Gray's Reef
National Marine Sanctuary



Final Environmental Impact Statement
Sanctuary Research Area Designation

August 2011

U. S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
Office of National Marine Sanctuaries

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

AUG 15 2011

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act of 1969 (NEPA), the National Oceanic and Atmospheric Administration (NOAA) has enclosed for your review the Final Environmental Impact Statement (FEIS) for the establishment of a research area in Gray's Reef National Marine Sanctuary (GRNMS). This FEIS assesses the environmental and socio-economic impacts of the revised regulations for Gray's Reef National Marine Sanctuary. GRNMS is located 16 miles offshore of Sapelo Island, Georgia, on an area of continental shelf stretching from Cape Hatteras, North Carolina, to Cape Canaveral, Florida. GRNMS protects 22 square miles of open ocean and submerged lands of particularly dense nearshore patches of productive live bottom habitat.

This FEIS is prepared pursuant to NEPA to assess the environmental impacts of the revisions to the regulations for GRNMS.

NOAA held public hearings and provided opportunity for public comments on the draft environmental impact statement and proposed rule from September to December 2010. All comments received are addressed in the document you are receiving.

Although NOAA is not required to respond to comments received as a result of issuance of the FEIS, any comments received will be reviewed and considered for their impact on issuance of a record of decision (ROD). Please send comments to the Sanctuary Official identified below by September 26, 2011. The ROD will be made available publicly following final agency action after September 26, 2011.

Responsible Official: David M. Kennedy
Assistant Administrator for Ocean Services and Coastal Zone Management

Sanctuary Official: George Sedberry
Gray's Reef National Marine Sanctuary Superintendent
Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration
Gray's Reef National Marine Sanctuary
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Sincerely,

Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

Enclosure

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ABOUT THIS DOCUMENT

This final environmental impact statement (FEIS) provides detailed information and analysis of a range of reasonable alternatives for a research area in Gray's Reef National Marine Sanctuary, including location and regulation of various human uses in that area.

The National Oceanic and Atmospheric Administration (NOAA) prepared this FEIS in accordance with the National Environmental Policy Act of 1969 (NEPA; 42 USC §4321 *et seq*.) as implemented by the Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and NOAA Administrative Order (NAO) 216-6, which describes NOAA policies, requirements, and procedures for implementing NEPA.

NOAA is the lead agency for this action. NOAA's Office of National Marine Sanctuaries (ONMS) is the implementing office for this action.

Recommended Citation:

Office of National Marine Sanctuaries. 2011. Gray's Reef National Marine Sanctuary Final Environmental Impact Statement Sanctuary Research Area Designation. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD.

ACKNOWLEDGEMENTS

This document was prepared by several staff members of NOAA's Gray's Reef National Marine Sanctuary including Superintendent George Sedberry, Deputy Superintendent and Research Coordinator Greg McFall, and Resource Protection Coordinator Becky Shortland. Significant assistance also came from Southeast, Gulf of Mexico, and Caribbean Region's Associate Science Coordinator Sarah Fangman, and Office of National Marine Sanctuaries Program Analysts Helene Scalliet and Meredith Walz. The bulk of the concept of a marine research area was developed over many years by the Research Area Working Group, which was established by and for the Gray's Reef Sanctuary Advisory Council. This dedicated group consisted of interested scientists, sport fishermen, divers, educators, law enforcement officials and representatives of state, federal and regional marine management agencies. Those individuals include: Working Group Chair Joe Kimmel; facilitators Paul Orlando, Steve Gittings, Jim Sullivan, and Brian Keller; members Jim Bohnsack, Joe Cavanaugh, Lad Akins, Henry Ansley, Charles Phillips, Judy Helmey, Judy Wright, Ryan Johnson, Herb Windom, Daniel Gleason, Steve Smith, Jack McGovern, Dorset Hurley, Gregg Waugh, Leslie Sautter, Doug Rader, Spud Woodward, Will Berson, Willie Olliff, John Duren, Jim Siler, Tim Tarver, Russell Kent, Tim Vincent, Doug Lewis, Matt Kendall, Laurie Bauer, Kate Eshcelbach, Clark Alexander, Jeff Hyland, Mark Chiappone, Marc Frischer, Geno Olmi, and Jennifer DeBose.

ACRONYMS

CINMS – Channel Islands National Marine Sanctuary
DEIS – Draft Environmental Impact Statement
EFH – Essential Fish Habitat
FEIS – Final Environmental Impact Statement
GADNR – Georgia Department of Natural Resources
GIS – Geographic Information System
GPS – Global Positioning System
GRNMS – Gray's Reef National Marine Sanctuary
GSU – Georgia Southern University
HMS – Highly migratory species
JEA – Joint Enforcement Agreement
MARMAP – Marine Resources Monitoring, Assessment and Prediction
MPA – Marine Protected Area
NCCOS – NOAA National Centers for Coastal Ocean Science
NEPA – National Environmental Policy Act
NMSA – National Marine Sanctuaries Act
NMSP – National Marine Sanctuary Program (now ONMS)
NMSS – National Marine Sanctuary System
NOAA – National Oceanic and Atmospheric Administration
NOS – National Ocean Service
OLE – NOAA Office of Law Enforcement
ONMS – Office of National Marine Sanctuaries (formerly NMSP)
RAWG – Research Area Working Group
SAB – South Atlantic Bight
SAG – Science Advisory Group
SAFMC – South Atlantic Fishery Management Council
SEDAR – Southeast Data, Assessment, and Review

EXECUTIVE SUMMARY

Gray's Reef National Marine Sanctuary (GRNMS or sanctuary) contains one of the largest nearshore live-bottom reefs in the southeastern United States. The sanctuary protects 22 square miles of open ocean and submerged lands of particular biological importance. GRNMS is located 16 miles offshore of Sapelo Island, Georgia, on an area of continental shelf stretching from Cape Hatteras, North Carolina, to Cape Canaveral, Florida called the South Atlantic Bight (SAB). NOAA designated the area (Figure 1) as a national marine sanctuary in 1981. A description of the sanctuary and its resources can be found in section IV (Affected Environment).

FIGURE 1: LOCATION OF GRNMS

NOAA is proposing to establish a research area in GRNMS to provide for comprehensive and coordinated conservation and management of natural resources consistent with the National Marine Sanctuaries Act (NMSA) (16 U.S.C. 1431 et. seq.). The purpose of a research area is to increase the opportunity to discriminate scientifically between natural and human-induced change to species populations in the sanctuary. Although allowable fishing gear is limited in the sanctuary, recreational fishing continues to impact the resources of GRNMS (ONMS 2008). Without having an area of the naturally-occurring live bottom devoted to research and devoid of direct human impacts, it becomes very difficult to scientifically understand how these reefs function. In fact, the principle conclusion of the broad-based Sanctuary Advisory Council's Research Area Working Group was that significant research questions exist at GRNMS that can only be addressed by establishing a research area closed to fishing and other human activities. The research area would also allow researchers to more accurately determine the effects of natural events (e.g., hurricanes) and to study impacts of climate change, including ocean acidification, which can be better determined in the absence of additional factors like fishing and diving. Currently the effects of subtle natural variability may be masked by the confounding or even overwhelming effect of fishing.

NOAA's preferred alternative is the designation of an area in the sanctuary where fishing and diving activities are prohibited and vessel transit is allowed without interruption (stopping). The preferred boundary (Figure 2) encompasses 8.27 square miles, roughly the southern third of the sanctuary. It is expected that the preferred boundary option would displace a minimal number of sanctuary visitors (Ehler 2010).

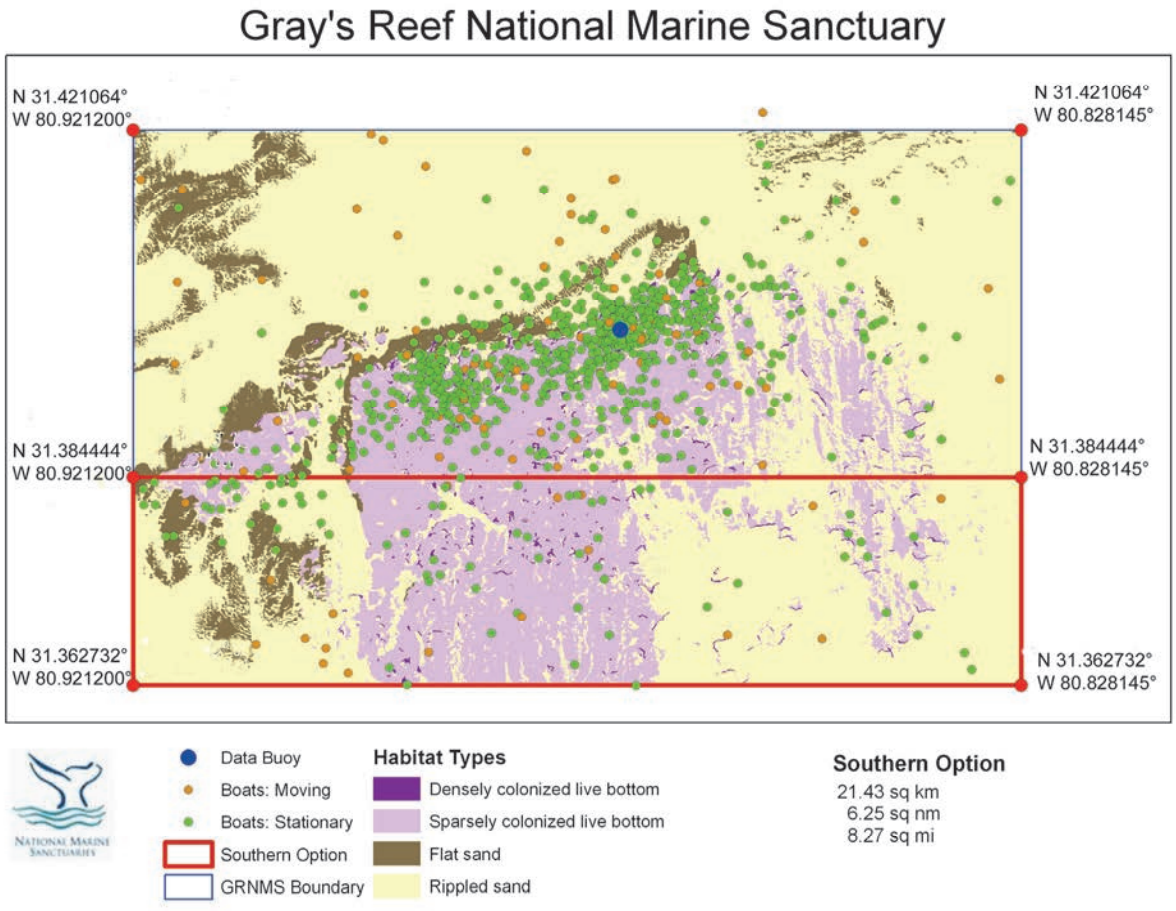

FIGURE 2: SOUTHERN OPTION BOUNDARY (PREFERRED BOUNDARY ALTERNATIVE). DOTS INDICATE BOAT LOCATIONS.

In addition to the preferred alternative, NOAA has evaluated a range of reasonable alternatives to address its needs, including a variety of locations and allowances of various human uses in that area. Section III (Description of Action and Alternatives) of this document provides a description of the following:

- Delineating the boundaries of the research area ("Boundary Alternatives");
- Regulating fishing within the research area ("Fishing Alternatives");
- Regulating diving within the research area ("Diving Alternatives"); and
- Regulating vessel operation in the research area ("Vessel Operations Alternatives").

In addition, section V (Environmental Consequences) provides a detailed analysis of the potential impacts of each alternative. No significant adverse impacts to resources and the

human environment are expected. Long-term beneficial impacts are anticipated if the action is implemented.

This document also includes relevant background (Section I), the Purpose of and Need for Action (Section II), Affected Environment (Section IV), and proposed action plans to implement a research area (Section VI).

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I. BACKGROUND

This section places the action into the context of the mission of the Office of National Marine Sanctuaries (ONMS) and Gray's Reef National Marine Sanctuary (GRNMS) through the provisions of the National Marine Sanctuaries Act (NMSA).

The National Marine Sanctuaries Act

The NMSA (16 U.S.C. 1431 et. seq.) is the organic legislation governing the ONMS (http://sanctuaries.noaa.gov/library/national/nmsa.pdf). The NMSA authorizes the Secretary of Commerce to designate as national marine sanctuaries areas of the marine environment or Great Lakes with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational or aesthetic qualities. Among the purposes and policies of the NMSA are the mandates to:

- Protect, and where appropriate, restore and enhance natural habitats, populations, and ecological processes (16 U.S.C. 1431 (b)(3)), and to
- Support, promote, and coordinate scientific research on, and long-term monitoring of, the resources of these marine areas (16 U.S.C. 1431 (b)(5)).

The designation of a research area within GRNMS would be consistent with and would further these purposes and policies.

The Office of National Marine Sanctuaries

The ONMS is the federal program within the National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) charged with managing national marine sanctuaries as the National Marine Sanctuary System (NMSS). The mission of ONMS is to identify, protect, conserve, and enhance the natural and cultural resources, values, and qualities of the NMSS for this and future generations throughout the nation. The ONMS serves as the trustee for a system of 14 protected areas encompassing more than 290,000 square miles of marine and Great Lakes waters from Washington State to the Florida Keys and from New England to American Samoa (Figure 3). Within their protected waters, giant whales feed, breed and nurse their young, coral colonies flourish, and shipwrecks tell stories of our maritime history. Sanctuary habitats include beautiful rocky reefs, lush kelp forests, whale migration corridors and destinations, spectacular deep-sea canyons, and underwater archaeological sites. They range in size from one-quarter square mile in American Samoa's Fagatele Bay to the more than 140,000 square miles in the Papahanāumokuākea Marine National Monument in the Northwestern Hawaiian Islands, which was established under the Antiquities Act (16 U.S.C. 431). Each sanctuary is a unique place deserving of special protection. Sanctuaries serve as natural classrooms, cherished recreational spots and places for valuable commercial activities. They represent many things to many people and are part of our nation's legacy to future generations.

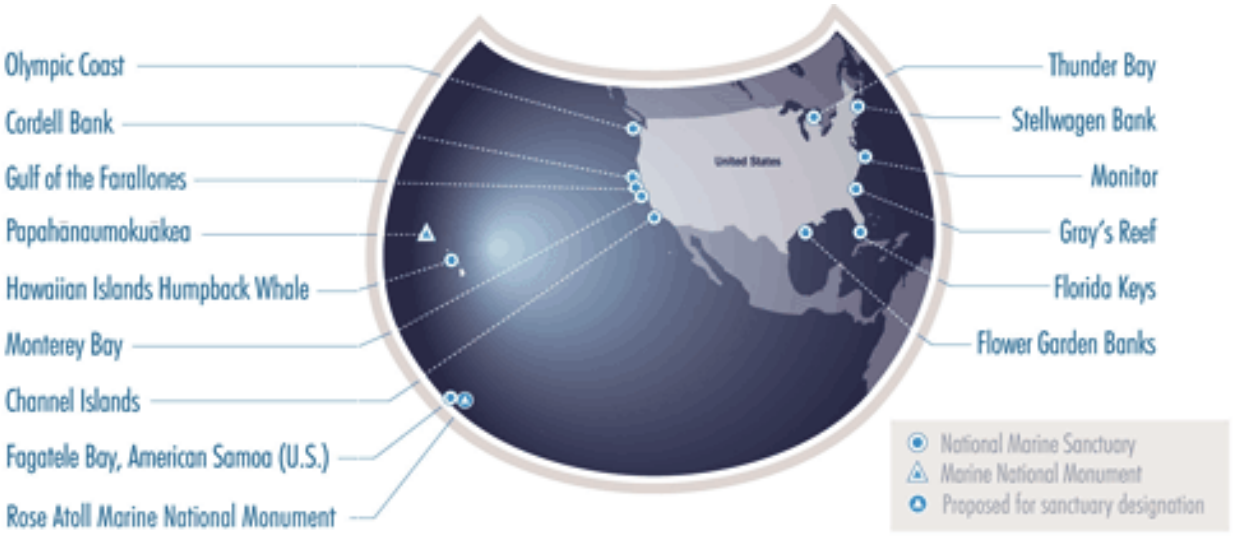

FIGURE 3: THE SYSTEM OF NATIONAL MARINE SANCTUARIES.

The ONMS raises public awareness of sanctuary resources and conservation issues through programs of scientific research, monitoring, exploration, education and outreach. The ONMS provides oversight and coordination of the sanctuary system by setting priorities for addressing resource management issues and directing program and policy development. To protect the living marine and non-living resources of sanctuaries, the ONMS works cooperatively with the public in developing sanctuary management plans consistent with the NMSA.

Sanctuaries as Marine Protected Areas

National marine sanctuaries, including Gray's Reef, are marine protected areas (MPAs). Executive Order No. 13158 (May 26, 2000, 65 F.R. 34909 Sec. 2. (a)) defines a marine protected area as "…any area of the marine environment that has been reserved by Federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." MPAs are geographical areas "where natural and/or cultural resources are given greater protection than the surrounding waters (E.O. 13158, 2000)."[1] An MPA can be located in the open ocean, coastal areas, intertidal zones, estuaries, or protected areas of the Great Lakes. Examples of MPAs in the Southeast, in addition to GRNMS, include Sapelo Island National Estuarine Research Reserve, the South Atlantic Fishery Management Council's (SAFMC) deepwater snapper-grouper MPAs and Cumberland Island National Seashore.

Comprehensive Management of the NMSS

The NMSA includes a finding by Congress that the ONMS will "maintain for future generations the habitat and ecological services of the natural assemblage of living resources that inhabit [sanctuaries]" (16 U.S.C. 1431 (a)(4)(A),(C). The NMSA further recognizes that "while the need to control the effects of particular activities has led to

[1] http://www.mpa.gov/aboutmpas/definition/

enactment of resource-specific legislation, these laws cannot in all cases provide a coordinated and comprehensive approach to the conservation and management of special areas of the marine environment" (16 U.S.C. 1431 (a) (3)). Accordingly, the ONMS applies a broad and comprehensive management approach to meet the NMSA's primary objective of resource protection (16 U.S.C. 1431 (b)(6)).

This comprehensive management approach serves as a framework for addressing long-term protection of a wide range of living and nonliving marine resources, while allowing multiple uses of the sanctuary to the extent that they are compatible with the primary goal of resource protection. The resources managed by the ONMS span diverse geographic, administrative, political and economic boundaries. Strong partnerships among resource management agencies, the scientific community, stakeholders and the public at-large are needed to realize the coordination and program integration that the NMSA calls for in order to comprehensively manage national marine sanctuaries.

GRNMS Management

GRNMS was designated in 1981 to protect 22 square miles of open ocean and submerged lands of particularly dense and nearshore patches of productive live-bottom habitat located 16 miles east of Sapelo Island, Ga. The current management plan for GRNMS was released in July 2006. Because GRNMS and the ONMS embrace regional governance and ecosystem approaches to management, the new management plan contains activities that address the need for increased levels of cooperation with other management and research agencies. These activities consider ecological interrelationships and the entire coastal ocean system from watershed to oceanic influences and within the larger context of the SAB and the Carolinian Province (an area encompassing warm temperate marine waters of the western North Atlantic). In addition, robust research, monitoring and education plans are being implemented.

Among programs in the management plan is the proposal to designate a research area within the sanctuary to increase the opportunity to discriminate scientifically between natural and human-induced change to species populations. The proposal originated in 1999 with the scoping process for review and revision of the 1983 GRNMS Management Plan. In 2004, the Sanctuary Advisory Council (Advisory Council) convened a working group to explore the idea in detail. A series of recommendations from the Research Area Working Group (RAWG) to the Advisory Council over the next three years led to a formal proposal for designation of a research area. A formal public process for designation began in early 2008 and culminates with the preferred alternative described here that would establish the Research Area.

Section III (Description of Action and Alternatives) of this document provides a description of the process and alternatives developed for designation of a research area. In addition, section V (Environmental Consequences) provides an analysis of the potential impacts of each alternative.

II. PURPOSE OF AND NEED FOR ACTION

This section specifies the underlying purpose and need for the action to designate a research area in GRNMS.

Purpose of Action

The purpose for taking action to address the need described below is derived principally by the NMSA and the goals and objectives for GRNMS.

NMSA

To facilitate comprehensive and coordinated conservation and management of natural resources at GRNMS by enhancing and improving conditions for scientific research as required by the NMSA, research – that includes a control or research area where human impacts are limited – is necessary. The purpose for this action is compatible with the purposes and policies of the NMSA. The NMSS, of which GRNMS is a part, is managed pursuant to provisions of the NMSA of 1972, as amended (16 USC 1431 *et seq*.). Sanctuaries are managed to protect and conserve their resources and to allow uses that are compatible with the primary objective of resource protection. The purposes and policies of the NMSA are included in Appendix B of this document.

GRNMS Designation, Goals and Objectives

NOAA designated the sanctuary as this nation's fourth national marine sanctuary in 1981 for the purposes of:

- Protecting the quality of the unique and fragile ecological community;
- Promoting scientific understanding of the live-bottom ecosystem; and
- Enhancing public awareness and wise use of the significant regional resource.

NOAA developed new and expanded goals and objectives that built upon the above purposes and added clarity, specifics and details regarding resource protection, research to enhance understanding, making the public aware of the sanctuary and its resources and promoting compatible use of the sanctuary. These goals were developed in coordination with the GRNMS Sanctuary Advisory Council in 2000 and are included in Appendix C of this document.

Need for Action

Science-based Management and the GRNMS Research Area

When attempting to protect any natural resource, including GRNMS, information on the status and natural variability of fish communities, habitat and ecological systems is essential for informed management. In order to adequately differentiate between anthropogenic and natural changes and to further determine how those changes might affect other components of the ecosystem, a baseline set of ecosystem measurements should be established and monitored over subsequent years. As these data are gathered and analyzed, scientists and managers can determine with greater confidence how much variability is natural in the system and how much may be the result of human influence. With a better understanding of the factors that influence ecosystem health and function, managers can better protect the resources and respond rapidly and appropriately to

natural or human-induced events. An area that is available for research with minimal direct human influence in GRNMS will provide scientists with a control area useful for the comparison of natural processes with human-induced change.

There are no natural live-bottom areas in GRNMS or anywhere in the SAB that have been set aside for scientific use only (NMSP 2006; Kendall et al 2008). There is agreement among scientists that without having an area of the naturally-occurring live bottom devoted to research and devoid of direct human impacts, it becomes very difficult to understand how these reefs function in the life history of many economically valuable species, and what the effects of extractive uses of these habitats are on their productivity (Halpern 2003). GRMNS managers have limited options to gain better management information due to the lack of a control area.

In response to these challenges, NOAA is proposing to designate a research area in GRNMS that would enable managers and researchers to discern between human-induced and natural changes. In particular, the research area would allow investigations to evaluate possible impacts from recreational fishing – particularly bottom fishing – on the sanctuary's natural resources. The research area would allow researchers to determine the effects of natural events (e.g., hurricanes) and cycles (e.g. droughts) on the sanctuary. The research area would also serve as an important sentinel site to monitor and study impacts of climate change, which could be better determined in the absence of additional factors like fishing and diving. Sentinel sites are areas well suited to ensure sustained observations of environmental change, to track indicators of ecosystem integrity, and to provide early warning services. Currently the effects of subtle natural variability may be masked by the confounding or even overwhelming effect of fishing.

GRNMS is relatively shallow and affords the opportunity for scientists to conduct experiments and make observations using SCUBA in a productive reef habitat that is relatively close to shore. The proximity of the sanctuary to coastal universities and marine research laboratories makes GRNMS a logical natural area that can be used to further understanding and management of these complex ecosystems.

GRNMS Resource Conditions

In 2008, NOAA released a report on the condition of GRNMS providing a summary of the status of resources, pressures on those resources, current conditions and trends, and management responses to the pressures that threaten the integrity of the marine environment (ONMS 2008).[2] Specifically, the document includes information on water quality, habitat, living resources, and maritime archaeological resources and the human activities that affect them. Overall, the resources protected by GRNMS appear to be in fair condition as defined in the 2008 GRNMS Condition Report. Emerging threats to the sanctuary include invasive species, contamination of organisms by waterborne chemicals from human coastal activities, climate change and ever increasing coastal populations and recreational use of the sanctuary.

[2] http://sanctuaries.noaa.gov/science/condition/grnms/welcome.html

NOAA's regulations for the sanctuary limit fishing gear to rod and reel, which is used by the vast majority of users in the sanctuary (Ehler and Leeworthy 2002), and handline gear. Although allowable fishing gear is limited, recreational fishing continues to impact the living marine resources and habitat of the sanctuary (ONMS 2008). Because recreational fishing occurs throughout the sanctuary, NOAA has limited options for gaining better information for GRNMS on the effects of fishing on fish and invertebrate populations and their habitats. The ability to conduct these investigations in a marine environment free of direct human influences is critical.

III. DESCRIPTION OF ACTION AND ALTERNATIVES

This section describes the preferred and other alternatives NOAA considered to meet the purpose and need for the action. This section also explains the process that led to development of the range of alternatives along with the role of the GRNMS Advisory Council and the SAFMC.

Development of Alternatives

The concept of a research (control) area within the sanctuary has been under discussion for many years. The idea was first raised by members of the public in 1999 during the early stages of the GRNMS Management Plan review process at public scoping meetings. The GRNMS Advisory Council described the problem as the need for a naturally occurring, live-bottom site within the sanctuary established exclusively for research. The Advisory Council then set a target to increase the opportunity to discriminate scientifically between natural and human-induced change to species populations in the sanctuary (NMSP 2006). As a means to reach this target, the Advisory Council formed the RAWG to consider the concept of a research area within GRNMS.

The broad-based RAWG consisted of representatives from research, academia, conservation groups, sport fishing and diving, education, commercial fishing, law enforcement, and state and federal agency representatives. The RAWG met initially in May 2004, and then periodically over the course of a year, to discuss the concept in detail. The RAWG employed a consensus-driven, constituent-based process. All participants discussed the issues, considerations, priorities and concerns at length for each step of the process. A Geographic Information System (GIS) tool was also developed to systematically analyze the space within the entire sanctuary and determine suitable placement options of a research area according to the general characteristics and boundary configurations requested by the working group (Kendall et al. 2008).

The primary site selection criterion for a research area was an area that included bottom features representative of the sanctuary as a whole, with a minimum of 20 percent densely-colonized ledge habitat including small, medium and tall ledges. The RAWG also determined that while ledge habitat is the highest priority in terms of research interest, sufficient amounts of the other three habitat types (flat sand, rippled sand, and sparsely-colonized ledge habitat) are necessary to replicate the diversity of sanctuary habitats in a research area. The other important criterion was to minimize the displacement of users.

The principle conclusion of the RAWG was that significant research questions exist at GRNMS that can only be addressed by establishing a research area. In June 2005, the GRNMS Advisory Council met to consider the work of the RAWG. The Advisory Council developed a series of recommendations for the sanctuary superintendent, based on the RAWG recommendations.

2005 Recommendations of the GRNMS Advisory Council
Significant research questions exist at GRNMS that can only be addressed by establishing a control (research) area. Therefore, it is the finding of the Sanctuary Advisory Council based on the recommendation of the Research Area Working Group that the research area concept should be further explored through a public review process.
The Sanctuary Advisory Council recommends that as many appropriate tools as feasible, especially the GIS-based site evaluation tool and the Research Area Working Group, be used to investigate a research area in GRNMS with proper siting criteria.
The Sanctuary Advisory Council recommends consideration of the diversity of habitat (with emphasis on high relief habitat) as the primary siting criterion. Should NOAA decide to proceed, the Research Area Working Group should be maintained to support NOAA in consideration of these various criteria (e.g., habitat, size, existing research and monitoring sites, bottom fishing data) in developing proposed options for a Draft Environmental Impact Statement (DEIS).
The Sanctuary Advisory Council recommends minimizing impacts to user communities including fishing, diving, research, and resource management and considers this a priority under the research area concept. The Sanctuary Advisory Council also endorses the Research Area Working Group finding that non-bottom impinging activities are not viewed as conflicting with the primary objectives of a proposed research area.

