

# GRAY'S REEF NATIONAL MARINE SANCTUARY



## FINAL MANAGEMENT PLAN

[HTTP://GRAYSREEF.NOAA.GOV/](http://graysreef.noaa.gov/)

JULY 2014



National Oceanic and  
Atmospheric Administration

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Sanctuary seascape with diver; Greg McFall/Gray's Reef National  
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## About This Document

A sanctuary management plan is a site-specific planning and management document that describes the goals, objectives, and management activities for a national marine sanctuary. This document is the final management plan for the National Oceanic and Atmospheric Administration (NOAA) Gray's Reef National Marine Sanctuary (GRNMS). The plan is accompanied by a separate final environmental assessment.<sup>1</sup> Both documents are the result of the Office of National Marine Sanctuaries' (ONMS) review of the strategies and activities detailed in the 2006 Final Management Plan and the emerging resource protection issues for GRNMS. A management plan review is conducted at a sanctuary periodically in accordance with the National Marine Sanctuaries Act (NMSA; 16 USC 1431 et seq.). The final management plan serves as the primary management document for GRNMS for approximately the next five to ten years.

## Acknowledgments

Gray's Reef National Marine Sanctuary would like to thank both current and former members of the sanctuary advisory council for their efforts in guiding the development of this management plan. The sanctuary would also like to acknowledge the advisory council and its science advisory group for their contributions in evaluating sanctuary resources for the 2012 Addendum to the 2008 Gray's Reef NMS Condition Report, an important tool in designing new strategies and activities described in this document.

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<sup>1</sup> <http://graysreef.noaa.gov/management/mgmtplanreview/welcome.html>



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## Executive Summary

The National Oceanic and Atmospheric Administration (NOAA) Office of National Marine Sanctuaries (ONMS) is revising the 2006 Gray's Reef National Marine Sanctuary (GRNMS or sanctuary) Management Plan and making minor changes to the existing GRNMS regulations.

The objectives and activities in the revised plan are derived from the sanctuary vision, mission and goals, evaluation of the 2006 management plan, public scoping, current resource conditions and trends, protection issues, implementation of the research area, new technologies, emerging issues, and public awareness needs. Throughout the process, considerable discussion with and recommendations received from the GRNMS Sanctuary Advisory Council set the framework for the plan.

The introduction outlines the jurisdictional framework of the sanctuary as well as the vision, mission and goals for the sanctuary.

**The final management plan focuses on the following three themes:**

- I. Maintain or Improve the Condition of all Sanctuary Resources
- II. Increase the Awareness of, and Support for, GRNMS
- III. Advance Collaborative and Coordinated Management



Oyster toadfish, GRNMS. Photo: Greg McFall

## Acronyms

GADNR – Georgia Department of Natural Resources  
GADNR LE – GADNR Law Enforcement  
GCES – General Counsel Enforcement Section  
GRNMS – Gray's Reef National Marine Sanctuary  
NEPA – National Environmental Policy Act  
NMFS – NOAA National Marine Fisheries Service (also known as NOAA Fisheries Service)  
NMSA – National Marine Sanctuaries Act  
NMSP – National Marine Sanctuary Program (now ONMS)  
NMSS – National Marine Sanctuary System  
NOAA – National Oceanic and Atmospheric Administration  
NOAA OLE – NOAA Office of Law Enforcement  
NOS – NOAA National Ocean Service  
ONMS – NOAA Office of National Marine Sanctuaries (formerly the National Marine Sanctuary Program (NMSP))  
SAB – South Atlantic Bight  
SAFMC – South Atlantic Fishery Management Council  
SKIO – Skidaway Institute of Oceanography (part of the University of Georgia)

## Glossary

Benthic – occurring at the bottom of a body of water  
Epifauna - animals that live on hard bottom  
Filter feeders - obtaining nutrition by straining particles of food from the water column  
Infauna – aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom  
Invertebrate - animal species that do not develop a vertebral column  
Macroalgae - multicellular marine algae  
Ocean acidification – the term given to the chemical changes in the ocean as a result of increased carbon dioxide in the atmosphere  
pCO<sub>2</sub> – the concentration of carbon dioxide in seawater  
Pelagic – living or occurring in the open sea  
pH – the scale of acidity and alkalinity  
Sessile – attached to the substrate

## Why is it called Gray's Reef?



Sam Gray, inspects the contents of a trawl.

It was said that, “Milton Sam Gray knows more about invertebrates on the Atlantic coast than any living man.” It is therefore fitting that Gray’s Reef National Marine Sanctuary, an invertebrate-rich livebottom habitat off the

coast of Georgia, should be named for him. A collector of marine invertebrates since his youth, Sam was recruited by the Sapelo Island Research Foundation and the University of Georgia Marine Institute to collect invertebrates in the nearshore waters around Sapelo Island and preserve them for taxonomic research. It was there that he was introduced to the reef, then called “Sapelo livebottom” by local fishermen, where he would spend years collecting and identifying marine plants and animals. Gray’s Reef was designated as a National Marine Sanctuary on January 16, 1981 and named Gray’s Reef in recognition of Sam Gray to commemorate his valuable contribution to the understanding of offshore habitats and marine organisms of the Georgia coast.

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## Introduction

### The National Marine Sanctuaries Act

The National Marine Sanctuaries Act (NMSA; 16 U.S.C. § 1431 et seq.) is the legislative mandate that governs the Office of National Marine Sanctuaries (ONMS) and the National Marine Sanctuary System (NMSS). Under the NMSA, the Secretary of Commerce is authorized to designate and manage areas of the marine environment as national marine sanctuaries. Such designation is based on attributes of special national significance, including conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or aesthetic qualities. The primary objective of the NMSA is to provide protection for the resources of these special ocean and Great Lakes areas.

### NOAA Office of National Marine Sanctuaries

Day-to-day management of national marine sanctuaries has been delegated by the Secretary of Commerce to ONMS. ONMS serves as the trustee for 14 marine protected areas encompassing more than 170,000 square miles of ocean and Great Lakes waters from the Hawaiian Islands to the Florida Keys, and from Lake Huron to American Samoa. National marine sanctuaries protect our Nation’s most vital coastal and marine natural and cultural resources, and through active research, management, and public engagement, sustains healthy environments that are the foundation for thriving communities and stable economies. Habitats include beautiful coral reefs, lush kelp forests, whale migration corridors, spectacular deep-sea canyons, and underwater archaeological sites. These special places provide homes to thousands of unique or endangered species and are important to America’s cultural heritage.

## NATIONAL MARINE SANCTUARY SYSTEM



Figure 1: The National Marine Sanctuaries and Marine National Monument

Because of considerable differences among sites in settings, resources, and threats, each marine sanctuary has a tailored management plan. Conservation, education, research, monitoring and enforcement programs vary accordingly. The integration of these programs is fundamental to national marine sanctuary management.

### Gray's Reef National Marine Sanctuary

Gray's Reef National Marine Sanctuary (GRNMS or sanctuary) off the coast of Georgia contains one of the largest nearshore, live-bottom reefs of the southeastern United States. Located 16 miles offshore from Sapelo Island, GRNMS is currently the only protected natural reef on the continental shelf off the Georgia coast and one of only a few marine protected areas in the ocean between Cape Hatteras, North Carolina and Cape Canaveral, Florida. NOAA designated the sanctuary in 1981 to protect the quality of this unique and fragile ecological community. The approximately 22-square-mile sanctuary (about 14,000 acres) is just a small part of U.S. territorial waters, yet its value as a natural marine habitat is recognized nationally and internationally.

