

Seagrass Conservation Plan for Texas  
Revised Research Objectives (9/08)

**OBJECTIVE I:** Regularly assess status and trends of seagrass distribution on a coast-wide basis

Strategy 1: Refine and implement the Seagrass Monitoring Program Strategic plan that shall include seagrass biological parameters as well as sediment and water quality indicators.

1. Coordinate efforts among invested state and federal agencies, including Texas Parks and Wildlife, the Texas General Land Office, the Texas Commission on Environmental Quality and the US Geological Survey
2. Establish and implement a rigorous Quality Assurance/Quality Control (QA/QC) protocol for all monitoring and mapping efforts.
3. Extend mapping and monitoring efforts to low coverage areas, especially along central and upper coast (e.g. Matagorda, Christmas, Galveston Bays, etc.)

Strategy 2: Develop a data management plan to incorporate data collected under monitoring plan.

1. Establish and implement a rigorous Quality Assurance/Quality Control (QA/QC) protocol for management of data obtained under monitoring plan.
2. Integrate historical and current mapping data on cover, composition, productivity, indicators, etc.
3. Archive mapped data into GIS or equivalent database according to standard protocols.

**OBJECTIVE II:** Continue to determine causes of changes in seagrass species composition and coverage (acreage), including areal losses and gains on a regional basis.

Strategy 1: Continue to conduct process-oriented (basic) research on seagrasses that serves to identify key indicators for monitoring, including: physiology, production ecology, reproduction, indicator development, landscape ecology, and demography.

1. Physiological studies: photosynthesis, nutrient acquisition by leaves vs. below ground tissues, stable isotope ratios, carbohydrate concentrations and biochemical stress responses.
2. Studies of reproductive biology: genetic variation, seed production/survival, factors influencing vegetative vs. sexual reproduction.
3. Studies on landscape ecology to address relationship between population changes and environmental perturbations, including: drift algae, episodic loading events, physical disturbance (e.g. propeller scarring, dredging) and large-scale disturbances (e.g. hurricanes, brown tide, etc.).

4. Studies on indicator development that addresses rapid morphological, biomass, density and/or physiological (e.g. C:N:P ratio) changes in plant tissues and associated fauna that readily reflects degradation of seagrass habitat.
5. Apply information on seagrass research from outside of Texas.
6. Studies on population ecology and assessment of susceptibility of seagrasses to diseases based on exposure to environmental stressors.

Strategy 2: Conduct process-oriented research on water column and sediment factors that affect seagrasses.

1. Determine the range of physico-chemical parameters (e.g. salinity, temperature, etc.) required to maintain the current condition and distribution of seagrasses.
2. Determine how changes in light quantity and mass transport affect seagrass condition and depth limits. Assess how these changes are affected by nutrient loading and stimulation of phytoplankton blooms (brown tide), epiphytes and drift macroalgae.
3. Establish the biogeochemical environments occupied by below-ground tissues, including:
  - pore water composition (NH<sub>4</sub>, FeS, DIN, P, H<sub>2</sub>S, etc.)
  - physical characteristics (grain size, composition, porosity, organic carbon)
  - benthic nutrient flux
  - Microbially mediated processes
  - seagrass-sediment pore water interactions as they affect density and distribution of seagrasses.

Strategy 3: Compile and summarize historical information (e.g. USA Corps of Engineers permits) and conduct experimental research on seagrass bed creation and restoration.

1. Determine how donor stocks should be chosen to achieve maximum success.
2. Determine if there are methods to accelerate natural recruitment of seagrasses (e.g. establishment of breakwaters or similar landscape features).
3. Develop methods for evaluating ecological functioning of restored seagrass beds.

**OBJECTIVE III:** Identify habitat functions and productivity of natural seagrass community types and identify linkages with other habitats to support habitat conservation, creation, enhancement and restoration

Strategy 1: Conduct process-oriented research on seagrass landscapes and community ecology of grassbeds

1. Ecological processes associated with seagrass community structure and function
  - Functional difference of seagrass bed types
    - Species differences
    - Secondary production and trophic structure
    - Other primary producers (epiphytes, macroalgae)
  - Factors influencing colonization and species succession
    - Abiotic factors (e.g. salinity, temperature, sediment properties, hydrological, etc.)
    - Biotic factors (e.g. mesograzers, benthic fauna)
    - Sediment biogeochemical processes
    - Genetic factors (e.g. diversity within founding population)
  - Seagrass diseases and interactions with environmental stressors
  - Biotic and abiotic factors that influence genetic variation
  - Influence of landscape morphology on:
    - Size of habitat patches in relation to secondary production
    - Effect of habitat fragmentation on function
    - Genetic diversity and gene flow
2. Importance of linkages between seagrass and other habitats with respect to community composition and productivity.
  - Relation to other systems (e.g. Mexican Laguna)
  - Seagrass beds as sinks and sources of carbon, nitrogen or other nutrients
  - Sources and sinks of genetic diversity

Strategy 2: Evaluation of success of mitigation efforts through examination of existing projects (apply adaptive resource management to seagrass restoration and enhancement)

1. Develop GIS database of all seagrass creation/mitigation/restoration projects in state and private waters.
2. Establish functional equivalency of mitigation projects as a function of age.

**OBJECTIVE IV.** Provide data for development of management policies in response to natural or human induced impacts.

Strategy 1. Review existing information, enter into existing metadatabase (e.g. GOMA PHINS) and add new data as becomes available.