FIGURE 4: 2005 RECOMMENDATIONS OF THE GRNMS ADVISORY COUNCIL

The above recommendations were accepted by the GRNMS superintendent with a commitment to initiate a more formal public review process on designation of a research area. That decision was outlined in the Research and Monitoring Action Plan of the 2006 GRNMS Final Management Plan (NMSP 2006).

By 2007, new information had been gained on benthic and pelagic community linkages and law enforcement concerns. When the RAWG reconvened in October 2007, members reassessed allowable fishing activities for a research area in light of the new information. The 2005 RAWG and Advisory Council recommendation to allow pelagic fishing was based on the assumption that pelagic fishing would not result in "bottom-impinging" gear use or other effects in a research area. The conclusion in 2007 was that this assumption is not always true. First, it was shown that sport fishermen sometimes utilize methods to fish both coastal pelagic and reef species at the same time (Herum 1999; Bolin 2000). Scientists are also beginning to understand the relationship between benthic and pelagic species and their interactions.

In 2005, an expert workshop of fisheries biologists, marine ecologists, MPA managers, and recreational fishermen was convened in Monterey, California. Participants examined the current knowledge on benthic-pelagic linkages in U.S. marine ecosystems. They concluded that while local benthic-pelagic linkages will differ, linkages can generally be expected to be stronger and more direct in shallow water habitats (<50 meters or approximately 165 feet) (Grober-Dunsmore et al. 2008). This new information is relevant to GRNMS because the sanctuary ranges from approximately 17-21 meters (55-70 feet) in depth. They also concluded that there are many circumstances in which ecologically important interactions

are likely to be complex, unpredictable, and/or poorly understood. Local ecological factors contributing to complex linkages include multiple interactions within and among trophic levels (e.g., with mid-water forage or bait fish); complex behaviors and life histories among key local species; the ephemeral appearance of highly mobile predators; and/or the size of pelagic predator populations.

There are reef-associated species at GRNMS, like the jacks and great barracuda, that have a significant role in reef health, but that role is not yet well understood. Preliminary results from research in progress indicate that jacks, mackerels and great barracuda drive schools of baitfish from the water column down to the bottom, where the bait provides feeding opportunities for bottom-dwelling grouper and snapper.[3] Further understanding of benthic-pelagic interactions will benefit sustainable management of commercially-important fish species for the future. Thus, setting aside an area where no harvest is permitted would allow researchers to begin to study these interactions and to determine how fishing impacts both benthic and pelagic species.

In addition, during deliberations over restrictions in Channel Islands National Marine Sanctuary (CINMS) MPAs, NOAA determined that all fishing should be prohibited in the marine reserves. Fishermen argued that pelagic fishing would not compromise the usefulness of the MPAs, but NOAA determined that while the MPAs are not expected to yield the same benefits for pelagic species as for bottom-dwelling species, there are likely to be positive ecological benefits of protecting these species while they are within the MPAs (NMSP 2007). Many of these species play important roles as apex predators within the marine ecosystem. Their removal from the system may lead to trophic cascades that change the ecosystem structure, in some cases altering the composition and productivity of the system. Furthermore, law enforcement agents would have to make on-water determinations as to the type and disposition of gear, the species being taken, and the location of the vessel, complicating an already complicated job.

Researchers in the Gulf of Mexico who were studying recovery of gag grouper populations in MPAs where pelagic fishing was allowed reported that trolling activities were causing serious enforcement problems (David 2003). Law enforcement personnel were not able to distinguish the depth of trolling from the surface, and therefore could not determine if fishermen were in fact fishing for bottom species.

Officials who are charged with enforcing a pelagic-fishing-only rule could also encounter numerous complications with fishing gear combinations. As noted above, examples of combined pelagic and bottom-fishing techniques are sometimes used in the southeast. The challenges to law enforcement officials at GRNMS and to users wanting to comply with the restrictions in a research area would be greatly simplified if all forms of fishing were equally prohibited.

[3] http://graysreef.noaa.gov/science/research/fish_behavior/welcome.html

As a result, the final 2008 RAWG conclusions and 2009 GRNMS Advisory Council recommendations to the GRNMS superintendent included the unanimous recommendation that all fishing, including fishing for pelagic species, be prohibited in the research area.

Through early 2008, the RAWG and Advisory Council continued to evaluate selection criteria and boundaries utilizing the GIS tool and incorporating new information as it became available. Final criteria recommended by the Advisory Council for selecting a research area in GRNMS included:

1. Maximize densely-colonized ledges (high priority), short, medium and tall
2. Include all bottom types represented in the full sanctuary
3. Minimize user displacement
4. Provide "outside" comparison sites

Initially, the data buoy (maintained by the NOAA National Data Buoy Center) and the long-term monitoring site in GRNMS were two data sources thought to be desirable within the boundaries of a research area. The buoy station collects data, such as sea surface conditions, air temperature, water temperature and atmospheric pressure. The long-term monitoring site established in 1995 is a small area of the sanctuary established as an on-going monitoring site for fish populations, benthic invertebrates, oceanographic conditions, sediment transport, and visitor use. Further consideration by the RAWG and Advisory Council resulted in the conclusion that maintaining the status quo of the long-term monitoring site (outside of the research area) allows continuation of the baseline of conditions, avoiding the need to establish a new monitoring station outside of the research area. Because the data buoy collects oceanographic variables that are basically uniform at the scale of the whole sanctuary, the buoy does not need to be inside the research area. Thus, these two criteria were determined to be unnecessary.

Ultimately, six boundary scenarios and several activity restrictions were selected and became the focus of public scoping during March and April 2008. After consideration of public comments and deliberations by the RAWG, the sanctuary superintendent received final recommendations from the Advisory Council in January 2009. With the exception of the recommended boundary marking, the following Advisory Council recommendations are reflected in the preferred alternatives presented in this document:

2009 Recommendations of the GRNMS Advisory Council
Boundary option #6 (Southern Option) as the preferred boundary alternative.
Boundary options #1 (Optimal Scientific), #2 (Minimal User Displacement), #3 (Compromise) and "no action" as other alternatives to be considered and analyzed, but not preferred.
Boundary options #4 and #5 as alternatives considered but eliminated from further analysis due to insufficient ledge habitat.
Boundary Options #6, #1, #2, #3 would be considered and analyzed with the following terms of closure: • Prohibit all fishing at all times based on issues of enforceability and increased difficulty with voluntary compliance, and because of the potential impacts to the integrity of the research area; • Transit through the research area be allowed with no stopping; all fishing gear must be stowed and unavailable for use; • Prohibit all recreational diving; • Boundaries would be marked by line-of-sight buoys (approximately every 2 miles) around the research area; corners buoys would also be deployed and maintained at the remaining unmarked corners of the full sanctuary;
A scientific advisory group would be established as a working group of the Sanctuary Advisory Council to advise GRNMS on the types of studies to be conducted in the research area (e.g., manipulative experiments, long-term monitoring), to assist GRNMS in evaluating the suitability of proposals and requests to conduct scientific studies within the research area, and to help GRNMS develop performance criteria for long term evaluation of the benefits of the research area.
The research area would not be conditioned by any limit on the number of years of closure, but would be evaluated or reviewed and may be subject to change each time the Gray's Reef NMS Management Plan is reviewed.
GRNMS would, in addition to the five-year management plan review, conduct an annual review of usage and performance criteria of the research area. A report of the findings would be made available to all interested parties.

FIGURE 5: 2009 RECOMMENDATIONS OF THE GRNMS ADVISORY COUNCIL

Pursuant to section 304(a)(5) of the NMSA (16 U.S.C. 1434(a)(5)), the ONMS presented the SAFMC the opportunity to prepare draft sanctuary fishing regulations to further the goals and objectives of the GRNMS. Specifically, ONMS asked the SAFMC to draft regulations for prohibiting fishing within a proposed research area. In March 2009, the SAFMC voted unanimously to defer to GRNMS for rule-making in terms of the establishment of the research area.

Preferred Alternative

NOAA's overall preferred alternative to satisfy the purpose and need would be the designation of an area in the sanctuary where fishing and diving activities are prohibited and vessel transit is allowed without interruption (stopping). The preferred boundary to meet the purpose and need is the Southern Option Boundary (Figures 2 and 6), which

encompasses 8.27 square miles. The preferred boundary option is expected to displace a minimal number (9.2 percent) of sanctuary visitors (Ehler 2010; Appendix D). As recommended by the RAWG and Advisory Council, the research area would not automatically expire after a certain number of years. It would be evaluated during periodic GRNMS management plan reviews, and NOAA could propose changes in regulatory regime (including abolishing the research area) as part of these future planning processes.

The preferred and other alternatives are described and analyzed below. Action plans as proposed in this document (Section VI) apply to all the boundary alternatives.

Alternatives Analyzed

No Action

Under the no action alternative, NOAA would not designate a research area in GRNMS. Current levels of research and monitoring activities would continue and extractive use would continue to be allowed throughout the sanctuary.

Under this alternative, there would be no area of the SAB relatively free of human extractive use that could be used to make observations and conduct experiments furthering our understanding of live-bottom ecosystems and how they function to provide ecological services. In spite of years of study, the role of the live-bottom ecosystem in fishery production, and the role of healthy fish populations in maintaining stable productive communities on live-bottom reefs, would not be known. The heavy fishing pressure exerted throughout the region would continue to make well-designed studies difficult. Without this research there would not be any of the data needed to assess the impacts of fishing and diving on biological and physical (habitat) resources in GRNMS, and by extension to manage these resources, including fish, invertebrates, sea turtles, marine mammals and pelagic birds. Interest in these studies has increased among resource managers, especially in relation to development of ecosystem-based fishery management plans.

Unfortunately, populations of fishes have already been subject to intense fishing for decades, so it is difficult to determine how habitat and diverse invertebrate and fish assemblages interact with exploited species under natural conditions. There are no inner- or middle-shelf, live-bottom areas where fishing is prohibited in the entire SAB. In light of changing conditions at GRNMS as a result of invasive species, climate change and other factors, it is important to be able to understand these effects without the confounding effects of fishing and diving.

The importance of shallow complex habitat such as live bottom in the juvenile and young adult stages of many reef fishes is documented (e.g., Gwak 2003; McGovern et al. 2005; Afonso et al. 2007). Because of the large size attained by some of these species, a portion of the population reaches legal catch size before reaching maturity and is often harvested before reproducing. In addition, there is high release mortality in undersized fish released at the depths found at GRNMS (Ridersjaisem et al. 2007), so there is some measure of

mortality on fishes caught but released in accordance with minimum size and other regulations. The effects of removal of these younger stages on the fishery and the ecology of live bottom reefs are unknown.

In February 2009, the SAFMC established eight small (approximately 10 – 200 square mile) no-bottom-fishing MPAs on the outer continental shelf (approximately 165 – 1000 ft depth) from southern North Carolina to the Florida Keys (74 FR 1621). These small areas are aimed at protecting deepwater reef species and providing areas where natural deepwater reef ecosystems can function. Many of the species that are afforded protection in these deepwater MPAs have juvenile or young adult stages that occur primarily in shallower water, including live-bottom areas such as GRNMS, where they can be caught as fishery targets or bycatch. In order to help restore populations of these species by protecting younger stages, shallow-water MPAs might be effective. However none currently exist where the potential can be studied. In addition, many of the deep MPA sites harbor spawning populations of invasive Indo-Pacific lionfish, a problem that does not exist at GRNMS at present, which makes the sanctuary an ideal location for determining natural functions of live-bottom reefs in the absence of fishing and invasive lionfish, in depths that can be easily dived and observed.

No action would result in the status quo for conducting research to fully understand live-bottom ecosystems at GRNMS and in the region. A research area that is not impacted by fishing and diving would not be available to understand natural variability and other impacts on live-bottom systems. This action would not provide that needed control area, therefore this alternative is not preferred.

Delineating the boundaries of the research area (Boundary Alternatives)

1. Southern Option Boundary (preferred).

The Southern Option Boundary (Figure 6) is formed by stretching a line parallel to the southern boundary of the sanctuary and moving it northward from that boundary to a point where the requisite number of ledges (densely-colonized) are included to accomplish experimental and monitoring goals. Ledge habitat was determined by the RAWG to be the chief criterion for a research area. The RAWG also determined that a minimum of 20 percent of each ledge type (30 short, 30 medium and 30 tall ledges) are needed to accomplish experimental and monitoring goals (Kendall et al 2008). Specifically, in the Southern Option Boundary there are 30 short, 52 medium and 36 tall ledges as determined by ground-truthed field studies. The area encompasses 8.27 square miles (21.43 square km) which includes the area between the southern boundary of the sanctuary and a line north of and parallel to the southern boundary at N 31.384444°.

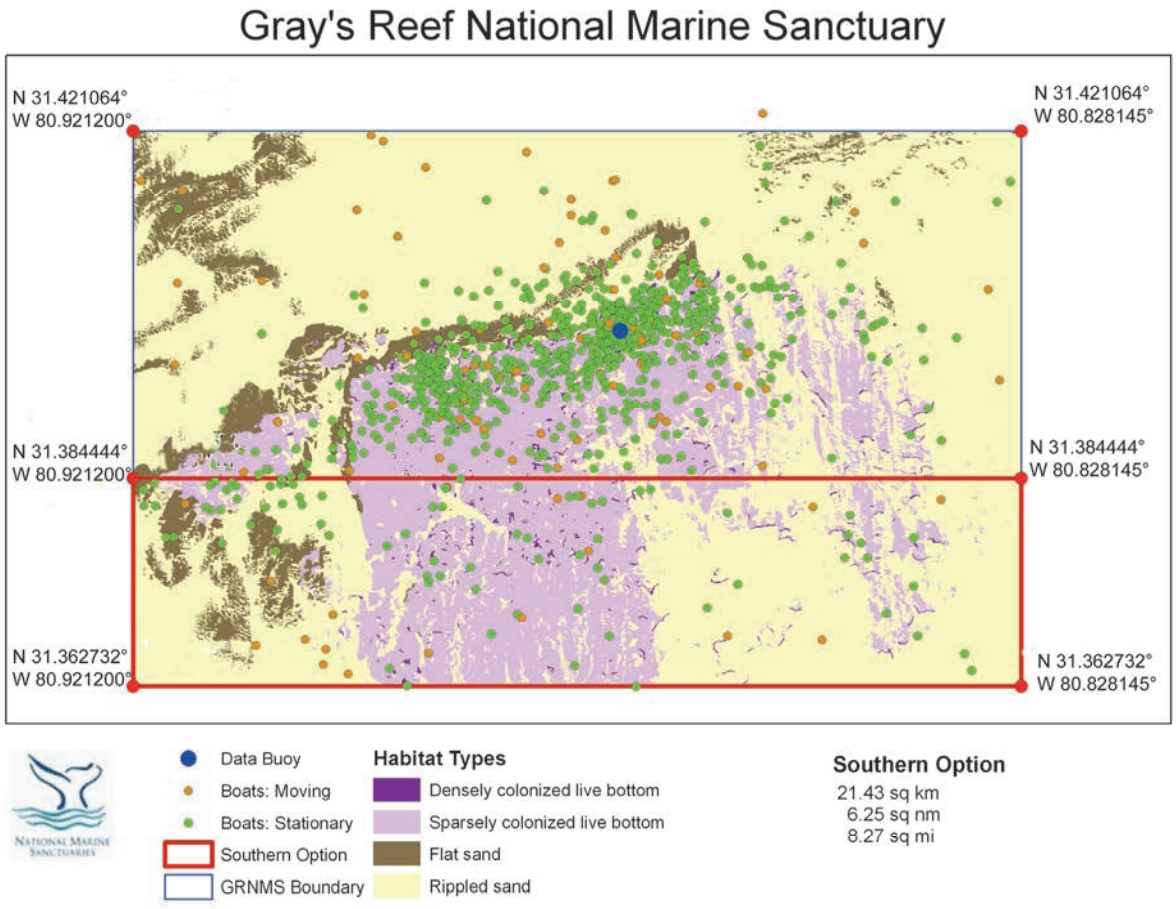

FIGURE 6: SOUTHERN OPTION BOUNDARY (PREFERRED ALTERNATIVE)

All bottom types are included in the Southern Option Boundary and there would be more than adequate (approximate 80 percent) ledge and other habitat types outside the boundary for necessary comparisons and to provide areas for activities such as

recreational fishing and diving. In fact, the areas outside of the Southern Option Boundary appear to be the preferred fishing and diving locations for users. Although the long-term monitoring site and the data buoy were thought to be desirable inside the boundary of a research area due to the available data sets for both, the RAWG determined that including these features was not essential for the purposes of the research area (see discussion on page 17 of this document). Therefore, they are not included in this boundary alternative (Kendall et al 2008).

Under this alternative, no boundary markers would be placed around the research area. Coordinates of the research area in particular, and the sanctuary as a whole, would be included in nautical charts, in various outreach materials and posted on the Notice to Mariners and other such outlets frequently visited by users of GRNMS. Although law enforcement officials have recommended marking the boundaries with line-of-sight buoys, scientists are concerned that such an array of buoys would significantly alter the natural systems of the research area. The buoys are certain to attract bait fish and thus artificially attract pelagic species. This in turn is likely to attract more fishermen fishing for bait at the buoys and possibly for pelagic species, which may disturb the natural systems in the slim buffer around core projects. Pelagic fish attracting devices have also been shown to unnaturally alter bottom fish assemblages (Rountree 1990; Kellison and Sedberry 1998) which would compromise the research area.

Three sides of the Southern Option Boundary are existing boundaries of the sanctuary, which is expected to minimize user conflicts and make compliance simpler. The location, which is somewhat distant from the heavily-used north-central area of concentrated ledge habitat, also eases the burden of compliance and enforcement while minimizing user displacement. The Southern Option Boundary was favored by most sanctuary users during the 2008 public scoping for the research area concept.

Some researchers and other stakeholders commenting on boundary options during scoping also favored the Southern Option Boundary due to the lower potential for interference with other kinds of uses. Other researchers, however, preferred the Optimal Scientific Option or the Compromise Option boundaries (Figures 7 and 9 below) because of the ability to compare before (heavily fished) and after (no fishing) resource conditions.

The Advisory Council recommendations to NOAA identify the Southern Option Boundary as the preferred boundary alternative. NOAA has determined that the Southern Option Boundary would meet the purpose and need of a research area and it is the preferred boundary alternative.

2. Optimal Scientific Option Boundary.

The Optimal Scientific Option Boundary was designed by the RAWG based solely on research considerations. For this scenario, the full size of the research area was selected to be 4 x 4 km for optimal scientific benefits, with 30 of each ledge type (short, medium, and tall) and adequate representative proportions of other bottom types. The resulting configuration would leave sufficient ledge and other bottom types outside the boundary for comparative studies and for fishing, diving and other activities. The data buoy and long-term monitoring site are included in the Optimal Scientific Option Boundary. Inclusion of the long-term monitoring site and data buoy, while determined not to be essential by the RAWG, would be beneficial to research and management because of the available long-term data sets. Six boundary placements were identified with the criteria for this option, and one boundary is shown to illustrate the approximate area and scale of all six boundaries (Figure 7).

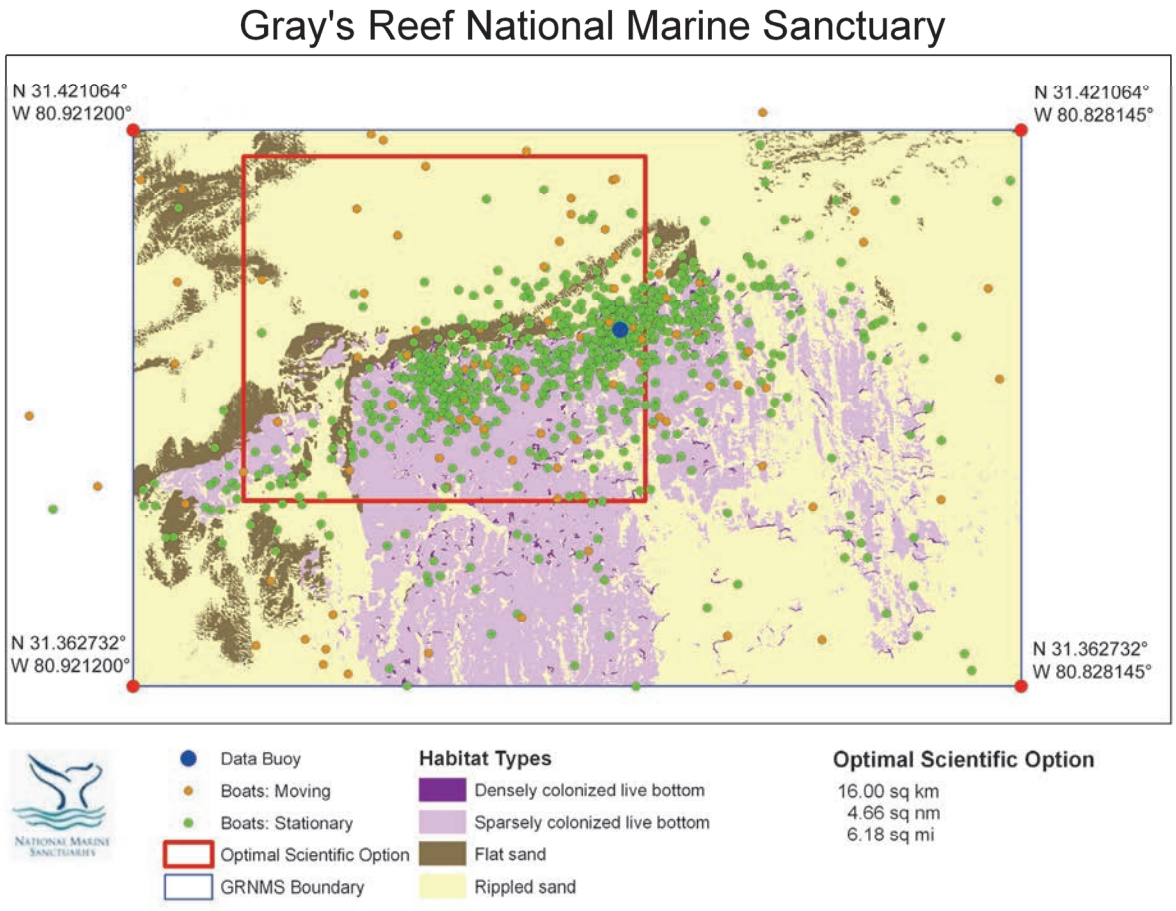

FIGURE 7: OPTIMAL SCIENTIFIC OPTION BOUNDARY

The Optimal Scientific Option Boundary would satisfy the primary criterion for ledge and other bottom types, and some scientists prefer this option for the potential to examine

before (heavily fished) and after (no fishing or reduced fishing) effects. This boundary would not, however, address the Advisory Council's recommendation to minimize user displacement and would have the highest level of displacement (67 percent) and related socioeconomic impacts of concern to the fishing community. In addition, this boundary option would create open areas of the sanctuary on all sides of the boundaries resulting in compliance and enforcement complications.

As with the other boundary options, no boundary markers would be placed around the research area due to the concern that an array of buoys could significantly alter the natural systems of a research area. Coordinates of the research area in particular, and the sanctuary as a whole, would be included in various outreach materials and posted on the Notice to Mariners and other such outlets frequently visited by users of GRNMS.

The Optimal Scientific Option Boundary, while preferred by some scientists and meeting the criterion for habitat inside and outside of the boundary scenario, would not meet the recommended minimization of user displacement. This scenario also complicates enforcement and compliance due to the area being non-contiguous with the existing sanctuary boundaries and its placement in a well-used area of GRNMS. This option is, therefore, not preferred.

3. Minimal User Displacement Option Boundary.

The Minimal User Displacement Option Boundary was delineated by using selection criteria based on the least impact on or displacement of users (minimal user displacement) while meeting the absolute minimum scientific requirements in ledge inclusion. For this scenario, the full size of the research area was selected to be 3 x 3 km and placed where there is a minimum of 30 of each ledge type (short, medium, and tall) and the lowest percentage of user displacement. The resulting configuration would leave sufficient ledge and other bottom types outside the research area available for comparative research and other allowable activities. The Minimal User Displacement Option Boundary encompasses approximately 15 percent of boat sightings. Little if any flat sand, however, is included. The data buoy and long term monitoring site are not included; the RAWG determined that their inclusion would be beneficial but not essential. The southern boundary of this option could be adjusted to match the existing southern boundary of GRNMS, but open areas to the east and west would result in compliance and enforcement complications. Nineteen boundary placements were identified with the criteria for this option, and four boundaries are shown to illustrate the approximate area and scale of all nineteen boundaries (Figure 8).

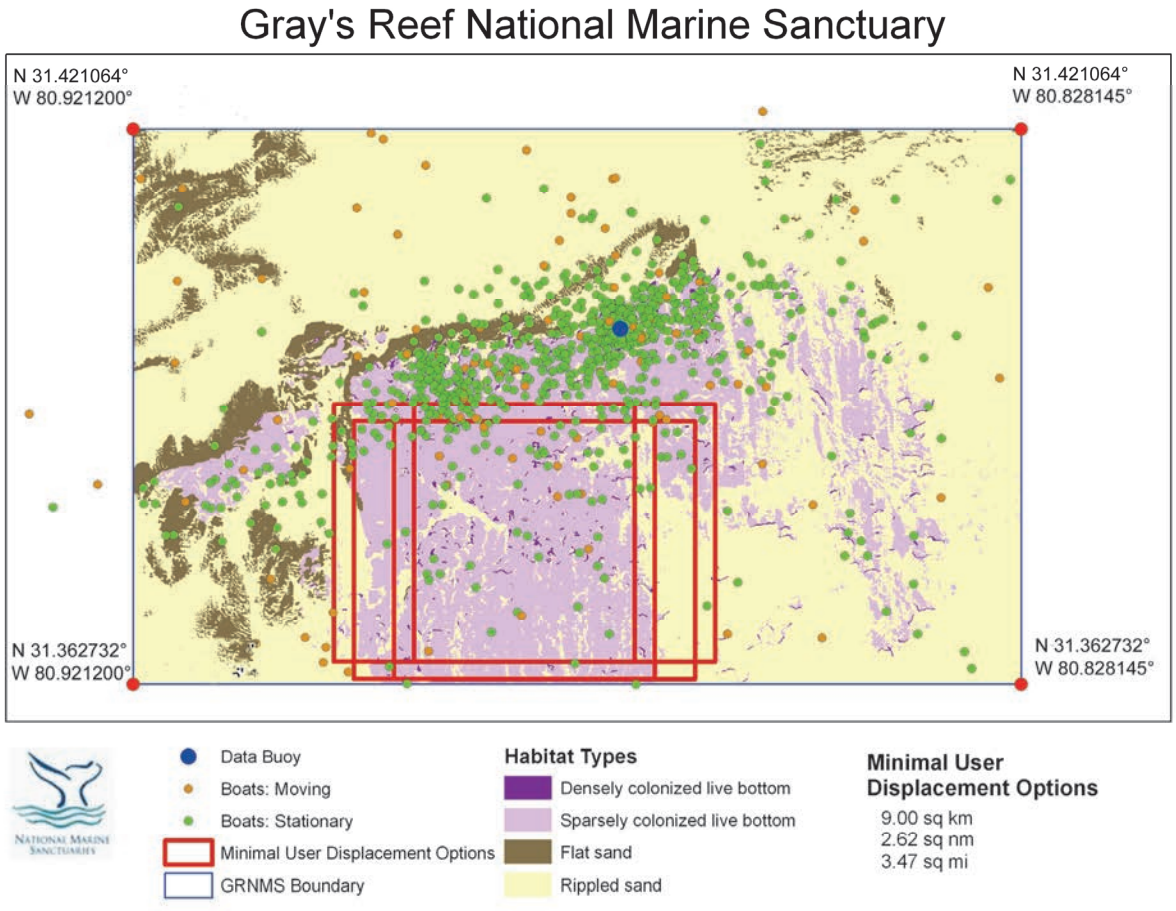

FIGURE 8: MINIMAL USER DISPLACEMENT OPTION BOUNDARY

As with the other boundary options, no boundary markers would be placed around the research area due to concerns that an array of buoys could significantly alter the natural systems of a research area. Coordinates of the research area in particular, and the sanctuary as a whole, would be included in various outreach materials and posted on the Notice to Mariners and other such outlets frequently visited by users of GRNMS.

