high-priority research topics related to the six societal themes described in the Joint Subcommittee on Ocean Science and Technology's 2007 document "Charting the Course for Ocean Science in the United States for the Next Decade—An Ocean Research Priorities Plan and Implementation Strategy." The themes included:

- stewardship of natural and cultural ocean resources,
- increasing resilience to natural hazards,
- enabling marine operations,
- the ocean's role in climate,
- improving ecosystem health, and
- enhancing human health.

A process (appendix B) was developed to allow workshop participants (appendix C) to efficiently develop a list of research priorities in a limited amount of time. Participants were divided into breakout groups by theme area to discuss specific research topics, information needs, and other topics that related to their theme area. Individuals in the breakout group then voted for the research topics discussed in their session that they believed were most important. The eight to ten topics with the highest votes were then presented to all workshop participants. All workshop participants then voted for these top research topics across all theme areas.

This report presents 1) the results of the breakout group voting for each theme area, 2) the non-research topics discussed in each breakout group, and 3) the results of the large group voting session across all theme areas.

If you will be using the information provided in this report for planning or other purposes we would like to hear from you. For more information about the Gulf of Mexico Research Planning effort or to share how you will be using the results of the GMRP workshop(s) please contact Steve Sempier, Gulf of Mexico Research Planning Coordinator, at stephen.sempier@usm.edu.

You can also learn more about the GMRP at the project's web site at: masgc.org/gmrp.

Breakout Group Results

Participants in each themed breakout group identified research needs and voted for the research topics they believed were most important. Each participant was provided eight votes and they could place up to two votes on an individual research topic.

Prior to the voting session some breakout groups combined multiple ideas that were mentioned during the brainstorming session, and therefore crossed out similar ideas so that they would not be available during the voting session. The tables below include all comments written on the flip chart paper, and those topics that were crossed out on the flip chart paper are indicated with a strike through in the table.

Information needs and policy, management, and education related topics were also captured in the breakout group sessions but were not voted on for the prioritization process. The results of these discussions are also included under each themed heading.

Stewardship of Natural and Cultural Ocean Resources

Research Needs

Table 1. Research topics identified by the "Stewardship of Natural and Cultural Ocean Resources" breakout group and voting results from the breakout group voting session.

Research Topic	Votes
Human use trends -What is the level, what is the effect on the resource? -Need to increase, decrease protection of resource (regs) -What is socio-economic impact of increase/decrease on users?	15
Research on targeted trophic relationships to support ecosystem based approach (ex: fisheries (menhaden snapper), endangered spp., non-indigenous spp.)	15
Bottom up. Impact of freshwater inflow on lower trophic levels of food chain and the water quality / nutrients / sediment	11
Connectivity of populations species and habitats	11
ID changes in diversity and abundance over time and habitat to ID causes (anthro/climate) time series over w/years	10
Develop new maps physical and biological habitats to determine what resources exist	9
Socio-economic value of restoration and conservation programs and variable scales and examine if the is habitat functioning as expected (or as replacement)	9
Analyze and predict ecosystem health through visualization of anthropogenic stressors for GOM	6
Continuous non-indigenous fowling community monitoring in GOM waters	6
Research into communication and behavior change related to conservation projects	5
Geo/technology advances and impacts to resources / geopolitical (example: Panama Canal super panamex ships)	3
How to share and collaborate data collection in real time to capitalize on others' collections (i.e. I can use their bycatch)	2

Stewardship of Natural and Cultural Ocean Resources

Information Needs

- Access to existing data -- ex: fisheries, all sorts of data
- Data mining from individual researchers
- Database of technical and human resources available to support field research
- Description of the linkage between the value of functional ecosystems and human-use value
- Ecosystem based management of endangered spp.
- Increased instrumentation and coordination of oceanographic data and real time access
- Mapping of physical and biological habitats w/ 21st Century technology
- Models to look at human-use trends and effects on ecosystems data gap analysis to couple existing models

Policy, Management or Education Topics

- Forecast and develop solutions to environmental impacts of increasing human population density along the Gulf Coast
- How do freshwater inflows meet needs of users and ecosystems
- Science interpretation to close gap between education and science

Increasing Resilience to Natural Hazards

Research Needs

Table 2. Research topics identified by the "Increasing Resilience to Natural Hazards" breakout group and voting results from the breakout group voting session.