Within the sanctuary there are rocky ledges covered with sponge and coral live-bottom communities, as well as sandy-bottom areas teeming with smaller invertebrates. "Live bottom" is a term referring to hard or rocky seafloor that typically supports high numbers of invertebrates (animals without backbones) such as sponges, corals and sea squirts. They form a dense carpet of living creatures that in places completely hides the rock. The rocky ledges on GRNMS can be as tall as six feet but lay beneath 60 to 70 feet of ocean water. The ledges are complex - they have nooks and crannies, and caves and bumps that provide plenty of places for invertebrates to latch on to or hide in. Those invertebrates provide food for many fishes that also shelter in the cracks and crevices or hover above the reef.

The reef attracts over 200 species of fish that live on or near the substrate (benthic) or that swim in the water above (pelagic). Since the sanctuary lies in a transition zone between temperate and tropical waters, fish population composition changes seasonally. Loggerhead sea turtles, a threatened species, use GRNMS year-round for foraging and resting and the reef is in the only known winter calving ground for the highly endangered North Atlantic right whale.

GRNMS was also designated to promote scientific understanding of this unique ecosystem. As a discrete, managed location in the southeast Atlantic marine environment, GRNMS affords the opportunity to serve as a "sentinel site," where sustained observations help us understand and detect change in the ecosystems it represents, as well as provide early warning of impending problems.

*Gray's Reef is considered a livebottom reef rather than a living hard coral reef such as those found in the tropics, as its foundation was not built by living hard corals. Instead, it was formed by the consolidation and cementing of shell fragments, sand, and mud derived from land and sea that were originally deposited as a blanket of loose grains between six and two million years ago.*



Fishes, such as black sea bass, thrive above a living carpet of plants and animals along Gray's Reef. Photo: Greg McFall

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### The Research Area

In December 2011, NOAA GRNMS designated the southern third of the sanctuary as a dedicated research area. The purpose of the research area is to provide a place where scientists are able to study naturally-occurring live-bottom ecosystems to better understand the impact of human activities on the sanctuary's marine resources (ONMS 2011).

The research area allows scientists to design and implement studies where critical variables can be controlled over long periods of time. In order to provide an area devoid of some direct human impacts, fishing, diving and stopping a vessel in transit are prohibited. The research area is used to study potential impacts from various human activities and impacts of climate change and natural events like hurricanes and droughts.

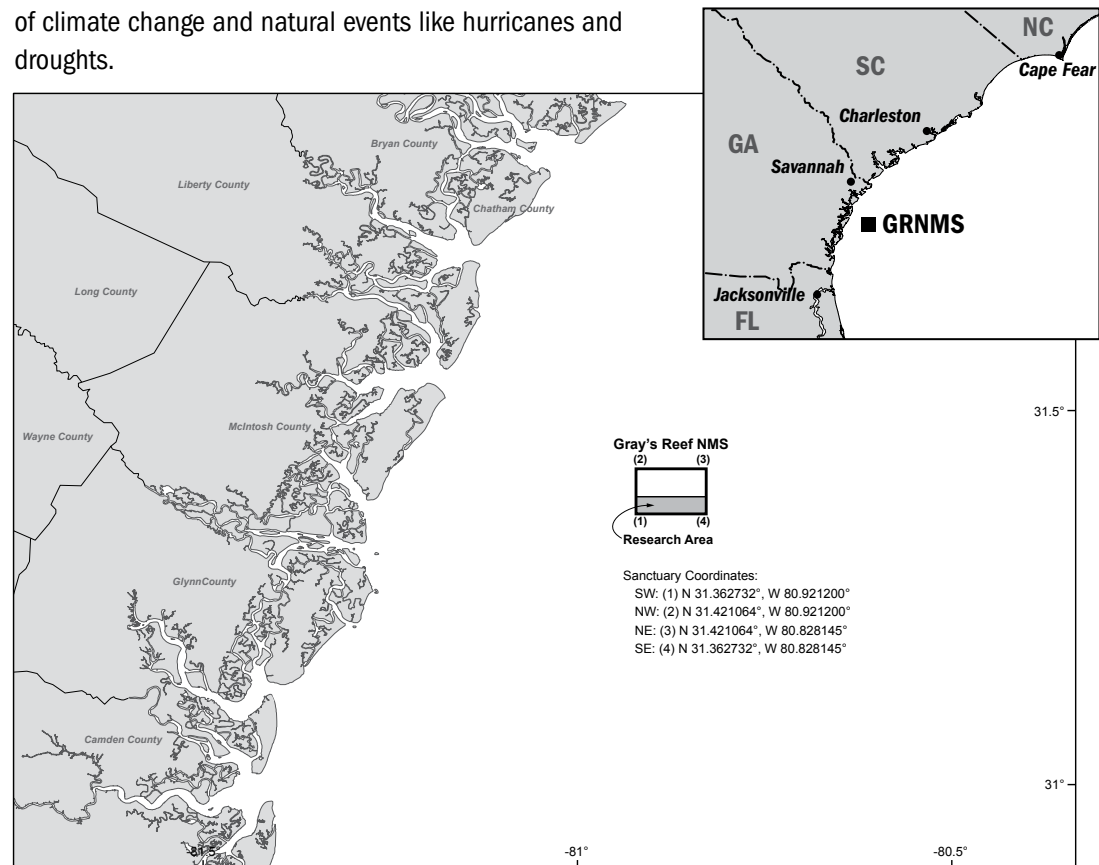


Figure 2: Location of Gray's Reef National Marine Sanctuary, and the research area within the sanctuary.



## Management Plan Review

Each national marine sanctuary is required to periodically review the ways it protects and conserves natural and cultural resources. But this review is more than a legal requirement – it's a vital tool for involving researchers, administrators, stakeholders, and members of the general public in the process of protecting sanctuary resources.

The final management plan was developed by members of the sanctuary staff and ONMS with input from a variety of stakeholders and subject matter experts. The process was initiated in 2010 with review of the 2006 GRNMS management plan and has always involved public input.

All programs, accomplishments and lessons learned were discussed with the sanctuary advisory council in public meetings and internally with GRNMS and ONMS staff. In addition, NOAA sought comments from the public during a scoping period in 2012; and again in the comment period on the draft management plan from December 2013 to February 2014.

## Sanctuary vision, mission and goals

As part of the planning process for this final management plan, the GRNMS staff and advisory council revised existing sanctuary goals and objectives and developed new vision and mission statements to better articulate the desired future for the sanctuary.

