EXECUTIVE SUMMARY

Since 1997, the Florida Bay and Adjacent Marine Systems (FBAMS) Science Program has been organized around five central questions that directed efforts at identifying the basic structure of the Florida Bay ecosystem and the underlying causes of specific changes. These changes occurred in response to stressors, some local but others distant and outside of Florida Bay. One important external stressor was upstream water management.

The Strategic Science Plan for Florida Bay (2004) builds on these efforts by 'moving the existing science forward' to a more predictive state in order to help guide restoration planning and implementation and satisfy individual agency responsibilities (e.g., natural resource management).

To function in a predictive capacity, the FBAMS Science Program will emphasize those activities that yield information which refines understanding of critical linkages expressed in regional conceptual ecological models, improves definition of restoration targets, and assists in developing, calibrating and validating the numerical or statistical models used to make system predictions. This emphasis is consistent with the "ecosystem approach to management"[1] as recommended by the Science Coordination Group to the South Florida Ecosystem Restoration Task Force.

Program Profile

Name:
Florida Bay and Adjacent Marine Systems Science Program

Details:
- Initiated in 1993 in response to public concerns regarding changes in Florida Bay
- Comprises research, monitoring, and modeling activities conducted and/or funded by cooperating federal and state agencies
- Includes independent expert scientific review
- Guided by a strategic science plan
- Coordinated through an interagency Program Management Committee

Mission:
- Generate science for restoration and natural resource management
- Advance basic understanding of the Florida Bay ecosystem
- Facilitate efficient exchange of scientific information

Given the needs to evolve with and respond to new demands from the implementation of restoration, specific science priorities (i.e., needs) have been identified and organized by theme. These include Physical Processes, Water Quality, Benthic Habitats, Higher Trophic Levels, and the Mangrove-Estuarine Transition Zone. Each theme is then organized into two sets of questions (Section 3.0). The first addresses restoration modeling needs and the second addresses other science needs. Where possible, the questions include specific associated tasks or projects.

[1] An *ecosystem approach to management* is management that is adaptive, geographically specified, takes account of ecosystem knowledge and uncertainties, considers multiple external influences, and strives to balance diverse societal objectives (NOAA 2004).

Science Priorities - Themes

Physical Processes. To date, research and monitoring of physical processes has encompassed all major physical driving forces (i.e., winds and storms, precipitation, evaporation, surface water inflow, groundwater, sea level and tides, and boundary currents) and the hydrodynamic character of Florida Bay (i.e., varying salinity and circulation patterns, and exchanges with adjacent waters). Although considerable data exist on each of these processes, more work remains to fully characterize their relative importance and variability, particularly in the case of groundwater inputs and evaporation for which available estimates vary over a significant range of values. The degree to which these processes need to be better defined will be determined by the needs of the suite of hydrological and hydrodynamic models used to predict bay salinity and circulation patterns. The same can be said for improved measurements of such hydrodynamic characteristics as bathymetry and flow across the extensive mud banks that divide the inner portion of Florida Bay. The sufficiency of the physical models will have to be assessed in light of the requirements of the numeric and statistical water quality and ecological models and improved or modified if necessary. Furthermore, to the degree that predictions of rapid local sea level rise can be verified, the relationship between sea level and bay flushing processes will need to be better understood given the multi-decadal time span of the CERP implementation.

Water Quality. Water quality has been shown to have substantial ecological consequence and be related to upstream water management and human development. The foremost need regarding water quality is to accurately predict the sensitivity of Florida Bay's nutrient regime and phytoplankton to changes in freshwater flow into the bay. For much of the bay, any factor that increases P availability either by increasing sources or decreasing removal would likely have substantial effects. The effects of increased nitrogen, potentially introduced as DON from the Everglades, are uncertain. Alteration of contaminant exposures is also possible with changes in the sources of water introduced into the bay. In general, a more thorough understanding of the bay's nutrient cycles is critical to making predictions and evaluating restoration alternatives.

Benthic Habitats. Seagrass and hardbottom habitats account for a large portion of primary production, provide food and/or shelter to many organisms, and are critical to the ecological function of Florida Bay. These habitats strongly influence water quality and have themselves been affected by freshwater inflow and water quality changes attributable to upstream water management practices. Research has yet to address critical metabolic and community responses to sediment characteristics, water temperature, salinity, and light levels.

Higher Trophic Levels. Advances in understanding higher trophic level responses to restoration require an interdisciplinary approach with input from all the other science themes. For instance, the basic question of "how do changes in stressors affecting the bay affect pathways of higher trophic species' movement within and between FBAMS" requires information from physical processes, water quality, benthic habitats and the mangrove-estuarine transition zone. As many higher trophic level species initially settle in seagrass, hardbottom and mangrove communities, we cannot predict the impact of various stressors on their recruitment without understanding the impact of stressors on juvenile habitat. These nursery areas need to be delineated so that the potential effect of water management changes on salinity patterns, nutrient inputs, seagrass community structure and other conditions in these areas can be predicted. For some species such as gray snapper and sea trout, these nursery areas are within the Florida Bay geographic scope. However, other sought-after gamefish species such as red drum, snook, tarpon and bonefish are found in Florida Bay as pre-adults and adults, but the current nursery grounds of most of their populations are not delineated and are likely located outside of Florida Bay. Linking the higher trophic level theme to the other themes will require complete GIS integration data layers as they become available including salinity, fresh-water flows, benthic communities, and habitat structure and appropriate species distribution and abundance patterns.

Mangrove-Estuarine Transition Zone. The Florida Bay mangrove-estuarine transition zone has many important ecological attributes, many of which have been affected by altered freshwater inflow from upstream water management practices. Some of these attributes will likely be affected by restoration activities and respond more quickly than the same attributes within Florida Bay.

Name:
Program Management Committee (PMC)

Points of Contact:
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Primary Role:
To establish direction and priorities for science activities

Details:
- Voluntary interagency committee
- Initiated in 1993, approved by SFERTF in 1994
- Coordinates and supports scientific research, monitoring, and modeling activities
- Lacks mandate in law or regulation
- Operates without an integrated program budget

Participating Agencies:
- Florida Department of Environmental Protection
- Florida Fish and Wildlife Conservation Commission
- Miami-Dade Department of Environmental Resources Management
- South Florida Water Management District
- National Oceanic and Atmospheric Administration
- National Park Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

The Program Management Committee (PMC) recognizes the need for integration across ecosystem type and region to answer restoration and natural resource management questions. Thus, every effort will be made to ensure that PMC supported physical modeling activities will address ecological and water quality modeling needs and water quality modeling will be sufficient for ecological uses and other cross-disciplinary requirements.

The PMC will also continue to rely upon many of the same organizational elements that have been responsible for the program's success. These include a standing Science Oversight Panel, topical workshops, science conferences, and technical contributions from the local scientific community. However, given the present funding climate and constraints of PMC agencies, it will not be possible to maintain active science teams at this time. Should support become available, the PMC intends to reinitiate theme-based science teams, including an additional model integration team.