Research Topic	Votes
Compare characteristics along coast to measure natural sustainability vs. hazard. -What makes a community resilient?	6
Interactions between barrier / coastal / nearshore morphology an vegetation and hurricane impacts	6
Vulnerability assessment of natural and human communities to global and local sea-level rise and the underlying source of vulnerability	6
Long-term changes to coastal sediment budgets	5
What is magnitude and frequency of hurricanes long term?	5
How often do tsunamis impact GOM? -Magnitude and frequency	4
Understand/quantify impacts of winter/spring storms	3
Effect of Gulf loop current on tropical systems	2
How do natural hazards impact living resources?	2
How do oceanographic current patterns in Gulf help to build resilience in ecosystems?	2
How have humans impacted resiliency of biological and physical environments?	2
Characterize long-term ecological change caused by natural hazards	1
Is there a link between ecological footprint and natural hazards and all aspects of social and ecological?	1
What can be done to increase resilience of built environments?	0
~~How is surge impacted by nearshore morphology; how does vegetation impact surge?~~	0
~~What characteristics that make a community resilient or vulnerable?~~	0
~~What is natural sediment budget for a region (major river system)?~~	0

Increasing Resilience to Natural Hazards

Information Needs

- Add gauging stations in tidal plains to monitor water quality and quantity
- High-resolution comprehensive geophysical, habitat, bathy mapping continental shelf
- Long-term data modeling
- Measure interaction between SST and ecology
- More LIDAR, more often

Policy, Management or Education Topics

- Better beach and dune protection policies
- Info GIS-based geodatabase of various discipline data
- Need a better understanding of data (available/accessible) and how to get it

Enabling Marine Operations

Research Needs

Table 3. Research topics identified by the "Enabling Marine Operations" breakout group and voting results from the breakout group voting session.

Research Topic	Votes
Effect of morphological changes ~~due~~ on society relative to (e.g., coastal photogrammetry); long-term study of (intracoastal waterway, etc.) -Shoreline changes -Development -Habitat identification Sea-level rise and its impact on industrial operations -Assessment -How do we cope	7
Enhance ports -Develop, validate, and assimilate data models and numerical forecast models -Observing system experiments (OSEs) modeling allows you to determine optimal observations ~~-Validation (comparing and improving models)~~	6
Enhancing coastal and real-time systems -Developing and validating numerical forecast models	5
~~Ship traffic and port facilities marine operations~~ Shipping, dredging, and port facilities impacts on ecosystems, such as: -Air pollution -Human/animal health -Sediment -Water quality -~~Dredging~~ expansions	5
Developing better models for valuation of habitats to allow for policy-makers to make more informed decisions about placement of development, etc. (cost benefit analysis)	4
Improve forecasts of hurricane intensity	4
Research and development techniques for rapid assessment of bathymetry of ports and harbors ~~following~~ (i.e., autonomous underwater vehicles, SS sonar)	4
Determine what the mean shoreline is and making common references (datum) for sea level measurements	2
Understanding impacts of ~~offloading~~ open loop LNG terminals to ecosystems	2
Understanding loop current ring shedding, how they work so we can increase our ability to predict	1

Table 3 (continued). Research topics identified by the "Enabling Marine Operations" breakout group and voting results from the breakout group voting session.

Integrating differing HF radar systems	0
~~Develop new techniques for data assimilation into numerical models (e.g., of circulation)~~	0
~~Dredging impacts on ecosystems~~	0

Information Need

- Process of educating public on recreational and commercial use of the port/waterways for successful/non-successful use of ports (how do varying uses affect various user groups)

Policy, Management or Education Topics

(none provided)

The Ocean's Role in Climate

Due to group size limitations one breakout group that was comprised of individuals with interest in "Enhancing Human Health" and/or "The Ocean's Role in Climate" identified and prioritized research topics and related needs for both theme areas. The top ranked research priorities from these two theme areas were presented to the large group for the large voting session.