**GOAL 1: Protect, maintain, restore, and enhance the natural habitats, populations, and ecological processes in the sanctuary.**

**GOAL 2: Coordinate with federal, state, and local governments, international organizations, and other public and private interests to develop and implement plans to protect the marine environment and the sanctuary, and encourage the conservation of these resources.**

**GOAL 3: Support, promote, and coordinate scientific research, characterization, and long-term monitoring to enhance the understanding of the sanctuary environment and processes and improve management decision-making for optimal sanctuary resource protection.**

**GOAL 4: Enhance public awareness, understanding, sustainable use, and appreciation of the sanctuary, while connecting people to the unique resources of Gray's Reef National Marine Sanctuary.**

**GOAL 5: Allow uses of the sanctuary not prohibited pursuant to other authorities, and consistent with resource protection.**

**GOAL 6: Dedicate appropriate infrastructure and resources to support all programs, including the creation of models and incentives for conservation of sanctuary resources, and the development of innovative management techniques.**

### The VISION:

**Gray's Reef National Marine Sanctuary will continue to be an area teeming with a diversity and abundance of marine life supported by healthy habitats in clean ocean waters. The public will be aware of, care about, and want to protect their sanctuary for current and future generations to use in diverse ways that are compatible with resource protection.**



### The MISSION:

**The mission of Gray's Reef National Marine Sanctuary is to identify, protect, conserve, and enhance the natural and cultural resources, values, and qualities of the sanctuary for current and future generations.**

## Sanctuary Condition Reports

With completion of all 14 sanctuary condition reports (including the GRNMS Condition Report), it has been determined that a number of changes to the structure of the reports are necessary, including modifications to the 17 questions (See Appendix B for questions) addressed by each sanctuary, and an expansion to the Pressure-State-Response framework to consider both “drivers” of the pressures found at each sanctuary and the ecosystem and societal benefits derived from resource integrity. These changes are already underway and will be implemented when the next round of reports begins, including addressing the modified questions.

## Sanctuary resource conditions

Concurrently with the management plan review, ONMS also assessed sanctuary resources and updated the 2008 GRNMS Condition Report with a 2012 Addendum. Condition reports provide a summary of resources in each sanctuary, pressures on those resources, the current condition and trend of sanctuary resources, and management responses to the pressures that have the potential to threaten the integrity of the marine environment.

The 2012 Condition Report Addendum provides a summary of the condition and trends of living marine resources, habitat and water quality in the sanctuary (see Appendix B for the summary table).



*Reefscape, GRNMS. Photo: GRNMS.*

While showing improvement in some resource conditions, particularly in areas that have been directly impacted by specific management actions, the report also highlighted areas where further emphasis is needed.

The sanctuary made management and regulatory changes with implementation of the 2006 management plan, establishing a no-anchoring rule and restricting fishing to rod and reel and handline fishing gear. Spearfishing was prohibited in 2010 and the research area was designated in late 2011. Studies conducted since the 2008 GRNMS Condition Report enabled scientists to better and more confidently assess resource conditions and trends. The 2012 Addendum notes that habitat conditions have improved and water quality appears to be unchanged and still considered good. Actions taken regionally for fishery management along with GRNMS actions, such as the prohibition on spearfishing, led to improvements in the condition of living marine resources. Sustainable fishing and effects from fishing on habitat and key species continue to be issues that should be tracked by GRNMS. It is expected that the research area will continue to allow GRNMS to track changes in sanctuary resource conditions.

## Public scoping

Very few comments were received during public scoping for the management plan during the summer of 2012. The topics of concern brought up by the public are all important to GRNMS management – invasive lionfish, the need for increased public awareness of GRNMS, and use of weighted marker buoys during diving and fishing activities.

### Invasive lionfish

Two species of Indo-Pacific lionfish (*Pterois volitans* and *P. miles*) have become well established in the western Atlantic along the eastern coast of the U.S. Their range and abundance is considered to be rapidly increasing in the region (Ruiz-Carus et al. 2006, Morris and Whitfield 2009). The first sighting of lionfish in GRNMS was documented in 2007 and no lionfish were observed again until 2012 when lionfish of varying sizes were more commonly found in the sanctuary and were observed associated with densely-colonized live-bottom habitat.

### Public awareness

While awareness of GRNMS has grown in the past decade, there is still a concern that the sanctuary is not well known particularly among the communities of non-users. Along with increasing awareness of the sanctuary, there is the challenge to gain more appreciation for the site's unique marine resources and the mandate to manage them sustainably for future generations.

### Weighted marker buoys

Public comment and sanctuary advisory council discussion before and during scoping for the management plan review revealed strong support for resolution to the issue of weighted marker buoy use in GRNMS. The use of weighted marker buoys can enhance recreational diving safety in GRNMS, but placement of the weights on the bottom had been prohibited.

Scoping comments also included a recommendation to consider extending the boundaries of GRNMS to include the North Atlantic right whale's Southeastern U.S. critical habitat. The request was made to also consider significant northeast Florida near-shore marine resources, in addition to protecting the highly endangered right whale's calving area. An additional comment that requested designation of a national marine sanctuary in northeast Florida also strongly encouraged the activation of a process to nominate and evaluate new sanctuary sites.

As a result of these comments NOAA will consider whether areas outside GRNMS may have important ecological connectivity with the sanctuary and merit further protection. These considerations will include sites of public concern in northeast Florida but also hard-bottom reefs in the region that are connected to GRNMS through oceanographic circulation or migratory patterns of species that use the sanctuary during their lives.



Photo: Todd Recicar/Amy Rath.

While sanctuary regulations prohibit the placement of any material on the seafloor, which previously included weights to mark locations during recreational diving or fishing, the exemption will allow for weighted marker buoys:

- Weighing up to 10 pounds
- Maximum of 1\4 inch buoy line
- Continuously tended by divers and fishers
- Cannot be attached to a vessel
- Cannot be capable of holding a boat at anchor
- Must be removed within 12 hours of deployment



Gray's Reef works with regional and national partners as well as a team of volunteer Team Ocean Divers to conduct underwater research in the sanctuary. Photo: Amy Rath.

## Public comment on the draft management plan and changes in the final plan

During the public comment period on the draft management plan (December 10, 2013 to February 10, 2014) four written comments were received electronically. Three public hearings were also held to receive comment, but no members of the public attended. The comments addressed only the proposed exemption to allow the use of weighted marker buoys in the sanctuary. Comments supported the proposal, with one suggesting a temporary exemption to study and document any impacts to sanctuary resources. NOAA's responses to the public comments can be found in appendix C of the accompanying final environmental assessment.<sup>2</sup> Only minor edits to the text were made between the draft and final management plan, and the environmental assessment was removed from this document and published as a stand-alone document. No substantive changes were made.

### Table 1: Issues identified and where addressed in management plan.

Issues suggested by the public are incorporated into the action plans as follows:

Invasive lionfish	Action Plan I	Objective SR4, activity 4B	page 16
Weighted marker buoys	Action Plan I	Objective SR5, activity 5A	page 17
Areas of ecological connectivity	Action Plan I	Objective SR6	page 18
Public awareness	Action Plan II	All objectives and activities	pages 19-20



Starfish seascape. Photo: Greg McFall.

<sup>2</sup> <http://graysreef.noaa.gov/management/welcome.html>

## Final Management Plan

### Overview

This section outlines the specific work Gray's Reef National Marine Sanctuary (GRNMS) management will undertake over the next five to ten years. GRNMS was established to protect and conserve its resources and to allow uses that are compatible with resource protection. The final management plan represents the way we put our sanctuary's mission and vision into action. Protecting and conserving these resources requires planning for various programs such as science, education and marine operations. The challenge of facilitating commercial and recreational uses to the extent compatible with the primary objective of resource protection and the potential impacts of climate change also means that sanctuary management must look ahead to future needs and areas outside sanctuary boundaries that may influence sanctuary resources.