The Minimal User Displacement Option Boundary, while minimizing user displacement, would include some areas preferred by tournament fishermen. In addition, the smaller core size of this boundary would not offer adequate research and monitoring opportunity. One of the criteria for a research area is that it contains adequate amounts of all habitat types. The Minimal User Displacement Option Boundary would include little if any flat sand habitat. This boundary option is, therefore, not preferred.

4. Compromise Option Boundary.

Selection criteria for the Compromise Option Boundary were based on moderate values for both user displacement and scientific needs. The full size of the research area was selected to be 4 x 4 km with the minimum of 30 of each ledge type (small, medium, and tall) and bottom types represented in proportions similar to those of the entire sanctuary. The resulting configuration would leave sufficient ledge and other bottom types outside the research area available for comparative research and activities such as fishing and diving. The boundary would include the long term monitoring site but not the data buoy. The Compromise Option Boundary would encompass approximately 33 percent of boat sightings. The boundary would also create open areas on all sides of the research area resulting in enforcement and compliance complications. Twenty-two boundary placements were identified with the criteria for this option, and two boundaries are shown to illustrate the approximate area and scale of all twenty-two boundaries (Figure 9).

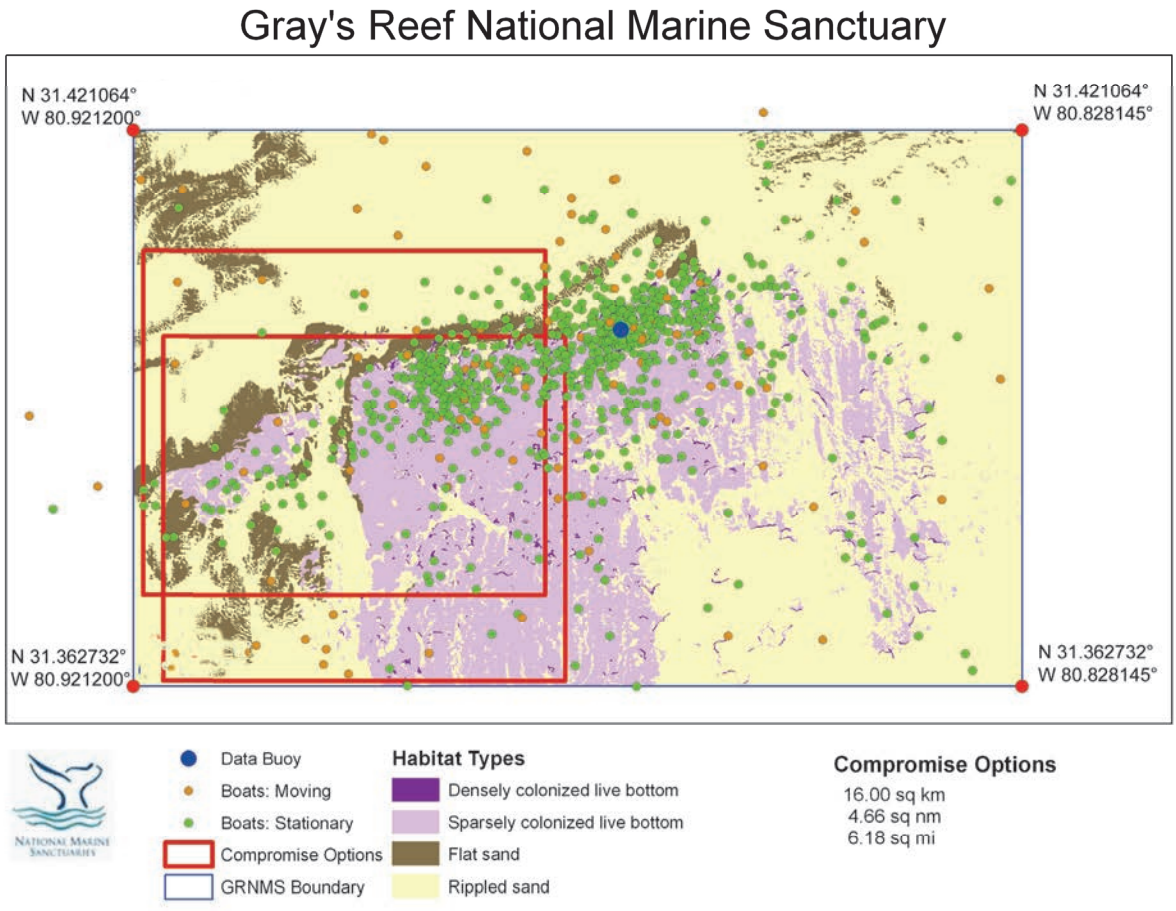

FIGURE 9: COMPROMISE OPTION BOUNDARY

As with the other boundary options, no boundary markers would be placed around the research area due to concerns that an array of buoys could significantly alter the natural systems of a research area. Coordinates of the research area in particular, and the

sanctuary as a whole, would be included in various outreach materials and posted on the Notice to Mariners and other such outlets frequently visited by users of GRNMS.

The Compromise Option Boundary, while preferred by some scientists and meeting the primary criterion for habitat inside and outside of the boundary, would not meet the recommended minimization of user displacement. This boundary option would represent the second highest displacement of known users resulting in socioeconomic impacts of concern to the fishing community, and would be expected to create complications with compliance and enforcement. This boundary option is, therefore, not preferred.

BOUNDARY	SELECTION CRITERIA	HABITAT INCLUDED	INCLUDES LONG-TERM MONITORING SITE (LTM)	INCLUDES DATA BUOY	GRNMS USERS POTENTIALLY DISPLACED (EHLER 2010)	SIZE	SUFFICIENT LEDGE AND OTHER BOTTOM TYPES OUTSIDE FOR COMPARATIVE RESEARCH AND USE
Southern Option	Extend northward from GRNMS southern boundary until 20% ledges of each type are included	Required 30 of each ledge type included; all bottom types included	No	No	9.2%	8.27 sq mi 21.28 sq km	Yes
Optimal Scientific Option	Research needs only	Required 30 of each ledge type included; all bottom types included	Yes	Yes	67%	6.18 sq mi 16 sq km	Yes
Minimal User Displacement Option	Lowest level of fishing impact	Required 30 of each ledge type included; little if any flat sand included	No	No	10.5%	3.47 sq mi 9 sq km	Yes
Compromise Option	Lower level of fishing	Required 30 of each ledge type included; all bottom types included	Yes	No	35%	6.18 sq mi 16 sq km	Yes

FIGURE 10: SUMMARY OF BOUNDARY OPTIONS

Regulating fishing within the research area (Fishing Alternatives)

1. Prohibit all fishing in the research area (preferred).

Under this alternative, fishing would not be allowed in the research area. The 2005 RAWG recommendation to the Advisory Council to allow pelagic fishing assumed that trolling for coastal pelagic fish species does not involve "bottom-impinging" activities or gear types. As described above in Development of Alternatives, the final RAWG and Advisory Council recommendations included the unanimous recommendation that all fishing be prohibited in the research area.

Due to increasing evidence of linkages between benthic and pelagic communities in the marine environment, the potential for mixed pelagic and bottom-fishing methods, and the concerns for law enforcement NOAA's preferred fishing alternative is to prohibit all forms of fishing. Prohibiting all fishing in the research area would meet the purpose and need of a research area and result in management benefits for the sanctuary and its partners.

2. Allow trolling for pelagic species only.

Under this alternative, year-round trolling (including during tournaments) for coastal pelagic species (e.g., barracuda, king mackerel) would be allowed in the research area. Bottom fishing (e.g., for groupers, snappers) would not be allowed.

As noted above in the Development of Alternatives, the original recommendations received by the Advisory Council from the RAWG in 2005 (NMSP 2006) promoted the idea that all bottom-impinging fishing gear (i.e., bottom fishing) should be eliminated from a research area. It was thought that fishing for coastal pelagic species could be allowed without compromising the integrity of the research area. However, as discussed above in the Development of Alternatives, the final RAWG and Advisory Council determinations identified important benthic and pelagic links. Therefore, allowing pelagic fishing is not preferred.

3. Allow trolling for coastal pelagic species only during tournaments.

Under this alternative, only trolling for coastal pelagic species of fish would be allowed in the research area and only during tournaments. A series of fishing tournaments for king mackerel are held generally beginning in May and extending into September and are based out of ports in northern Florida, Georgia and southern South Carolina. Boat sightings in GRNMS increase substantially during tournament days (NMSP 2006). There are generally more boats sighted in GRNMS during warm weather months in addition to boats drawn to the sanctuary for tournament or pre-tournament fishing.

As described above in the Development of Alternatives, scientists have expressed concerns that the integrity of a research area would be severely compromised if any fishing were allowed in a research area even a few days during the year. Adjusting study results for those impacts could be difficult to impossible, thereby decreasing the utility of the research area. In addition, many tournaments can draw 100 or more boats in one day, making law enforcement extremely difficult and increasing the potential for marine debris deposited in the research area if any fishing were allowed in the research area.

Given the concerns for the integrity of the research area and the difficulties of law enforcement during tournaments, NOAA does not prefer this alternative.

Regulating diving within the research area (Diving Alternatives)

1. Prohibit diving in the research area (preferred).

Under this alternative, all recreational diving would be prohibited in the research area. Diving for research, education, management, and salvage and recovery operations would still be allowed under a research, education, management, or salvage and recovery operations permit. Recreational diving in the remainder of the sanctuary would continue to be allowed and would not require a permit.

The issue of diving in the research area drew substantial discussion from RAWG and Advisory Council members throughout the deliberation process. While it is estimated that few visitors dive in GRNMS due to the open-ocean conditions and uncertain visibility, the objectives of a research area could be compromised by even seemingly small interferences. Enforcement of prohibitions on other boat-based activities if diving continues was also a concern expressed by many. On the other hand, some argued that supervised diving should be allowed to demonstrate the beneficial effects of the research area on sanctuary resources. In conclusion, simply allowing unrestricted recreational diving – even a small amount - in the research area without any restrictions was not acceptable to the majority of participants in the RAWG and Advisory Council.

This alternative is more likely to ensure the integrity of a research area by eliminating the potential for interference with research experiments or monitoring, and other intended or unintended violations or disturbances. Ultimately, the recommendation from the GRNMS Advisory Council was that any recreational diving activity would make law enforcement difficult and could potentially negate the validity of a research area. Law enforcement officials also noted that having all users eliminated from the research area would enhance public assistance. If users know that the only visitors permitted to dive are researchers in a marked vessel, they are more likely to report violations. Therefore, prohibiting all recreational diving in the research area is the preferred diving alternative to meet the purpose and need of a research area.

2. Allow recreational diving by permit only in the research area.

Under this alternative, recreational diving in the research area would be allowed under a special use permit from GRNMS. A new category for special use permits for recreational fishing would be developed and published in the Federal Register. If approved, the permit and relevant applicant information would be forwarded to law enforcement officials and the holder of the permit would be required to submit a follow-up report so that GRNMS staff could benefit from diver observations. The permit would be conditioned as needed to protect the integrity of the research area and designate where in the research area diving would be permitted and prohibited.

As noted above in the no-diving alternative, it is estimated that relatively few visitors dive in GRNMS due to the open-ocean conditions and uncertain visibility. Despite the estimated small numbers of divers, the purposes of a research area could be compromised by even seemingly small interferences. Enforcement of prohibitions or restrictions on other boat-based activities if diving continues was also a concern expressed by law enforcement officials. As described in the alternatives for fishing, it is difficult to determine the activities of a boat's occupants from a distance or as officers approach a boat. As noted above, the recommendation from the GRNMS Advisory Council was that any recreational diving activity – even permitted activity - would make law enforcement difficult and could potentially negate the validity of a research area. In addition, while management could benefit from information and observations in a follow up report from permitted divers, permitting activities and acquiring follow up reports could be an administrative burden on GRNMS staff.

Due to the enforcement complications, potential compromising of the research area and the burden on GRNMS Staff, this alternative does not meet the purpose and need of this action. Allowing recreational diving by permit is, therefore, not preferred by NOAA.

Regulating vessel operation in the research area (Vessel Operations Alternatives)

1. Allow vessel transit through the research area without stopping (preferred).

Under this alternative, boaters would be allowed to transit through the research area without interruption (stopping), except for law enforcement, emergency purposes, or pursuant to a permit (e.g., while conducting permitted research). Because it is difficult to determine from a distance what a boater may be doing, and because a violator may hide evidence as law enforcement officials approach, it is difficult for law enforcement to detect and prosecute violations if stopping were allowed. Law enforcement officials have expressed concerns that enforcement of fishing and diving prohibitions or restrictions would be severely impeded if boaters were allowed to stop in the research area. RAWG and Advisory Council members, however, agreed that to prohibit transit would be a hardship for many boaters. Given the potential hardship to boaters if the research area were designated "no entry" (transit prohibited), and the law enforcement concerns if stopping in the research area were allowed, allowing transit with no interruption (stopping) is NOAA's preferred alternative for vessel operations.

2. Allow vessel transit through the research area and stopping in the research area.

Under this alternative boaters would be allowed to transit through the research area and to stop within the area. If recreational activities are restricted or prohibited in the research area, this alternative would result in a challenging law enforcement environment. As described above in the preferred vessel transit alternative, allowing vessels to stop while transiting creates a significant challenge for law enforcement since it is difficult to determine from a distance what a boater may be doing, and because a violator may hide evidence as law enforcement rangers approach. Also as noted above, RAWG and Advisory Council members agreed that to prohibit transit would be a hardship for many boaters although no entry would simplify law enforcement.

Given the potential hardship to boaters if transit through the research area were prohibited, but the law enforcement burden if stopping were allowed, transit with stopping in the research area is not NOAA's preferred alternative to meet the purpose and need of a research area.

Alternatives considered and eliminated

1. Delineate the southeast quadrant of GRNMS as a research.

Under this boundary alternative, the southeast quadrant (Figure 10) of the sanctuary would be designated as a research area. This option, which was suggested by some users of GRNMS, would encompass approximately 9 percent of the boats sighted, which meets the criteria to minimize user displacement. The absence of sufficient ledge habitat (only 22 short, 25 medium, and 23 tall ledges), however, and the absence of flat sand makes this boundary option unsuitable for a research area.

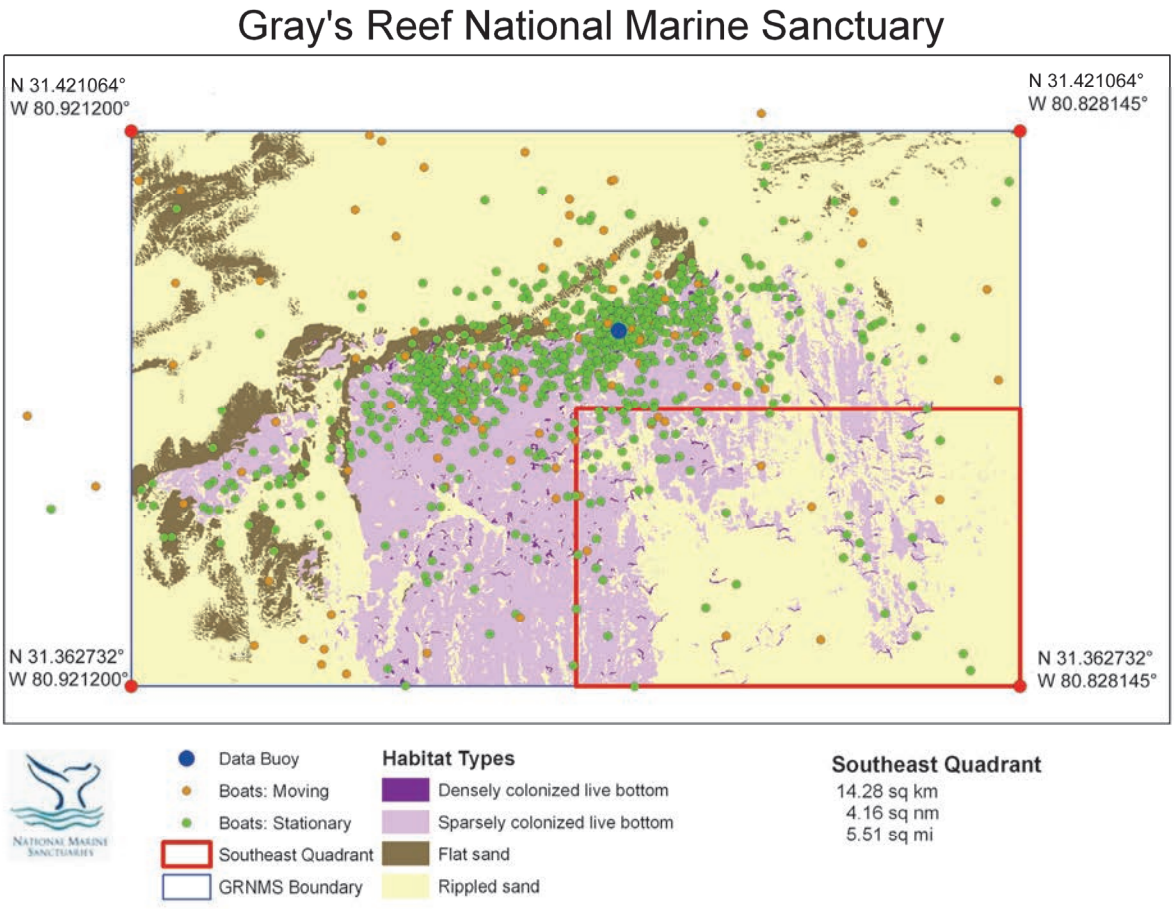

FIGURE 11: SOUTHEAST QUADRANT OF GRNMS

2. Delineate the southwest quadrant of GRNMS as a research area.

Under this boundary alternative, the southwest quadrant (Figure 11) of the sanctuary would be designated as a research area. This option would encompass approximately 10 percent of the boats sighted in the sanctuary, which meets the criteria to minimize user displacement. The absence of sufficient ledge habitat (only 21 tall ledges), however, makes this boundary option unsuitable for a research area.

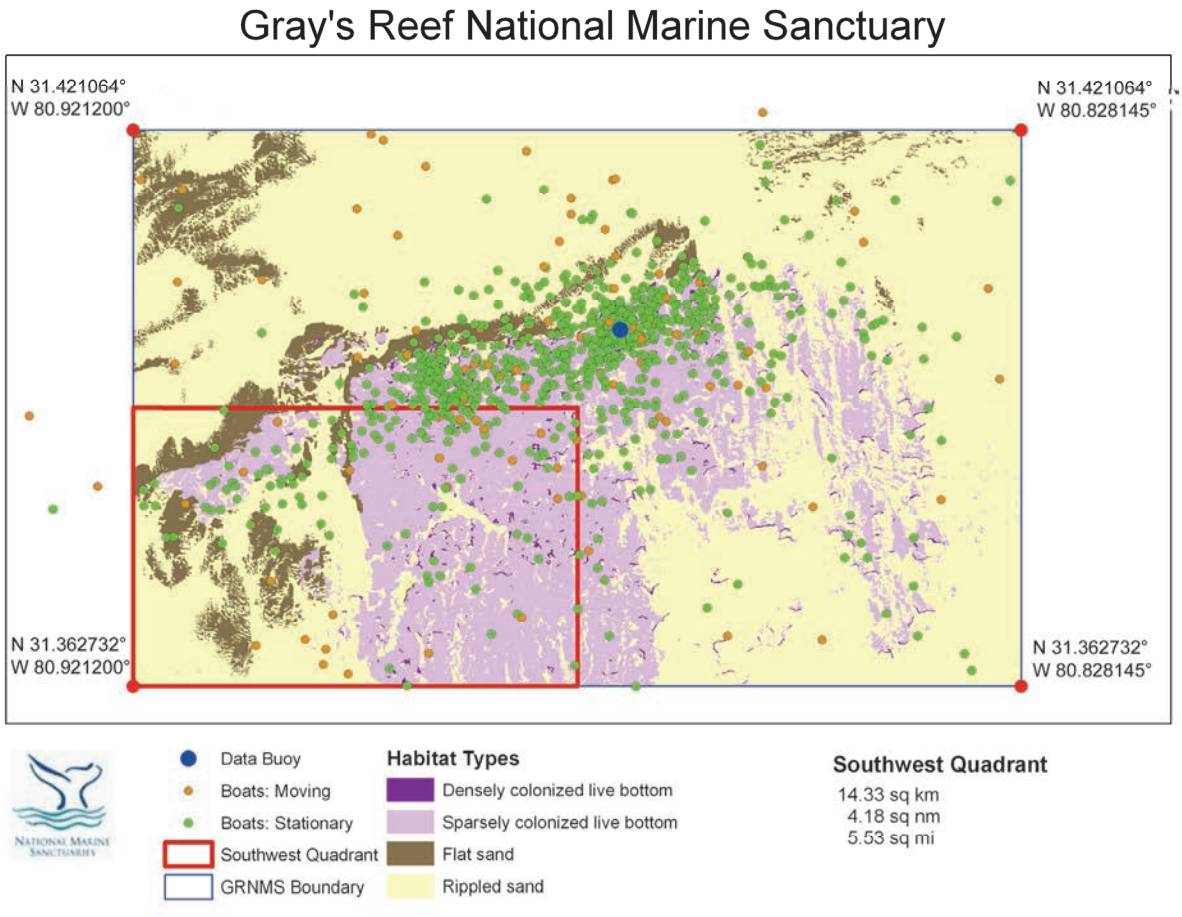

FIGURE 12: SOUTHWEST QUADRANT OF GRNMS

3. Transit prohibited (no entry) into the research area.

Under this alternative for vessel operations, boaters would be prohibited from entering the research area and would, instead, be required to go around the research area. While this alternative would simplify law enforcement, it could increase fuel and other costs to boaters. Given the potential hardship to boaters this option was eliminated.

IV. AFFECTED ENVIRONMENT

The affected environment for this action was extensively described in the GRNMS Final Management Plan/Final Environmental Impact Statement (NMSP 2006). That description is incorporated by reference, and is summarized and supplemented below.

Overview

GRNMS is one of the largest nearshore live-bottom reefs in the southeastern United States. The sanctuary is a marine protected area in federal waters (U.S. Exclusive Economic Zone) in the SAB (Figure 12), an area of continental shelf stretching from Cape Hatteras, N.C. to Cape Canaveral, Fla. It is the only marine protected area in the region that focuses on protection and conservation of all natural marine resources. Located 16 miles offshore of Sapelo Island, Ga., the 22-square-mile sanctuary (Figure 13) contains rocky ledges and sandy flats. Unlike reefs built by corals, GRNMS comprises scattered limestone rock outcroppings that stand above the sandy substrate of the nearly flat continental shelf. The reef also supports soft corals, non-reef-building hard corals, bivalves and sponges, as well as associated fishes, sea turtles, marine mammals, and pelagic sea birds.

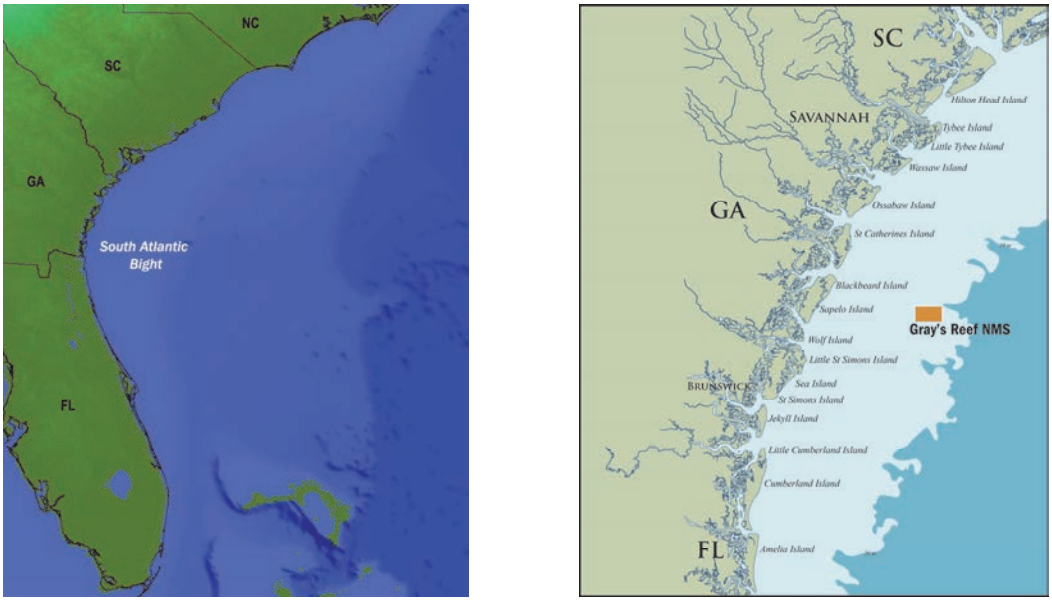

FIGURE 13: SOUTH ATLANTIC BIGHT (LEFT) AND LOCATION OF GRNMS (RIGHT)

The sanctuary is one of the most popular recreational fishing destinations along the Georgia coast. Fishing for pelagic species, such as king mackerel, is one of the most prevalent activities, particularly during king mackerel tournaments. For divers, access to the reef itself requires experience in open-ocean diving; currents can be strong and visibility varies greatly. For those who do not scuba dive or fish, the staff at GRNMS engages the public through extensive land-based education and outreach programs. For scientists, the sanctuary is a living laboratory for a variety of marine research and monitoring projects (NMSP 2006).

Biological and Physical Resources

Water and Climate
The outer reaches of the SAB are dominated by the Gulf Stream flowing northeastward. The inner area is defined by the cuspate curves of the coastline between Cape Canaveral and Cape Hatteras and is dominated by tidal currents, river runoff, local winds, seasonal storms, hurricanes and seasonal atmospheric changes. GRNMS lies at the break between the inner- and mid-shelf zone of the SAB and is subject to seasonal variations in temperature, salinity and water clarity. It is also influenced by the Gulf Stream, which draws deep, nutrient-rich water to the region, and carries and supports many of the tropical fish species and other animals found seasonally in the sanctuary. Ocean currents and eddies also transport fish and invertebrate eggs and larvae from other areas, linking this special place to reefs north and south (NMSP 2006; Hare and Walsh 2007).

Habitat
GRNMS is a consolidation of marine and terrestrial sediments (sand, shell and mud) that was laid down as loose aggregate between 6 and 2 million years ago. Some of these sediments were likely brought down by coastal rivers draining into the Atlantic and others were delivered by currents from other areas. These sediments continued to accumulate until a dramatic change began to take place on Earth during the Pleistocene Epoch, between 2 million and 10,000 years ago. During this time, the area that is now GRNMS was periodically exposed land and the shoreline was at times as much as 80 miles east of its present location as sea levels rose and fell at least seven times. As the glacial ice melted for the last time starting 18,000 years ago, the meltwater flowed back into the sea, filling the ocean basins back to their previous levels.

GRNMS is underlain by aragonitic limestone. These rocky features vary from flat, smooth surfaces to exposed vertical scarps and ledges with numerous overhangs, crevices and slopes (Riggs et al. 1996). The irregularities of the bathymetry can be attributed to the easily erodible limestone that has dissolved and pitted, creating the appearance of isolated ledges and patches of hard bottom. Exposed surfaces are colonized to varying extents by algae and sessile and burrowing invertebrates, which in turn provide shelter, foraging habitat and nursery areas for a large diversity of fish. Percent cover of benthic species, with the exception of gorgonians, is significantly greater on ledges in comparison to the sparse live bottom. In addition, total percent cover and cover of macroalgae, sponges and other organisms is significantly lower on short ledges in comparison to medium and tall ledges (Kendall et al. 2007). This habitat is known as a "live bottom" (NMSP 2006).