Research Needs

Table 4. Research topics identified by the "Ocean's Role in Climate" breakout group and voting results from the breakout group voting session.

Research Topic	Votes
Sea-level rise (SLR) and climate change -Rate of change of SLR and subsidence -Effect of SLR on coastal shorelines and environment -Effect of SLR on ecosystems -Measure public attitude on SLR -Research on approaches to restore habitat -Research on local government approaches to SLR -Role of development in inhibiting vertical migration	15
Precipitation -Change in patterns and quantity (gradient shift) -Freshwater influx/inflow -Inflow of freshwater, nutrients, sediments and effect it has on biological, biogeochemical, and physical coastal processes -Frequency and intensity of droughts	13
Loop current -Relationship with storm frequency and intensity -Change in current regime -Temperature -Links to global scale climate patterns	12
Relationship of climate change to fisheries -Recruitment -Distribution -Link between fish ecology and climate change	12
Change climate related to temperature -Distribution of species -Invasive species change susceptibility -Stratification of water column -Link between fish ecology and climate change	9
Research best locations and types of in situ sensors needed and temperature and spatial distribution of measurements	6
Change in CO_2 levels on aquatic biology (ocean acidification)	4

Table 4 (continued). Research topics identified by the "Ocean's Role in Climate" breakout group and voting results from the breakout group voting session.

Groundwater and subsidence -Relationship exists -Rate of change	3
How humans will respond -Impacts on communities -Impacts of industry -Infrastructure breakdown -Change in energy usage	3
~~Add social dimensions; Economics~~	0
~~Change in CO_2 levels on biology~~	0
~~Change in current regime~~	0
~~Change in energy usage; effects on climate, communities, economy~~	0
~~Change precipitation patterns and change in freshwater inflows~~	0
~~Climate change affect on quality of oysters and contamination (also move to human health)~~	0
~~Climate change versus precipitation change and inflows (nutrients, sediments, etc.)~~	0
~~Current, heat engines and how climate is related -Nutrients, hypoxia~~	0
~~Effect of SLR on coastal erosion~~	0
~~How will climate change affect invasive species? -Plankton; strong vertical migration -Changes in recruitment patterns~~	0
~~How will wetland habitats respond to SLR (and habitats and communities in general)~~	0
~~Link between ecology and climate changes (impacts on industry and communities lost)~~	0
~~Links to larger systems~~	0
~~Loop current impact on storm frequency and intensity~~	0
~~Public attitudes toward SLR~~	0
~~Rainfall patterns across GOM changes in ecosystem -Temperature and currents~~	0
~~Rate of change SLR~~	0
~~Rate of subsidence change~~	0
~~Research best locations and types of ground sensors~~	0
~~Role of development in inhibiting wetland migration as a result of SLR~~	0
~~Species ranges changes/freezes due to climate change~~	0
~~What is the value of wetlands to fisheries~~	0

The Ocean's Role in Climate

Information Needs

- Increase monitoring and data collection (sea-level rise, surface elevation tables) long term monitoring
- Need 3-D patterns of currents in GOM
- Standardize data measurements (establish standards)

Policy, Management or Education Topics

- Educate public on value of data collection and uses
- Federal flood insurance policies need updated
- Risk assessment
- Sound policy of local community with climate change

Improving Ecosystem Health

Research Needs

Table 5. Research topics identified by the "Improving Ecosystem Health" breakout group and voting results from the breakout group voting session.