The objectives and activities in the following sections are derived from the sanctuary vision, mission and goals, evaluation of the 2006 management plan, public scoping, current resource conditions and protection issues, implementation of the research area, new technologies, emerging issues and public awareness needs. Throughout the process considerable discussion with, and recommendations received from, the sanctuary advisory council, including input to the council from its working groups, fine-tuned the plan and helped to set priorities.

Our management plan is divided into three distinct but complementary themes each of which concurrently allows us to achieve our goals, fulfill our vision and meet a variety of objectives:

**I: Maintain or Improve the Condition of all Sanctuary Resources**

**II: Increase the Awareness of, and Support for, GRNMS**

**III: Advance Collaborative and Coordinated Management**

The effectiveness of implementing the management plan depends upon the availability of resources and partnerships. Predicted lean budgets for the next few years also necessitate more focused priorities and the leveraging of resources through a broad range of options including grants and donations where feasible. Strong partnerships between the ONMS and other resource management agencies, the scientific community, stakeholders and the public at large are indispensable. These partnerships enable ONMS and GRNMS to realize the coordination and program integration that the NMSA calls for in order to comprehensively manage national marine sanctuaries, individually and as a system.

Evaluation of the sanctuary's performance is an integral component of the successful management of GRNMS as a public trust resource and a means to work more effectively toward the GRNMS vision.



*Fragile invertebrate animals live permanently attached to the rocky ledges of Gray's Reef. Photo: Greg McFall*



The rocky ledges of Gray's Reef are covered by a living carpet of marine invertebrates. Photo: Greg McFall.

On an annual basis, specific activities will be integrated into fiscal-year operating plans as resources and priorities dictate. Prior to developing each successive year's operating plans, the activities will be evaluated to see how well they are working.

Each activity in this draft plan is assigned a rating for priority, cost and effort (Table 2). In addition to priority rating, evaluating all activities for the expected costs and staffing needs helps GRNMS management to develop each year's operating plans.

Objectives and activities related to historical/cultural resources were not developed for this management plan, in part due to budgetary constraints. GRNMS does not have any evidence of maritime archaeological resources. Limited paleontological resources were identified and described in the 2006 Management Plan (NMSP 2006).

**Table 2: Key to priority, cost and effort**

Priority	Cost	Effort
H - High priority	\$\$\$ - High cost (≥ \$24K)	▲ - High effort (≥ 50 person-days*)
M - Medium priority	\$\$ - Moderate cost (\$11-\$24K)	■ - Moderate effort (26-50 person-days*)
L - Low priority	\$ - Low cost (\$0-\$10K)	▼ - Low effort (≤25 person-days*)

\* A person day = 8 hour work day

## I: Maintain or Improve the Condition of all Sanctuary Resources (SR)

The purpose of the activities in this section is to strengthen resource protection of all sanctuary resources – habitat, water and living marine resources. Tied to this purpose is allowing activities that are compatible with resource protection and reviewing those activities (i.e., fishing, diving, research and education) periodically. The objectives will be accomplished through better understanding of sanctuary resources, as well as the human and natural impacts on those resources. This is accomplished through research and monitoring along with communicating the information to users and non-users of GRNMS. Most sanctuary goals are addressed through these objectives and activities.

### Objective SR-1: Maintain good<sup>3</sup> water quality in GRNMS over the next five years.

Water quality in GRNMS is considered to be good and unchanging (ONMS 2012). Ongoing coastal and inland development with associated population increases dictate that monitoring is important for early detection of potential water quality problems. The following activities are designed to continually monitor the status and trends of sanctuary water quality and to inspire behavioral changes in coastal and inland populations. Partners considered to accomplish this objective include the Skidaway Institute of Oceanography (SkIO), Georgia Southern University, and Sea Grant.

#### Activity SR-1A – Water quality monitoring and data analysis M \$\$ ▼

Implement and maintain a water quality program, monitoring for nutrients, contaminants and seasonal or periodic changes that may result in degradation of water quality.

#### Activity SR-1B – Education and outreach M \$\$ ▲

Translate water quality goals and GRNMS monitoring results into education and outreach materials and programs, such as website updates to influence behavior changes that protect water quality.

#### Activity SR-1C – Water quality program evaluation M \$ ▼

Evaluate effectiveness of the water quality program and adapt as indicated by evaluation results. In the case that water quality declines below the threshold of “good” GRNMS will request the assistance of the sanctuary advisory council, including its science advisory group, to develop a plan of action.

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<sup>3</sup> “Good” water quality is defined in the GRNMS Condition Report Addendum as: conditions do not appear to have the potential to negatively affect living resources, habitat quality or human health. Few or no activities occur that are likely to negatively affect water quality.

## GRNMS Goals Addressed in Section I:

**Goal 1:** Protect, maintain, restore, and enhance the natural habitats, populations, and ecological processes in the sanctuary.

**Goal 2:** Coordinate with federal, state, and local governments, international organizations, and other public and private interests to develop and implement plans to protect the marine environment and the sanctuary, and encourage the conservation of these resources.

**Goal 3:** Support, promote and coordinate scientific research, characterization, and long-term monitoring to enhance the understanding of the sanctuary environment and processes and improve management decision-making for optimal sanctuary resource protection.

**Goal 4:** Enhance public awareness, understanding, sustainable use, and appreciation of the sanctuary, while connecting people to the unique resources of Gray’s Reef National Marine Sanctuary.

**Goal 5:** Allow uses of the sanctuary not prohibited pursuant to other authorities, and consistent with resource protection.

## *Gray's Reef A Sentinel Site*

*Gray's Reef is well poised to serve as a sentinel site (an area with sustained observations for detecting and understanding ecosystem change over time) during a period of regional climate change. We regularly monitor temperature, pH, and carbon dioxide in our waters. In addition to detecting changes in our ocean's temperature and chemistry, the sanctuary may be able to detect the northern migration of more subtropical species which could also provide indications of ocean warming.*

### **Objective SR-2: Continually monitor and annually assess climate and oceanographic conditions in GRNMS in order to inform other GRNMS projects and assess potential impacts of climate change.**

GRNMS collects information on current, salinity, water temperature, wind speed and direction, wave height, dominant wave period, average wave period, air temperature, atmospheric pressure, pH, pCO<sub>2</sub>, dissolved oxygen and turbidity using a National Data Buoy Center buoy and seafloor instruments. Ongoing observations collected in GRNMS provide context for various monitoring projects and a baseline for the effects of climate change. Partners considered to accomplish this objective include the University of Georgia, National Data Buoy Center, Pacific Marine Environmental Laboratory, and the Southeast Coastal Ocean Observing Regional Association.

#### **Activity SR-2A – Ocean observations and data analysis H \$\$\$ ■**

Work with regional and national partners to collect oceanographic and climate data, and produce annual reports.

#### **Activity SR-2B – Climate Change Site Scenario L \$ ▲**

Develop a site scenario to assess potential impacts of climate change on resources of GRNMS.

#### **Activity SR-2C – Education and outreach H \$ ▼**

Translate climate information and oceanographic monitoring results into education and outreach materials and programs such as news stories on ocean acidification.

#### **Activity SR-2D – Climate and oceanographic studies program evaluation H \$ ▼**

Ocean observations analyses will be reviewed and evaluated annually by the GRNMS Sanctuary Advisory Council and its Science Advisory Group to ensure that these programs are producing results needed for management of sanctuary resources.