Live-bottom habitats are structurally complex and provide a number of microhabitats. Although GRNMS is the most intensely surveyed live-bottom feature in the region, diver-focused survey methods provided only basic information on the extent and distribution of the live-bottom areas within the sanctuary. Video transects, coupled with side-scan and multi-beam sonar mapping suggest, however, that sand habitats (rippled sand and flat sand) dominate, accounting for 75 percent of the sanctuary area. Approximately 24 percent of the sanctuary is sparsely or moderately colonized live bottom, and less than 1 percent of the sanctuary is considered densely colonized live bottom (Kendall et al. 2005).

Sediments covering the vast areas of sand in the sanctuary are probably re-suspended and redistributed during times of high wave action that accompanies winter and tropical storms. These shifting sands can uncover barely emergent limestone rock areas or, conversely, cover areas that were previously exposed. The effect of storm-suspended sediments has even been observed to scour entire low-relief ledges, removing all but the hardiest of attached marine organisms (McFall pers. comm.).

Living Resources

Invertebrates

The hard bottom provides a firm base for a variety of sessile invertebrates including bryozoans (moss fauna), ascidians or tunicates (sea squirts), sponges, barnacles, and hard-tubed worms that form dense encrustations. Larger sessile invertebrates, such as sea whips and fans (gorgonians), hard corals, and large sponges, provide refuges for many smaller, more cryptic invertebrates. Other dominant invertebrates include sea stars, brittlestars, crabs, lobsters, shrimps, bivalves, and snails. The scientific term for the organisms living on these hard substrates is "epifauna." The attached epifauna are primarily filter feeders (obtaining nutrition by straining particles of food from the water column), while the more motile epifauna consist mostly of active predators and surface browsers.

The rather featureless sandy bottom overlying the rock substrate within GRNMS and adjacent shelf waters may at first glance appear to be a biological void, especially in comparison to the more visually impressive live-bottom assemblages associated with rocky outcrops. However, these soft bottom substrates can be teeming with life. Living buried within these sediments are assemblages of relatively sedentary worms, crustaceans, mollusks (snails and clams), echinoderms, and other invertebrate species commonly referred to as "infauna." Benthic infauna are predominantly deposit feeders, obtaining nutrition by ingesting organically enriched sediment particles and associated detrital material that settles onto the seafloor. However, the infauna may consist of filter feeders and active predators as well. Motile epifaunal species such as sea stars and crab, and more sessile forms attached to small pieces of rock or shell (e.g., barnacles, corals, anemones, sea fans, sea pansies) also can be found living at the surface of these soft bottom substrates. These fauna are a valuable component of the sanctuary ecosystem, playing vital roles in detrital decomposition, nutrient cycling, and energy flow to higher trophic levels. They can be especially important as food to species of fish that feed away from live bottom rocky outcrops interspersed throughout the shelf.

Because the Sanctuary lies within a transition zone between temperate and tropical waters, several invertebrate species appear to be surviving at the edge of their geographic range. The size of many sponges suggests that they may be year-round residents. New evidence on the growth rates of tropical sponges indicates that some of the larger colonies may be 15-20 years old (McFall and LaRoache, 1998). The same situation exists for a number of the hard and soft corals, many of which are surviving year-round and are at the northern limit of their range.

Fishes

The biologically diverse live-bottom habitat of GRNMS attracts reef-associated fishes including bottom-dwelling and mid-water fish species such as sea bass, snapper, grouper and mackerel, as well as their prey. An estimated 200 species of fish, encompassing a wide variety of sizes, forms and ecological roles, have been recorded at the sanctuary. Some fish species are dependent upon the reef for food and shelter, and rarely venture away from it during their life. Many of these fishes are nocturnal, seeking refuge within the structure of the reef during the day and emerging at night to feed. Some species of reef-dwelling fish disperse to sandy habitats or to other reef areas north and south or offshore for feeding and spawning. Other reef residents, such as gag and black sea bass, rely on the inshore areas and estuaries in early life stages.

Many reef–associated, snapper-grouper species of fish are overfished or subject to overfishing. According to NOAA Fisheries Service (National Marine Fisheries Service), overfished stocks include red snapper, snowy grouper, black sea bass, red grouper, and red porgy. Stocks subject to overfishing include vermillion snapper, snowy grouper, red grouper, gag, warsaw grouper, red snapper, tilefish, black sea bass, and speckled hind.[4] In GRNMS, gag and scamp have decreased in abundance in visual census transects, and length-frequency measurements of black sea bass, gag and scamp (from trap and visual census data) indicate that a large portion of the population is removed upon reaching minimum size, either by fishing or by migration out of the sanctuary. The reduced abundance of these selected key species may inhibit full community development and function in GRNMS (ONMS 2008). In addition, recent research suggests that a very low level of increased fishing pressure on the sanctuary's ledges could reduce local abundance of snapper-grouper complex species within a short amount of time (Kendall 2008).

In addition to reef-associated fishes, GRNMS serves as habitat for a number of other fish species. King mackerel, Spanish mackerel, great barracuda, and cobia make up the majority of coastal pelagic species that are targeted for recreational angling. The high abundance of schooling baitfishes, such as Spanish sardine and round scad, likely attract these pelagic predators to sanctuary waters. There is considerable but unmeasured fishing effort on king and Spanish mackerel during tournaments and at other times. Federal management of coastal pelagic species has resulted in sustainable fisheries for king mackerel and the stock is not currently overfished (SEDAR 16 2008).

Approximately 30 species of fish spawn in the vicinity of GRNMS and only a third of these are reef-associated (Walsh et al. 2006, Sedberry et al. 2006). The large areas of sandy habitat in the sanctuary form another habitat that is not as rich in fish species, and is not targeted by recreational fishermen. These sandy areas support a number of species including flounders, tonguefishes, cusk eels, stargazers, and lizardfishes (Gilligan 1989, Walsh et al. 2006).

Sea Turtles

[4] http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm

Sea turtles known to occur in the South Atlantic Bight include the Kemp's ridley, hawksbill, leatherback, green and loggerhead. Except for the loggerhead, all these species are federally listed as endangered. The loggerhead sea turtle is the most abundant sea turtle in the SAB and is federally-listed as threatened. GRNMS is an important area for loggerheads to rest and forage throughout the year, especially during the summer nesting season when females may nest two to four times on area beaches laying approximately 120 eggs per nest.

Marine Mammals

Marine mammals on the southeastern United States continental shelf include cetaceans, occasional pinnipeds (harbor seals and sea lions) and sirenians (West Indian manatees). Atlantic spotted dolphins and bottlenose dolphins are the most common marine mammals at GRNMS. Both species have been designated as depleted under the Marine Mammal Protection Act. There are four species of federally-listed endangered whales in the region: North Atlantic right, humpback, sperm and fin. Of these, only the highly endangered North Atlantic right whale – whose only known calving grounds are off coastal Georgia and northern Florida – has been observed in GRNMS during the winter.

Pelagic Birds

Pelagic birds, many of which are seasonal migratory species, occur on the middle and outer shelf regions of the SAB, particularly along the western edge of the Gulf Stream. More than 30 species of marine birds occur off the southeastern coast of the United States. Seabirds observed in the sanctuary area include gulls, petrels, shearwaters, Northern Gannet, phalaropes, jaegers and terns. To date, species such as the band-rumped storm-petrel and Audubon's shearwater have not been observed in GRNMS, although records exist for offshore Georgia. No records for the threatened roseate tern are known from offshore Georgia, including GRNMS. NOAA, however, recognizes the waters of GRNMS may be important as a "stop-over" site for various seabird species that move over long distances.

Socioeconomic Resources

Recreational Fishing

GRNMS attracts recreational fishing enthusiasts. Although there is no primary access point to the sanctuary, a variety of public and private boat launches and marinas extending from Savannah to Brunswick, Georgia, serve as staging sites for sanctuary users. Surveys indicate the majority of users in GRNMS are recreational fishing with rod and reel fishing gear (Ehler and Leeworthy 2002). Recreational fishing at GRNMS occurs year-round but at different levels of intensity. Most recreational fishing activities occur on weekends. The highest levels of use are during fishing tournaments for king mackerel that occur annually from May through September. A recent analysis of the economic impact of a research area in GRNMS estimated that expenditures related to fishing in the sanctuary total $1.5 million annually. Total expenditures (economic impact) of saltwater fishing in Georgia in 2006 were $119 million (Ehler 2010).

Commercial Fishing
With designation of GRNMS in 1981, commercial fishing gear, such as traps and bottom trawls, was prohibited to protect the live bottom habitat. Regulations with the revision of the GRNMS Management Plan in 2006 now limit fishing to rod and reel and handline gear.

Other Recreational Activities
A small amount of scuba diving by more experienced divers occurs year-round, although most diving activities occur on weekends during warmer months of the year. Diving is sometimes in conjunction with recreational fishing activities. Underwater photography and nature observing are also popular activities for scuba divers. Other forms of ecotourism are not known to occur at GRNMS.

Research and Education
GRNMS is increasingly a focus of scientific research. The sanctuary is relatively shallow and affords the opportunity for scientists to conduct experiments and make observations using scuba in a productive reef habitat that is relatively close to shore. The proximity of the sanctuary to coastal universities and marine research laboratories makes GRNMS a logical natural area that can be used to further understanding and management of these complex ecosystems. Likewise, GRNMS has been increasingly utilized as a living laboratory for education purposes both at the K-12 and the university level.

V. ENVIRONMENTAL CONSEQUENCES

This section describes and analyzes the anticipated environmental consequences of the preferred action and alternatives on the biological, physical, and socioeconomic resources of GRNMS described in the Affected Environment (Section IV). The impacts are identified generally as either beneficial (positive) or adverse (detrimental) effects. Direct, indirect and cumulative impacts expected to result from the action and alternatives are considered. Figure 14 summarizes the environmental impacts of the various alternatives.

1.0 Description of significant vs. non-significant impacts:

This section describes the impacts to the GRNMS environment. For the purposes of this analysis, NOAA considered short term impacts to occur within 1-2 years and long-term impacts to occur beyond 2 years.

(++) *Significant beneficial* (positive) impact describes expected increases in biomass resulting from reduced mortality of snapper-grouper and coastal pelagic fish species in the short-term (1-2 years) and resulting increases in biomass in the long-term (beyond 2 years). Impacts could also include a short-term (1-2 years) decrease in physical disturbance to habitat from diving and fishing (e.g., abandonment of fishing line and deposit of other marine debris), and substantially reduced physical disturbance from diving and fishing in the long-term, resulting in enhanced natural live-bottom community conditions. NOAA defines significant beneficial economic impact as an economic benefit (gain) exceeding $1million per year. $1 million is slightly lower than 1% of the 2006 total GA saltwater fishing expenditures of $119 million.

(+) *Less than significant beneficial* (positive) impact describes expected biomass increases resulting from decreased mortality of fish species. The increase in biomass, however, is not expected to be substantial. Impacts could also include a decrease in physical disturbance to habitat from diving and fishing (e.g., abandonment of fishing line and deposit of other marine debris) from decreased fishing activity resulting in enhanced natural live-bottom community conditions. It also describes an economic benefit (gain) under $1million but more than $200,000 per year.

(--)*Significant adverse* (detrimental) impact describes expected biomass decreases resulting from increased mortality of snapper-grouper and coastal pelagic fish species. Biomass declines would be expected to be more definitive in the long-term (beyond 2 years) than the short-term. Impacts could also include an increase in physical disturbance to habitat from diving and fishing (e.g., abandonment of fishing line and deposit of other marine debris) resulting in poorer natural live-bottom community conditions in the short and long-term. Significant adverse economic impact is defined as an economic loss exceeding $1million per year.

(-)*Less than significant adverse* (detrimental) impact describes expected biomass decreases resulting from increased mortality of some fish species. Impacts also include an increase in physical disturbance to habitat from diving and fishing (e.g., abandonment of fishing line and deposit of other marine debris) from increased fishing activity resulting in poorer

natural live-bottom community conditions. It also describes an economic loss under $1million but more than $200,000 per year.

(0) *No impact* describes no expected biological or physical impacts (beneficial or adverse). A rating of no impact also indicates that the overall economic impact (loss or gain) is less than $200,000 per year. $1 million is slightly lower than 1% of the 2006 total GA saltwater fishing expenditures of $119 million. Therefore, $200,000 is less than 0.04% of the 2006 total GA saltwater fishing expenditures.

++ Significant beneficial (positive)
+ Less than significant beneficial (positive)
-- Significant adverse (detrimental)
- Less than significant adverse (detrimental)
0 No impact

	Southern Option Boundary (Preferred)		**Optimal Scientific Option Boundary**		**Minimal User Displacement Option Boundary**		**Compromise Option Boundary**	
Activity Alternatives	Biological/ Physical Impacts	Socioeconomic Impacts	Biological/ Physical Impacts	Socioeconomic Impacts	Biological/ Physical Impacts	Socioeconomic Impacts	Biological/ Physical Impacts	Socioeconomic Impacts
No Action								
No new restriction	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**
Fishing								
Prohibit all fishing	**++**	**0**	**++**	**--**	**+**	**-**	**++**	**-**
Allow fishing for pelagic species	**+**	**0**	**+**	**-**	**+**	**0**	**+**	**0**
Allow fishing for pelagic species during tournaments	**+**	**0**	**+**	**-**	**+**	**0**	**+**	**-**
Diving								
Prohibit all recreational diving	**+**	**0**	**+**	**0**	**+**	**0**	**+**	**0**
Allow recreational diving by permit only	**+**	**0**	**+**	**0**	**+**	**0**	**+**	**0**
Vessel Operation (transit)								
Allow transit without stopping	**+**	**0**	**+**	**0**	**+**	**0**	**+**	**0**
Allow transit with stopping	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**

FIGURE 14: SUMMARY OF BIOLOGICAL, PHYSICAL AND SOCIOECONOMIC IMPACTS OF THE ACTION AND ALTERNATIVES

2.0 Direct and Indirect Impacts of Alternatives

2.1 No Action Alternative

2.11 Biological and Physical Resources

In the long term, the biological and physical impacts in the absence of a research (control) area in GRNMS are expected to be less than significant adverse. Under the no action alternative, fishing activities would continue. Mortality (decreasing biomass) of fish and any associated physical impacts to the live-bottom from fishing would persist and possibly increase in the long term as fishing pressure increases. It is anticipated that fishing activities would continue to adversely affect the biomass of fish species and decrease live-bottom habitat conditions in the sanctuary with little opportunity for recovery. Establishing a research area is expected to increase biomass and increase protection of marine organisms and sanctuary habitat conditions within the area that would be designated for research. These benefits would not be realized with the no action alternative.

2.12 Socioeconomic Resources

Under the no action alternative, there are no social or economic consequences expected because no research area would be designated. Activities would be expected to continue with no displacement of users.

2.2 Boundary Size and Location Alternatives

Each of the boundary alternatives has different locations and sizes and each encompasses a different amount of sanctuary habitat. In addition, in order to assess the biological, physical and socioeconomic effects that are anticipated to result from all of the alternatives, the analysis considers each activity restriction's effect on the various boundary alternatives. This way, the effects of the activity alternatives can be compared based on the nature of the boundary size and location and activity restriction. Activity restrictions are not analyzed individually since any analysis without the consideration of boundary size and location would be meaningless to the decision.

2.3 Fishing Alternatives

2.31 Biological and Physical Resources

2.311 Prohibit all fishing (preferred):

Under this alternative, all fishing would be prohibited inside the research area.

2.3111 Southern Option Boundary (preferred): The prohibition of all fishing activities applied to the Southern Option Boundary is expected to result in significant beneficial impacts to biological and physical resources in the long term. The Southern Option Boundary does not encompass the densest concentration of ledges in comparison to the other options. Neither does the Southern Option Boundary represent the area with the highest fishing pressure. However, the size of this boundary is larger than all other

boundary options, and therefore the Southern Option includes substantial, but scattered, ledge habitat overall.

With a prohibition on all fishing, decreased mortality of all fish species and only some biomass increases are expected in the short term due to the low fishing pressure in this area. This will likely result, however, in even more abundant populations of snapper-grouper (non-migratory) and other fish species in the research area in the long term. NOAA recognizes that potential increases in snapper-grouper predatory fish species due to prohibited human activity in a research area may result in declines of prey species, such as crustaceans. Thus, increases in biomass may be lessened somewhat. For example, snapper-grouper fish species, such as gag grouper, may increase in abundance, while their prey, such as bait fish, may decrease.

The potential for displacement of fishing effort from the Southern Option Boundary to other areas of GRNMS or outside of GRNMS is likely. But, the percentage of boats sighted (9.2 percent; Ehler 2010, Appendix D) in the Southern Option Boundary is small, so overall displacement is expected to be minimal particularly if it is scattered. If, however, displacement of effort were directed to one location, particularly in GRNMS, the impacts could be adverse due to increased mortality of fishes resulting in decreased biomass. In addition, increased fish populations (biomass) spilling over into other areas of the sanctuary or outside the sanctuary as the result of no fishing in the research area is also possible in the long term and could counteract the impacts of displacement.

Physical disturbance to live-bottom habitat (e.g., fishing line, weights and marine debris deposited) is also expected to decrease. This will allow organisms to recover under unimpacted conditions, which will result in a significant beneficial impact to biological resources, particularly in the long term.

2.3112 Optimal Scientific Option Boundary: Significant beneficial effects would be expected if the prohibition were applied to the Optimal Scientific Option Boundary due to the concentration of ledge and other habitats, along with the associated marine species. With the number of users expected to be displaced (67 percent of boats; Ehler 2010, Appendix D), decreased mortality of all fish species and increased biomass would be expected in the short term, which would result in more abundant populations of snapper-grouper (non-migratory) fish species due to substantial reductions in fish mortality in the long term. NOAA recognizes that potential increases in snapper-grouper predatory fish species due to prohibited human activity in a research area may result in declines of prey species, such as crustaceans. Thus, increases in biomass may be lessened somewhat. For example, snapper-grouper fish species, such as gag grouper, may increase in abundance, while their prey, such as bait fish, may decrease.

The potential for displacement of fishing effort from the Optimal Scientific Option Boundary to other areas of GRNMS or outside of GRNMS is high given the higher percentage of boats sighted (67 percent; Ehler 2010, Appendix D) in this area. If displacement of effort were directed to one location, particularly in GRNMS, the impacts could be adverse due to increased mortality of fishes resulting in decreased biomass. In addition, increased fish populations (biomass) spilling over into other areas of the sanctuary or outside the sanctuary as the result of no fishing in the research area is also possible in the long term and could counteract the impacts of displacement.

Physical disturbance to live-bottom habitat (e.g., fishing line, weights and marine debris deposited) would also be expected to decrease. This would allow organisms to recover under unimpacted conditions, which would result in a significant beneficial impact to biological resources, particularly in the long term.

2.3113 Minimal User Displacement Option Boundary: The prohibition of all fishing in the Minimal User Displacement Option Boundary would result in less than significant beneficial effects for biological and physical resources. Fewer boats have been sighted in this area (10.5 percent; Ehler 2010, Appendix D) so fishing pressure is lower. The size of this option is smaller than the other alternatives, so less overall ledge and habitat are contained in this boundary. While benefits to biological and physical resources would be expected to be more than the no action alternative, beneficial impacts on the populations of fish and other marine organisms of GRNMS are expected to be less than significant. While the mortality of all fish species would be reduced in the short and long term, substantial increases in snapper-grouper and other fish species would not be expected in this area. NOAA recognizes that potential increases in snapper-grouper predatory fish species due to prohibited human activity in a research area may result in declines of prey species, such as crustaceans. Thus, increases in biomass may be lessened somewhat. For example, snapper-grouper fish species, such as gag grouper, may increase in abundance, while their prey, such as bait fish, may decrease.

The potential for displacement of fishing effort from the Minimal User Displacement Option Boundary to other areas of GRNMS or outside of GRNMS is likely. But, the percentage of boats sighted (10.5 percent average; Ehler 2010, Appendix D) is small, so overall displacement would be minimal particularly if it is scattered. If, however, displacement of effort were directed to one location, particularly in GRNMS, the impacts could be adverse due to increased mortality of fishes resulting in decreased biomass. In addition, increased fish populations (biomass) spilling over into other areas of the sanctuary or outside the sanctuary as the result of no fishing in the research area is also possible in the long term and could counteract the impacts of displacement.

Physical disturbance to the live-bottom habitat (e.g., fishing line, weights and marine debris deposited) would be expected to decrease. But, the overall benefit to the natural live-bottom community of GRNMS may not be as significant as the other boundary options due to the lower fishing pressure in this area and smaller area.

2.3114 Compromise Option Boundary: Significant beneficial effects would be expected if the prohibition were applied to the Compromise Option Boundary due to the concentration of ledge and other habitats, along with the associated marine species. With the number of users expected to be displaced (35 percent of boats; Ehler 2010, Appendix D), decreased mortality of all fish species and increased biomass would be expected in the short term, which would result in more abundant populations of snapper-grouper (non-migratory) fish species due to substantial reductions in fish mortality in the long term. NOAA recognizes that potential increases in snapper-grouper predatory fish species due to prohibited human activity in a research area may result in declines of prey species, such as crustaceans. Thus, increases in biomass may be lessened somewhat. For example, snapper-grouper fish species, such as gag grouper, may increase in abundance, while their prey, such as bait fish, may decrease.

The potential for displacement of fishing effort from the Compromise Option Boundary to other areas of GRNMS or outside of GRNMS is likely given the moderate percentage of boats sighted (35 percent; Ehler 2010, Appendix D) in this area. If, however, displacement of effort were directed to one location, particularly in GRNMS, the impacts could be adverse due to increased mortality of fishes resulting in decreased biomass. In addition, increased fish populations (biomass) spilling over into other areas of the sanctuary or outside the sanctuary as the result of no fishing in the research area is also possible in the long term and could counteract the impacts of displacement.

Physical disturbance to live-bottom habitat (e.g., fishing line, weights and marine debris deposited) would also be expected to decrease. This would allow organisms to recover under unimpacted conditions, which would result in a significant beneficial impact to biological resources, particularly in the long term.

2.312 Allow fishing for pelagic species:

Under this alternative, all bottom fishing would be prohibited. Fishing for pelagic species (year round) would be allowed.

Less than significant beneficial impacts to biological and physical resources are anticipated if pelagic fishing is allowed. This would be true for all four boundary alternatives. While benefits to biological resources would be expected to be more than the no action alternative, increased biomass due to reduced mortality on the populations of fish (snapper-grouper) could be limited. The potential for bottom fishing activity, which may accompany pelagic fishing, and the considerations for benthic and pelagic coupling as described in Section III, diminish the beneficial effects of this option. In addition, NOAA recognizes that potential increases in snapper-grouper predatory fish species due to prohibited human activity in a research area may result in declines of prey species, such as crustaceans. Thus, increases in biomass may be lessened somewhat. For example, snapper-grouper fish species, such as gag grouper, may increase in abundance, while their prey, such as bait fish, may decrease.

The potential for displacement of fishing effort for bottom fish (snapper-grouper) from any of the four boundary alternatives to other areas of GRNMS or outside of GRNMS is likely. If displacement of effort were directed to one location, particularly in GRNMS, the impacts could be adverse due to increased mortality of fishes resulting in decreased biomass. In addition, increased fish populations (biomass) spilling over into other areas of the sanctuary or outside the sanctuary as the result of no fishing in the research area is also possible in the long term and could counteract the impacts of displacement.

Physical disturbance to the live-bottom habitat (e.g., fishing line, weights and marine debris deposited) would be expected to decrease. But, the overall benefit to the natural live-bottom community of GRNMS may not be as significant due to continued pelagic fishing in the area.

2.313 Allow fishing for pelagic species during tournaments:
Under this alternative all bottom fishing would be prohibited. Fishing for pelagic species only during tournaments would be allowed.

Less than significant beneficial impacts to biological and physical resources are anticipated if pelagic fishing during tournaments is allowed. This would be true for all four boundary alternatives. While benefits to biological resources would be expected to be more than the no action alternative, increased biomass due to reduced mortality on the populations of fish (snapper-grouper) could be limited. The potential for bottom fishing activity, which may accompany pelagic fishing, and the considerations for benthic and pelagic coupling as described in Section III, diminish the beneficial effects of this option. In addition, NOAA recognizes that potential increases in snapper-grouper predatory fish species due to prohibited human activity in a research area may result in declines of prey species, such as crustaceans. Thus, increases in biomass may be lessened somewhat. For example, snapper-grouper fish species, such as gag grouper, may increase in abundance, while their prey, such as bait fish, may decrease.

The potential for displacement of fishing effort for bottom fish (snapper-grouper) from any of the four boundary alternatives to other areas of GRNMS or outside of GRNMS is likely. If displacement of effort were directed to one location, particularly in GRNMS, the impacts could be adverse due to increased mortality of fishes resulting in decreased biomass. In addition, increased fish populations (biomass) spilling over into other areas of the sanctuary or outside the sanctuary as the result of no fishing in the research area is also possible in the long term and could counteract the impacts of displacement.

Physical disturbance to the live-bottom habitat (e.g., fishing line, weights and marine debris deposited) would be expected to decrease. But, the overall benefit to the natural live-bottom community of GRNMS may not be as significant due to continued pelagic fishing in the area.

2.32 Socioeconomic Resources
An analysis was completed in 2009 to assess the effects of a research area in terms of the number of users that may be displaced by an area closed to fishing, and the related economic losses. The analysis (Appendix D) considered the economic impact to private-boat based (assumed for this analysis to be bottom fishing), tournament-boat based (assumed for this analysis to be pelagic fishing), and charter-boat based (assumed for this analysis to be bottom fishing) saltwater fishing if a research area were designated in GRNMS. Total expenditures were determined through various fishing statistics sources (e.g., American Sportfishing Association, US Fish and Wildlife Service, NOAA Fisheries Service) and GRNMS user (boat counts) data. Expenditures and related user data was applied to each boundary option resulting in estimated losses to private, tournament and charter-boat based fishing.

The analysis assumes that all economic value associated with the area closed is lost. Any factor that could mitigate or off-set the level of impact, such as the value of displacement of fishing effort to other areas in GRNMS or outside GRNMS, is not addressed. The estimated impacts are thought of as "maximum potential losses." It is also important to note that $1 million is slightly lower than 1% of the 2006 total Georgia saltwater fishing expenditures of $119 million (Appendix D). Expenditures for saltwater fishing in GRNMS are used, however, to determine significance.

2.321 Prohibit all fishing (preferred):
Under this alternative, all fishing will be prohibited inside the research area.

2.3211 Southern Option Boundary (preferred): No impact (less than $200,000 loss; Appendix D) is expected if the Southern Option Boundary is designated a research area, as very few fishermen (9.2 percent of boats sighted; Appendix D) utilize this area. (9.2 percent = $187,737 GRNMS saltwater fishing expenditures.)

2.3212 Optimal Scientific Option Boundary: Significant adverse socioeconomic impact (greater than $1million loss; Appendix D) would be anticipated if a prohibition on all fishing were applied to the Optimal Scientific Option Boundary. The Optimal Scientific Option Boundary encompasses 67 percent of boat sightings in GRNMS, thus 67 percent of users would be expected to be displaced. (67.0 percent = $1,365,815 GRNMS saltwater fishing expenditures.)

2.3213 Minimal User Displacement Option Boundary: Less than significant adverse socioeconomic impact (less than $1million but greater than $200,000 loss; Appendix D) would be expected if the Minimal User Displacement Option Boundary was chosen for a research area. Fewer boats utilize this area (10.5 percent average, Appendix D), therefore fewer fishermen would be expected to be displaced. (10.5 percent = $214,531 GRNMS saltwater fishing expenditures.)