Research Topic	Votes
Connectivity across the Gulf of Mexico (offshore banks roll, connections to estuaries); connectivity around Gulf—system wide model for the Gulf of Mexico (lay groundwork, not just conceptual—include data on forcing functions) -Need data to back up connectivity claims (we think connections are there)	8
Impacts of multiple anthropogenic stressors on estuarine populations (water quality degradation, fresh water inflow, alternates, loss of habitat)	7
Freshwater inflow -Effects of changing habitat characteristics on user species and production characteristics of the system -Researching putting processed water in confined areas -Use oysters as indicator species (health/disease and abundance) -Hydrodynamics--impacts to aquifers/understanding underground water movement	6
Development of ecosystem model; (Ecopath—parks and wildlife (TPWD) working on University of Houston) -Lay out relationships in food web -Lay out connections to abiotic factors	5
Impacts of fisheries on the bottom habitat in the Gulf of Mexico, commercial and recreational -On bottom habitat -Impacts of structures -Removal of top predators (impacts of) -Impacts on habitat -Economic impacts of regulation and marine reserves -Impacts on Gulf and estuarine populations	5
Invasive marine and estuarine species -Survey what's in there -Investigation impacts, interactions -Research socioeconomic impacts	5

Table 5 (continued). Research topics identified by the "Improving Ecosystem Health" breakout group and voting results from the breakout group voting session.

Changes in coastal demographics; changes in population density and changes in types of user groups—research how changes can influence decision/policy making -Changing makeup of communities (transitioning from resource-dependent, rural)	4
Impacts of tourism and urban development, specifically on water quality -Impacts of dune loss -Relationship to harmful algal blooms -Relationship to mangroves and submerged aquatic vegetation (increased vulnerability to sea-level rise and humans)	4
Species composition of primary producers and how changing over time impacts consumers (e.g., relate to oyster health); hope to do in Swan Lake project -Phytoplankton species -Changes in harmful algal blooms	3
Understanding larval movement and the importance of specific areas -Relative importance different sites -Would inform fisheries management -Would inform marine reserve placement -Would inform industrial activities (e.g. LNG) -Aquacultural siting	3
Climate induced changes in ecosystems, coupled with anthropogenic impacts -Movement of organisms; changes in where recruitment occurs; changes in species composition	2
Global economy's impacts on Gulf of Mexico tourism > impacts development in at risk areas, changes in demographics; impacts who's fishing	2
Global economy's impacts of Gulf of Mexico fisheries; understand changes, impacts to economics of local fisheries	1
Impacts of artificial reefs/role of artificial reefs in distribution of marine benthic species and other fish species -Impacts on fishing in surrounding areas -Role in spread of invasives?	1
Monitor seasonal abundances of different kinds of larvae—to inform oyster restoration work -Use genetic bar-coding to identify larvae -Eventually want to use genetic markers to quantify how much of each kind	1

Table 5 (continued). Research topics identified by the "Improving Ecosystem Health" breakout group and voting results from the breakout group voting session.

Impacts (biotic and abiotic) of offshore oil and gas (liquid natural gas and seismic activity) on benthic populations, water quality, and socioeconomic impacts that then result (e.g., impacts of mercury)	0
Impacts of low dissolved oxygen, trend of declining dissolved oxygen	0
Impacts of nutrients from offshore aquaculture sites -Impacts of nutrients -Impacts on fisheries/human use -Information placement -Research different species	0
More bathymetry (e.g., multi-beam) applied to identify habitats and associated communities	0
Need more information about how to restore mangroves, how can help natural regeneration after storms	0
Research efficacy of restoration sites over time -Site of sites -Function, condition/quality	0
Socioeconomic impacts of development in storm/flood-prone areas	0
~~Economic impacts of exotic species and social impacts (quality of life impacts)~~	0
~~Economic impacts of fisheries regulations going on now; economic impacts of marine reserves~~	0
~~Impacts of commercial and recreational fishing on Gulf populations~~	0
~~Impacts of liquid natural gas impacts of seismic activity — impacts on biotic and abiotic~~	0
~~Monitoring over oyster diseases and predator, re.: freshwater inflows (can inform restoration efforts)~~	0
~~Re: freshwater inflow – research delivery of used (processed) water to confined areas to increase freshwater flow – Sammy has work underway – Swan Lake~~	0
~~Research how vulnerability to sea-level rise and hurricanes changes when lose dunes to development~~	0