### **Objective SR-3: Maintain GRNMS habitats in good<sup>4</sup> condition over the next five years.**

The abundance, distribution and condition of the major habitat types in GRNMS is currently considered good, although human impacts have the potential to negatively alter live-bottom habitats. The trend in these conditions is unknown. Because habitats within GRNMS may be impacted by events such as currents and tides, storms, marine debris, and extractive activities, continued monitoring of habitat status is necessary. The existence of the research area within GRNMS allows for investigations to distinguish between some

<sup>4</sup> Habitats in “good” condition are defined in the GRNMS Condition Report Addendum as: habitats are in pristine or near-pristine condition and are unlikely to preclude full community development. Contaminants do not appear to have the potential to negatively affect living resources or water quality. Few or no activities occur that are likely to negatively affect habitat quality.



human-induced (e.g., fishing and diving) and natural influences. The following activities are designed to monitor the condition of GRNMS habitats. Partners considered to accomplish this objective include Georgia Southern University, NOAA Center for Coastal Environmental Health and Biomolecular Research, National Marine Fisheries Service, Coastal Carolina University, Jacksonville University, Team Ocean Volunteer Divers, and the College of Charleston.

**Activity SR-3A – Habitat mapping M \$\$ ▼**

Conduct multi-beam and side scan sonar mapping of the sanctuary and surrounding areas. Assess data for changes in abundance and distribution of the major habitat types as compared to existing maps.

**Activity SR-3B – Habitat condition studies H \$\$ ■**

Investigate the condition of habitats inside and outside the research area.

**Activity SR-3C – Contaminants monitoring L \$\$ ▼**

Periodically sample organisms and sediments for contaminants.

**Activity SR-3D – Marine debris monitoring and assessment L \$ ▼**

Conduct marine debris assessments at established monitoring sites in the sanctuary.

**Activity SR-3E – Education and outreach M \$ ▼**

Translate habitat monitoring results into education and outreach materials and programs, such as public awareness products on the effects of marine debris.

**Activity SR-3F – Habitat program evaluation M \$ ▼**

Monitoring and research outcomes will be evaluated annually by the GRNMS Sanctuary Advisory Council and its Science Advisory Group to ensure that programs are producing results needed for management of sanctuary habitat.



*Endangered Loggerhead Sea Turtles visit Gray's Reef to feed and rest among its ledges. Photo: Greg McFall*



*Nudibranch, commonly known as sea slugs, are brightly colored and easy to spot along the reef. Photo: Greg McFall*

**Objective SR-4: Improve the overall status of living resources to good<sup>5</sup> and maintain it at that level over the next five years.**

The status of biodiversity in GRNMS is considered to be good (ONMS 2012), however the other measures of living resource conditions range from “undetermined”<sup>6</sup> to “fair”<sup>7</sup> to “good/fair”<sup>8</sup>. The status of economically-valuable fish found in GRNMS has been improved by South Atlantic Fishery Management Council (SAFMC) actions (e.g., restrictions on harvest of Black Sea Bass and Red Snapper). More data, however, is needed to assess the condition of other species of fish and related ecosystem impacts. Likewise, more data is needed to understand the impacts of localized heavy fishing. The following activities are designed to fill these gaps and raise the status of GRNMS’ living resources. Partners considered to accomplish this objective include Georgia Southern University, NOAA Center for Coastal Monitoring and Assessment, NOAA Office of Protected Resources, Georgia Department of Natural Resources, University of Connecticut, Team Ocean Volunteer Divers, NOAA Sustainable Fisheries Division, NOAA Fisheries Ecosystem Branch, South Carolina Marine Resources Research Institute, South Atlantic Fishery Management Council, and NOAA Southeast Fisheries Science Center.

**Activity SR-4A – Fish and invertebrate monitoring and research H \$\$\$ ▲**

Conduct research on the invertebrates and fishes of GRNMS to better understand natural variability and determine human impacts on community development and structure.

**Activity SR-4B – Invasive species M \$ ■**

Monitor the presence/absence of invasive species in GRNMS and conduct removals as appropriate. The species that have been found in GRNMS to date are green mussels, titan acorn barnacles, orange cup coral (all on artificial substrate), and lionfish.

<sup>5</sup> To achieve an overall “good” rating for living resources, the following definitions must be met per the GRNMS Condition Report Addendum: biodiversity appears to reflect pristine or near-pristine conditions and promotes ecosystem integrity. Extraction does not appear to affect ecosystem integrity. Non-indigenous species are not suspected or do not appear to affect ecosystem integrity. Key and keystone species appear to reflect pristine or near-pristine conditions and may promote ecosystem integrity. The condition of key resources appears to reflect pristine or near-pristine conditions. Few or no activities occur that are likely to negatively affect living resource quality.

<sup>6</sup> Resource status and trend are undetermined per the GRNMS Condition Report Addendum.

<sup>7</sup> Per the GRNMS Condition Report Addendum, extraction may inhibit full community development and function, and may cause measurable but not severe degradation of ecosystem integrity. Selected activities have resulted in measurable living resource impacts, but evidence suggests effects are localized, not widespread.

<sup>8</sup> Non-indigenous species exist, precluding full community development and function, but are unlikely to cause substantial or persistent degradation of ecosystem integrity. Selected key or keystone species are at reduced levels, perhaps precluding full community development and function, but substantial or persistent declines are not expected.

#### **Activity SR-4C – Endangered and threatened marine resources L \$ ▼**

Participate in recovery efforts for the endangered North Atlantic right whale, threatened loggerhead sea turtle, Atlantic Sturgeon and any additional listed species found in GRNMS. Log sightings and report to appropriate agencies.

#### **Activity SR-4D – Education and outreach M \$ ▼**

Translate living resource monitoring results into education and outreach materials and programs, such as alerts and website information on protected species.

#### **Activity SR-4E – Living resource program evaluation M \$ ▼**

Monitoring and research will be evaluated annually by the sanctuary advisory council and its science advisory group to ensure that programs are producing results needed for management of living resources to maintain or improve their status.

### **Objective SR-5: Facilitate compatible sanctuary uses over the next five years ensuring that the resources are being maintained at a level of good<sup>9</sup>.**

Recreational fishing is the primary direct human use in the sanctuary, followed by research and recreational diving. Regulatory compliance is considered satisfactory, but overseeing a remote sanctuary is challenging. The regulatory changes suggested in Activity SR-5A will enhance safety for recreational divers and provide a convenience for the fishing public that use marker buoys for drift fishing. The regulatory changes were analyzed in a separate environmental assessment resulting in a finding of no significant impact. Partners considered to accomplish this objective include Georgia Department of Natural Resources, NOAA Office of Law Enforcement, NOAA General Counsel Enforcement Section, U.S. Coast Guard, and Coastal Conservation Association of Georgia.

#### **Activity SR-5A – Regulatory changes H \$ ▼**

Clarify the anchoring prohibition by adding “... or attempting to anchor” to the existing regulation. Revise regulations to allow use of weighted marker buoys during diving and fishing in GRNMS, while continuing to protect sanctuary resources. This activity was completed concurrently with the completion of the final management plan.

#### **Activity SR-5B – Sanctuary use data M \$\$ ▼**

Collect and assess data on sanctuary users and uses.

#### **Activity SR-5C – Permitting H \$ ▼**

Continue and enhance the sanctuary’s permitting program.

<sup>9</sup> Ibid., pages 13, 14 and 16.