2.3214 Compromise Option Boundary: Less than significant adverse socioeconomic impact (less than $1million but greater than $200,000 loss; Appendix D) would be anticipated if a prohibition on all fishing were applied to the Compromise Option Boundary. Surveys indicate that 35.5 percent of boats (Appendix D) utilize this area. Therefore, fewer fishermen would be expected to be displaced than with the Optimal Scientific Option Boundary (35.3 percent = $718,967 GRNMS saltwater fishing expenditures).

2.322 Allow fishing for pelagic species:
Under this alternative all bottom fishing would be prohibited. Fishing for pelagic species (year round) would be allowed.

The analysis for this alternative assumes all charter-boat based saltwater fishing would be displaced from the research area. It is assumed charter boats typically target bottom fish, which would be prohibited under this alternative. Only private and tournament-boat based saltwater fishing would be allowed in the research area to fish for pelagic species (year round).

The socioeconomic impact of the Optimal Scientific Option Boundary is expected to be less than significant adverse (less than $1million but greater than $200,000 loss) where 67 percent of boats were located. (67 percent = $335,339 GRNMS saltwater fishing expenditures.)

The rule applied to the Compromise Option Boundary is expected to result in no impact (less than $200,000 loss) although 35.5 percent of the boats are sighted in this boundary. (35.5 percent = $176,679 GRNMS saltwater fishing expenditures.)

No socioeconomic impact (less than $200,000 loss) would be anticipated with the Minimal User Displacement (10.5 percent of boats sighted = $52,553 GRNMS saltwater fishing expenditures), and Southern Option (9.2 percent of boats sighted = $46,047 GRNMS saltwater fishing expenditures).

2.323 Allow fishing for pelagic species during tournaments:
Under this alternative all bottom fishing would be prohibited. Fishing for pelagic species only during tournaments would be allowed.

The analysis for this alternative assumes all charter-boat based saltwater fishing would be displaced from the research area. It is assumed charter boats typically target bottom fish, which would be prohibited under this alternative. In addition, the analysis categorizes "private-boat based" saltwater fishing as fishing for bottom fish, and "tournament-boat based" saltwater fishing as private boats fishing during tournaments for pelagic species (e.g., king mackerel). Therefore, only tournament-boat based saltwater fishing would be allowed in the research area to fish for pelagic species during tournaments (Ehler 2010, Appendix D).

With a rule to allow only pelagic species fishing only during tournaments in the research area, the impact with the Optimal Scientific and Compromise Option boundaries is expected to be less than significant adverse (less than $1million but greater than $200,000 loss). (67 percent Optimal Scientific Option Boundary = $894,055 GRNMS saltwater fishing expenditures; 35.5 percent Compromise Option Boundary = $470,704 GRNMS saltwater fishing expenditures.)

No impact (less than $200,000 loss) is expected with the Southern Option and Minimal User Displacement Option boundaries. (10.5 percent Minimal User Displacement Option Boundary = $140,573 GRNMS saltwater fishing expenditures; 9.2 percent Southern Option Boundary = $122,870 GRNMS saltwater fishing expenditures.)

2.4 Diving Alternatives

2.41 Biological and Physical Resources

2.411 Prohibit recreational diving (preferred) *or* allow recreational diving by special use permit only:
Under the preferred diving alternative, no recreational diving would be allowed in the research area. Under the permitted diving alternative, recreational diving would be allowed with a special use permit obtained from GRNMS.

The current level of diving activity in the sanctuary is low (Ehler and Leeworthy 2002). In addition, a recent survey of dive operators (ONMS 2009) showed that no dive charter operators went to the sanctuary. Prohibiting all recreational diving would facilitate enforcement of the research area and, therefore less than significant beneficial impacts on biological and physical resources are expected. Allowing recreational diving through a permit would be expected to complicate enforcement, but still result in less than significant beneficial impacts on biological and physical resources. This would be true for all four boundary alternatives.

2.42 Socioeconomic Resources

2.421 Prohibit recreational diving (preferred) *or* allow recreational diving by special use permit only:
Under the preferred diving alternative, no recreational diving would be allowed in the research area. Under the permitted diving alternative, recreational diving would be allowed with a special use permit obtained from GRNMS.

Prohibiting all recreational diving within the research area would not be anticipated to have a socioeconomic impact due to the low level of recreational diving that currently occurs in the sanctuary. Likewise, allowing recreational diving by special use permit would not have a socioeconomic impact. This is true for all four boundary alternatives.

2.5 Vessel Operation (transit) Alternatives

2.51 Biological and Physical Resources

2.511 Allow vessel transit without stopping in the research area (preferred) *or* allow vessel transit and stopping in the research area:
Under the preferred vessel operation (transit) alternative, boat transit through the research area would be allowed, but with *no* stopping except in an emergency. Under the other vessel operation alternative, boat transit would be allowed *and* stopping in the research area.

The alternative to allow transit through the sanctuary *without* stopping (preferred) would facilitate enforcement of the research area and, therefore less than significant beneficial impacts on biological and physical resources are expected. The potential for illegal fishing in the research area is less likely if boats are not permitted to stop. This conclusion is true for all four boundary options.

Transit *with* stopping would be expected to result in less than significant adverse biological or physical impacts. Enforcement and compliance is complicated by allowing stopping in the research area, due to the impacts from potential illegal fishing. This conclusion is true for all four boundary options.

2.52 Socioeconomic Resources

2.521 Allow transit without stopping in the research area (preferred) *or* allow transit with stopping in the research area:
Under the preferred vessel operations alternative, boat transit through the research area would be allowed, but with *no* stopping except in an emergency. Under the other vessel operations alternative, boat transit would be allowed *with* stopping in the research area.

Either transiting with or without stopping in the research area is expected to result in no socioeconomic impact. Allowing transit with or without stopping in the research area is generally more beneficial than requiring all boats to transit around the research area because it wouldn't require vessels to travel out of their way on their way to or back from other destinations. This conclusion applies to all four boundary options.

3.0 Cumulative Impacts of Alternatives

This section discusses and analyzes the cumulative impacts (effects) of the action when viewed in the context of other past, present, and reasonably foreseeable influences and impacts. This analysis takes into account the following:

- GRNMS regulations including allowable fishing gear (rod and reel and handline), a prohibition on anchoring, and a prohibition on spearfishing gear;
- SAFMC actions addressing declines in snapper and grouper fish species;
- Climate change;
- Invasive species.

3.1 GRNMS Regulations Including Allowable Fishing Gear (Rod and Reel and Handline), a Prohibition on Anchoring, and a Prohibition on Spearfishing Gear

3.11 Biological and Physical Resources

Regulations limiting allowable fishing gear and prohibiting anchoring in GRNMS went into effect in February 2007. A prohibition on all spearfishing gear in the sanctuary went into effect in March 2010. NOAA determined in the analyses for both sets of regulations that the habitat and living marine resources of GRNMS will benefit due to the limitations on fishing gear that could damage habitat, the expected reduction in harvest of snapper-grouper species of fish, and elimination of impacts on the live bottom from anchoring. No adverse biological or physical impacts are expected due to the regulations already in place.

NOAA has also determined (see direct and indirect impacts analysis above) that overall, the boundary alternatives combined with the various restrictions or prohibitions on human activities for a research area result in beneficial impacts on biological and physical resources. The significance of benefit ranges from less than significant beneficial to significant beneficial (Figure 14). In combination with the regulations promulgated in February 2007 and March 2010, the cumulative impacts are expected to benefit biological and physical resources of GRNMS. The cumulative impacts – whether significant beneficial or less than significant beneficial – are expected to provide long-term benefits to GRNMS to protect the vulnerable and valuable biological and physical resources of the sanctuary for which it was designated (NMSP 2006). This is true for all four boundary alternatives.

3.12 Socioeconomic Resources

Socioeconomic studies conducted with proposal of the 2007 allowable fishing gear regulation and anchoring prohibition indicated the vast majority of sanctuary visitors were fishermen using rod and reel gear (allowable) while trolling or drift fishing rather than anchoring (Ehler and Leeworthy 2002). Thus, the vast majority of users could continue the same activities, and the economic burden is minimal (NMSP 2006). Prior to the proposed prohibition on spearfishing gear, another survey was conducted. That survey indicated that no dive operators used GRNMS as a destination for spearfishing, and that multiple substitution opportunities exist elsewhere in the offshore Georgia area outside of GRNMS for spearfishing by private boaters and dive operators (ONMS 2009). Thus, the economic burden was determined not to have a measurable or significant economic impact (ONMS 2009).

The economic analysis for the action to designate a research area in the sanctuary, determined that the losses from displacement of fishermen ranges from 0.12 percent (Southern Option Boundary) to 0.86 percent (Optimal Scientific Option Boundary) of total Georgia saltwater fishing expenditures. The number of users that may be displaced from GRNMS ranges from 9.2 percent (Southern Option Boundary) to 67 percent (Optimal Scientific Option Boundary) of boats in the sanctuary (Ehler 2010). In combination with the minimal and immeasurable socioeconomic impacts of the 2007 and 2010 regulations, the cumulative socioeconomic impacts of the research area would be primarily dictated by the boundary alternative in this action (Figure 14).

Therefore, there is an expected overall minimal socioeconomic impact from the Southern Option and Minimal User Displacement Option boundaries. The alternative to eliminate all fishing in the Optimal Scientific Option Boundary, however, is expected to result in significant adverse cumulative socioeconomic impacts, while the other fishing alternatives are expected to result in less than significant adverse cumulative socioeconomic impacts. The Compromise Option Boundary applied to the fishing alternatives is expected to range from minimal to less than significant adverse cumulative socioeconomic impacts. Transit and diving alternatives applied to any of the four boundary alternatives are expected to result in overall minimal cumulative socioeconomic impact.

These analyses assume, however, that all economic value associated with the research area is lost. All estimated impacts are thought of as "maximum potential losses." Any factor that could mitigate or off-set the level of adverse impact, such as fishing at other locations, is not considered.

3.2 SAFMC Actions Addressing Declines in Snapper and Grouper Fish Species

3.21 Biological and Physical Resources

On a regional basis, the SAFMC is implementing and considering numerous actions to address the overfished and/or overfishing status of several species in the snapper-grouper complex. Certain time-limited prohibitions and spatial closures are being implemented or proposed by SAFMC. The specific cumulative biological and physical effects of the action to designate a research area in GRNMS in combination with SAFMC actions are unfeasible to calculate due to the large portion of the U.S. Exclusive Economic Zone under the jurisdiction of the SAFMC compared to the 22 square miles of GRNMS. Given, however, that the sanctuary is just a minute part of the SAFMC managed area, the cumulative effects are not expected to reach any level of significance either beneficial or adverse.

3.22 Socioeconomic Resources

As described above, the SAFMC is implementing and considering time-limited prohibitions and spatial closures to address the overfished and/or overfishing status of several fishes in the snapper-grouper complex. The specific cumulative socioeconomic effects of the action to designate a research area in GRNMS in combination with SAFMC actions are unfeasible to calculate due to the large portion of the U.S. Exclusive Economic Zone under the jurisdiction of the SAFMC compared to the 22 square miles of GRNMS. Given, however, that the sanctuary is just a minute part of the SAFMC managed area, the cumulative effects are not expected to reach any level of significance either beneficial or adverse.

3.3 Climate Change

3.31 Biological and Physical Resources

Climate change, including ocean acidification, is projected to profoundly affect coastal and marine ecosystems on a global scale, and GRNMS is expected to manifest the consequences as well. Other human-induced disturbances, such as loss of habitat, also influence coastal and marine systems, often reducing the ability of systems to adapt. Specific and reliable forecasts for the marine environment are, however, still not possible and the effects may also vary greatly by region. Therefore, it is difficult to assess the potential effects of climate change over the next few decades on GRNMS. Overall, climate change is expected to add to the cumulative adverse impacts of both natural and human-caused stresses on the biological and physical resources of GRNMS.

The research area will provide critical information to inform management responses to protect resources. Given this scenario, the action to designate a research area in GRNMS, may the cumulative adverse impacts of climate change by providing a control area to monitor and study climate change alterations in the living marine resources and on live-bottom habitat.

3.32 Socioeconomic Resources

As described above, the profound impacts of climate change on marine ecosystems and thus the impacts on related socioeconomic resources are uncertain. The cumulative impacts on socioeconomic resources in combination with the action to designate a research area in GRNMS are similarly uncertain. The opportunity, however, to monitor and study the effects of climate change with a research area in the sanctuary may provide critical information to inform management responses. Thus, the overall socioeconomic burden of climate change may be slightly reduced by helping to guide management of socioeconomically important resources, such as fish.

3.4 Invasive Species

3.41 Biological and Physical Resources

Introduced, non-indigenous species can be invasive if they become common and have significant impacts on habitat and living marine resources. In GRNMS, the invasive titan acorn barnacle and the venomous, invasive Indo-Pacific lionfish have been documented.[5] The invasive green mussel and orange cup coral have been documented in GRNMS since 2008. Of these invasive species, the lionfish has the greatest known potential to alter the biological and physical resources of GRNMS because lionfish are prolific spawners and voracious predators. Lionfish prey primarily on fish and crustaceans, including commercially valuable and overfished species of fish. Lionfish have very few predators of their own, and none documented in their range in the western central Atlantic. As with climate change, invasive species are expected to add to the cumulative adverse impacts of

[5] Two individual lionfish were documented in GRNMS in September 2007 (ONMS 2008). The fate of the two lionfish is unknown, but no lionfish have been sighted in the sanctuary since then.

both natural and human-caused stresses on the biological and physical resources of GRNMS.

The research area will provide critical information, including more intense monitoring of invasive species, to inform management responses to invasive species impacts. Thus, the action to designate a research area in GRNMS may somewhat offset the cumulative adverse impacts of invasive species by providing a control area to monitor and study invasive species effects on biological and physical resources of GRNMS and other live-bottom habitats of the SAB.

3.42 Socioeconomic Resources

As described above, invasive species (i.e., lionfish) present a challenge for management of GRNMS. Likewise, the socioeconomic resources may ultimately bear the impacts of biological and physical resource alterations. Specific and reliable predictions of those impacts are unknown at this time.

The research area will, however, provide critical information, including more intense monitoring of invasive species, to inform management responses. Thus, the action to designate a research area in GRNMS may slightly offset the cumulative adverse socioeconomic impacts of invasive species by providing a control area to monitor and study invasive species in GRNMS. The results could inform protection of other live-bottom habitats of the SAB and possibly deter adverse socioeconomic impacts elsewhere.

VI. RESEARCH AREA ACTION PLANS

This section describes the specific strategies designed to meet the purposes and need of a research area in GRNMS and the activities to carry that out. Many of these strategies would require permits to be conducted in the sanctuary. Program regulations (15 CFR Part 922) outline the procedure and criteria under which the ONMS issues permits to allow certain activities beneficial to sanctuaries that would otherwise be prohibited. Therefore, environmental impacts of the following strategies and activities are not analyzed in this document, but would receive the same scrutiny under NEPA through the permitting process as outlined in ONMS and GRNMS regulations.

The strategies and activities are new or appended to existing strategies in the various actions plans found in the 2006 GRNMS Final Management Plan (NMSP 2006).

Resource Requirements

Action plan resource requirements (costs and time) are estimated for the strategies below. These preliminary estimates include staff salaries and are based on the overall needs for conducting the activities. These estimates have been developed to represent the full requirements to conduct programs and projects as described over a five-year period. Full implementation of these action plans is dependent on support from federal funding, contributions from partners and potential grants. Should funding not be adequate to cover all the projects listed below, GRNMS will implement the highest priority projects. Priority was determined with input from the Science Advisory Group (SAG) formed by the Sanctuary Advisory Council.

Performance Measures

Ongoing and routine performance evaluation is a priority for the ONMS to evaluate, and improve if necessary, management of national marine sanctuaries. Both site-specific and programmatic efforts are underway to better understand the ONMS's ability to meet stated objectives. To assess progress toward addressing the issues identified in this FEIS, research area action plan performance measures are described below. All performance measures will be appended to the current GRNMS Performance Evaluation Action Plan.

Research and Monitoring Action Plan

Introduction and Background
The goal of the research and monitoring action plan is to evaluate the state of resources within and outside the research area to determine what changes result from the establishment of a no-take area. This information would assist managers in their efforts to better protect the sanctuary. GRNMS enlisted the RAWG and the SAG to assist with the development of activities that should be undertaken to evaluate the research area. These activities would be expected to answer the following questions:

1. Does bottom fishing gear negatively impact bottom dwelling (benthic) invertebrate populations?
2. What are the recovery rates for populations of bottom dwelling invertebrates impacted by various levels of disturbance by bottom fishing gear?
3. What direct and indirect effects (e.g., changes in food web links, marine debris, etc.) does bottom fishing have on benthic communities?
4. What is the effect of bottom fishing on soft sediment (infaunal) and mobile invertebrate communities?
5. What is the effect of bottom fishing on benthic fish populations?

The following activities were developed to address these questions.

Strategy RM-2: (new strategy and activities replace old strategy and activities in the 2006 final management plan) Implementation of research area science and monitoring.

<u>Activity A: Marine debris distribution and abundance</u>
Understanding how marine debris from fishing affects GRNMS resources requires an assessment of the spatial distribution of debris, and the abundance of the various gear and trash types present in the area. To address this issue, GRNMS would initiate a marine debris distribution and abundance study that will address the following questions:

1) What is the frequency and spatial distribution of the fishing that affects bottom habitats?
2) What are the differences in frequency for different discarded or lost gear types?
3) How do discarded or lost fishing gear effects compare to natural variations in live bottom invertebrate species?

This activity would build on an existing marine debris assessment which is underway in the sanctuary. Sampling would include areas both within and outside the research area, and will occur throughout the year (sampling would include collecting data immediately following a fishing tournament). Data would be collected on the location of vessels during tournaments and at other times. The statistical design would be probabilistic, randomly stratified across habitats (excluding sand habitats), and distinguishing between the various strata that occur along ledges. The variables of interest are the distribution and frequency of occurrence within and among ledges for each gear type and other trash types.

This study would be conducted on an annual basis around all ledge habitats both inside and outside of the research area. It would require approximately 10 field days per year. The majority of field work would be conducted by NOAA and a volunteer corps of trained NOAA divers (called Team Ocean) and data analysis may be conducted by NOAA's National Centers for Coastal Ocean Science's (NCCOS) biogeography group, with funding from GRNMS. Additional GRNMS support requirements would include vessel support, dive support, dive gear and cameras from the sanctuary. A stratified random sampling design in conjunction with sampling for other projects may be considered.

Estimated Annual Cost: $40K at current level of effort (adding stratified random sampling would increase costs)
Time to Complete: Ongoing
Priority: Low

<u>Activity B: Entanglement impacts of lost or discarded gear</u>
Understanding how marine debris from fishing and other human activities affects GRNMS resources requires assessment of the effects of debris on individual organisms. Managers also need information on the potential for recovery after injury caused by marine debris. To address these issues, GRNMS would initiate studies to answer the following questions:

1) What is the severity of impact of bottom fishing gear (individual and cumulative) on sessile invertebrates?
2) What is the severity of impact of discarded and lost fishing gear (individual and cumulative) and how do the impacts differ among gear types?
3) How does the frequency and comparative severity of debris impacts on sessile invertebrates vary with gear type?
4) How do negative impacts that result from fishing gear compare to natural variation in survival of live bottom invertebrate species?
5) What are the recovery rates of invertebrates damaged by lost fishing gear?

This study would involve tracking the survivorship and recovery rates of animals entangled in fishing gear. Survey stations would be established within the research area to provide an undisturbed environment. Additional stations would be established outside the research area for comparison. Data collected would include assessments of the severity of injury by various fishing gear types, the ultimate fate of entangled organisms, and the rate of recovery of organisms from which gear is removed. Focal species would include *Oculina* and gorgonian corals. The statistical design would involve time series analyses at permanent stations where the degree of entanglement would be experimentally manipulated, as well as stations where previously entangled animals have been observed. Variables of interest include growth, measures of partial and complete mortality and general health for entangled and disentangled animals for each gear type encountered.

This study would be conducted on a quarterly basis and would require approximately eight field days to complete each year. The majority of field work would be conducted by NOAA and Team Ocean divers. Georgia Southern University (GSU) may serve as a partner in this

project. GRNMS support requirements include vessel support, dive support, dive gear and cameras from the sanctuary.

Estimated Annual Cost: $40K
Time to Complete: 3 years
Priority: Low

Activity C: Effects of changes in fish foraging pressure on the composition of infaunal and epifaunal benthic invertebrate communities

A number of benthic communities may exhibit changes as a result of closing even a small area to fishing. These may include organisms that live in the soft sediments (infauna) and organisms that live on the surface of the substrate (epifauna). These organisms may show changes in distribution, abundance, or size, among other characteristics. These changes can in turn influence habitat characteristics, including trophic structure, topographic complexity and chemistry. To address these issues, GRNMS would initiate a study that answers the following questions:

1) How does the distribution and abundance of sessile invertebrates on hard substrata and infaunal invertebrates in adjacent sands vary with changes in predation pressure?
2) How do changes in fish feeding activities on benthic invertebrates affect the trophic structure of the reef community?
3) How are motile epifaunal communities affected by changes in fishing pressure?

The objectives of this study would be to characterize and quantify changes in benthic community structure resulting from shifts in fish foraging pressures after creation of the research area. This study would also assess the changes in softbottom seafloor microhabitats (e.g. biogenic structures and geochemical characteristics) resulting from shifts in benthic community structure, and the changes in hardbottom topographic complexity resulting from changes in sessile macroinvertebrates. The variables of interest would be species diversity and abundance per unit area, as well as biogenic structure (observations and/or photographs), geochemistry and topographic complexity. The statistical design would require repeated sampling at fixed stations inside and outside the research area (with replication).

This study would be conducted on a quarterly basis. It would require two weeks of field work per year. The habitats of interest would include all types of ledge and sand habitats inside of and outside of the research area. The partners in the project could include GSU, NCCOS, and Skidaway Institute of Oceanography, with GRNMS providing funding and in-kind support through the use of the research vessels *Nancy Foster* and *Joe Ferguson*.

Estimated Annual Cost: >$170K
Time to Complete: >5 years
Priority: High

Activity D: Fishery dependent creel survey

It is important to know the level of fishing mortality from fishing activities in GRNMS, both prior to and after the establishment of the research area. This would allow investigators to more accurately interpret the results of studies conducted in both areas. Therefore GRNMS would initiate a fishery dependent creel survey to answer the following questions:

1) What are the targeted and by-catch fish species?
2) What is the fish biomass and number caught per unit of effort?
3) How does fishing affect the diversity and structure of the fish community?

The objective of this study is to determine fishery catch and effort prior to and after designation of the research area. The variables of interest would include what is landed, caught, released, discarded, or used at sea (i.e., bait). Scientists would also need to understand the total amount of catch per person, per hour/per trip, and per gear/method, by location. Finally, scientists would assess the level of related lost tackle/"break offs". Possible approaches to the statistical design involve creel surveys, questionnaires, observations, volunteer monitoring of fishermen (sentinel/ volunteer program), law enforcement reporting, remote sensing and acoustic sensing.

This study would consider all habitat types inside and outside of the research area. It would be conducted quarterly. GRNMS could partner with NOAA Office for Law Enforcement (OLE), Georgia Department of Natural Resources (GADNR), volunteers, students, interns, tournament directors and fishing clubs to complete this activity. GRNMS support requirements include providing funding, satellite data, NOAA personnel, survey instruments, vessels and computing/data analysis.

Estimated Annual Cost: $50K
Time to Complete: 2 years
Priority: High

<u>Activity E: Diver visual fishery independent survey</u>
Assuming that current fishing affects reef fish populations, changes in abundance, species composition and size structure of the community may be anticipated with the implementation of the research area. Over time, these changes would provide a reasonable estimate of the extent to which current fishing affects the reef community. To investigate these issues, GRNMS would initiate a diver visual fishery independent survey that would answer the following questions:

1) What are the targeted and by-catch fish species?
2) What are mortality rates of by-catch fish and what is their role in the ecosystem?
3) Are other fish species affected by the removal of targeted and by-catch species?
4) How does fishing affect the diversity and structure of the fish community?
5) What is the occurrence of invasive Indo-Pacific lionfish in nearshore live bottom areas?

The objective of this study would be to track populations and other characteristics of targeted and non-targeted fish species, both inside and outside the research area. The

variables of interest would be the number and length of all fish by species and habitat characteristics (e.g. ledge height). This study can also provide valuable information regarding the presence and impacts from invasive lionfish. This study would be conducted approximately three times per year (absolute minimum would be annually and absolute maximum would be quarterly). The design of the study would focus on a few selected species, including black sea bass. The allocation of samples among strata would be based on stratum size, variance of target species, and overall precision goal. All hardbottom habitats (high ledge, medium ledge, low ledge and flat hardbottom) would be of interest.

Investigators would sample approximately 10 sites of each habitat type inside of the research area and 30 sites of each habitat type outside of the research area. NCCOS and Reef Environmental Education Foundation could be partners in the project. GRNMS would supply funding, vessel support, dive support, dive gear and cameras from the sanctuary.

Estimated Annual Cost: >$125K
Time to Complete: >5 years
Priority: High

Activity F: Tagging of fishes to determine movement in relation to closed fishing area
It is important to understand how reef fish move in order to determine the extent to which an area closed to fishing encompasses their home range. If the fishing closure represents only a small fraction of a fish's home range, it may not offer much protection. In this case, observations of species with home ranges that extend beyond the study area may yield little information about the human impacts of activities that are controlled within that area. To investigate these issues in relation to the research area, GRNMS would continue an acoustic tagging study that was initiated in 2008 to evaluate site fidelity and provide information about the dynamics of populations within what is, in effect, a small marine protected area. In addition, a traditional fish tagging study would be initiated. These activities would be undertaken to answer the following questions:

1) How much do fish move in and out of the research area?
2) What are the daily movements of fish relative to the research area and how do the movement patterns change with time?

The objectives for these studies would be to determine the daily movements of fish relative to the research area and how the movement patterns change with time. Investigators would examine the seasonal/ annual patterns of migration and determine if the research area would exhibit spillover. The species of interest include black sea bass, grouper, tomtate and red snapper. This activity would involve two components: traditional tagging and acoustic tagging. As many as 1000 external tags would be placed on each target species as part of the traditional tagging study and may be tracked through a variety of methods including traps and diver visual censuses. In addition, 100 acoustic tags would be surgically implanted in the target species to track fish movement. To date, 16 fish have been implanted with acoustic tags. Acoustic receivers have been placed within and outside the research area to track fish within the sanctuary. To date, 14 receivers have been placed in GRNMS.

This study would continue to be conducted year round and would require approximately 60 days of field work. GRNMS would provide funding, vessel support, dive support, traps, receivers and acoustic tags. Project partners may include the South Carolina Department of Natural Resources (SCDNR) Marine Resources Monitoring, Assessment and Prediction (MARMAP) program, Team Ocean divers and NCCOS.

Estimated Annual Cost: $200K in year 1 and 2; $100K in years 3-5
Time to Complete: 5 years
Priority: Medium

Activity G: Comparative life histories of fish in protected and fished areas

Life history characteristics (size and age structure; population reproductive capacity [fecundity]; mortality; feeding habits) can be altered by fishing and, by extension, by closures to fishing. These changes ultimately affect productivity in a given area, resulting in community level influences. Understanding these dynamics, and whether they manifest in small closed areas like the GRNMS research area, inform managers about the consequences of their actions. Managers need to understand how varying levels of fishing pressure affect fish life histories and how protection from fishing pressure affects the production of fish biomass. To address these issues, GRNMS would initiate a study that answers the following questions:

1) What are the targeted and by-catch species?
2) Are other species affected by the removal of targeted and by-catch fish species?
3) How does fishing affect the diversity and structure of the fish community?

The objectives of this activity would be to compare life history traits in species residing in fished and protected areas. In addition, investigators would compare abundance, biomass and length-specific fecundity of fishes in the research area to those of fished areas. The objective of these comparisons would be to determine the potential reproductive output of fish populations in the absence of fishing, and what might be exported to fished areas. There are several variables of interest in this study, including length frequency, age structure, size at age of maturity, and size/age specific fecundity.