Improving Ecosystem Health

Information Needs

- Animal movement patterns
- Compiling historic information on areas impacted by development and areas where did mitigation/restoration (ID before lose institutional knowledge)
    - Determine if really no net loss
    - Also will help ID priority areas to preserve/conserve
- Habitat characterization
- Information on species diversity to inform an ecosystem approach especially the non-charismatic species (phytoplankton worms)
- Lots of basic information needs in Mexico (e.g., oceanographer, fish assessment, habitats)
    - Apply new technologies (i.e. sidescan sonar)
- On the ground data collection/monitoring needs to be increased; also need to coordinate
- Temporal/spatial gaps in data > hard to fill in gaps—need to coordinate monitoring and data management across diverse topics to get ecosystem approach (e.g., expand SEAMAP surveys)

Policy, Management or Education Topics

- Education (re: Gulf of Mexico as large system, connections)
- Establish offshore aquaculture where will have least impact
- Management needs biological, oceanographic, and socioeconomic assessment of Gulf of Mexico as system applied to improve management/address management issues
- Preserve/conserve priority areas (based on analysis of historical data or impacts and mitigation restoration)
- Prevention of invasives and remediation
- Select species for offshore aquaculture that will minimize impacts

Enhancing Human Health

Due to group size limitations one breakout group that was comprised of individuals with interest in "Enhancing Human Health" and/or "The Ocean's Role in Climate" identified and prioritized research topics and related needs for both theme areas. The top ranked research priorities from these two theme areas were presented to the large group for the large voting session.

Research Needs

Table 6. Research topics identified by the "Enhancing Human Health" breakout group and voting results from the breakout group voting session.

Research Topic	Votes
Pathogens -Reducing E.coli bacteria in coastal waters -Correlation between human health and water quality -Change in temperature and effects on human water-borne diseases -Impacts on ability of coastal wetlands to improve water quality -Impacts on temperature change and vibrio, etc. -Change water quality on seafood contaminants and infectious agents	16
Seafood safety -Change in water temperature, runoff, marshes -Mercury -Affects of water quality inflows on seafood -Bioaccumulation -Change water quality on seafood contaminants and infectious agents -Impacts on temperature change and vibrio, etc.	15
Disruption of fisheries -Endocrine disruptors (pharmaceuticals) -Mercury -Change water quality on seafood contaminants and infectious agents	13
Insect borne diseases -Betters ways to control mosquitoes without environmental blowback -What is relationship between mosquitoes, wetlands and malaria? -Impacts of spraying -Change insect-borne diseases? -Change water quality on seafood contaminants and infectious agents -Change in temperature and effects on human water-borne diseases	11

Table 6 (continued). Research topics identified by the "Enhancing Human Health" breakout group and voting results from the breakout group voting session.

HAB's -Factors responsible for HAB's -Occurrence and distribution of HAB's -Change water quality on seafood contaminants and infectious agents	10
Pharming the ocean for pharmaceuticals -Change water quality on seafood contaminants and infectious agents	5

Information Needs

- Educate public on value of monitoring programs
- More monitoring programs
    - Health issues
    - Elevation

Policy, Management or Education Topics

- Human health education on seafood safety
- Risk assessment for oyster safety, etc.

Overall Results—Research Priorities Determined in Large Group Voting Session

The research topics presented in Table 7 were derived from the highest rated topics from each of the themed breakout groups. The column titled, "Theme," in Table 7 corresponds to the breakout group from which the research topic originated. The following codes were used: stewardship of natural and cultural ocean resources (Stewardship), increasing resilience to natural hazards (Resilience), improving ecosystem health (Ecosystem), enabling marine operations (Operations), enhancing human health (Human), and the ocean's role in climate (Climate).

Each participant had 12 votes for the large group voting session and could place up to two votes for any one research topic.

Note that in some cases research topics presented by different breakout groups were very similar. An in-depth analysis of similar topics identified within and between workshops will be discussed in a later report.

Table 7. Results of the large voting session for high-priority research topics across all theme areas.