*With no natural predators, invasive lionfish are able to grow and multiply rapidly. Voracious predators they consume fish and invertebrates as large as half their body size and at an unsustainable rate. Photo: NOAA photo gallery*



Fishing using rod and reel or handline gear is allowed in the Sanctuary. Enforcement of regulations is supported by partner agencies such as Georgia Department of Natural Resources and the U.S. Coast Guard. Photos: Randy Rudd



#### **Activity SR-5D – Voluntary Compliance H \$ ▼**

Conduct community outreach and education programs, such as distribution of brochures at fishing tournaments, to foster understanding of sanctuary resources and regulations and inspire voluntary compliance with those regulations.

#### **Activity SR-5E – Law enforcement H \$\$\$ ▼**

Support and enhance enforcement of regulations in the sanctuary with partners NOAA Office of Law Enforcement, Georgia Department of Natural Resources Law Enforcement Division, NOAA Office of General Counsel Enforcement Section, and the U.S. Coast Guard.

#### **Activity SR-5F – Sanctuary use programs evaluation H \$ ▼**

Synthesize and review results from user data, law enforcement and compliance, permitting, and regulatory changes for potential future management applications. Adapt programming as needed to protect sanctuary resources.

### **Objective SR-6: Evaluate potential areas outside GRNMS that may have connectivity with GRNMS and may benefit from increased protection.**

To ensure adequate protection of sanctuary resources, management must often examine activities and resources beyond the boundaries of a national marine sanctuary. Facilitating commercial and recreational uses to the extent compatible with the primary objective of resource protection and the potential impacts of climate change with management measures also means that NOAA GRNMS must explore the connectivity with areas, marine resources and human uses within a larger ecosystem for effects that may influence sanctuary resources. Partners considered to accomplish this objective include a broad array of federal, state and local resource management agencies, private organizations, and individuals representing GRNMS constituents.

#### **Activity SR-6A – Connected areas working group M \$ ■**

Work with the sanctuary advisory council to engage a diversity of stakeholders and agencies, with appropriate expertise, to identify and report on areas within the Carolinian Ecoregion that have ecological connectivity with GRNMS and that may benefit from increased protection.

## II: Increase the Awareness of, and Support for, GRNMS (AS)

While awareness of GRNMS has grown in the past decade, there is still a concern that the sanctuary is not well known particularly among the communities of non-users. Along with awareness of the sanctuary, there is the challenge to gain more appreciation for the site's unique marine resources and the mandate to manage them sustainably for future generations. In addition, potential budget restructuring at the national level may diminish some education funding, requiring GRNMS to reevaluate current K-12 programming. The following activities are designed to address these challenges by focusing on the desired results and analyzing existing outreach and education programming for optimum effectiveness. The purpose is to attain the next level of awareness and support for the sanctuary.

**Objective AS-1: Understand where the tools of education and outreach are needed and how programs should be delivered to achieve higher public awareness, understanding, sustainable use, and appreciation of GRNMS during the first year of management plan implementation.**

Assessment of accomplishments of the 2006 sanctuary management plan indicates that particular emphasis is still needed in the areas of public awareness and support for the sanctuary. Accomplishing this objective requires targeted and effective education and communications. Partners considered to accomplish this objective include the sanctuary advisory council and its recently established education and outreach assessment working group. The working group was established specifically to assess education and outreach programming.

### **Activity AS-1A – Articulate the desired outcomes for achieving understanding, sustainable use, and appreciation of GRNMS using education and outreach programming H \$ ■**

The sanctuary advisory council and its education and outreach assessment working group will be tasked with recommending a suite of desired results for GRNMS outreach and education programming.

### **Activity AS-1B – Assess existing programs H \$ ▲**

As directed by the sanctuary advisory council, the education and outreach assessment working group will assess the existing GRNMS education and outreach programs to see if the programs achieve the desired outcomes; and identify gaps in programming.

### **Activity AS-1C – Adjust existing programs and develop new programs as necessary H \$ ■**

Restructure existing outreach and education programs and develop new programs to achieve understanding, sustainable use, and appreciation of GRNMS. Outline programming for the remaining life of the management plan.

## GRNMS Goal Addressed in Section II:

**Goal 4:** Enhance public awareness, understanding, sustainable use, and appreciation of the sanctuary, while connecting people to the unique resources of Gray's Reef National Marine Sanctuary.



*Gray's Reef hosts an annual Ocean Film Festival in Savannah, Georgia to raise awareness of the sanctuary, to inform the public of current issues related to our ocean, and to promote thinking and conversation about solutions to such issues.  
Photo: Amy Rath*



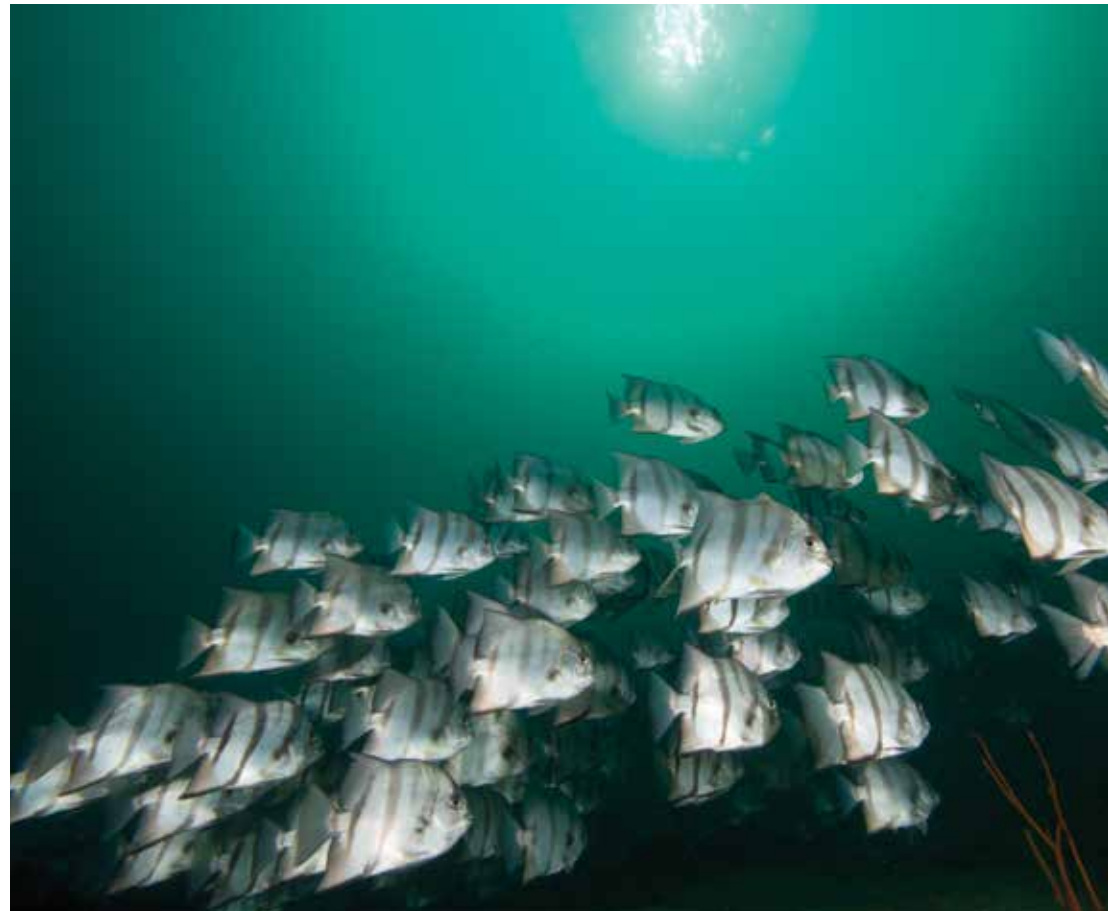
*Gray's Reef partners with University of Georgia, Georgia Aquarium, and Gordon State College to lead an annual Rivers to Reefs Educators Workshop for Georgia's teachers. Photo: Amy Rath*

**Objective AS-2: Implement education and outreach programming to achieve the desired outcomes by year 5 of the management plan as defined in Objective 1.**

Upon completion of a full assessment of GRNMS education and outreach programming, the action plan and specific education and outreach activities will be detailed. Partners considered to accomplish this objective will likely resemble those involved in Objective AS-1.