This study would be conducted on a monthly basis. It would look at all habitat types inside and outside of the study area. GRNMS could partner with SCDNR and NOAA Fisheries Service to complete these analyses. GRNMS would provide funding and support for field work, (approximately 60 days per year at five days/month).

Estimated Annual Cost: $125K
Time to Complete: 3 years
Priority: Medium; higher if significant changes in populations are detected.

Activity H: Research area information synthesis and review

Managers need to understand the impacts to socioeconomic, biological and physical resources resulting from the establishment of a research area. The research and

monitoring activities listed above would provide the information necessary to evaluate these impacts. In order to help GRNMS staff coordinate these efforts and synthesize and communicate information gathered on the research area, the GRNMS Advisory Council established the SAG as a working group. Through recommendations from the Advisory Council to the GRNMS Superintendent, this group provides input on the studies to be conducted in the research area (e.g., manipulative experiments, long-term monitoring), to assist GRNMS in evaluating the suitability of proposals to conduct scientific studies within the research area, and to help GRNMS develop performance criteria for long-term evaluation of the benefits of the research area. The SAG would also help coordinate projects such that field work can be optimized in terms of collecting the most data possible.

The SAG would also assist GRNMS in developing performance measures and an annual report on research and monitoring activities undertaken in the research area. This information would be made available to the public in the form of a written report and would be posted on the GRNMS web site. In addition, every five years, GRNMS and the SAG would undertake a more detailed program review of research and monitoring related to the research area, and would evaluate the results from those studies. With the assistance of the SAG, GRNMS would also conduct periodic research area program reviews and adapt the research and monitoring activities accordingly. GRNMS would develop a GIS database to track research and monitoring activities within the research area. To support synthesis and review activities, GRNMS would host periodic information sharing meetings on an as needed basis.

Estimated Annual Cost: $10K
Time to Complete: Ongoing
Priority: High

Activity I: Socioeconomics

A report - *Economic Analysis of Recreational Fishing in the GRNMS Research Area, (Ehler 2010)* - was finalized prior to release of the FEIS. ONMS also initiated a "knowledge, attitudes and perceptions" survey of GRNMS users and non-users in early 2011. The objective of this survey is to ascertain perceptions and attitudes toward GRNMS and MPAs in general. After approximately 7 years of research area operations, ONMS would repeat the knowledge, attitudes and perceptions survey and produce a report to note any changes. After approximately 3 years of research area operations, ONMS would conduct a follow up assessment of the economic analysis to determine the actual costs to users.

Estimated Annual Cost: $15K year 1; $40K year 4
Time to Complete: 5 years
Priority: Medium

In addition to the specific projects described above, two broad projects would be pursued as part of the research area monitoring plan. These include:

- Re-map GRNMS to identify changes that have occurred since the first habitat map was created, and characterize the cause of those changes. Evidence suggests that the

seafloor within the sanctuary is very dynamic and previous studies have demonstrated that there are significant differences in the benthic infauna between rippled sand and flat sand. Therefore knowing how the habitat is changing can have significant implications for benthic communities.

- Continue to collect physical data within the sanctuary which would provide context for other monitoring projects. Currently the GRNMS data buoy collects the following: ADCP, salinity, water temperature, pCO_2, wind speed and direction, wave height, dominant wave period, average wave period, air temperature and atmospheric pressure. Data is collected on the seafloor for pCO_2 and water temperature.

Costs for these broad projects are not factored into this action plan because these projects are sanctuary-wide and would occur whether the research area is designated or not. These activities are integrated into annual operating plans for GRNMS as budget allows.

FIGURE 15: ESTIMATED RESOURCE REQUIREMENTS FOR THE RESEARCH AND MONITORING ACTION PLAN

Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
Strategy RM-2: Implementation of Research Area Monitoring	775	760	610	485	445
Total estimated annual cost ($1,000)	775	760	610	485	445

FIGURE 16: PERFORMANCE MEASURES FOR THE RESEARCH AND MONITORING ACTION PLAN

Outcome	Performance Measure	Baseline
Strategy RM-2: Inform management activities with the ability to evaluate the state of resources within and outside the research area to determine what changes result from the establishment of a no-take area.	Evaluation of research area analyses and applicability to management activities after 5 years.	Variables measured and analyzed inside and outside the research area prior to establishment of the research area.
Inform management activities with the ability to evaluate the knowledge, attitudes and perceptions of the general public and visitors regarding GRNMS and MPAs.	Evaluation of the knowledge, attitudes and perceptions of the general public and visitors regarding GRNMS and MPAs after 5 years.	Evaluate the knowledge, attitudes and perceptions of the general public and visitors regarding GRNMS and MPAs prior to establishment of the research area.

Education and Outreach Action Plan

Introduction and Background
The Education and Outreach Action Plan would have two main goals. The first is to raise awareness of the research area and associated regulations to promote compliance among anglers, divers, and other visitors to GRNMS. The second is to instill an understanding of the research area purposes among the general public and users, and to keep them updated about the research projects, outcomes, and value in the overall protection of GRNMS resources.

Strategy EO-1: Conduct Public Awareness Programs

Activity F: Conduct an outreach program to support awareness of the research area and compliance with regulations
GRNMS staff would produce and issue press releases and other materials announcing establishment of the research area, its location and restrictions in the area. The press releases would be distributed widely through media lists, listserves, Facebook, and Twitter, as well as posted on the GRNMS website. Particular emphasis would be placed on informing users about research area boundaries and regulations. Coordinates of the research area would be included in various outreach materials and posted on the Notice to Mariners and other such outlets frequently visited by users of GRNMS. In addition, staff would also contact partners, such as the National Data Buoy Center and SAFMC, requesting research area information be included in appropriate publications and webpages. GRNMS staff would also prepare an advertisement for inclusion in the Georgia Sportfishing Regulations Guide giving the location of the research area and restrictions. The GRNMS Sanctuary Advisory Council would be asked to distribute information to their constituents.

To enhance awareness of the research area and regulations in the long term, GRNMS staff would develop and distribute various "give away" materials (e.g., wallet cards, key chains) that identify the location of the research area and associated regulations. Distribution could take place at fishing tournaments, boat shows and other events frequented by users.

Estimated annual cost: $24K in year 1; $7K in year 2; $5K in year 3
Time to complete: 3 years

Activity G: Prepare and distribute information on the effectiveness and applicability of the GRNMS research area
GRNMS staff would prepare regular and on-going information about science and monitoring projects of the research area. Annual results (beginning in year 2) and longer term (year 5) reports would be made available to the public and users through various outreach venues, including the GRNMS webpage.

Estimated annual cost: $7K year 2, 3 and 4, $10K year 5
Time to complete: 4 years

Activity H: Make research area science accessible to the public

GRNMS staff would work to "translate" research area science and monitoring results for a non-scientific audience through media outlets, public presentations and events. Information that conveys science projects and results in a way that is understandable and interesting to the general public would be developed. GRNMS staff would leverage relationships with outreach partners to spread the messages through materials and exhibits at various locations.

Estimated annual cost: $6.5K years 2-5
Time to complete: 5 years

Strategy EO-2: Create and provide scholastic programs in ocean science education

Activity E: Incorporate research area information into existing education programs and create new programs as appropriate to support public knowledge of the purpose of the research area

GRNMS staff would create lesson plans that underscore the necessity and the utility of the research area. The plans would be announced and posted on the website and distributed via the education listserve. GRNMS staff would also work with the education representatives on the Sanctuary Advisory Council to ensure that the establishment and ongoing information about the research area is reported to their constituents. GRNMS staff would also write articles on significant research findings for publication in education journals.

FIGURE 17: ESTIMATED RESOURCE REQUIREMENTS FOR THE EDUCATION AND OUTREACH ACTION PLAN

Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
Strategy EO-1: Conduct Public Awareness Programs	24	20.5	18.5	13.5	16.5
Strategy EO-2: Create and provide scholastic programs in ocean science education	5	4	1	1	1
Total estimated annual cost ($1,000)	29	24.5	19.5	14.5	17.5

FIGURE 18: PERFORMANCE MEASURES FOR THE EDUCATION AND OUTREACH ACTION PLAN

Outcome	Performance Measure	Baseline
Strategy EO-1: Greater awareness, understanding, and protection of the research area	GADNR patrol reports after 1 year, 3 years, and 5 years of Research Area designation.	GADNR patrol and boat observations in Research Area at designation.
Strategy EO-2: Greater awareness and understanding of the research area	Post tests for education program with questions specific to the research area and knowledge gained.	Pre tests for education program with questions specific to the research area and knowledge gained.

Resource Protection Action Plan

Introduction and Background
The Resource Protection Action Plan for the research area focuses on law enforcement and permitting efforts. The purpose of the plan is to protect the integrity of the area for maximum use as a research area by preventing prohibited activities. Beneficial activities that will otherwise be prohibited may, however, occur when applied for and carefully considered through the GRNMS permitting program.

Strategy MRP-5: Enhance Enforcement Efforts to protect the integrity of the research area.

Activity E: Establish a compliance and enforcement program for the GRNMS research area
GRNMS staff will work with law enforcement partners (NOAA Office of Law Enforcement, Georgia Department of Natural Resources, U.S. Coast Guard, NOAA General Counsel for Enforcement and Litigation) to promote compliance with research area regulations and, as necessary, to support law enforcement actions. Particular emphasis will be placed on informing users about research area boundaries and regulations. Boundaries will not be marked with buoys or other mechanisms to alert boaters they are entering the research area. Instead, boaters will be expected to recognize research area boundaries through vessel Global Positioning Systems (GPS). Coordinates of the research area will be included in various outreach materials and posted on the Notice to Mariners and other such outlets frequently visited by users of GRNMS. GADNR patrols of the research area will also become an ongoing activity through the Joint Enforcement Agreement (JEA) between NOAA OLE and GADNR. Coordination of these efforts will also be an ongoing topic for the Sanctuary Advisory Council and its Law Enforcement Working Group.

Strategy MRP-7: Continue oversight and enhance the GRNMS permitting program

Activity A: Continue permit review, evaluation and tracking activities with enhancements to support research area projects
GRNMS regulations provide for permitting of activities in the sanctuary that are otherwise prohibited. Permit applications are reviewed and evaluated based on their potential single and cumulative impacts to sanctuary resources versus the potential benefits the activity may provide in terms of resource protection. Permitted activities are typically research or education oriented. GRNMS staff will continue the program with a renewed emphasis on protocols and streamlining procedures to support projects in the research area.

FIGURE 19: ESTIMATED RESOURCE REQUIREMENTS FOR THE RESOURCE PROTECTION ACTION PLAN

Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
Strategy MRP-5: Enhance Enforcement Efforts	65	70	70	75	75
Strategy MPR-7: Continue permit review, evaluation and tracking activities with enhancements to support research area projects	10	10	5	5	5
Total estimated annual cost ($1,000)	75	80	75	80	80

FIGURE 20: PERFORMANCE MEASURES FOR THE RESOURCE PROTECTION ACTION PLAN

Outcome	Performance Measure	Baseline
Strategy MRP-5: Enhanced enforcement efforts, increased awareness of, and compliance with, regulations protecting the research area.	By 2015, enforcement actions will be reduced to no more than 2 per year.	To be determined from first year law enforcement patrols.
Strategy MPR-7: Ongoing efficient and effective permitting actions.	By 2015, permit applications will be evaluated and permits issued or denied within 30 days.	To be determined from first year performance.

FIGURE 21: TOTAL ESTIMATED 5-YEAR COSTS FOR THE RESEARCH AREA

Strategy	Total 5-Year Cost ($1,000)
Strategy RM-2: Implementation of Research Area Monitoring	3,075
Strategy EO-1: Conduct Public Awareness Programs	93
Strategy EO-2: Create and provide scholastic programs in ocean science education	12
Strategy MRP-5: Enhance Enforcement Efforts	355
Strategy MPR-7: Continue permit review, evaluation and tracking activities with enhancements to support research area projects	35
Total estimated 5-year cost ($1,000)	3,570

VII. APPENDICES

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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/

NOAA Fisheries Service, Southeast Regional Office Web Site: http://sero.nmfs.noaa.gov/

B. Purposes and Policies of the NMSA as Amended (16 USC 1431 et seq.)

(1) to identify and designate as national marine sanctuaries areas of the marine environment which are of special national significance and to manage these areas as the National Marine Sanctuary System;

(2) to provide authority for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities;

(3) to maintain the natural biological communities in the national marine sanctuaries, and to protect, and, where appropriate, restore and enhance natural habitats, populations, and ecological processes;

(4) to enhance public awareness, understanding, appreciation, and wise and sustainable use of the marine environment, and the natural, historical, cultural, and archeological resources of the National Marine Sanctuary System;

(5) to support, promote, and coordinate scientific research on, and long-term monitoring of, the resources of these marine areas;

(6) to facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities;

(7) to develop and implement coordinated plans for the protection and management of these areas with appropriate Federal agencies, State and local governments, Native American tribes and organizations, international organizations, and other public and private interests concerned with the continuing health and resilience of these marine areas;

(8) to create models of, and incentives for, ways to conserve and manage these areas, including the application of innovative management techniques; and

(9) to cooperate with global programs encouraging conservation of marine resources.

C. GRNMS Goals and Objectives

The following sanctuary "Goals and Objectives" were developed with the Sanctuary Advisory Council in 2000 (NMSP 2006) and adopted by GRNMS in 2006 and are consistent with the purposes and policies set forth by the NMSA.

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

Objectives
a. Develop, implement, and periodically evaluate a comprehensive resource protection plan tailored to sanctuary resources and uses that provides direction for resource management and protection.
b. Develop, implement, and maintain an on-site management capability that reviews and assesses resource conditions and human activities, and recommends action if problems arise.
c. Develop, implement, and maintain the surveillance and enforcement presence needed to ensure compliance with sanctuary regulations and adequate protection of sanctuary resources.
d. Inform and educate the public users on the sensitive nature of the sanctuary resources, the purpose of sanctuary designation, and the need for sanctuary regulations with enforcement.

GOAL 2: Support, promote, and coordinate scientific research and long-term monitoring to enhance the understanding of the sanctuary environment and to improve management decision-making.

Objectives
a. Develop, implement, and periodically evaluate a comprehensive research and monitoring plan that looks over a five-year horizon, and that is based on existing knowledge of ecosystems, socioeconomic conditions, and evolving management issues.
b. Encourage and support resource and socioeconomic research and monitoring that addresses priority information needs.
c. Provide a means for information exchange among managers, scientific investigators, user groups, and the public.
d. Ensure the ability to rapidly respond to unforeseen events.

GOAL 3: Enhance public awareness, understanding, wise and sustainable use, and appreciation of the marine environment and the sanctuary's natural, historical, cultural, and archeological resources.

Objectives
a. Develop, implement, and periodically evaluate a comprehensive education and outreach plan to broaden public support for the protection of sanctuary resources.

b. Promote the sanctuary as a resource for educational, interpretive, commercial, and recreational use consistent with the primary objective of resource protection.
c. Provide mechanisms to engage the public in sanctuary planning activities and evaluation.

GOAL 4: Facilitate, to the extent compatible with the primary objective of resource protection, all public and private uses of the sanctuary not prohibited pursuant to other authorities.

Objectives
a. Facilitate uses of the sanctuary that are consistent with the primary objective of resource protection.
b. Establish a means to monitor sanctuary use and resource quality over time to minimize potential user conflicts and environmental degradation.

GOAL 5: Dedicate appropriate infrastructure and resources for all programs, and create models of, and incentives for, ways to conserve and manage sanctuary resources, including the application of innovative management techniques.

Objectives
a. Develop, implement, and periodically evaluate a comprehensive operation plan to coordinate activities related to the sanctuary.
b. Evaluate the effectiveness of the plan on an annual basis and initiate changes as necessary.
c. Identify the roles and responsibilities of parties involved in sanctuary administration and specify procedures for implementing essential components of the management plan.

GOAL 6: 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 to encourage the conservation of these resources.

Objectives
a. Collaborate with other organizations to enhance opportunities for research priorities related to sanctuary ecosystems and resource management.
b. Collaborate with other public and private organizations to promote communication and cooperation between sanctuary management and sanctuary users.
c. Cooperate with international programs encouraging conservation of marine resources.

D. Economic Analysis of the GRNMS Research Area

ECONOMIC ANALYSIS OF THE GRAY'S REEF NATIONAL MARINE SANCTUARY RESEARCH AREA

ROD EHLER, ECONOMIST, NOAA

DECEMBER 2010

Introduction

NOAA Gray's Reef National Marine Sanctuary (GRNMS) began developing a proposal to establish a research area in GRNMS in 2004 when a working group was convened to explore the concept. The purpose of a research area would be to increase the opportunity to discriminate scientifically between natural and human-induced change to species populations in the sanctuary. This analysis was produced in 2008 to assess the social and economic effects of a research area.

Economic Analysis of Private Boat Recreational Fishing in the GRNMS Research Area (April 2008)

Rationale:

- Determine the economic impact of private boat based saltwater fishing in Georgia, and prorate it based on estimated angler activity in Gray's Reef National Marine Sanctuary.

Georgia Saltwater Fishing Statistics 2006[6]:

- 146,000 Georgia Saltwater Anglers
- 1,707,000 Georgia Saltwater Fishing Days

Total Economic Impact of Saltwater Fishing in Georgia in 2006[1]:

- Total Expenditures $119,250,000
- Total Impact – Sales $153,361,000
- Total Impact – Income $ 63,021,000
- Total Impact – Employment $ 1,892

Methodology and Assumptions:

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6 Sources: American Sportfishing Association, Sportfishing in America, January 2008
US Fish and Wildlife Service, 2006 National Survey of Fishing, Hunting and Wildlife Associated Recreation, 2006
NOAA, NMFS, Marine Angler Expenditures in the Southeast Region, 1999
NOAA, NMFS, The Economic Importance of Marine Angler Expenditures in the United States, 2004

- Multiple GRNMS boat location data sources were used, including aerial photography and on water GADNR patrol boat records.
- Boat location data span 1999 to 2007. 1,266 boat locations were identified.
- Approximately 50 percent of these boat sightings occurred on fishing tournament days. No difference in spatial distribution of kingfish tournament days compared with non-tournament days.
- Statistical analysis of boat location data estimated a typical year of person days of fishing within GRNMS to be 4,694. A person day is equivalent to one person engaging in the activity for any portion of one day.
- Total expenditures = average person day expenditures x total person days x % private/tournament x % GA resident/non-resident.
- Assumptions for GRNMS fishing analysis:
  - All boats identified are fishing
  - Average of 4 fishers per boat
  - Trip expenditure profile of tournament boats provided by Georgia DNR
  - Trip expenditure profile of private boats provided by NMFS
  - 50 percent of boats are private or rental and 50 percent boats participating in a tournament
  - 95 percent of boaters are Georgia residents and 5 percent are non-resident

- This analysis also assumes that all economic value associated with the area closed is lost. Any factor that could mitigate or off-set the level of impact is not addressed. The estimated impacts are thought of as "maximum potential losses" because humans have proven to be very adaptive, resilient and quite ingenious in responding to changes and rarely does society fail to at least mitigate or off-set most losses.

Table 1: GRNMS Fishing Expenditures

GRNMS		Average Person Day Expenditures		Total Expenditures	
Trip Expenditures	**Mode**	**Resident Spenders ($)**	**Nonresident Spenders ($)**	**Resident Spenders ($)**	**Nonresident Spenders ($)**
Private Transportation	Tournament	13	13	28,985	1,526
	Private	7	10	15,324	1,142
Food	Tournament	6	6	13,378	704
	Private	14	35	31,862	4,135
Lodging	Tournament	100	100	222,965	11,735
	Private	301	27	670,368	3,168
Public Transportation	Tournament			-	-
	Private		41	-	4,814
Boat Fuel	Tournament	50	50		
	Private	24	23	54,103	2,686
Tournament Entry Fee	Tournament	100	100	222,965	11,735
Access/Boat Launching	Tournament	6	6	13,378	704
	Private	6	4	12,788	439
Equipment Rental	Tournament			-	-
	Private		11	-	1,306
Bait	Tournament	19	19	42,363	2,230
	Private	11	8	25,090	947
Ice	Tournament	6	6	13,378	704
	Private	2	3	5,396	318
Total	**Tournament**	**300**	**300**	**668,895**	**35,205**
	Private	**365**	**162**	**814,931**	**18,954**

(4,694 person days = $1,537,985 total fishing expenditures)

The total annual recreational fishing expenditures for the entire GRNMS in 2006 is estimated to be $1,537,985. The following is an explanation of the methodology for estimating total expenditures. First, each of the itemized expenditures must be calculated by multiplying the itemized average person day expenditures by total person days by percent private/tournament by percent Georgia resident/nonresident.

Total expenditures = (average person day expenditures) x (total person days) x (% private/tournament) x (% GA resident/non-resident)

For example, in the table above, private transportation expenditures for tournament resident spenders is estimated to be $28,985. The calculation for this is:

$28,985 = 13 x 4,694 x .50 x .95

The totals at the bottom of the above table simply sum the itemized expenditures for tournament/private and resident/nonresident. Finally, total fishing expenditures are the sum of the four total expenditures for mode and resident status.

Optimal Scientific Option Boundary Economic Analysis

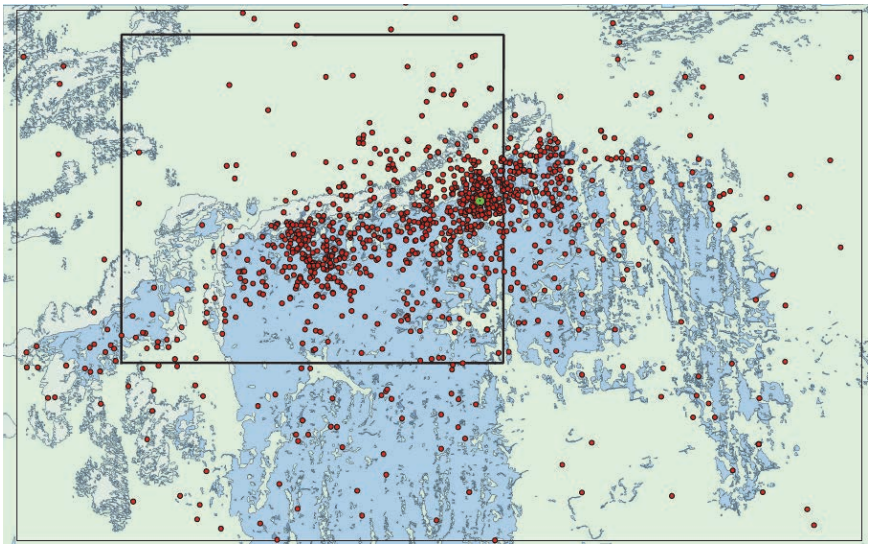


Table 2: Optimal Scientific Option Boundary Impacts to Fishing Expenditures

GRNMS		Expenditure Impacts Scenario 1	
Trip Expenditures	**Mode**	**Resident Spenders ($)**	**Nonresident Spenders ($)**
Private Transportation	Tournament	19,421	1,022
	Private	10,267	765
Food	Tournament	8,963	472
	Private	21,348	2,770
Lodging	Tournament	149,390	7,863
	Private	449,158	2,123
Public Transportation	Tournament	-	-
	Private	-	3,225
Boat Fuel	Tournament		
	Private	36,250	1,799
Tournament Entry Fee	Tournament	149,390	7,863
Access/Boat Launching	Tournament	8,963	472
	Private	8,568	294
Equipment Rental	Tournament	-	-
	Private	-	875
Bait	Tournament	28,384	1,494
	Private	16,811	635
Ice	Tournament	8,963	472
	Private	3,615	213
Total	**Tournament**	**448,171**	**23,588**
	Private	**546,017**	**12,699**

67.0 percent of fishing impacted =$1,030,476

The total annual impact to recreational fishing expenditures of the Optimal Scientific Option Boundary in 2006 is estimated to be $1,030,476. This estimate was calculated using the same methodology as described above for total estimated expenditures, with the addition of multiplying each of the itemized expenditures for mode and resident status by the percent of fishing impacted.

Minimal User Displacement Option Boundary Economic Analysis

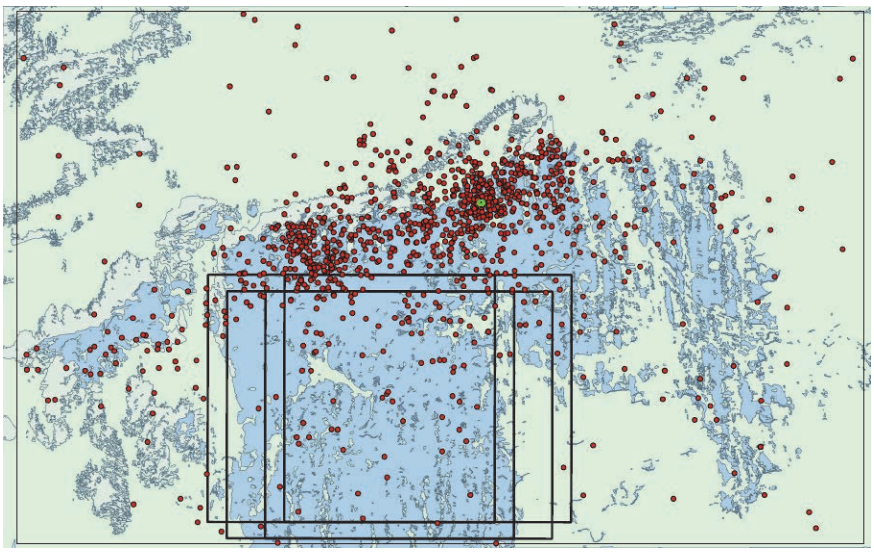


Table 3: Minimal User Displacement Option Boundary Impacts to Fishing Expenditures

GRNMS		Expenditure Impacts Scenario 2, Boundary 1		Expenditure Impacts Scenario 2, Boundary 2		Expenditure Impacts Scenario 2, Boundary 3		Expenditure Impacts Scenario 2, Boundary 4	
Trip Expenditures	**Mode**	**Resident Spenders ($)**	**Nonresident Spenders ($)**	**Resident Spenders ($)**	**Nonresident Spenders ($)**	**Resident Spenders ($)**	**Nonresident Spenders ($)**	**Resident Spenders ($)**	**Nonresident Spenders ($)**
Private Transportation	Tournament	3,593	189	3,544	187	2,549	134	2,525	133
	Private	1,899	142	1,874	140	1,348	100	1,335	99
Food	Tournament	1,658	87	1,636	86	1,176	62	1,165	61
	Private	3,949	513	3,896	506	2,802	364	2,775	360
Lodging	Tournament	27,637	1,455	27,264	1,435	19,607	1,032	19,421	1,022
	Private	83,094	393	81,971	387	58,952	279	58,391	276
Public Transportation	Tournament	-	-	-	-	-	-	-	-
	Private	-	597	-	589	-	423	-	419
Boat Fuel	Tournament								
	Private	6,706	333	6,616	328	4,758	236	4,712	234
Tournament Entry Fee	Tournament	27,637	1,455	27,264	1,435	19,607	1,032	19,421	1,022
Access/Boat Launching	Tournament	1,658	87	1,636	86	1,176	62	1,165	61
	Private	1,585	54	1,564	54	1,125	39	1,114	38
Equipment Rental	Tournament	-	-	-	-	-	-	-	-
	Private	-	162	-	160	-	115	-	114
Bait	Tournament	5,251	276	5,180	273	3,725	196	3,690	194
	Private	3,110	117	3,068	116	2,206	83	2,185	82
Ice	Tournament	1,658	87	1,636	86	1,176	62	1,165	61
	Private	669	39	660	39	475	28	470	28
Total	**Tournament**	**82,912**	**4,364**	**81,791**	**4,305**	**58,822**	**3,096**	**58,262**	**3,066**
	Private	**101,013**	**2,349**	**99,648**	**2,318**	**71,665**	**1,667**	**70,982**	**1,651**

Boundary 1: 12.4 percent of fishing impacted = $190,638
Boundary 2: 12.2 percent of fishing impacted = $188,062
Boundary 3: 8.8 percent of fishing impacted = $135,250
Boundary 4: 8.7 percent of fishing impacted = $133,962

The total annual impact to recreational fishing expenditures of the Minimal User Displacement Option Boundaries in 2006 is estimated to be between $133,962 and $190,638. These estimates were calculated using the same methodology as described above for total estimated expenditures, with the addition of multiplying each of the itemized expenditures for mode and resident status by the percent of fishing impacted.

