FLOWER GARDEN BANKS

The Flower Garden Banks National Marine Sanctuary (FGBNMS) consists of three geographically separate underwater features – the East and West Flower Garden Banks, and Stetson Bank (Figure FGB-1). The Sanctuary is located approximately 100 miles south of the Texas-Louisiana border in the northwestern Gulf of Mexico and contains some of the northernmost coral reefs on the continental shelf of North America. The coral reefs of the

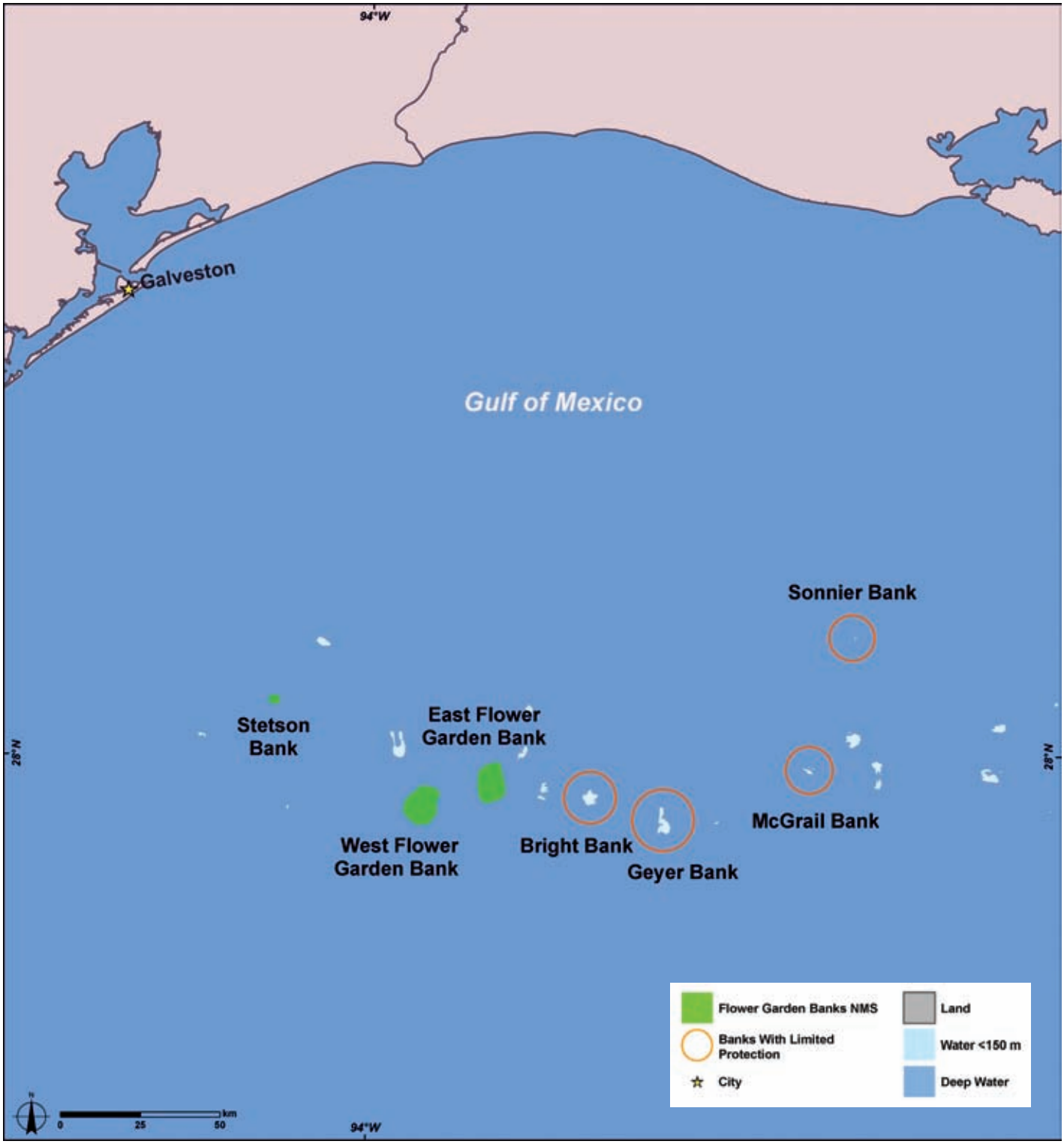

Figure FGB-1. Map showing the locations of the coral banks of the Gulf of Mexico. While some of the banks are protected by the provisions of the Flower Garden Banks National Marine Sanctuary, unprotected coral communities are present at Bright, Sonnier, Geyer, and McGrail Banks. These banks are part of the network of reefs and banks which are biologically and ecologically associated with the ecosystems of the sanctuary. Map: A. Shapiro. Source: Hickerson and Schmahl (2005).

East and West Flower Garden Banks are presently in good condition, compared to most other reef systems of the Caribbean and western Atlantic. Over 20 years of long-term coral reef monitoring at the East and West Flower Garden Banks indicates that the reefs have maintained approximately 50 to 70% coral coverage within the coral zone - an extraordinary coverage in a global climate of coral reef decline. The reefs are dominated by extremely large boulder corals (*Montastraea* spp.*, Diploria strigosa*, and *Colpophyllia natans*). Branching corals are dominated by *Madracis mirabilis* fields in the deeper portions of the reefs. The coral cap ranges in depths from 17 to 49 m and covers an area of approximately 0.55 square miles (350 acres). Fish populations appear to be in good condition, although scuba divers encounter fishing debris and bycatch on a regular basis. This reef system appears to be thriving in spite of the fact that the FGBNMS is located in the middle of one of the most productive oil and gas fields in the world. Stetson Bank is a colorful, geologically exciting feature, dominated by sponges, several species of corals, and algae.