Research Topic	Votes	Theme
Connectivity across the Gulf of Mexico: -Connections between offshore banks and estuaries -System-wide model for the GOMEX - not just conceptual - include data on forcing functions -Need data to back up connectivity claims	31	Ecosystem
Rate of sea-level rise (SLR) & subsidence: -Effect of SLR on coastal shorelines & environment -Effects of SLR on ecosystems -Measure public attitude on SLR -Research approaches to restore habitat -Research on local governmental approaches to SLR -Role of development in inhibiting vertical migration	25	Climate
Seafood safety: -Effect of HAB's -Effect of bioaccumulation -Change in water quality, temperature, runoff, mercury -Impacts of temperature change & vibrio	20	Human
Developing better economic models for the valuation of various habitats (ecosystems) allowing informed decisions on placement / construction / development / expansion of marine facilities and operations	18	Operations
Shipping, dredging, port facilities impacts on ecosystems (ex. air pollution, human / animal health, sediment, water quality)	18	Operations

Table 7 (continued). Results of the large voting session for high-priority research topics across all theme areas.

Enhance coastal & ocean real time observation systems: -Develop & validate numerical circulation models and develop techniques for data assimilation into those models -Use OSSEs to determine optimal placement of offshore observations	16	Operations
Precipitation: -Change in pattern & quantity (gradient shift) -Freshwater influx / inflow -Inflow of freshwater, nutrients, sediments, & effects it has on biological, biogeochemical, and physical coastal processes	16	Climate
Human use trends: -Level of human use -Effect on resources -Need to change (increase/decrease) protection of resources -Socio-economic impact of changes (increase/decrease) on users -Models to capture above & gap analysis to couple with existing models -Models to forecast impacts of increasing human populations	15	Stewardship
Relationship of climate change to fisheries: -Recruitment -Distribution -Link between fish ecology & climate change	15	Climate
Research on targeted trophic relationships to support ecosystem based approach (i.e. fisheries (menhaden, snapper); endangered species; non-indigenous species)	15	Stewardship
Freshwater inflow: -Effect of changing habitat characteristics on user species and production characteristics of the system -Researching putting processed water into confined areas -Use oysters as indicator species (abundance & health / disease)	14	Ecosystem
Pathogens: -Reducing E. coli in coastal waters -Temperature effects on water-borne diseases -Vibrio & oysters -Change in wetland abilities to remove aquatic pathogens as result of climate change -Change in water quality & inflows	14	Human
Socio-economic value of restoration & conservation programs at variable scales & is the habitat functioning as expected	14	Stewardship

Table 7 (continued). Results of the large voting session for high-priority research topics across all theme areas.

Change in climate related to temperature: -Distribution of species -Invasive species – how they are changing -Stratification of water column -Link between fish ecology & climate change	13	Climate
Identify changes in diversity & abundance over time (time series over & within years) to identify causes (anthropogenic / climate)	13	Stewardship
Understanding the impact of the Gulf of Mexico Loop current on 1) Tropical systems 2) Ecosystem resiliency	13	Resilience
Characterize & model community resilience and sustainability against natural hazards -Ecological footprint -Built environment	12	Resilience
Develop new physical & biological habitat maps to determine what resources exist	12	Stewardship
Impacts of tourism & urban development -Impacts on water quality -Relationship to harmful algal blooms -Impacts to mangroves and submerged aquatic vegetation -Impacts of dune loss on vulnerability to sea-level rise & hurricanes	11	Ecosystem
Interactions between coastal / nearshore morphology & vegetation and hurricane impacts	11	Resilience
Understand larval movement & the importance of specific areas: -Relative importance, different sites -Inform fisheries management, marine reserve placement, industrial activity siting (LNG, aquaculture)	11	Ecosystem
Assess the vulnerability of natural & human communities to global & local sea-level rise & the underlying source of vulnerability	10	Resilience
Pollutants: -Pharmaceuticals, endocrine disruptors, metals, etc.; effect on fisheries -Change in water quality & inflows on pollutants & result on seafood	10	Human

Table 7 (continued). Results of the large voting session for high-priority research topics across all theme areas.