Compromise Option Boundary Economic Analysis

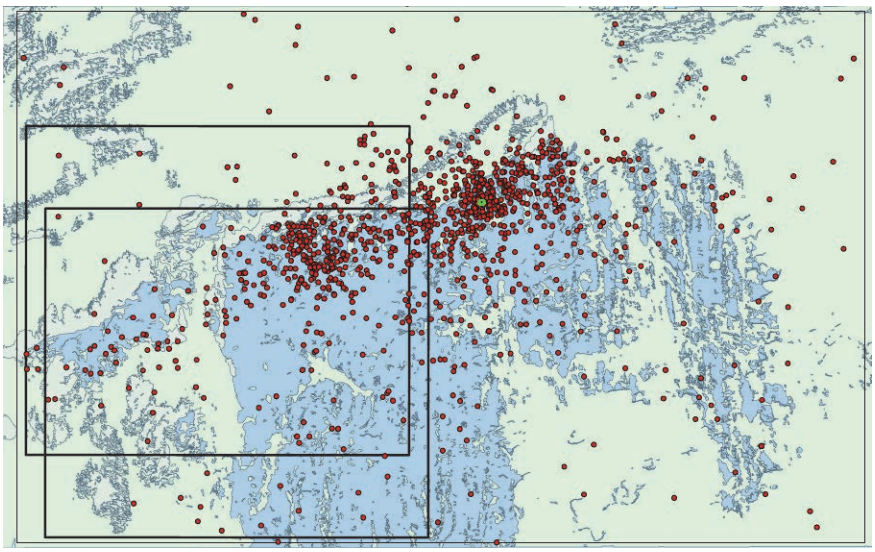


Table 4: Compromise Option Boundary Impacts to Fishing Expenditures

GRNMS		Expenditure Impacts Scenario 3, Boundary 1		Expenditure Impacts Scenario 3, Boundary 2	
Trip Expenditures	**Mode**	**Resident Spenders ($)**	**Nonresident Spenders ($)**	**Resident Spenders ($)**	**Nonresident Spenders ($)**
Private Transportation	Tournament	10,414	548	10,026	528
	Private	5,506	410	5,300	395
Food	Tournament	4,807	253	4,627	244
	Private	11,448	1,486	11,021	1,430
Lodging	Tournament	80,111	4,216	77,123	4,059
	Private	240,861	1,138	231,878	1,096
Public Transportation	Tournament	-	-	-	-
	Private	-	1,730	-	1,665
Boat Fuel	Tournament				
	Private	19,439	965	18,714	929
Tournament Entry Fee	Tournament	80,111	4,216	77,123	4,059
Access/Boat Launching	Tournament	4,807	253	4,627	244
	Private	4,595	158	4,423	152
Equipment Rental	Tournament	-	-	-	-
	Private	-	469	-	452
Bait	Tournament	15,221	801	14,653	771
	Private	9,015	340	8,679	328
Ice	Tournament	4,807	253	4,627	244
	Private	1,939	114	1,866	110
Total	**Tournament**	**240,332**	**12,649**	**231,368**	**12,177**
	Private	**292,802**	**6,810**	**281,882**	**6,556**

Boundary 1: 35.9 percent of fishing impacted = $552,593
Boundary 2: 34.6 percent of fishing impacted = $531,983

The total annual impact to recreational fishing expenditures of the Compromise Option Boundaries in 2006 is estimated to be between $531,983 and $553,593. These estimates were calculated using the same methodology as described above for total estimated expenditures, with the addition of multiplying each of the itemized expenditures for mode and resident status by the percent of fishing impacted.

Southern Option Boundary Economic Analysis

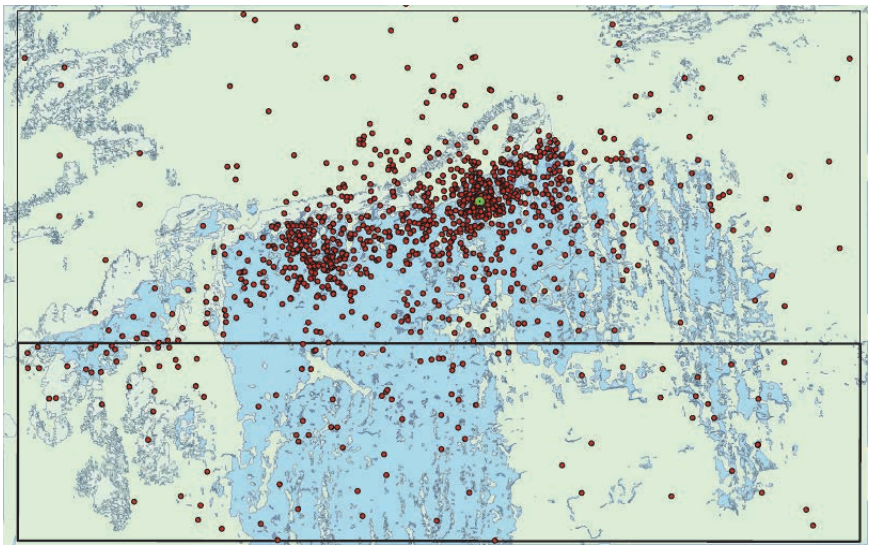


Table 5: Southern Option Boundary Impacts to Fishing Expenditures

GRNMS		Expenditure Impacts Southern Expansion	
Trip Expenditures	**Mode**	**Resident Spenders ($)**	**Nonresident Spenders ($)**
Private Transportation	Tournament	2,670	141
	Private	1,412	105
Food	Tournament	1,232	65
	Private	2,935	381
Lodging	Tournament	20,541	1,081
	Private	61,759	292
Public Transportation	Tournament	-	-
	Private	-	443
Boat Fuel	Tournament		
	Private	4,984	247
Tournament Entry Fee	Tournament	20,541	1,081
Access/Boat Launching	Tournament	1,232	65
	Private	1,178	40
Equipment Rental	Tournament	-	-
	Private	-	120
Bait	Tournament	3,903	205
	Private	2,311	87
Ice	Tournament	1,232	65
	Private	497	29
Total	**Tournament**	**61,623**	**3,243**
	Private	**75,077**	**1,746**

9.2 percent of fishing impacted = $141,690

The total annual impact to recreational fishing expenditures of the Southern Option Boundary in 2006 is estimated to be $141,690. This estimate was calculated using the same methodology as described above for total estimated expenditures, with the addition

of multiplying each of the itemized expenditures for mode and resident status by the percent of fishing impacted.

Summary of Economic Analyses of Private Boat Recreational Fishing in the GRNMS Research Area:

It is estimated that the economic impact of a research area on Georgia private boat based recreational fishing may be between 0.11% and 0.86% of statewide saltwater fishing expenditures. This is considered to the maximum potential loss.

Table 6: Summary of Economic Analyses of Private Boat Recreational Fishing in the GRNMS Research Area

Scenario #	Boundary #	% GRNMS Impacted	Impacted GRNMS Person Days	Impacts to GRNMS Saltwater Fishing Expenditures	% Impact to GA Person Days of Saltwater Fishing	% Impact to GA Total Saltwater Fishing Expenditures
1	1	67.0%	3,145	$1,030,476	0.18%	0.86%
2	1	12.4%	582	$190,638	0.03%	0.16%
2	2	12.2%	574	$188,062	0.03%	0.16%
2	3	8.8%	413	$135,250	0.02%	0.11%
2	4	8.7%	409	$133,962	0.02%	0.11%
2	*Average*	*10.5%*	*495*	*$161,978*	*0.025%*	*0.135%*
3	1	35.9%	1,687	$552,593	0.10%	0.46%
3	2	34.6%	1,624	$531,983	0.10%	0.45%
3	*Average*	*35.3%*	*1,656*	*$542,288*	*0.10%*	*0.455%*
4	1	6.7%	315	$103,048	0.02%	0.09%
5	1	14.5%	680	$222,840	0.04%	0.19%
Southern Option Boundary	-	9.2%	432	$141,690	0.03%	0.12%

Economic Analysis of Charter Boat Based Recreational Fishing in the GRNMS Research Area 2008

In 2002, a survey of charter fishing boat owners/operators was completed. This survey identified 15 charter boats that utilize GRNMS as one of their fishing locations. It was estimated that their 2001 total gross revenue was $1,029,000 and their total operating expense was $582,000 with total profit of $447,000. Converting these values to 2008 dollars using the consumer price index results in gross revenue of $1,251,264, total operating expenses of $707,712, and total profit of $543,552. The survey found that approximately 40 percent of their fishing activity took place in GRNMS, thus the analysis below is based on gross revenue of $500,506, and total profit of $217,421.

Economic impact by alternative can be estimated by combining results from the 2002 survey with boat location analysis completed in 2008. This produces the following results, which are summarized in Table below. The Southern Option Boundary (preferred) impacts 9.2 percent of recreational fishing resulting in impacts of $46K to total gross revenue and $20K to total profit. The Optimal Scientific Boundary Option impacts 67 percent of recreational fishing resulting in impacts of $335K to total gross revenue and $146K to total profit. The Minimal User Displacement Option Boundary impacts 10.5 percent of recreational fishing resulting in impacts of $75K to total gross revenue and $32K to total profit. Compromise Boundary Option impacts 35.3 percent of recreational fishing resulting in impacts of $177K to total gross revenue and $77K to total profit.

This analysis assumes that all economic value associated with the area closed is lost. Any factor that could mitigate or off-set the level of impact is not addressed. The estimated impacts are thought of as "maximum potential losses" because humans have proven to be very adaptive, resilient and quite ingenious in responding to changes and rarely does society fail to at least mitigate or off-set most losses.

Table 7: Estimated Economic Impacts to Recreational Charter Fishing Businesses by Alternative, 2008 $

Alternative	Percent Impact	Total Impact to Gross Revenue ($)	Total Impact to Profit ($)
No Action	0%	-	-
Southern Option Boundary (preferred alternative)	9.2%	46,047	20,003
Optimal Scientific Option Boundary	67%	335,339	145,672
Minimal User Displacement Option Boundary	10.5%	52,553	22,829
Compromise Option Boundary	35.3%	176,679	76,097

Summary of Total Economic Impacts to Fishing by Boundary Alternative

The impact to charter fishing gross revenue is considered to be equivalent to charter fishing customer expenditure. This assumption allows for combining the charter fishing economic analysis with the private boat fishing analysis for an overall look at the economic impact of the various alternatives. The economic impact estimate equates to an economic loss.

Table 8: Summary of Total Economic Impact to Fishing by Boundary

Alternative	Impact (loss) to GRNMS private boat and tournament recreational fishing expenditures ($)	Impact from GRNMS charter customer expenditures ($)	Total Economic Impact (loss) ($)
No Action	-		-
Southern Option Boundary (preferred alternative)	141,690	46,047	**187,737**
Optimal Scientific Option Boundary	1,030,476	335,339	**1,365,815**
Minimal User Displacement Option Boundary	161,978*	52,553	**214,531**
Compromise Option Boundary	542,288**	176,679	**718,967**

*Average of 4 boundary considerations in option (see Figure 24. Summary of Economic Analyses of Private Boat Fishing above)
**Average of 2 boundary considerations in option (see Figure 24. Summary of Economic Analyses of Private Boat Fishing above)

Table 9: Summary of Total Economic Impact (loss) to Fishing by Boundary and Fishing Alternatives

Fishing Alternative	Southern Option Boundary	Optimal Scientific Option Boundary	Minimal User Displacement Option Boundary	Compromise Option Boundary
Prohibit all fishing	**$187,737**	**$1,365,815**	**$214,531**	**$718,967**
Allow fishing for pelagic species*	**$141,690**	**$1,030,476**	**$161,978**	**$542,288**
Allow fishing for pelagic species during tournament**	**$64,866**	**$471,759**	**$74,155**	**$248,263**

*Assumes participants are private and tournament fishermen only; no charter fishing
**Assumes participants are tournament fishermen only (average of only tournament impacts from each of the boundary option tables); no private or charter fishing

E. Findings and Determinations

Under the NMSA the Secretary of Commerce may designate an area as a national marine sanctuary and promulgate regulations implementing the designation if the Secretary makes a set of determinations and findings and has considered factors and conducted consultations described in the NMSA (16 U.S.C. 1433(a) and (b)). Although GRNMS was designated in 1981, the NMSA states that terms of designation may be modified only by the same procedures by which the original designation was made. Because this action includes revisions to the GRNMS terms of designation (see summary below), relevant determinations and findings based on required factors and consultations are described here. In addition, NEPA requires that the ONMS explain how the action and regulations described in this document relate to existing law and executive orders. This Appendix meets these NMSA and NEPA requirements by describing the consultations, making determinations and findings and considering factors, and discussing the relation of the action to existing laws and executive orders.

Summary of Changes to GRNMS Terms of Designation
NOAA is changing the scope of regulation in the terms of designation for GRNMS. NOAA has the authority to regulate sanctuary activities only if they are included in the sanctuary scope of regulation. Changes authorize regulation of diving, which is currently not included in the scope of regulation. In addition, "injuring, catching, harvesting, or collecting any marine organism or any part thereof, living or dead, or attempting any of these activities, by any means except by use of rod and reel and handline gear" are currently activities NOAA is authorized to regulate. This list of items, however, is changed by removing "by any means except by use of rod and reel and handline gear." This alteration would allow a protected (no take) research area to be established in GRNMS. No other terms of designation are changed.

Consultations under the NMSA
Under section 303(b)(2) of the NMSA, the ONMS is required to conduct a series of consultations with Congress, federal and state agencies, and other interested parties. Per this requirement, consultation letters were sent in April 2008 to the following:

- Department of Defense;
- Department of Energy;
- Department of the Interior;
- U.S. Fish & Wildlife Service Southeast Region;
- Minerals Management Service;
- Department of State;
- Department of Transportation;
- Environmental Protection Agency;
- NOAA Fisheries;
- South Atlantic Fishery Management Council;
- Atlantic States Marine Fisheries Commission;
- U.S. Coast Guard;

- U.S. Army Corps of Engineers;
- U.S. Navy;
- House of Representatives Resources Committee;
- Senate Committee on Commerce, Science, and Transportation;
- Members of Georgia's Congressional Delegation.

The comments and ideas received in response to the consultation letters were considered in the preparation of this EIS. The result of these consultations was also used to assist in making the findings and determinations described below.

The NMSA and other laws require an additional set of consultations after the DEIS is released for public review (September 2010). These additional consultations include:

- Section 7 Endangered Species Act consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (required by the Endangered Species Act);
- Essential Fish Habitat and Highly Migratory Species consultation with the National Marine Fisheries Service (required by the Magnuson-Stevens Act);
- Federal consistency consultation (determination) with Georgia's coastal zone management agency (required by the Coastal Zone Management Act); and
- National Historic Preservation Act Section106 consultation.

Responses that were received are included at the end of this Appendix.

NMSA and NEPA Findings and Determinations
A. Determinations Required Under Section 303(a) of the NMSA
1. The designation will fulfill the purposes and policies of the NMSA.
2. The area is of special national significance due to–
A. its conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or esthetic qualities;
B. the communities of living marine resources it harbors; or
C. its resource or human-use values.

These determinations and findings were made when GRNMS was designated in 1981 and are described in the 1980 Final Environmental Impact Statement (FEIS) (OCZM 1980) on pages 17 and 18. The addition of diving to the scope of regulation and the other changes to existing items in the scope of regulation described in the summary above are consistent with and further support the original determinations and findings.

The waters and submerged lands of the sanctuary and their associated marine organisms possess exceptional value in all categories (conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, and esthetic qualities). The changes will provide additional protection to bottom formations, the associated living resources, and historical resources within GRNMS as a result of a deeper understanding of the human impacts taking place in the sanctuary.

3. Existing State and Federal authorities are inadequate or should be supplemented to ensure coordinated and comprehensive conservation and management of the area, including resource protection, scientific research, and public education.

4. Designation of the area as a national marine sanctuary will facilitate the objectives stated in paragraph 3.
The original FEIS (OCZM 1980) found that existing statutes did not provide a comprehensive management mechanism for GRNMS. The changes to the scope of regulation in the terms of designation will allow designation of a protected research area in the sanctuary. The changes will also allow for a more comprehensive and coordinated management, enhancing scientific research and public education, of the living and non-living resources in GRNMS.

5. The area is of size and nature that will permit the comprehensive and coordinated conservation and management.
Changes to the scope of regulation in GRNMS terms of designation will not change the sanctuary's size.

B. Section 303(b)(1) of the NMSA (16 U.S.C. 1433(b)(1)) requires that the following factors be considered for purposes of determining if an area of the marine environment meets the standards set forth in section 303(a). Each factor is discussed below:

1. The area's natural resource and ecological qualities, including its contribution to biological productivity, maintenance of ecosystem structure, maintenance of ecologically or commercially important or threatened species or species assemblages, maintenance of critical habitat or endangered species, and the biogeographic representation of the site.

2. The area's historical, cultural, archaeological, or paleontological significance.
The exceptional natural and ecological qualities of GRNMS are described in the original FEIS (OCZM 1980) on pages 47-76. An updated description is provided in the 2006 GRNMS Final Revised Management Plan/FEIS (NMSP 2006), and a summary is provided in the Affected Environment section of this document. The proposal to establish a protected research area in GRNMS emphasizes recognition of the significance of the bottom formations, the associated living resources, and historical resources within the sanctuary.

3. The present and potential uses of the area that depend on maintenance of the area's resources, including commercial and recreational fishing, subsistence uses, other commercial and recreational activities, and research and education.

4. The present and potential activities that may adversely affect the factors identified in subparagraphs 1, 2, and 3.
A description of the human uses of the sanctuary and its surrounding areas is provided in the original FEIS (OCZM 1980) on pages 76-103. An updated description is provided in the GRNMS Final Revised Management Plan/FEIS (NMSP 2006), and a summary is provided in the Affection Environment section of this document. The changes to the scope of regulation in the terms of designation will allow for designation of a research area in the sanctuary

and increase the understanding of the impacts from human-induced and natural changes in the resources that support compatible uses of the sanctuary.

5. The existing State and Federal regulatory and management authorities applicable to the area and the adequacy of those authorities to fulfill the purposes of the NMSA.
The management authorities applicable to the sanctuary are described in the original FEIS (OCZM 1980) on pages 104-123l. An updated description is provided in the GRNMS Final Revised Management Plan/FEIS (NMSP 2006), and a summary is provided in the Affected Environment section of this document. Existing management authorities were considered in the Final Rule designating the Sanctuary in 1981 (46 FR 7942, 7943) and the additional protections and comprehensive management approach provided by the original and revised sanctuary management plan and regulations continue to apply.

6. The manageability of the area, including such factors as its size, its ability to be identified as a discrete ecological unit with definable boundaries, its accessibility, and its suitability for monitoring and enforcement activities.
The changes to the scope of regulation in the GRNMS terms of designation will not change the size of the sanctuary. The changes to the scope of regulation will allow designation of a protected research area. The research area, while eliminating a minimal amount of accessibility, is expected to enhance management of the sanctuary with needed information on impacts of human-induced and natural changes. The sanctuary will continue to be identified as a discrete ecological unit with definable boundaries as was determined in the original FEIS (OCZM 1980) and the Revised GRNMS Management Plan (NMSP 2006).

7. The public benefits to be derived from sanctuary status, with emphasis on the benefits of long-term protection of nationally significant resources, vital habitats, and resources which generate tourism.
The public benefits from sanctuary status were described in the original FEIS (OCZM 1980) and final rule designating the Sanctuary and reaffirmed in the GRNMS Final Revised Management Plan/FEIS (NMSP 2006). The changes to the terms of designation by this FEIS will enhance public benefits by allowing for increased research and education capabilities and continued protection for sanctuary resources.

8. The negative impacts produced by management restrictions on income-generating activities such as living and nonliving resources development.

9. The socioeconomic effects of sanctuary designation.
An analysis of the socioeconomic impacts of the changes to the terms of designation by this FEIS is included in the Environmental Consequences Section and as Appendix D. The impacts are also analyzed in the Final Regulatory Flexibility Analysis included in the final rule. The socioeconomic analysis concludes that impacts of the changes will be minimal.

10. The area's scientific value and value for monitoring the resources and natural processes that occur there.
The area's scientific value and value for monitoring the resources and natural processes are described in the original FEIS (OCZM 1980) and reaffirmed in the GRNMS Final Revised

Management Plan/FEIS (NMSP 2006). The changes in the scope of regulation in the GRNMS terms of designation will greatly enhance the sanctuary's scientific and monitoring value by allowing designation of a control area (protected research area).

11. The feasibility, where appropriate, of employing innovative management approaches to protect sanctuary resources or to manage compatible uses.
The changes to the terms of designation represent an appropriate mechanism to manage and protect sanctuary resources by establishing a needed control area (protected research area) for scientific purposes that does not now exist.

12. The value of the area as an addition to the System.
The Sanctuary has already been a part of the National Marine Sanctuary System since 1981.

C. Resource Assessment
1. Present and potential uses of the area, including commercial and recreational fishing, research and education, minerals and energy development, subsistence uses, and other commercial, governmental, or recreational uses.
A full description of the current and potential uses of the area can be found in the Affected Environment section of the GRNMS Final Revised Management Plan/FEIS (NMSP 2006) and the Affected Environment section of this FEIS.

2. Any commercial, governmental, or recreational resource uses in the areas that are subject to the primary jurisdiction of the Department of the Interior.
The Department of the Interior has been contacted and responded with several recommendations, which are addressed in the FEIS in Section IV (Affected Environment) and listed in Appendix F.

3. Information prepared in consultation with the Secretary of Defense, the Secretary of Energy, and the Administrator of the Environmental Protection Agency, on any past, present, or proposed future disposal or discharge of materials in the vicinity of the proposed sanctuary
As noted above, these three agencies were consulted. NOAA GRNMS is not aware of any disposal or discharge areas designated by these agencies that are within the vicinity of the sanctuary.

Relation to Existing Laws and Executive Orders
NEPA requires that a discussion of the relation of the action to other existing laws and executive orders be included. The relation of this action to other legal requirements is discussed as follows:

Coastal Zone Management Act (CZMA)
The CZMA creates a partnership between the Federal and State governments that allows States to develop coastal zone management programs within a set of Federal guidelines but tailored to their individual needs. The act also requires that each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner that is, to the maximum extent practicable,

consistent with the enforceable policies of the Federally-approved state coastal zone management program.

Although GRNMS is located outside State waters, sanctuary staff works closely with the Georgia Department of Natural Resources, which houses the Coastal Resources Division. NOAA consulted with the State of Georgia on the federal consistency of this action with the Georgia Coastal Zone Management Program.

Magnuson-Steven Fishery Conservation and Management Act (MSFCMA)

The MSFCMA governs the management and conservation of fisheries in Federal waters of the United States and created the South Atlantic Fishery Management Council (SAFMC), along with seven other regional councils. The ONMS works closely with the SAFMC and NOAA Fisheries Service, through the provisions of a Memorandum of Understanding (NMSP 2006).

This act requires Federal agencies to consult with NOAA Fisheries Service regarding any agency action they authorize (e.g., issue permits for), fund, or undertake, that may adversely affect essential fish habitat (EFH) or Highly Migratory Species (HMS). The ONMS consulted with NOAA Fisheries Service on the impact of the action on EFH and HMS.

National Historic Preservation Act (NHPA)

The NHPA was enacted to help protect and preserve the historic heritage of the U.S. Section 106 of the NHPA requires that Federal agencies take into account the effects of their activities and programs on historic properties (which are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places) by providing the Advisory Council on Historic Preservation with the opportunity to comment on actions. The ONMS consulted with the Advisory Council on Historic Preservation on the impact of the action on any historic or cultural resource in the sanctuary.

Endangered Species Act (ESA)

NOAA's Fisheries Service and the FWS share responsibility for implementing the ESA. The ESA provides for informal consultation to take place between the U.S. Fish & Wildlife Service (FWS) and NMFS and Federal agencies to assist the Federal agency in determining whether formal consultation or a conference is required. The ONMS has determined that the proposed action will not adversely affect marine listed species or critical habitat. The ONMS consulted with the FWS and NMFS with the determination that the proposed action will not adversely affect listed species or critical habitat.

Regulatory Flexibility Act (RFA)

The Regulatory Flexibility Act requires Federal agencies to consider the effects of their regulatory actions on small businesses and other small entities, and to minimize any undue disproportionate burden. If the regulations will have a significant economic impact on a substantial number of small businesses, then a sanctuary will have to prepare an initial regulatory flexibility analysis (IRFA). The IRFA was included in the proposed rule. A final

regulatory flexibility analyses (FRFA) is contained in the final rule. The FRFA concludes that the action will have no significant socioeconomic impacts.

Executive Order 12866 Cost-Benefit Analysis

Under Executive Order 12866, if a rule is determined to be significant, then a socioeconomic impact study (i.e., assessment of the costs and benefits of the regulatory action) must be conducted. Under 12866 a regulatory action is significant if the rule may:

- have an annual effect on the economy of $100 million or more or adversely affecting in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;
- create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- materially alter the budgetary impacts of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients thereof; or
- raises novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

NOAA has concluded that the final rule analyzed in this FEIS is not significant under E.O. 12866. The Office of Management and Budget has concurred with this conclusion.

Executive Order 13132 Federalism

Under Executive Order 13132, each agency must consult, to the extent practicable and permitted by law, with State and local officials early in the process of developing regulations. These consultations should seek comment on the compliance costs or preemption, as appropriate to the nature of the rulemaking under development.

When an agency submits a draft final regulation to OMB for review under Executive Order 12866 prior to promulgation of the final regulation, the agency must include a separately identified portion of the preamble to the regulation as a "federalism summary impact statement" that must include:

- a description of the extent of the agency's prior consultation with State and local officials;
- a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation; and
- a statement of the extent to which the concerns of State and local concerns have been met.

The ONMS has worked closely with partner agencies within the State of Georgia and the Federal government in the development of this FEIS. In 1999, GRNMS established a Sanctuary Advisory Council, which includes a broad range of representation from federal, state and private interests. Advisory Council members assisted with development of the FEIS, including public workshops conducted to explore the concept of a research area in GRNMS and to design such an area. The State of Georgia, the primary state agency affected by management of GRNMS, was consulted throughout the process of exploring the concept and designation of a protected research area in the sanctuary. The State of Georgia is also represented on the SAFMC, which has been consulted formally and informally throughout

the process. As noted above, the ONMS works closely with the SAFMC and NOAA Fisheries Service through provisions of the MOU provided in Appendix J. Deliberations with the State of Georgia are also specifically outlined in the MOU.

Responses from other agencies to consultation letters follow.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5511
(727)824-5317; FAX (727) 824-5300
http://sero.nmfs.noaa.gov/

October 6, 2010 F/SER4:DD

MEMORANDUM FOR: George Sedberry
Superintendent, Gray's Reef National Marine Sanctuary

FROM: Miles M. Croom
ARA, Habitat Conservation Division

SUBJECT: Essential Fish Habitat (EFH) Review of a Proposed Rule to Designate a Protected Research Area in Gray's Reef National Marine Sanctuary

This responds to your September 29, 2010, memorandum requesting an EFH review of the subject action. The proposed rule would prohibit fishing and diving in the designated research area located in the southern third of the sanctuary.