**Activity AS-2A – Education and outreach programming H \$\$\$ ▲**

Conduct new or ongoing education and outreach programming.



*Schooling spadefish at GRNMS. Photo: Greg McFall*

### III: Advance Collaborative and Coordinated Management (M)

The purpose of the objectives and activities in this section is to outline the activities that enable all the other objectives and activities in the management plan and to increase efficiencies and the effectiveness of GRNMS management. GRNMS currently occupies an office building on the campus of the Skidaway Institute of Oceanography (SkIO; part of the University of Georgia) on Skidaway Island near Savannah, Georgia. The sanctuary's mission is supported by six full-time GRNMS staff, a significant portion of a regional full-time staff member, a NOAA Corps officer, and part-time interns and volunteers.

#### **Objective M-1: In year one of the revised management plan fill vacant positions and restructure staffing assignments to improve operational capabilities, efficiency and effectiveness.**

GRNMS staffing levels are currently inadequate as the site has been functioning without a full-time research coordinator and without a full-time deputy superintendent. ONMS staffing plans call for full-time research coordinators at all sanctuary sites and deputy superintendents at most sites. The scope of duties for the remainder of the staff, such as education and outreach, may also adjust in the analysis that takes place.

#### **Activity M-1A – Staff vacancies H \$\$\$ ▼**

Fill priority staff vacancies.

#### **Activity M-1B – Staff structure analysis H \$ ▼**

Analyze current structure of GRNMS staff and adjustments for more efficient and effective operations.

#### **Activity M-1C – Staff restructuring M \$ ▲**

Restructure staff responsibilities for more efficient and effective operations based on analysis of the current structure.

#### **Objective M-2: Continue to maintain, and acquire as necessary, the infrastructure required to accomplish the mission and goals specified in the GRNMS management plan.**

GRNMS staff currently occupies a leased office building on the SkIO campus. Two sanctuary vessels, vessel docking, dive locker and other field equipment storage are located nearby and the sanctuary currently operates three vehicles. A facilities master plan was completed in 2010 and an outreach facilities strategy was done in 2011. The 2010 ONMS National Facilities and Exhibits Master Plan suggested improvements to existing facilities, including improved office space, vessel docking, dive locker and field equipment storage, in addition to consideration of a stand-alone visitor center in

#### **GRNMS Goal Addressed in Section III:**

**Goal 6:** Dedicate appropriate infrastructure and resources to support all programs, including the creation of models and incentives for conservation of sanctuary resources, and the development of innovative management techniques.



Research in the sanctuary is conducted from aboard the Gray's Reef research vessels; R/V Joe Ferguson and R/V Sam Gray.  
Photo: Sarah Fangman



Corals, anemones, sea jellies, and hydroids are equipped with stinging cells for defense from predators and to capture prey.  
Photo: Greg McFall

downtown Savannah. Partners considered to accomplish this objective include the National Marine Sanctuaries Foundation, Visit Savannah, Savannah Area Tourism Leadership Council, UGA's SKIO, and the Savannah Maritime Association.

**Activity M-2A – Maintain current infrastructure H \$\$\$▲**

Maintain current facilities, vessels, vehicles and other equipment.

**Activity M-2B – Continue to investigate the implementation of the 2010 plan for facilities and infrastructure, including the concept of a stand-alone visitors center. L \$\$ ▼**

Long-range planning should include seeking sources of support of a downtown Savannah visitor center. Activities for the next five years will concentrate on maintaining existing facilities and improving their security and efficiency.

**Objective M-3: “Green” GRNMS facilities and operations to meet standards of the ONMS Climate Smart initiative by year five.**

GRNMS has a commitment to continually improve operational and business practices to reduce the site’s environmental impacts (i.e., greening). Staff will seek certification as a Climate-Smart<sup>10</sup> National Marine Sanctuary. Partners considered to accomplish this objective include UGA’s SKIO and Georgia Southern University Center of Sustainability.

**Activity M-3A – Green operations assessment L \$ ▼**

Staff will assess existing operational and business practices to meet standards for emissions, transportation, energy efficiency, waste management and supplies, landscaping and water management.

**Activity M-3B – Advanced GRNMS greening L \$ ▼**

Develop a plan and implement actions for further greening of GRNMS facilities and operations based on the assessment and ONMS standards.

**Objective M-4: Annually develop operating plans that articulate how GRNMS resources would be distributed to meet the site’s goals and objectives, and conduct ongoing evaluations of the effectiveness of annual operating plans toward meeting management plan objectives.**

This objective captures the “big picture” planning and evaluation for GRNMS on an annual basis. The annual operating plans support the objectives of the management plan.

<sup>10</sup> See NOAA’s Climate-Smart Sanctuaries: Helping the National Marine Sanctuary System Address Climate Change. ONMS, 2010.



**Activity M-4A – Annual operating plan H \$ ▼**

Formulate an annual operating plan to meet the objectives of the overall GRNMS management plan and GRNMS annual budget allocation.

**Activity M-4B – Operating plan evaluation H \$ ▼**

Evaluate annual operating plan effectiveness toward meeting program objectives. Seek appropriate participation of the GRNMS Sanctuary Advisory Council.

**Objective M-5: Continue to maintain and further enhance community-based and partner engagement to improve collaborative and coordinated management in order to achieve the sanctuary's vision.**

GRNMS will continue to engage partners and community entities (academics, intra-agency and inter-agency affiliates, non-governmental organizations and the public at large) to achieve effective sanctuary management.

**Activity M-5A – Sanctuary Advisory Council H \$\$\$ ▲**

Continue to support at least three advisory council meetings each year along with subcommittee and working group meetings, as needed.

**Activity M-5B – Other partner coordination and collaboration H \$ ▼**

Remain engaged with current partners and seek opportunities to facilitate partnerships with other agencies and organizations, including non-governmental conservation organizations and civic groups.

**Activity M-5C – Volunteer program H \$ ■**

GRNMS staff will continue to engage and train volunteers in programming such as Team Ocean diving and citizen science, and remain active in recruiting volunteers to support existing operations and programs while developing additional opportunities for involvement to achieve the objectives and support the activities outlined in this plan.



GRNMS Sanctuary Advisory Council. Photo: Michael Jordan.