Enhance PORTS (Physical Oceanography Real Time Systems) through: -Develop & validate numerical models for nowcasts and forecasts of currents, waves, & water levels for PORTS -Use observing system experiments (OSEs) to determine observations needed for models	8	Operations
HAB's -Factors responsible for HAB's -Occurrence & distribution of HAB's -Effects of change in water quality & inflows	8	Human
Loop current -Changing temperature -Changing current regime -Relation with storm frequency & intensity -Links to global scale climate patterns	8	Climate
Changes in coastal demographics; changes in population density and changes in community make-up – research how changes influence decision / policy-making (e.g. transition from rural, resource-dependent communities)	7	Ecosystem
Impacts of commercial & recreational fisheries; economic impacts re: fisheries -Impacts on habitat, benthos -Impacts on top predators; how does removal of top predators impact system -Impacts on Gulf & estuarine areas -Economic impacts of fishing regulations and marine reserves	7	Ecosystem
Invasive species (marine & estuarine): -Survey what's there -Impacts & interactions -Research socioeconomic impacts	7	Ecosystem
What is long-term magnitude & frequency of hurricanes?	7	Resilience
Analyze & predict ecosystem health through visualization of anthropogenic stressors of Gulf of Mexico	6	Stewardship
Change in carbon dioxide levels on aquatic biology (e.g. ocean acidification)	6	Climate
Connectivity of species & habitat populations	6	Stewardship
Development of ecosystem model -Lay out relationships in food web -Lay out connections to abiotic factors	6	Ecosystem
Impacts of multiple anthropogenic stressors on estuarine populations (e.g. look at water quality degradation, changes in freshwater inflow and loss of habitats all together)	6	Ecosystem

Table 7 (continued). Results of the large voting session for high-priority research topics across all theme areas.

Research & develop techniques for rapid assessment of bathymetry of ports & harbors (i.e. AUV, side-scan sonar, satellite)	6	Operations
What are long-term changes to coastal sediment budgets?	6	Resilience
How will humans respond? -Impact of communities -Impact of industry -Infrastructure breakdown -Change in energy usage	5	Climate
Impact of freshwater inflow on lower trophic levels of food chain & the water quality (nutrients / sediments)	5	Stewardship
Improve forecasts of hurricane intensity	4	Operations
Pharming the sea -Pharming the ocean for pharmaceuticals -How water quality changes & inflows affect the "pharm"	4	Human
Determine the mean shoreline and common references (datums) for various sea level measurements	3	Operations
Effects of morphological changes on society relative to: -Sea-level rise -Coastline / shoreline changes -Development -Habitat identification	3	Operations
How often do tsunamis impact the Gulf of Mexico – magnitude & frequency	3	Resilience
Understand impacts of open loop LNG terminals to ecosystems	3	Operations
Quantifying climate change – determine / research best locations & types of in situ sensors needed and temporal and spatial distributions of measurements	2	Climate
Species composition primary producers & how changing over time: -Phytoplankton species -Changes in HAB's – try to identify triggers / causes -Impacts on consumers (e.g. oysters)	2	Ecosystem
Understand / quantify impacts of winter / spring storms	2	Resilience

Table 7 (continued). Results of the large voting session for high-priority research topics across all theme areas.

Continuous non-indigenous fowling community monitoring in GOM waters	1	Stewardship
Insect-borne diseases: -Research better ways to control mosquitoes without environmental blowback -Relation of mosquitoes, wetlands, malaria: -Impact of spraying -Change in insect-borne diseases	1	Human
Ground water & subsidence: -Relationship -Spatial extent -Rate of change	0	Climate
Inland runoff variability impacts to coastal systems	0	Resilience

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Appendix A:

Gulf of Mexico Research Planning Workshop Agenda

NOAA Fisheries Service Galveston Laboratory
Galveston, Texas
February 28, 2008
10:00 a.m. – 2:45 p.m.