Strategy 2. Continue to support applied studies to provide science-based answers to specific management questions.

1. Effects of boating impacts (e.g. trawling, sailboats, jet skis, motor boats)
2. Effects of municipal and industrial discharges on seagrass beds
3. Effects of aquaculture discharges on seagrass beds
4. Socioeconomic values of seagrass beds and associated impacts of management on users
5. Effects of changes in coastal land use (e.g. population changes, non-point nutrient loading, user impacts)
6. Effects of oil, gas and mineral exploration and development
7. Global climate change: increases in mean sea level.
8. Effects of prop scar damage (included under item 1?).
9. Dredging impacts (e.g. bed burial, light attenuation)
10. Stabilization of dredged material disposal (included under item 9?)
11. Indirect effects of dredged materials (included under item 9?)
12. Development and verification of seagrass models (regarding?)
13. Impact of invasive species (on?)
14. Development of watershed management plans.

SGWG Research Subcommittee  
Meeting Report 9/9/08  
Harte Research Institute, Texas A&M University - Corpus Christi

Members in attendance: Nathan Kuhn (TPWD), Beau Hardegree (USFWS), Warren Pulich (Texas State U.), John Wood (HRI), Jim Simons (TPWD), Kirk Cammarata (TAMUCC), Faye Grubbs (TPWD), Pat Radloff (TPWD), Jennifer Stephens (TGLO), Cindy Contreras (TPWD), Charlie Belaire (Belaire Environmental), Ken Dunton (UTMSI, Committee Co-chair), Jim Tolan (TPWD), Joseph Kowalski (UTPA), Hudson DeYoe (UTPA), Patrick Larkin (TAMUCC, Committee Co-Chair).

16 members of the Seagrass Working Group Research Subcommittee met at the Harte Research Institute on the campus of Texas A&M University - Corpus Christi on Sept. 9, 2008 to review the Goals and Objectives outlined in the Seagrass Conservation Plan for Texas (SCPT), in anticipation of a statewide meeting to be held in June 2009. Much has been accomplished since the original G&O's were formulated in 1996. One significant outcome has been the creation of the Texas Seagrass Monitoring Program – 2000 Strategic Plan, a detailed document that contains specific recommendations for the design of a statewide seagrass mapping, monitoring, sampling and data management plan. The subcommittee reviewed each of the four major objectives from the SCPT research section and recommended changes that reflect progress made in specific areas, changing priorities in regards to new information, and emerging issues that have arisen over the last decade. A summary of the subcommittee's review of each objective is provided below. New recommendations have been incorporated into a revised version of the SCPT Seagrass Research Plan.

**Objective I: Status and Trends of Seagrass Distribution.** As noted, the Seagrass Monitoring Program Plan has incorporated many of the SCPT's recommendations in a detailed manner. Discussion of monitoring efforts focused on the need for a rigorous Quality Assurance/Quality Control protocol for all efforts related to sampling, mapping, monitoring, data storage and distribution. This will be especially important if monitoring data will be used to support enforcement of current regulations, or development of new ones. The QA/QC protocol should contain specific recommendations regarding temporal and spatial scales for sampling, mapping resolution, and database management. It was also emphasized that all data collected on Texas seagrasses need to be entered into a collective database, preferably in a manner that allows it to be queried or referenced by GIS applications. While the Seagrass Monitoring Plan is a very good start, it could be refined to incorporate strategies developed by others (e.g. Hilary Neckles), including higher resolution mapping at specific locales (e.g. Corpus Christi Bay), rapid assessment procedures, and the establishment of permanent transects to monitor biomass, species composition, light conditions, etc. Discussions also centered on the idea of dividing the coast into approximately 5 regions, with specific institutional monitoring responsibilities (e.g. UTPA for lower Laguna Madre), in order to more adequately and consistently monitor seagrass conditions.

**Objective II: Determining causes of change in composition and coverage.** This section remained largely unchanged, except to emphasize the continued need to perform basic research on seagrass physiology, genetics, stress responses and landscape ecology, which has not kept up with mapping studies over the last decade. While much work has been done outside of Texas (compiled in the 2006 text, *Seagrasses: Biology, Ecology and Conservation*), it has primarily focused on genera and species not found in the Gulf of Mexico/Caribbean Sea.

**Objective III: Identifying habitat functions, productivity, and linkages.** Discussion of this objective resulted in several specific action items being added. These included items related to the functional differences of seagrass bed types, factors influencing colonization and species succession and the influence of landscape morphology on bed production, function and genetic variation. Action items were also added to the second strategy, concerning adaptive resource management. In particular, it is believed that the USACOE possesses a great deal of information regarding past and current mitigation efforts. This data should be captured and contacts at the USACOE should be cultivated to keep current with this type of information.

**Objective IV: Providing data for management policies.** This section also remained largely unchanged, reflecting the continued importance and lack of data concerning many of the action items listed in the SCPT. Notes were made to include existing information into a current metadatabase (GOMA PHINS?). Additional action items were also included to address the impact of changes in coastal land use (population growth, urbanization, non-point source pollution, etc.) and invasive species.

As a whole, the meeting seemed to be successful in that several action items were either revised or added to reflect new information and emerging issues. Large scale mapping efforts appear to have shown the most progress over the past decade, while more labor intensive (more expensive?) studies on seagrass physiology, genetics, ecology and restoration have lagged, most likely due to a lack of research personnel and funding. This could change as the public is made more aware of the importance of seagrasses to the productivity and sustainability of coastal ecosystems.