In addition to the FGBNMS, there are dozens of other reefs and banks in the northwestern Gulf of Mexico. The three banks within the Sanctuary are accessible to recreational scuba divers (within 130 ft depth), whereas the other reefs and banks are generally deeper. Coral reef communities are thriving on several of the other northwestern Gulf of Mexico features, including but not limited to McGrail Bank, Sonnier Bank, and Bright Bank. Evidence suggests that the coral reef communities of McGrail, Sonnier, and Bright Banks are biologically and ecologically linked to those found in the FGBNMS. These coral communities have historically been unprotected from threats other than those related to the oil and gas industry.

Due to the remote location of the banks, limited recreational activities occur (e.g., approximately 3,000 scuba divers per year visit FGBNMS). Hook and line fishing, both recreational and commercial, is allowed at the FGBNMS. However, the level of fishing pressure is not known, mainly due to the logistics of monitoring this activity at the site, and due to the manner in which commercial data is collected and managed.

The Gulf of Mexico Fisheries Management Council recently identified 13 reefs and banks in the northwestern Gulf of Mexico as HAPCs. While HAPC designation does not offer regulatory protections, a number of measures to regulate fishing gears and protect sensitive habitats were identified for these areas within specific fishery management plans. This includes prohibitions on bottom anchoring in coral reef areas; and prohibitions on trawling gear, bottom longlines, buoy gear, and fish traps in some areas.

Research Needs

FLOWER GARDEN BANKS	**FISHING**
Management Objective	***Research Need***
Conserve and manage fisheries to prevent overfishing, rebuild stocks, and minimize destructive fishing. *See Jurisdiction-Wide Section for additional research needs.*	Assess the status and trends of fish populations within FGBNMS and on other banks in the northwestern Gulf of Mexico.
	Assess temporal dynamics of coral reef fish trophic structure, including interactions with varying levels of fishing and other stresses.
	Assess larval fish dynamics in and around the FGBNMS.

FLOWER GARDEN BANKS	POLLUTION
Management Objective	***Research Need***
Reduce the impacts of pollutants on coral reef ecosystems by improving the understanding of their effects. *See Jurisdiction-Wide Section for additional research needs.*	Determine the sources, types, concentrations, and effects of pollutants on important coral reef species in the FGBNMS.
	Model the water circulation patterns of the northern Gulf of Mexico.
	Assess the potential impacts of oil and gas exploration and production on neighboring related coral reef communities.
	Assess the levels of toxins in commercially fished species within the FGBNMS.
	Assess the level of landborne and industry generated pollutants, including nutrients and hydrocarbon-associated contaminants in coral reef environments and in indicator organisms.

FLOWER GARDEN BANKS	COASTAL USES
Management Objective	***Research Need***
Reduce the impacts from recreational use, industry, development, and maritime vessels on coral reef ecosystems. *See Jurisdiction-Wide Section for additional research needs.*	Determine the annual number of violations of Sanctuary "no-anchoring" regulations by both commercial and recreational vessels, and evaluate their impact on the resource.
	Compare current bathymetric data to historical seismic and multibeam data to assess possible changes in bank topography due to natural processes or industry impacts.
	Evaluate the location and placement of artificial reefs proposed by the Texas Parks and Wildlife Department's Artificial Reef Program.
Balance resource use to minimize user conflicts, provide equitable uses, and ensure optimal benefits to present and future generations.	Assess the level of demand for recreational diving from commercial diving operators and private recreational boats, and the impacts of recreational diving on coral reef resources.
	Determine the effectiveness of mooring buoys in reducing physical impacts to coral reef resources.
Restore injured and degraded coral reef habitats. *See Jurisdiction-Wide Section for additional research needs.*	Determine the feasibility of deep water coral restoration.
Evaluate and improve the effectiveness of MPAs as a management tool.	*See Jurisdiction-Wide Section for research needs.*

FLOWER GARDEN BANKS	COASTAL USES
Management Objective	***Research Need***
Manage coral reef ecosystems and their uses in a holistic manner. *See Jurisdiction-Wide Section for additional research needs.*	Determine the level of vulnerability and exploitation of coral reef resources that are currently unprotected using deepwater survey techniques.

FLOWER GARDEN BANKS	INVASIVE SPECIES
Management Objective	***Research Need***
Control or eradicate invasive species that have the potential to cause damage to coral reef ecosystems. *See Jurisdiction-Wide Section for additional research needs.*	Identify and remove introduced species from natural coral reef areas (e.g., *Tubastrea coccinea*).
	Investigate growth rates and reproductive potential of identified invasive species on artificial structures and nearby natural hard bottom features.
	Determine whether nearby oil and gas platforms serve as "stepping stones" for the introduction of invasive species.

FLOWER GARDEN BANKS	CLIMATE CHANGE
Management Objective	***Research Need***
Minimize the effects of climate change on coral reef ecosystems. *See Jurisdiction-Wide Section for additional research needs.*	Characterize bleaching events (including the extent, impact, and causes) on deeper reef communities in the northwestern Gulf of Mexico, and identify factors that affect recovery/mortality.

FLOWER GARDEN BANKS	EXTREME EVENTS
Management Objective	***Research Need***
Identify causes and consequences of diseases in coral reef ecosystems and mitigate their impacts. *See Jurisdiction-Wide Section for additional research needs*	Characterize the types of diseases and other direct sources of coral mortality (e.g., damselfish and parrotfish predation) on deeper reef communities in the northwestern Gulf of Mexico, including their impacts and relationships with known stressors.