As specified in the Magnuson-Stevens Fishery Conservation and Management Act, EFH consultation is required for federal actions which may adversely affect EFH. However, as the federal action agency in this matter, the Gray's Reef National Marine Sanctuary has determined that the proposed action would not adversely affect EFH and, based on our review, we agree with your determination. Please be advised that further consultation on this matter is not necessary unless future modifications are proposed and you believe that resulting action may result in adverse impacts to EFH.

cc: F/SER47 - Wilber
F/HC - Lederhouse
File

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

ER 10/773
9043.1

March 1, 2011

Mr. George Sedberry
Superintendent, Gray's Reef National Marine Sanctuary
Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration
10 Ocean Science Circle
Savannah, GA 31411

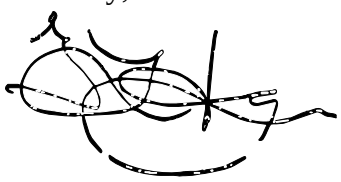
Re: Comments on the Review of the Draft Environmental Impact Statement (DEIS) for the Gray's Reef National Marine Sanctuary Research Areas Designation

Dear Mr. Sedberry:

The Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the Gray's Reef National Marine Sanctuary Research Areas Designation Project. We have no comments at this time.

If you have questions or need additional information, I can be reached on (404) 331-4524 or via email at gregory_hogue@ios.doi.gov.

Sincerely,



Gregory Hogue
Regional Environmental Officer

cc:
Jerry Ziewitz – FWS
David Vela – NPS
Brenda Johnson – USGS
OEPC - WASH

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION

CHRIS CLARK
COMMISSIONER

DR. DAVID CRASS
DIVISION DIRECTOR

MEMORANDUM

TO: George Sedberry
Superintendent
United States Department of Commerce
National Oceanic and Atmospheric Administration
Grey's Reef National Marine Sanctuary
10 Ocean Science Circle
Savannah, Georgia 31411
Attn: Becky Shortland

FROM: Elizabeth Shirk
Environmental Review Coordinator
Historic Preservation Division

RE: Finding of "No Historic Properties Affected"

PROJECT: **GRNMS: Sanctuary Research Area Designation, Off Sapelo Island**
Federal Agency: NOAA
HP-101001-015

COUNTY: McIntosh

DATE: October 12, 2010

The Historic Preservation Division (HPD) has reviewed the information received concerning the above-referenced project. Our comments are offered to assist federal agencies and their project applicants in complying with the provisions of Section 106 of the National Historic Preservation Act, as amended.

Based on the information submitted, HPD has determined that no historic properties or archaeological resources that are listed in or eligible for listing in the National Register of Historic Places will be affected by this undertaking. Please note that historic and/or archaeological resources may be located within the project's area of potential effect (APE), however, at this time it has been determined that they will not be impacted by the above-referenced project. Furthermore, any changes to this project as proposed will require further review by our office for compliance with Section 106.

If we may be of further assistance, please do not hesitate to contact Elizabeth Shirk, Environmental Review Coordinator, at (404) 651-6624. Please refer to the project number assigned above in any future correspondence regarding this project.

ES:ebp

cc: Jason Kotarski, Coastal Georgia Regional Commission
Chris McCabe, Deputy State Archaeologist, Underwater

F. Relationship to Other Legal Requirements

Executive Order 12962: Recreational Fisheries

The final rule has been determined not to be significant within the meaning of Executive Order 12962 because, while the outcome of the action is expected to advance and foster sound marine resource conservation, the immediate outcome is not likely to enhance recreational fishing opportunities.

Executive Order 13112: Invasive Species

The final rule is likely to support the agency in meeting the mandates of E.O. 13112 because increased scientific activity it GRNMS due to a designated research (control) area will likely lead to early detection and rapid response to invasive species such as invasive lionfish. Other species, whose eradication is unlikely to be feasible, such as the orange cup coral, can be monitored more reliably.

Executive Order 13158: Marine Protected Areas

The final rule is likely to support the agency in meeting the mandates of E.O. 13158 because the increased monitoring and scientific activity in GRNMS should lead to a strengthening of the management and protection of the sanctuary as a marine protected area. GRNMS is included in the national system of MPAs as established by this E.O.

Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds

The final rule has been determined not to be significant within the meaning of Executive Order 13186 because the action is not expected to result in negative effects on migratory bird populations. The action is expected to contribute to some extent to the intent of E.O. 13186 by providing an area of the marine environment that is relatively free from human impact.

Executive Order 13449: Protection of Striped Bass and Red Drum Fish Populations

The final rule is likely to support the agency in meeting the mandates of E.O. 13449 because the designation of a research area will greatly reduce direct human impacts on the resources of GRNMS, including red drum fish populations. Red drum are occasionally observed in the sanctuary during winter months.

G. Response to Public Comments

National Environmental Policy Act

When changing a term of designation of a national marine sanctuary, section 304 of the NMSA (16 U.S.C. 1434) requires the preparation of a draft environmental impact statement (DEIS), as provided by the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and that the DEIS be made available to the public. The DEIS was released on September 10, 2010 (75 FR 55326). The public comment period ended on December 13, 2010.

During the public comment period, eight (8) written comments were received through the eRulemaking Portal http://www.regulations.gov. Three (3) public hearings were also held to receive comment, but no members of the public attended. The written comments were compiled and grouped by general topics. Substantive comments are summarized below, followed by NOAA's response. Similar comments have been treated as one comment for purposes of response resulting in 16 different comments with responses.

Comment 1: Several commenters expressed support for the establishment of a research area in GRNMS.
Response: Comment noted.

Comment 2: The Southern Option Boundary represents minimal impact to members of the general public who wish to visit and use the sanctuary.
Response: NOAA agrees that the preferred alternative Southern Option Boundary would result in minimal impact to visitors. In addition, all bottom types are included in the Southern Option Boundary and there would be more than adequate ledge and other habitat types outside the boundary for necessary comparisons and to provide areas for activities such as recreational fishing and diving. In fact, the areas outside of the Southern Option Boundary appear to be the preferred fishing and diving locations for users.

Comment 3: The Optimal Scientific Option Boundary would be a better boundary choice for the research area because it includes the existing long-term monitoring site and data buoy. If the existing monitoring equipment were included within the boundaries, valuable scientific analysis could occur immediately without costly delays.
Response: NOAA agrees that the Optimal Scientific Option Boundary would offer multiple benefits toward realizing the purpose of a research area as this boundary was designed based solely on scientific research considerations. Although inclusion of the long-term monitoring site and the data buoy was initially preferred inside the boundary of a research area due to the available data sets for both, further consideration by the RAWG and Advisory Council resulted in a different conclusion. Maintaining the status quo of the long-term monitoring site (outside the research area) allows continuation of the baseline of conditions, avoiding the need to establish a new monitoring station outside of the research area. Further, because the data buoy collects oceanographic variables that are basically uniform at the scale of the whole sanctuary, the buoy does not need to be inside the

research area. NOAA agrees with that conclusion. In addition, the Optimal Scientific Option Boundary does not satisfy NOAA's selection criteria to minimize user displacement; it would have the highest level of displacement (67 percent). The Optimal Scientific Option Boundary also creates open areas of the sanctuary on all sides resulting in compliance and enforcement complications.

Comment 4: In choosing the Southern Option Boundary NOAA has overestimated the socioeconomic costs and underestimated the numerous benefits of the Optimal Scientific Option Boundary that includes the long-term monitoring site and data buoy. Socioeconomic impacts to the sanctuary should be analyzed within the broader scope of fishing expenditures in Georgia as a whole. For instance, 2006 saltwater fishing expenditures in Georgia totaled $119,250,000; therefore, the Optimal Scientific Option Boundary would impact only 0.86% of Georgia fishing expenditures compared to 0.13% for the Southern Option Boundary.
Response: NOAA agrees that from the perspective of total fishing expenditures in Georgia, the potential economic loss from fishing displacement is quite small. NOAA, however, considered the population of users most affected by this action, and thus, analyzed the environmental (economic) consequences using GRNMS fishing expenditures instead of Georgia-wide fishing expenditures. See response to comment #3 above.

Comment 5: I support the Optimal Scientific Option Boundary. Studies have shown that restoration of fish populations in "no take" areas actually leads to increased fish catches outside of the protected area due to "spillover" effects. This effect could generate positive economic impacts in Georgia that would mitigate losses due to user displacement from establishment of a research area using the Optimal Scientific Option Boundary.
Response: Although the primary goal of the research area is not to increase fish populations for harvest, NOAA agrees that "spillover" effects may be a result of no fishing in the proposed research area. NOAA also agrees that this may mitigate some of the economic impacts of the research area, regardless of which boundary option is selected. However, NOAA believes that the benefits of lower displacement and expected compliance and enforcement benefits if the research area is located at a distance from heavily fished areas outweigh the benefits of the Optimal Scientific Option Boundary. Also see responses to comments #3 and #4 above.

Comment 6: A third of the sanctuary is an excessive area to set aside for academic studies.
Response: The primary site selection criterion for a research area was an area that included bottom features representative of the sanctuary as a whole, with a minimum of 20 percent densely-colonized ledge habitat including small, medium and tall ledges. The RAWG also determined that while ledge habitat is the highest priority in terms of research interest, sufficient amounts of the other three habitat types (flat sand, rippled sand, and sparsely-colonized ledge habitat) are necessary to replicate the diversity of sanctuary habitats in a research area. The size of the Southern Option Boundary is based on the minimum of this criterion. A smaller boundary size for this option would result in insufficient habitat diversity.

Comment 7: The most important use of the sanctuary is recreation, not research. Therefore, recreation opportunities at Gray's Reef should not be restricted in order to further research objectives.
Response: The protection of the natural and cultural resources of sanctuaries is NOAA's primary objective under the NMSA. GRNMS was designated in 1981 as a national marine sanctuary in part for its unique marine ecosystem, which was determined to be of national significance due to its natural resource and ecological qualities, maintenance of ecosystem structure, and biological productivity as well as its recreational and commercial value. NOAA has determined that fully meeting its resource protection mandate requires being able to answer significant questions about the impacts of human use on sanctuary resources, which cannot be done without a control (research) area for scientific studies.
Comment 8: Preserving the reef, which is one of the largest of the unique live bottom reefs in the southeastern U.S., presents greater benefits than protecting fishing operations.
Response: See response to comments #6 and #7 above and #9 below.

Comment 9 (Marine Mammal Commission (MMC)): Adopt the proposed rule to establish a research area within the GRNMS and prohibit fishing, diving, and stopping while transiting the area. Encourage research to assess the localized effects of removing fishing and other human activities on the size, distribution, abundance, and reproduction of economically important fish and shellfish within and outside the research area.
Response: The purpose of a research area would be to increase the opportunity to discriminate scientifically between natural and human-induced change to species populations in the sanctuary. The research area would also allow researchers to more accurately determine the effects of natural events (e.g., hurricanes) and to study impacts of climate change, including ocean acidification, which can be better determined in the absence of additional factors like fishing and diving.
Comment 10 (MMC): The sanctuary provides habitat for Atlantic spotted and bottlenose dolphins, the latter of which are designated as depleted under the Marine Mammal Protection Act. The proposed research area also may provide opportunities to advance scientific understanding and management of those dolphins. NOAA should encourage researchers in the GRNMS to record information on bottlenose dolphins that occur in this area and thereby provide a stronger basis for their management and conservation. Such information might include where and when dolphins are sighted, group size, behavior, and collection of tissue samples from dead animals for genetic analysis. Such activities should be coordinated with the National Marine Fisheries Service to ensure that they are permitted appropriately.
Response: NOAA agrees that the proposed research area might be used to collect data on bottlenose dolphin presence/absence, group size and behavior. Very few bottlenose dolphins are seen in GRNMS and the occurrence of a dead animal has never been recorded in the sanctuary. NOAA will work with the MMC to better understand data collection needs to benefit marine mammal research. Furthermore, activities related to marine mammals would be coordinated with and, as necessary, permitted by the National Marine Fisheries Service.

Comment 11: Support curtailment of human activities that are necessary to carry out studies in the GRNMS proposed research area. Ban all fishing gear of any type in this area.

Response: NOAA agrees that without having an area of the naturally-occurring live bottom devoted to research and devoid of direct human impacts, it is very difficult to scientifically understand how live bottom reefs, including GRNMS, function.

Comment 12: I support keeping all fishing and research out of this area and keep it closed to all boats.
Response: While fishing will be restricted in the research area, the purpose of a research area allows research to be conducted within that area. This will result in vessels operating in the research area to support scientific and working divers, and vessels may transit the area without stopping.

Comment 13 (U.S. Environmental Protection Agency (EPA)): EPA supports the proposed designation of a research site within GRNMS. Habitat needs should be emphasized as the primary criteria and displacement of users as secondary in selecting the site.
Response: NOAA agrees that habitat needs should be the primary site selection criteria for a research area. In fact, the RAWG determined, and recommended to the advisory council early in deliberations, that the primary site selection criterion for a research area was an area that included bottom features representative of the sanctuary as a whole, with a minimum of 20 percent densely-colonized ledge habitat including small, medium and tall ledges. The RAWG also determined, and recommended to the advisory council, that while ledge habitat is the highest priority in terms of research interest, sufficient amounts of the other three habitat types (flat sand, rippled sand, and sparsely-colonized ledge habitat) are necessary to replicate the diversity of sanctuary habitats in a research area.

Comment 14 (U.S. EPA): In order to eliminate or minimize confounding parameters, the research area should prohibit all fishing and diving and consider prohibiting boat traffic (except for emergencies and study access). Eliminating boat traffic other than research vessels would also minimize potential water quality impacts. Attempts should also be made to locate and configure the site so that boaters can reasonably circumvent it.
Response: NOAA's preferred alternatives for human activities includes the prohibition of fishing and diving. Throughout the process to develop the concept of a research area and specific boundaries in GRNMS, NOAA sought ways to minimize impacts on users of the sanctuary. Thousands of locations and configurations were considered and refined by consensus criterion down to the four boundary options analyzed in the draft and final environmental impact statement. NOAA considered a "no entry" alternative whereby boaters would be prohibited from entering the research area. While this alternative would simplify law enforcement, it could increase fuel and other costs to boaters, and would not offer environmental benefits that outweigh the costs. Therefore, NOAA did not choose this alternative.

Comment 15 (U.S. EPA): The site boundaries should conform to some of the sanctuary boundaries by having some common sides with the sanctuary (to simplify enforcement and minimize the need for boundary marker buoys, which may attract fish and bias the studies).
Response: NOAA agrees that compliance and enforcement would be enhanced if the research area boundaries were common with sanctuary boundaries. In fact, one of the

reasons the Southern Option Boundary is preferred is because three sides of the research area will be contiguous with existing boundaries of the sanctuary. GRNMS boundaries have been in place for 30 years and most boaters in the area would be familiar with the sanctuary and its location, facilitating compliance.

H. Revised Terms of Designation

Section 304(a)(4) of the NMSA requires that the terms of designation include the geographic area included within the Sanctuary; the characteristics of the area that give it conservation, recreational, ecological, historical, research, educational, or aesthetic value; and the types of activities subject to regulation by the Secretary to protect these characteristics. Section 304(a)(4) also specifies that the terms of designation may be modified only by the same procedures by which the original designation was made. To implement this action, the GRNMS Designation Document, revised and published in the Federal Register on October 12, 2006 (74 FR 60055), is modified to read as follows (new text in bold and deleted text in strikethrough text):

Preamble

Under the Authority of Title III of the Marine Protection, Research and Sanctuaries Act of 1972, as amended, (the Act), the waters and the submerged lands thereunder at Gray's Reef in the South Atlantic Bight off the coast of Georgia are hereby designated a National Marine Sanctuary for the purposes of: (1) protecting the quality of this unique and fragile ecological community; (2) promoting scientific understanding of this live bottom ecosystem; and (3) enhancing public awareness and wise use of this significant regional resource.

Article 1. Designation and Effect

The Gray's Reef National Marine Sanctuary was designated on January 16, 1981 (46 FR 7942). The Act authorizes the Secretary of Commerce to issue such regulations as are necessary and reasonable to implement the designation, including managing and protecting the conservation, recreational, ecological, historical, scientific, educational, cultural, archaeological or aesthetic resources and qualities of a national marine sanctuary. Section 1 of Article 4 of this Designation Document lists activities of the type that are presently being regulated or may need to be regulated in the future, in order to protect sanctuary resources and qualities. Listing in Section 1 does not mean a type of activity would be regulated in the future, however, if a type of activity is not listed, it may not be regulated, except on an emergency basis, unless section 1 is amended, following the procedures for designation of a sanctuary set forth in the Act, to include the type of activity.

Nothing in this Designation Document is intended to restrict activities that do not cause an adverse effect on the resources or qualities of the sanctuary or on sanctuary property or that do not pose a threat of harm to users of the sanctuary.

Article 2. Description of the Area
The sanctuary consists of an area of ocean waters and the submerged lands thereunder located 16 miles due east of Sapelo Island, Georgia. The exact coordinates are defined by regulation (15 CFR § 922.90).

Article 3. Characteristics of the Area
The sanctuary consists of submerged calcareous sandstone rock reefs with contiguous shallow-buried hard layer and soft sedimentary regime which supports rich and diverse marine plants, invertebrates, finfish, turtles, and occasional marine mammals in an otherwise sparsely populated expanse of ocean seabed. The area attracts multiple human uses, including recreational fishing and diving, scientific research, and educational activities.

Article 4. Scope of Regulation
Section 1. Activities Subject to Regulation.

The following activities are subject to regulation under the NMSA, either throughout the entire sanctuary or within identified portions of it or, as indicated, in areas beyond the boundary of the sanctuary, to the extent necessary and reasonable. Such regulation may include prohibitions to ensure the protection and management of the conservation, recreational, ecological, historical, scientific, educational, cultural, archaeological or aesthetic resources and qualities of the area. Because an activity is listed here does not mean that such activity is being or would be regulated. All listing means is that the activity can be regulated, after compliance with all applicable regulatory laws, without going through the designation procedures required by paragraphs (a) and (b) of section 304 of the NMSA (16 U.S.C. 1434(a) and (b)).

1. Dredging, drilling into, or otherwise altering the submerged lands of the sanctuary;

2. Within the boundary of the sanctuary, discharging or depositing any material or other matter or constructing, placing, or abandoning any structure, material or other matter; or discharging or depositing any material or other matter outside the boundary of the sanctuary that enters and injures a sanctuary resource or quality;

3. Vessel operations, including anchoring;

4. Injuring, catching, harvesting, or collecting any marine organism or any part thereof, living or dead, or attempting any of these activities~~;, by any means except by use of rod and reel, and handline gear;~~

5. Diving;

6. Possessing fishing gear that is not allowed to be used in the sanctuary;

7. Using explosives, or devices that produce electric charges underwater; and

8. Moving, removing, injuring, or possessing historical resources.

Section 2. Emergency Regulation
Where necessary to prevent or minimize the destruction of, loss of, or injury to a sanctuary resource or quality; or to minimize the imminent risk of such destruction, loss or injury,

any activity, including any not listed in Section 1 of this article, is subject to immediate temporary regulation, including prohibition.

Article 5. Relation to Other Regulatory Programs
Section 1. Defense Activities. The regulation of activities listed in Article 4 shall not prohibit any Department of Defense activity that is essential for national defense or because of emergency. Such activities shall be consistent with the regulations to the maximum extent practical.

Section 2. Other Programs. All applicable regulatory programs will remain in effect, and all permits, licenses and other authorizations issued pursuant thereto shall be valid within the sanctuary unless authorizing any activity prohibited by a regulation implementing Article 4.

Article 6. Alteration of this Designation
The terms of designation, as defined in paragraph (a) of section 304 of the Act (16 U.S.C. 1434(a)) may be modified only by the procedures outlined in paragraphs (a) and (b) of section 304 of the Act (16 U.S.C. 1434(a) and (b)) including public hearings, consultation with interested federal, state, and local government agencies, the South Atlantic Fishery Management Council, review by the appropriate Congressional committees, and approval by the Secretary of Commerce, or his or her designee.

I. List of Preparers

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- Dr. Clark Alexander, non-living resources research
- Ms. Venetia Butler, K-12 education
- Ms. Kellie Parr, sport diving
- Ms. Mary Conley, regional conservation
- Capt. Wendell Harper, charter/commercial fishing
- Dr. Danny Gleason, living resources research
- Dr. Scott Harris, university education
- Tim Tarver, sport fishing
- Capt. Doug Lewis, GADNR law enforcement
- LT Brandon Fisher, USCG
- Mr. Spud Woodward, GADNR CRD
- Dorset Hurley, Sapelo Island NERR
- Al Samuels, NOAA OLE
- Georgia conservation seat, vacant

K. Memorandum of Understanding with SAFMC and NOAA Fisheries

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

AND

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

THROUGH

THE NATIONAL OCEAN SERVICE
OFFICE OF NATIONAL MARINE SANCTUARIES

AND

THE NATIONAL MARINE FISHERIES SERVICE
SOUTHEAST REGION

NOS Agreement Number: MOA-2001-664
(as amended December 2004)

I. PURPOSE

The purposes of this Memorandum of Understanding (MOU) are: (1) to provide a framework for cooperation and coordination between the South Atlantic Fishery Management Council (SAFMC), Gray's Reef National Marine Sanctuary (GRNMS), and the National Marine Fisheries Service, Southeast Region (NMFS/SER) within the SAFMC's area of geographic authority; (2) to facilitate the exchange of information, advice and technical assistance between GRNMS, SAFMC and NMFS/SER; and (3) to coordinate their efforts concerning public outreach.

II. AUTHORITIES

This MOU is entered into by and between the Office of National Marine Sanctuaries (ONMS), National Ocean Service, NOAA; the NMFS/SER, NOAA; and the SAFMC (the "Parties"), pursuant to Sections 309 and 311 of the National Marine Sanctuaries Act, as amended, 16 U.S.C. 1440 and 1442 of 16 U.S.C. 1431, et seq. (NMSA or the Act), and the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801, et seq.

III. BACKGROUND

A. GRNMS - Gray's Reef was designated as a National Marine Sanctuary in 1981, due to its significance as a live-bottom habitat and the diversity of marine life. National marine sanctuaries are established to protect areas of the marine environment that have special conservation, recreational, ecological, historical, cultural, archaeological, scientific, educational, and aesthetic qualities. In accordance with the National Marine Sanctuaries Act, each sanctuary is managed to maintain natural biological communities, enhance public awareness, support research and monitoring, and facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities.

B. SAFMC - The South Atlantic Fishery Management Council is responsible for the conservation and management of fish stocks within the Federal 200-mile limit exclusive economic zone of the Atlantic Ocean off the coast of North Carolina, South Carolina, Georgia, and east Florida to Key West. In addition, the Council must describe and protect essential fish habitat (EFH) and essential fish habitat-habitat areas of particular concern (EFH-HAPC), as well as address an ecosystem management approach.

C. NMFS/SER - The National Marine Fisheries Service is dedicated to protecting and preserving our nation's living marine resources through scientific research, fisheries, management, enforcement, and habitat conservation. The NMFS/SER provides administrative and technical support to the SAFMC and works in partnership with the SAFMC to manage marine fisheries.

IV. GOALS

A. To exchange information, advice, and technical assistance, and to improve public outreach.

B. To involve the public in discussions and evaluations regarding management of specific marine areas.

C. To ensure that the public is well informed of the work and policy decisions of the SAFMC, GRNMS, and NMFS/SER.

D. To consult and cooperate fully with each other in matters regarding the conservation and management of natural resources of mutual concern and geographic authority. The consultations and cooperation shall take the form of participation in and presentations to the various committees, advisory panels, and working groups of each of the parties, and exchange of documents, viewpoints, recommendations, advice, and other pertinent information between the SAFMC, GRNMS and NMFS/SER. This consultation and cooperation should occur prior to implementation of regulatory changes affecting any of the parties.

E. To protect the ecological integrity of Gray's Reef and its biotic communities and their associated habitats for the benefit of current and future generations.

F. To contribute to the conservation and management offish, the protection of EFH, EFH-HAPCs, and ecosystem management within the South Atlantic Region.

V. COMMITMENTS OF THE PARTIES

SAFMC, ONMS, and NMFS/SER hereby affirm their mutual understanding and agree to use their efforts to take the following steps:

A. To carry out their mutual intent to discuss and evaluate management and regulation of specific marine areas.

B. To work together to coordinate current and future discussion, evaluation, and informational activities through cooperative planning.

C. To ensure that the public and constituent groups of all three organizations participate fully in the activities of the SAFMC, GRNMS, and NMFS/SER.

D. To share research and information that contribute to the above goals.

E. To request and respond to requests for input from each other in a timely and cooperative manner as required by or consistent with applicable laws, regulations and policies.

F. Specific matters for coordination may include but are not limited to:

1. Review, revision, and implementation of Gray's Reef National Marine Sanctuary Management Plan.
2. Consideration, development, and review of Fishery Management Plans related to GRNMS.
3. Research and education initiatives that further the goals and missions of the SAFMC, GRNMS and NMFS/SER.
4. Technical assistance regarding fisheries management (including fishing techniques, presence/abundance of fish species), protected species, habitat types and conditions, and socioeconomic issues and enforcement, related to GRNMS.

G. Regarding fishing regulations for the Sanctuary, GRNMS is required to follow the provisions of section 304(a)(5) of the NMSA, (16 U.S.C. 1434(a)(5)). The process described in section 304(a)(5) is summarized, in part, here:

1. SAFMC will have the opportunity to draft Sanctuary fishing regulations for GRNMS. Regulations drafted by SAFMC, or a determination by SAFMC that regulations are not necessary, will be accepted and shall be issued as the proposed regulations for GRNMS unless the Secretary of Commerce finds that SAFMC's action does not fulfill the purposes and policies of the NMSA and the objectives

of the designation of GRNMS. In that event, the Secretary will draft the fishing regulations.

2. GRNMS will also consult with the State of Georgia regarding fishing regulations proposed by GRNMS for the Sanctuary and shall consider the views and comments of the State of Georgia before issuing final fishing regulations. As part of this process, GRNMS will meet with representatives from the State of Georgia to discuss draft fishing regulations prior to issuance of final fishing regulations. GRNMS will also coordinate with the Georgia Coastal Management Program pursuant to the Federal consistency requirement under § 307 of the Coastal Zone Management Act (16 U.S.C. 1456) and implementing NOAA regulations.

VI. TECHNICAL POINTS OF CONTACT

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(727) 570-5301

VII. OTHER PROVISIONS

A. Nothing herein is intended to conflict with any requirement of any Federal law or with any Federal, council, or Department of Commerce/NOAA regulation, policy, administrative order, or directive. If terms of this MOU are deemed to be inconsistent with the policies or programs of any party hereto, then those specific terms shall be deemed not binding on that party.

B. The responsibilities agreed to in this MOU are contingent upon the availability of funding and other necessary resources. The signature of agency officials on this MOU does not legally obligate their respective agencies to provide personnel or funds for planning or coordination unless specifically agreed to in subsequent obligatory documents.

C. This MOU will become effective upon the last date of the signatures of the approving officials of the parties and will remain in effect until terminated by written notice from any party. Any party to this MOU may terminate its involvement upon 90 days written notice to the other parties.

D. The Parties will review this Agreement at least once every three years to determine whether it should be revised or canceled. Any revision or amendment to this MOU may be made upon approval of all of the parties.

E. This MOU does not affect the confidentiality provisions of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1881a).

APPROVALS

ACCEPTED AND APPROVED FOR THE
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

BY: _____
Daniel J. Basta
Director
National Marine Sanctuary Program

DATE: NOV 2 5 2004

ACCEPTED AND APPROVED FOR THE
SOUTH ATLANTIC FISHERY
MANAGEMENT COUNCIL

BY: _____
Dr. Louis Daniel
Council Chairman

DATE: 12/9/04

BY: _____
Reed Bohne
Manager
Gray's Reef National Marine Sanctuary

DATE: 11/29/04

ACCEPTED AND APPROVED FOR THE
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHEAST REGION

BY: _____
Roy Crabtree, Ph.D.
Regional Administrator

DATE: 12/9/04

NATIONAL MARINE SANCTUARIES

GRAY'S REEF

10 Ocean Science Circle
Savannah, GA
31411
USA