**The Gray's Reef  
National Marine Sanctuary  
Advisory Council**

**is a community-based advisory panel consisting of representatives from various user groups, government agencies and the public at large. The role of an advisory council is to provide advice to the sanctuary superintendent on the operation of a national marine sanctuary.**

## Appendices

### Appendix A: References

- Gray's Reef National Marine Sanctuary Regulations. 2006. Federal Register **71(197)**: 60055-60064. October 12, 2006. From the Federal Register Online via GPO Access [wais.access.gpo.gov] [DOCID:fr12oc06-1]
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- Ruiz-Carus, R., R.E. Matheson, D.E. Roberts, P.E. Whitfield. 2006. The western Pacific red lionfish, *Pterois volitans* (Scorpaenidae). In: Florida: Evidence for reproduction and parasitism in the first exotic marine fish established in state waters. *Biol. Conserv.* **128**:384-390.

### **Additional Website Resources**

Gray's Reef National Marine Sanctuary Web Site: <http://graysreef.noaa.gov/>

Office of National Marine Sanctuaries Web Site: <http://sanctuaries.noaa.gov/>

## Appendix B: GRNMS Condition Report Addendum Summary Table

The following table summarizes the “State of Sanctuary Resources” section of this report. The first two columns list 17 questions used to rate the condition and trends for qualities of water, habitat, living resources, and maritime archaeological resources. The Rating column consists of a color, indicating resource condition, and a symbol, indicating trend (see key for definitions). The Basis for Judgment column provides a short statement or list of criteria used to justify the rating. The Description of Findings column presents the statement that best characterizes resource status, and corresponds

to the assigned color rating. The Description of Findings statements are customized for all possible ratings for each question. The Response column describes current or proposed management responses to pressures impacting sanctuary resources. Questions that have new information to report since the 2008 Gray’s Reef National Marine Sanctuary Condition Report (ONMS 2008) are those with red numbers (questions 1, 5, 6, 8, 9, 10, 12 and 14).

<b>Status:</b> <b>Good</b> <b>Good/Fair</b> <b>Fair</b> <b>Fair/Poor</b> <b>Poor</b> <b>Undetermined</b>						<b>Trends: Conditions appear to be improving (▲), Conditions do not appear to be changing (■), Conditions appear to be declining (▼), Undetermined trend (?), Question not applicable (N/A)</b>	
#	Questions/Resources	Rating	Basis for Judgment	Description of Findings	Sanctuary Response		
<b>WATER</b>							
1	Are specific or multiple stressors, including changing oceanographic and atmospheric conditions, affecting water quality and how are they changing?	■	Limited data since 2000 suggest comparatively unaltered oxygen, temperature, and salinity, and some contaminants, but below EPA guidelines.	Conditions do not appear to have the potential to negatively affect living resources or habitat quality.	Recognized challenges due to coastal and inland development, population increases and climate change.  Continue monitoring for nutrient levels, contaminants and indicators of climate change.		
2	What is the eutrophic condition of sanctuary waters and how is it changing?	?	Comparatively unaltered levels of nutrients and chlorophyll, and lack of harmful algal blooms.	Conditions do not appear to have the potential to negatively affect living resources or habitat quality.			
3	Do sanctuary waters pose risks to human health and how are they changing?	■	2000 baseline, 2005 indicators below FDA Levels of Concern.	Selected conditions that have the potential to affect human health may exist, but human impacts have not been reported.			
4	What are the levels of human activities that may influence water quality and how are they changing?	■	Increasing human activities, but little evidence of negative effects.	Few or no activities occur that are likely to negatively affect water quality.			
<b>HABITAT</b>							
5	What are the abundance and distribution of major habitat types and how are they changing?	?	New map data recently collected; assessment of trends awaits comparison to earlier data.	Habitats are in pristine or near-pristine condition and are unlikely to preclude full community development.	Final management plan contains anchoring prohibition and outreach plans, and marine debris outreach, education and monitoring programs.  Sanctuary will enhance ongoing science to better understand biologically-structured habitat, continue monitoring benthic fauna and sediment quality, and conduct studies in research area to discern between human-induced and natural changes.		
6	What is the condition of biologically structured habitats and how is it changing?	?	Recent data on biological assemblages suggest ephemeral nature of predominant human impacts (anchoring, fishing).	Habitats are in pristine or near-pristine condition and are unlikely to preclude full community development.			
7	What are the contaminant concentrations in sanctuary habitats and how are they changing?	■	Low contaminant levels in 2000 and 2005.	Contaminants do not appear to have the potential to negatively affect living resources or water quality.			
8	What are the levels of human activities that may influence habitat quality and how are they changing?	▲	Human impacts localized within areas of heavy use.	Selected activities have resulted in measurable habitat impacts, but evidence suggests effects are localized, not widespread.			

#	Questions/Resources	Rating	Basis for Judgment	Description of Findings	Sanctuary Response
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## LIVING RESOURCES

9	What is the status of biodiversity and how is it changing?	■	High diversity of sessile invertebrates, benthic infaunal invertebrate density and abundance, and algal abundance and diversity.	Biodiversity appears to reflect pristine or near-pristine conditions and promotes ecosystem integrity (full community development and function).	<p>Fishing is limited to rod and reel and handline. Spearfishing is now prohibited. Regulations prohibit divers from taking marine organisms. A research area has been designated to evaluate impacts of bottom fishing. Education and outreach programs are in place that promotes good diving techniques.</p> <p>Monitoring will continue for invasive species.</p> <p>Sanctuary will confirm and characterize key species, conduct analysis of sponge mortality samples and monitor key species.</p>
10	What is the status of environmentally sustainable fishing and how is it changing?	▲	Recent data showing improvements in black sea bass and red snapper; need more data on non-targeted species to assess ecosystem impacts.	Extraction may inhibit full community development and function, and may cause measurable but not severe degradation of ecosystem integrity.	
11	What is the status of non-indigenous species and how is it changing?	▼	Occasional lionfish sightings in sanctuary since 2007; titan acorn barnacle, Asian green mussel and orange cup coral currently only found on manmade structures.	Non-indigenous species exist, precluding full community development and function, but are unlikely to cause substantial or persistent degradation of ecosystem integrity.	
12	What is the status of key species and how is it changing?	▲	Recent improvements in black sea bass and red snapper populations.	Selected key or keystone species are at reduced levels, perhaps precluding full community development and function, but substantial or persistent declines are not expected.	
13	What is the condition or health of key species and how is it changing?	?	Key species tentatively identified but condition and health undetermined; some contaminants detected in sponges, black seabass and arc shells.	N/A	
14	What are the levels of human activities that may influence living resource quality and how are they changing?	▲	Localized within areas of heavy use, with reduced pressure in certain areas due to management actions and the status of the economy, but trend data limited, suggesting a significant monitoring gap.	Selected activities have resulted in measurable living resource impacts, but evidence suggests effects are localized, not widespread.	

## MARITIME ARCHAEOLOGICAL RESOURCES

15	What is the integrity of known maritime archaeological resources and how is it changing?	N/A	No archaeological evidence, though former human occupation remains a possibility based on paleontological data.	N/A	<p>Anchoring has been banned, in part to reduce threat to archaeological resources.</p>
16	Do known maritime archaeological resources pose an environmental hazard and is this threat changing?	N/A	No archaeological evidence, though former human occupation remains a possibility based on paleontological data.	N/A	
17	What are the levels of human activities that may influence maritime archaeological resource quality and how are they changing?	■	Potential for diving and fishing to damage sites.	Some potentially relevant activities exist, but they do not appear to have had a negative effect on maritime archaeological resource integrity.	







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