Workshop Agenda

10:00-10:15 **Check-in, coffee**

10:15-10:40 **Welcome and Purpose of the GMRP workshop** (all participants)

10:40-10:45 **Small Group Session Goals and Objectives** (all participants)

10:45-11:45 **Identify Research Topics within Themes** (breakout group)

11:45-12:10 **Break and Pick-up Lunches**

12:10-1:30 **Refine and Prioritize Research Topics—includes breakout group voting session** (breakout group)

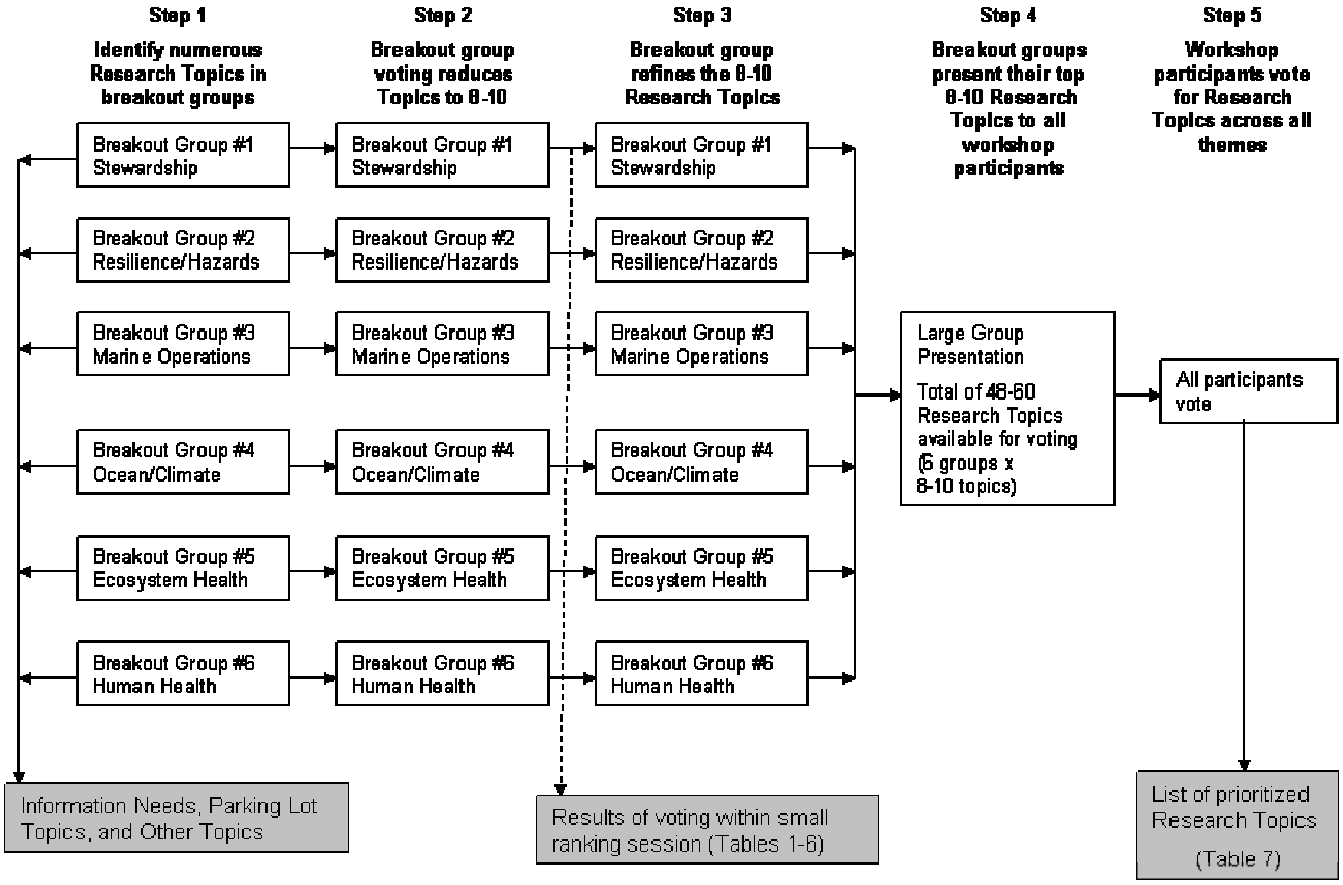
1:30-2:00 **Groups Present Top Research Topics for each Theme** (all participants)

2:00-2:30 **Voting Session of all Research Topics** (all participants)

2:30-2:45 **Wrap up** (all participants)

Appendix B:

Process diagram to identify and prioritize research topics at the GMRP workshop



Appendix C:

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